School of Engineering & Technology, Vikram University Ujjain

Bachelor of Technology

School Of Engineering & Technology ,Vikram University, Ujjain

Scheme of Examination

Bachelor of Engineering B.E. (Common to all Disciplines)

For the candidates admitted in session July 2011-2012 and onward

I-Semester Set-A: Applicable to Branches : EC & EE

Subject wise distribution of marks and corresponding credits

S.No.	Subject Code	Subject Name & Title	Maximum Marks Allotted						Credits Allotted Subject wise			Total Credits	Remark
			Theory Slot			Practical Slot							
			End Sem.	Mid Sem. MST (Two tests average)	Quiz, Assig-nment	End Sem	Term work: Lab work & sessional	Term work: Assignment / quiz	L	T	P		
1	BE-101	Engineering Chemistry	70	20	10	30	10	10	3	1	2	06	one hour teaching in theory, Tutorial and in practical. :32 hour workload per week corresponding to LTP
2	BE-102	Engineering Mathematics -I	70	20	10				3	1		04	
3	BE-103	Communication Skills	70	20	10	30	10	10	3	1	2	06	
4	BE-104	Basic Electricals & Electronics Engg.	70	20	10	30	10	10	3	1	2	06	
5	BE-105	Engineering Graphics	70	20	10	30	10	10	3	1	2	06	
6	BE-106	Work Shop Practice	-	-	-	30	10	10	-	-	2	02	Total Mark
		Total	350	100	50	150	50	50	15	05	10	30	750

MST: Mid Semester Tests Taken at Least twice Per Semester

L: Lecture - T: Tutorial - P: Practical

9.9.21

School Of Engineering & Technology ,Vikram University, Ujjain

Scheme of Examination

Bachelor of Engineering B.E. (Common to all Disciplines)

For the candidates admitted in session July 2011-2012 and onward

II-Semester Set-B: Applicable to Branches : EC & EE,

Subject wise distribution of marks and corresponding credits

S.No.	Subject Code	Subject Name & Title	Maximum Marks Allotted						Credits Allotted Subject wise			Total Credits	Remark
			Theory Slot			Practical Slot							
			End Sem.	Mid Sem. MST (Two tests average)	Quiz, Assign-ment	End Sem.	Term work: Lab work sessional	Term work: Assignment / quiz	L	T	P		
1	BE-201	Engineering Physics	70	20	10	30	10	10	3	1	2	06	one hour teaching in theory, Tutorial and in practical. :32 hour workload per week corresponding to LTP
2	BE-202	Energy, Environment, Ecology & Society	70	20	10				3	1		04	
3	BE-203	Basic Mechanical Engg.	70	20	10	30	10	10	3	1	2	06	
4	BE-204	Basic Civil Engg. & Engg. Mechanics	70	20	10	30	10	10	3	1	2	06	
5	BE-205	Basic Computer Engg.	70	20	10	30	10	10	3	1	2	06	
6	BE-206	Language Lab. & Seminars	-	-	-	30	10	10	-	-	2	02	Total Mark
		Total	350	100	50	150	50	50	15	05	10	30	750

MST: Mid Semester Tests Taken at Least twice Per Semester

L: Lecture - T: Tutorial - P: Practical

9-9-21

School Of Engineering & Technology ,Vikram University, Ujjain

Scheme of Examination

Bachelor of Engineering B.E. (Common to all Disciplines)

For the candidates admitted in session July 2011-2012 and onward

II-Semester Set-A: Applicable to Branches : CE & ME

Subject wise distribution of marks and corresponding credits

S.No.	Subject Code	Subject Name & Title	Maximum Marks Allotted						Credits Allotted Subject wise			Total Credits	Remark
			Theory Slot			Practical Slot							
			End Sem.	Mid Sem. MST (Two tests average)	Quiz, Assig-nment	End Sem	Term work: Lab work & sessional	Term work: Assignment / quiz	L	T	P		
1	BE-101	Engineering Chemistry	70	20	10	30	10	10	3	1	2	06	one hour teaching in theory, Tutorial and in practical. :32 hour workload per week corresponding to LTP
2	BE-102	Engineering Mathematics -I	70	20	10				3	1		04	
3	BE-103	Communication Skills	70	20	10	30	10	10	3	1	2	06	
4	BE-104	Basic Electricals & Electronics Engg.	70	20	10	30	10	10	3	1	2	06	
5	BE-105	Engineering Graphics	70	20	10	30	10	10	3	1	2	06	
6	BE-106	Work Shop Practice	-	-	-	30	10	10	-	-	2	02	Total Mark
		Total	350	100	50	150	50	50	15	05	10	30	750

MST: Mid Semester Tests Taken at Least twice Per Semester

L: Lecture - T: Tutorial - P: Practical

9.9.21

School Of Engineering & Technology ,Vikram University, Ujjain

Scheme of Examination

Bachelor of Engineering B.E. (Common to all Disciplines)

For the candidates admitted in session July 2011-2012 and onward

I Semester Set-B: Applicable to Branches : CE & ME

Subject wise distribution of marks and corresponding credits

S.No.	Subject Code	Subject Name & Title	Maximum Marks Allotted						Credits Allotted Subject wise			Total Credits	Remark
			Theory Slot			Practical Slot							
			End Sem.	Mid Sem. MST (Two tests average)	Quiz, Assign-ment	End Sem.	Term work: Lab work sessional	Term work: Assignment / quiz	L	T	P		
1	BE-201	Engineering Physics	70	20	10	30	10	10	3	1	2	06	one hour teaching in theory, 1 tutorial and in practical. :32 hour workload per week corresponding to LTP
2	BE-202	Energy, Environment, Ecology & Society	70	20	10				3	1		04	
3	BE-203	Basic Mechanical Engg.	70	20	10	30	10	10	3	1	2	06	
4	BE-204	Basic Civil Engg. & Engg. Mechanics	70	20	10	30	10	10	3	1	2	06	
5	BE-205	Basic Computer Engg.	70	20	10	30	10	10	3	1	2	06	
6	BE-206	Language Lab. & Seminars	-	-	-	30	10	10	-	-	2	02	Total Mark
		Total	350	100	50	150	50	50	15	05	10	30	750

MST: Mid Semester Tests Taken at Least twice Per Semester

L: Lecture - T: Tutorial - P: Practical

9.9.21

School of Engineering and Technology

Branch Mechanical Engineering

Subject wise distribution of marks and corresponding credits

Semester III

S. No.	Subject Code	Subject Name & Title	Maximum Marks Allotted							Credits Allotted Subject wise			Total Credits	Remark
			Theory Slot			Practical Slot			Total Marks	Period per week				
			End Sem.	Mid Sem. MST (Two tests average)	Quiz, Assig-nment	End Sem	Term work: Lab work & sessional	Term work: Assignment/ quiz		L	T	P		
1	BE-301	Mathematics -II	70	20	10	-	-	-	100	3	1	-	04	
2	AU/IP/ME -302	Production Process	70	20	10	-	-	-	100	3	1	-	04	
3	AU/IP/ME -303	Strength & Mechanics of Materials	70	20	10	30	10	10	150	3	1	2	06	
4	AU/IP/ME -304	Thermodynamics	70	20	10	30	10	10	150	3	1	2	06	
5	AU/IP/ME -305	Machine drawing & design	70	20	10	30	10	10	150	3	1	2	06	
6	ME-306	Computer Programming (Java)	-	-	-	30	10	10	50	0	0	2	02	
7	ME-307	Self study (Internal Assesment)	-	-	-	-	-	50	50	0	0	2	02	Grand Total
8.	ME-308	Seminar / Group Discussion (Internal Assessment)	-	-	-	-	-	50	50	0	0	2	02	
		Total	350	100	50	120	40	140	800	15	5	12	32	800

School of Engineering and Technology

B.E. IV Semester (Mechanical Engineering)

Subject wise distribution of marks and corresponding credits

S.No.	Subject Code	Subject Name & Title	Maximum Marks Allotted							Credits Allotted Subject wise			Total Credits	Remark
			Theory Slot			Practical Slot			Total Marks	Period per week				
			End Sem.	Mid Sem. MST (Two tests average)	Quiz, Assig-nment	End Sem	Term work: Lab work & sessional	Term work: Assignment/ quiz		L	T	P		
1	BE-401	Mathematics III	70	20	10	-	-	-	100	3	1	-	04	
2	AU/IP/ME -402	Material Science and Metallurgy	70	20	10	-	-	-	100	3	1	-	04	
3	AU/IP/ME -403	Theory of M/C and Mechanism	70	20	10	30	10	10	150	3	1	2	06	
4	ME -404	Thermal Engg and gas dynamics	70	20	10	30	10	10	150	3	1	2	06	
5	AU/IP/ME -405	Fluid Mechanics	70	20	10	30	10	10	150	3	1	2	06	
6	ME-406	Dot Net	-	-	-	30	10	10	50	0	0	2	02	
7	ME-407	Self study (Internal Assessment)	-	-	-	-	-	50	50	0	0	2	02	Grand Total
8.	ME-408	Seminar / Group Discussion (Internal Assessment)	-	-	-	-	-	50	50	0	0	2	02	
		Total	350	100	50	120	40	140	800	15	5	12	32	800

School of Engineering and Technology

B.E. V Semester (Mechanical Engineering)

Subject wise distribution of marks and corresponding credits

S.No.	Subject Code	Subject Name & Title	Maximum Marks Allotted							Credits Allotted Subject wise			Total Credits	Remark
			Theory Slot			Practical Slot			Total Marks	Period per week				
			End Sem.	Mid Sem. MST (Two tests average)	Quiz, Assig-nment	End Sem	Term work Lab work & sessional	Term work Assignment/ quiz		L	T	P		
1	ME-501	Entrepreneurship and Management Concepts.	70	20	10	-	-	-	100	3	1	-	04	
2	ME-502	Turbo Machinery	70	20	10	-	-	-	100	3	1	-	04	
3	ME-503	Mechanical Measurement & control	70	20	10	30	10	10	150	3	1	2	06	
4	ME-504	Machine Component Design	70	20	10	30	10	10	150	3	1	2	06	
5	ME -505	Dynamics of Machines	70	20	10	30	10	10	150	3	1	2	06	
6	ME-506	RDBMS Lab	-	-	-	30	10	10	50	0	0	2	02	
7	ME-507	Self study (Internal Assessment)	-	-	-	-	-	50	50	0	0	2	02	Grand Total
8.	ME-508	Seminar / Group Discussion (Internal Assessment)	-	-	-	-	-	50	50	0	0	2	02	
		Total	350	100	50	120	40	140	800	15	5	12	32	800

School of Engineering & Technology

B.E. VI Semester (Mechanical Engineering)

Subject wise distribution of marks and corresponding credit

S.No.	Subject Code	Subject Name & Title	Maximum Marks Allotted						
			Theory Slot			Practical Slot			Total Mark
			End Sem.	Mid Sem. MST (Two tests average)	Quiz, Assig-nment	End Sem	Term work: Lab work & sessional	Term work: Assignm ent/ quiz	
1	ME-601	Operations Management	70	20	10	-	-	-	100
2	ME-602	Power Plant Engg	70	20	10	-	-	-	100
3	ME-603	Metal Cutting and CNC machines	70	20	10	30	10	10	150
4	ME-604	IC engines	70	20	10	30	10	10	150
5	ME -605	Heat and Mass Transfer	70	20	10	30	10	10	150
6	ME-606	Computer Aided Engg	-	-	-	30	10	10	50
7	ME-607	Self study (Internal Assessment)	-	-	-	-	-	50	50
8.	ME-608	Seminar / Group Discussion (Internal Assessment)	-	-	-	-	-	50	50
		Total	350	100	50	120	40	140	800

School of Engineering and Technology

B.E. VII Semester (Mechanical Engineering)

Subject wise distribution of marks and corresponding credit

S.No.	Subject Code	Subject Name & Title	Maximum Marks Allotted							Credits Allotted Subject wise			Total Credits	Remark
			Theory Slot			Practical Slot			Total Marks	Period per week				
			End Sem.	Mid Sem. MST (Two tests average)	Quiz, Assig-nment	End Sem	Term work: Lab work & sessional	Term work: Assignment/ quiz		L	T	P		
1	ME-701	Elective -I	70	20	10	-	-	-	100	3	1	-	04	
2	ME-702	Elective -II	70	20	10	-	-	-	100	3	1	-	04	
3	ME-703	Mechanical Vibration & Noise Engineering	70	20	10	30	10	10	150	3	1	2	06	
4	ME-704	Automobile Engg	70	20	10	30	10	10	150	3	1	2	06	
5	ME -705	O R & Supply Chain	70	20	10	30	10	10	150	3	1	2	06	
6	ME-706	Minor Project and seminar	-	-	-	60	20	20	100	0	0	4	04	
7	ME-707	Industrial Training (2 Week)	-	-	-	30	10	10	50	0	0	2	02	Grand Total
		Total	350	100	50	180	60	60	800	15	5	12	32	800

MST: Mid Semester Tests Taken at Least twice Per Semester

L: Lecture - T: Tutorial - P: Practical

ME 701 Elective –I

701(A) Design of Heat Exchanger
701(B) Computer Aided Engineering and FEM
701(C) Industrial Robotics
701(D) Work Study & Ergonomics

ME 702 Elective II

702 (A) Renewable Energy System
702 (B) Project management
702 (C) Total Quality Management and SQC
702 (D) MIS, ERP and e- Business

School of Engineering and Technology

B.E. VIII Semester (Mechanical Engineering)

Subject wise distribution of marks and corresponding credit

S.No.	Subject Code	Subject Name & Title	Maximum Marks Allotted							Credits Allotted Subject wise			Total Credits	Remark
			Theory Slot			Practical Slot			Total Marks	Period per week				
			End Sem.	Mid Sem. MST (Two tests average)	Quiz, Assig-nment	End Sem	Term work: Lab work & sessional	Term work: Assignment/ quiz		L	T	P		
1	Refer Table Below	Elective –III	70	20	10	-	-	-	100	3	1	-	04	
2	ME-802	Machine Design	70	20	10	30	10	10	150	3	1	2	06	
3	ME-803	Refrigeration & Air Conditioning	70	20	10	30	10	10	150	3	1	2	06	
4	ME-804	CAD/CAM/CIM	70	20	10	30	10	10	150	3	1	2	06	
	ME -805	Major Project	-	-	-	120	40	40	200	-	-	8	08	
6	ME-806	Seminar and Group Discussion (Only Internal Assessment)	-	-	-	-	-	50	50	0	0	2	02	
		Total	280	80	40	210	70	120	800	12	4	16	32	800

L: Lecture - T: Tutorial - P: Practical

MST: Mid Semester Tests Taken at Least twice Per Semester

ME 801 Elective –III

801(A) Energy Management & Audit.
801 (B) Tools Design and Machine Tools
801(C) Reliability & Maintenance
801(D) Simulation & Process Modeling.

School of Engineering and Technology

VikramUniversity,Ujjain

B.E. III Semester (Civil Engineering)

Subject wise distribution of marks and corresponding credits

S.No.	Subject Code	Subject Name & Title	Maximum Marks Allotted							Credits Allotted Subject wise			Total Credits	Remark
			Theory Slot			Practical Slot			Total Marks	Period per week				
			End Sem.	Mid Sem. MST (Two tests average)	Quiz, Assig-nment	End Sem	Term work: Lab work & sessional	Term work: Assignment/ quiz		L	T	P		
1	BE-301	Mathematics -II	70	20	10	-	-	-	100	3	1	-	04	
2	CE-302	Transportation Bridges and Tunnels	70	20	10	-	-	-	100	3	1	-	04	
3	CE/FT-303	Strength of Materials	70	20	10	30	10	10	150	3	1	2	06	
4	CE-304	Engineering Geology	70	20	10	30	10	10	150	3	1	2	06	
5	CE/FT-305	Bldg. Design & Drawing	70	20	10	30	10	10	150	3	1	2	06	
6	CE-306	Computer Programming	-	-	-	30	10	10	50	0	0	2	02	
7	CE-307	Self study / Practical of Basic civil (Internal Evaluation)	-	-	-	-	-	50	50	0	0	2	02	Grand Total
8.	CE-308	Seminar / Discussion (Internal Evaluation) etc.	-	-	-	-	-	50	50	0	0	2	02	
		Total	350	100	50	120	40	140	800	15	5	12	32	800

MST: Mid Semester Tests Taken at Least twice Per Semester

L: Lecture - T: Tutorial - P: Practical

School of Engineering and Technology,
Vikram University, Ujjain
B.E. IV Semester (Civil Engg.)

Subject wise distribution of marks and corresponding credits

S.No.	Subject Code	Subject Name & Title	Maximum Marks Allotted							Credits Allotted Subject wise			Total Credits	Remark
			Theory Slot			Practical Slot			Total Marks	Period per week				
			End Sem.	Mid Sem. MST (Two tests average)	Quiz, Assig-nment	End Sem	Term work Lab work & sessional	Term work Assignment/ quiz		L	T	P		
1	BE-401	Mathematics III	70	20	10	-	-	-	100	3	1	-	04	
2	CE-402	Concrete Technology	70	20	10	-	-	-	100	3	1	-	04	
3	CE-403	Surveying	70	20	10	30	10	10	150	3	1	2	06	
4	CE-404	Construction Materials & Techniques	70	20	10	30	10	10	150	3	1	2	06	
5	CE-405	Fluid Mechanics	70	20	10	30	10	10	150	3	1	2	06	
6	IT-406	Computer Programming -II	-	-	-	30	10	10	50	0	0	2	02	
7	CE-407	Self study (Internal Assessment)	-	-	-	-	-	50	50	0	0	2	02	Grand Total
8.	CE-408	Seminar / Group Discussion (Internal Assessment)	-	-	-	-	-	50	50	0	0	2	02	
		Total	350	100	50	120	40	140	800	15	5	12	32	800

MST: Mid Semester Tests Taken at Least twice Per Semester

L: Lecture - T: Tutorial - P: Practical

School of Engineering and Technology

B.E. V Semester (Civil Engg.)

Subject wise distribution of marks and corresponding credits

S.No.	Subject Code	Subject Name & Title	Maximum Marks Allotted							Credits Allotted Subject wise			Total Credits	Remark
			Theory Slot			Practical Slot			Total Marks	Period per week				
			End Sem.	Mid Sem. MST (Two tests average)	Quiz, Assig-nment	End Sem	Term work Lab work & sessional	Term work Assignm ent/ quiz		L	T	P		
1	CE-501	Transportation Engineering	70	20	10	30	10	10	150	3	1	2	06	
2	CE-502	Advanced Surveying	70	20	10	30	10	10	150	3	1	2	06	
3	CE-503	Fluid Mech. - II	70	20	10	30	10	10	150	3	1	2	06	
4	CE-504	Structural Design & Drawing – I (RCC)	70	20	10	30	10	10	150	3	1	2	06	
5	CE-505	Theory of Structures -I	70	20	10	-	-	-	100	3	1	-	04	
6	CE-507	**Self study (Internal Assessment)**	-	-	-	-	-	50	50	0	0	2	02	Grand Total
7.	CE-508	**Seminar / Group Discussion (Internal Assessment)**	-	-	-	-	-	50	50	0	0	2	02	
		Total	350	100	50	120	40	140	800	15	5	12	32	800

School of Engineering & Technology Vikram University Ujjain
B.E. VI Semester (Civil Engg.)
Subject wise distribution of marks and corresponding credit

S.No.	Subject Code	Subject Name & Title	Maximum Marks Allotted						
			Theory Slot			Practical Slot			Total Mark
			End Sem.	Mid Sem. MST (Two tests average)	Quiz, Assignment	End Sem	Term work: Lab work & sessional	Term work: Assignment/ quiz	
1	**CE-601**	Theory of Structures-II	70	20	10	30	10	10	150
2	**CE-602**	Water Resources & Irrigation Engineering	70	20	10	-	-	-	100
3	**CE-603**	Environmental Engg. - I	70	20	10	30	10	10	150
4	**CE-604**	Geo Tech Engg I	70	20	10	30	10	10	150
5	**CE-605**	Structural Design & Drawing – II	70	20	10	30	10	10	150
6	**CE-606**	**Self study (Internal Assessment)**	-	-	-	-	-	50	50
7.	**CE-607**	**Seminar / Group Discussion (Internal Assessment)**	-	-	-	-	-	50	50
		Total	350	100	50	120	40	140	800

School of Engineering and Technology
Vikram University, Ujjain
B.E. VII Semester (Civil Engg.)

Subject wise distribution of marks and corresponding credit

S.No.	Subject Code	Subject Name & Title	Maximum Marks Allotted: Theory Slot: End Sem.	Theory Slot: Mid Sem. MST (Two tests average)	Theory Slot: Quiz, Assignment	Practical Slot: End Sem	Practical Slot: Term work: Lab work & sessional	Practical Slot: Term work: Assignment/ quiz	Total Marks	Credits Allotted Subject wise: Period per week: L	T	P	Total Credits	Remark
1	CE-701	Design of Hydraulic Structure	70	20	10	-	-	-	100	3	1	-	04	
2	CE-702	Advanced Structural Design – II (R.C.C.)	70	20	10	30	10	10	150	3	1	2	06	
3	CE-703	Environmental Engg. - II	70	20	10	30	10	10	150	3	1	2	06	
4	CE-704	Quantity Surveying & Costing	70	20	10	30	10	10	150	3	1	2	06	
5	CE-705	Elective -I	70	20	10	-	-	-	100	3	1	-	04	
6	CE-706	Minor Project	-	-	-	60	20	20	100	0	0	4	04	Grand Total
7.	CE-707	Tour /Training (2Week) (Internal Assessment)	-	-	-	30	10	10	50	0	0	2	02	
		Total	350	100	50	180	60	60	800	15	5	12	32	800

L: Lecture - T: Tutorial - P: Practical

MST: Mid Semester Tests Taken at Least twice Per Semester

Elective –I

CE -7101 COMPUTATIONAL METHODS IN STRUCTURAL ENGINEERING

CE -7102 TRAFFIC ENGINEERING

CE- 7103 INDUSTRIAL WASTE TREATMENT

CE-7104 COST EFFECTIVE & ECO-FRIENDLYCONSTRUCTION

CE-7105 ENVIRONMENTAL IMPACT ASSESSMENT

School of Engineering and Technology
Vikram University, Ujjain
B.E. VIII Semester (Civil Engg.)

Subject wise distribution of marks and corresponding credit

S.No.	Subject Code	Subject Name & Title	Maximum Marks Allotted: Theory Slot: End Sem.	Theory Slot: Mid Sem. MST (Two tests average)	Theory Slot: Quiz, Assig-nment	Practical Slot: End Sem	Practical Slot: Term work: Lab work & sessional	Practical Slot: Term work: Assignm ent/ quiz	Total Marks	Credits Allotted Subject wise: Period per week: L	T	P	Total Credits	Remark
1	CE-801	Geo. Technical Engg.II	70	20	10	30	10	10	150	3	1	2	06	
2	CE-802	Construction Planning & Management	70	20	10	-	-	-	100	3	1	-	04	
3	CE-803	Advanced Structural Design II (Steel)	70	20	10	30	10	10	150	3	1	2	06	
4	Refer Table Below	Elective -II	70	20	10	-	-	-	100	3	1	-	04	
5	CE-805	Major Project	-	-	-	100	100	50	250	-	-	10	10	
6	CE-806	Seminar and Group Discussion	-	-	-	-	-	50	50	-	-	2	02	Grand Total
		Total	280	80	40	160	120	120	800	12	4	16	32	800

MST: Mid Semester Tests Taken at Least twice Per Semester

L: Lecture - T: Tutorial - P: Practical

Elective –II

CE -8041 Structural Dynamics & Earthquake Engineering
CE -8042 Pavement Design
CE- 8043 Air Quality Monitoring & Control
CE-8044 Energy Efficient & Green Building
CE-8045 Design of Prestrassed Conc. Structure
CE-8046 Water Power Engineering
CE-8047 Advance Water Resources Engg.

School of Engineering and Technology

Vikram University, Ujjain

Semester III

Branch Electrical Engineering

Subject wise distribution of marks and corresponding credits

o.	Subject Code	Subject Name & Title	Maximum Marks Allotted							Credits Allotted Subject wise			Total Credits	Remark
			Theory Slot			Practical Slot			Total Marks	Period per week				
			End Sem.	Mid Sem. MST (Two tests average)	Quiz, Assig-nment	End Sem	Term work: Lab work & sessional	Term work: Assignment/ quiz		L	T	P		
1	BE-301	Mathematics -II	70	20	10	-	-	-	100	3	1	-	04	
2	EE-302	Electrical Engg. Materials	70	20	10	-	-	-	100	3	1	-	04	
3	EE -303	Electrical Instrumentation	70	20	10	30	10	10	150	3	1	2	06	
4	EE -304	Semiconductor Devices and circuits	70	20	10	30	10	10	150	3	1	2	06	
5	EE -305	Network Analysis	70	20	10	30	10	10	150	3	1	2	06	
6	EE -306	Java Programming	-	-	-	30	10	10	50	0	0	2	02	
7	EE -307	Self Study (Internal Assessment)	-	-	-	-	-	50	50	0	0	2	02	Grand Total
8.	EE -308	Seminar / Group Discussion (Internal Assessment)	-	-	-	-	-	50	50	0	0	2	02	
		Total	350	100	50	120	40	140	800	15	5	12	32	800

School of Engineering and Technology
Vikram University, Ujjain
B.E. IV Semester (Electrical Engineering)
Subject wise distribution of marks and corresponding credits

S.No.	Subject Code	Subject Name & Title	Maximum Marks Allotted							Credits Allotted Subject wise			Total Credits	Remark
			Theory Slot			Practical Slot			Total Marks	Period per week				
			End Sem.	Mid Sem. MST (Two tests average)	Quiz, Assig-nment	End Sem	Term work: Lab work & sessional	Term work: Assignment/ quiz		L	T	P		
1	BE-401	Mathematics III	70	20	10	-	-	-	100	3	1	-	04	
2	EE-402	Electromagnetic Theory	70	20	10	-	-	-	100	3	1	-	04	
3	EE -403	Power System	70	20	10	30	10	10	150	3	1	2	06	
4	EE -404	Electric M/C -1	70	20	10	30	10	10	150	3	1	2	06	
5	EE -405	A D Communication	70	20	10	30	10	10	150	3	1	2	06	
6	EE -406	Dot Net	-	-	-	30	10	10	50	0	0	2	02	
7	EE -407	Self study (Internal Assessment)	-	-	-	-	-	50	50	0	0	2	02	Grand Total
8.	EE -408	Seminar / Group Discussion (Internal Assessment)	-	-	-	-	-	50	50	0	0	2	02	
		Total	350	100	50	120	40	140	800	15	5	12	32	800

School of Engineering and Technology

Vikram University, Ujjain

B.E. V Semester (Electrical Engineering)

Subject wise distribution of marks and corresponding credits

S.No.	Subject Code	Subject Name & Title	Maximum Marks Allotted							Credits Allotted Subject wise			Total Credits	Remark
			Theory Slot			Practical Slot			Total Marks	Period per week				
			End Sem.	Mid Sem. MST (Two tests average)	Quiz, Assig-nment	End Sem	Term work: Lab work & sessional	Term work: Assignment/ quiz		L	T	P		
1	EE -501	Electrical Machine-II	70	20	10	30	10	10	150	3	1	2	06	
2	EE-502	Electronic Instrumentation	70	20	10	30	10	10	150	3	1	2	06	
3	EE -503	Signals & Systems	70	20	10	-	-	-	100	3	1	-	04	
4	EE -504	Digital Electronics & Logic Design	70	20	10	30	10	10	150	3	1	2	06	
5	EE -505	Principles of Management and Managerial Economics	70	20	10	-	-	-	100	3	1	-	04	
6	EE -506	Electrical Engg. Simulation Lab	-	-	-	30	10	10	50	0	0	2	02	
7	EE -507	Self study (Internal Assessment)	-	-	-	-	-	50	50	0	0	2	02	Grand Total
8.	EE -508	Seminar / Group Discussion (Internal Assessment)	-	-	-	-	-	50	50	0	0	2	02	
		Total	350	100	50	120	40	140	800	15	5	12	32	800

School of Engineering and Technology

Vikram University, Ujjain

B.E. VI Semester (Electrical Engineering)

Subject wise distribution of marks and corresponding credits

S. No.	Subject Code	Subject Name & Title	Maximum Marks Allotted							Credits Allotted Subject wise			Total Credits	Remark
			Theory Slot			Practical Slot			Total Marks	Period per week				
							Term work							
			End Sem.	Mid Sem. MST (Two tests average)	Quiz, Assig-nment	End Sem	Lab work & sessional	Assignment/ quiz		L	T	P		
1	EE -601	Microprocessor & Microcontrollers	70	20	10	30	10	10	150	3	1	2	06	
2	EE-602	Electrical Power Generation	70	20	10	-	-	-	100	3	1	-	04	
3	EE -603	Electrical Machine Design	70	20	10	-	-	-	100	3	1	-	04	
4	EE -604	Power Electronics	70	20	10	30	10	10	150	3	1	2	06	
5	EE -605	Energy Conservation & Management	70	20	10	-	-	-	100	3	1	-	04	
6	EE -606	Minor Project	-	-	-	60	20	20	100	0	0	4	04	
7	EE -607	Electrical Machine Design (CAD)	-	-	-	30	10	10	50	0	0	2	02	Grand Total
8.	EE -608	Self Study / Seminar	-	-	-	-	-	50	50	0	0	2	02	
		Total	350	100	50	150	50	100	800	15	5	12	32	800

School of Engineering and Technology
Vikram University, Ujjain
B.E. VII Semester (Electrical Engineering)
Subject wise distribution of marks and corresponding credits

S.No.	Subject Code	Subject Name & Title	Maximum Marks Allotted: Theory Slot: End Sem.	Theory Slot: Mid Sem. MST (Two tests average)	Theory Slot: Quiz, Assignment	Practical Slot: End Sem	Practical Slot: Term work: Lab work & sessional	Practical Slot: Term work: Assignment/ quiz	Total Marks	Credits Allotted Subject wise: Period per week: L	T	P	Total Credits	Remark
1	EE -701	Power System Analysis & Control	70	20	10	30	10	10	150	3	1	2	06	
2	EE-702	Utilization of Electrical Energy	70	20	10	-	-	-	100	3	1	-	04	
3	EE -703	Electrical Drives	70	20	10	30	10	10	150	3	1	2	06	
4	Refer Table Below	Elective-I	70	20	10	-	-	-	100	3	1	-	04	
5	Refer Table Below	Elective-II	70	20	10	-	-	-	100	3	1	-	04	
6	EE -704	Major Project -I (Planning &Literature Survey)	-	-	-	60	20	20	100	0	0	4	04	
7	EE -705	Industrial Training (2 Week)	-	-	-	30	10	10	50	0	0	2	02	Grand Total
8.	EE -706	Self Study / Seminar	-	-	-	-	-	50	50	0	0	2	02	
		Total	350	100	50	150	50	100	800	15	5	12	32	800

L: Lecture - T: Tutorial - P: Practical

MST: Mid Semester Tests Taken at Least twice Per Semester

Elective –I

EE- 7101 Computer Aided Design of Electrical Machines

EE- 7102 Soft Computing Techniques & Applications

EE- 7103 SCADA Systems & Application

Elective –II

EE-7201 High Voltage Engg.

EE-7202 Calibration and Testing of Electrical Equipments

EE-7203 Generalised Theory of Electrical Machines

School of Engineering and Technology
Vikram University, Ujjain
B.E.VIII Semester(Electrical Engg)
Subject wise distribution of marks and corresponding credits

S.No.	Subject Code	Subject Name & Title	Maximum Marks Allotted							Credits Allotted Subject wise			Total Credits	Remark
			Theory Slot			Practical Slot			Total Marks	Period per week				
			End Sem.	Mid Sem. MST (Two tests average)	Quiz, Assig-nment	End Sem	Term work: Lab work & sessional	Term work: Assignment/ quiz		L	T	P		
1	EE -801	Control System	70	20	10	30	10	10	150	3	1	2	6	
2	EE -802	Power System Protection	70	20	10	30	10	10	150	3	1	2	6	
3	Refer Table below	Elective –III	70	20	10	-	-	-	100	3	1	-	4	
4	Refer Table below	Elective -IV	70	20	10	-	-	-	100	3	1	-	4	
5	EE -803	Major Project	-	-	-	120	80	-	200	-	-	8	8	
6	EE -804	Modeling & Simulation Lab	-	-	-	30	10	10	50	-	-	2	2	
7	EE -805	Self study & Seminar	-	-	-	-	-	50	50	-	-	2	2	Grand Total
		Total	280	80	40	210	110	80	800	12	4	16	32	800

MST: Mid Semester Tests Taken at Least twice Per Semester

L: Lecture - T: Tutorial - P: Practical

		ELECTIVE-III			
EE-8301	Advanced Electrical drives	EE-8302	Process Control	EE-8303	Computer Application to Power Systems
		ELECTIVE-IV			
EE-8401	Renewable & Non Conventional Energy Systems	EE-8402	Power System Planning & reliability	EE-8403	EHVAC and DC Transmission

School Of Engineering & Technology

Vikram university Ujjain

Semester III Branch- Electronics Engineering **(Grading System)**

Subject wise distribution of marks and corresponding credits

S.No.	Subject Code	Subject Name & Title	Maximum Marks Allotted							Credits Allotted Subject wise			Total Credits	Remark
			Theory Slot			Practical Slot			Total Marks	Period per week				
			End Sem.	Mid Sem. MST (Two tests average)	Quiz, Assig-nment	End Sem	Term work: Lab work & sessional	Term work: Assignment/ quiz		L	T	P		
1	BE-301	**Mathematics -II**	70	20	10	-	-	-	100	3	1	-	04	
2	EC-302	**Computer System Organization**	70	20	10	-	-	-	100	3	1	-	04	
3	EC-303	**Electronic Instrumentation**	70	20	10	30	10	10	150	3	1	2	06	
4	EC-304	**Electronic Devices**	70	20	10	30	10	10	150	3	1	2	06	
5	EC-305	**Network Analysis**	70	20	10	30	10	10	150	3	1	2	06	
6	EC-306	**Software Lab-I**	-	-	-	30	10	10	50	0	0	2	02	
7	EC-307	**Self Study (Internal Assessment)**	-	-	-	-	-	50	50	0	0	2	02	Grand Total
8.	EC-308	**Seminar / Group Discussion (Internal Assessment)**	-	-	-	-	-	50	50	0	0	2	02	
		Total	350	100	50	120	40	140	800	15	5	12	32	800

School Of Engineering & Technology
Vikram University ,Ujjain

B.E. IV Semester

Electronics Engineering

Subject wise distribution of marks and corresponding credits

S.No.	Subject Code	Subject Name & Title	Maximum Marks Allotted							Credits Allotted Subject wise			Total Credits	Remark
			Theory Slot			Practical Slot			Total Marks	Period per week				
			End Sem.	Mid Sem. MST (Two tests average)	Quiz, Assig-nment	End Sem	Term work Lab work & sessional	Term work Assignment/ quiz		L	T	P		
1	BE-401	Mathematics III	70	20	10	-	-	-	100	3	1	-	04	
2	EC-402	Electromagnetic Theory	70	20	10	-	-	-	100	3	1	-	04	
3	EC-403	Digital Electronics	70	20	10	30	10	10	150	3	1	2	06	
4	EC-404	Electronic Circuits	70	20	10	30	10	10	150	3	1	2	06	
5	EC-405	Analog Communication	70	20	10	30	10	10	150	3	1	2	06	
6	EC-406	Software Lab-II	-	-	-	30	10	10	50	0	0	2	02	
7	EC-407	Self study (Internal Assessment)	-	-	-	-	-	50	50	0	0	2	02	Grand Total
8.	EC-408	Seminar / Group Discussion (Internal Assessment)	-	-	-	-	-	50	50	0	0	2	02	
		Total	350	100	50	120	40	140	800	15	5	12	32	800

School Of Engineering & Technology, Vikram University, Ujjain
Electronics Engg. -V Semester

S.No.	Subject Code	Subject Name & Title	Maximum Marks Allotted							Credits Allotted Subject wise			Total Credits	Remark
			Theory Slot			Practical Slot			Total Marks	Period per week				
			End Sem.	Mid Sem. MST (Two tests average)	Quiz, Assig- nment	End Sem	Term work: Lab work & sessional	Term work: Assignm ent/ quiz		L	T	P		
1	EC-501	Voice & Data Communication	70	20	10	-	-	-	100	3		-	04	
2	EC.-502	Control Systems	70	20	10	-	-	-	100	3		-	04	
3	EC-503	Digital Communication	70	20	10	30	10	10	150	3		2	06	
4	EC-504	Microprocessors & Microcontrollers	70	20	10	30	10	10	150	3		2	06	
5	EC-505	Communication Network and Transmission Lines	70	20	10	30	10	10	150	3		2	06	
6	EC-506	Software Lab - III				30	10	10	50	-	-	2	02	
7	EC-507	Self study (Internal Assessment)						50	50			2	02	Grand Total
8.	EC-508	Seminar / Group Discussion/	-	-	-	-	-	50	50	-	-	2	02	
		Total	350	100	50	120	40	140	800	15	5	12	32	800

MST: Mid Semester Tests Taken at Least twice Per Semester   L: Lecture - T: Tutorial - P: Practical

School Of Engineering & Technology
Vikram University ,Ujjain

B.E. VI Semester (Electronics Engineering)

Subject wise distribution of marks and corresponding credits

S.	Subject Code	Subject Name & Title	Maximum Marks Allotted							Credits Allotted Subject wise			Total Credits	Remark
			Theory Slot			Practical Slot			Total Marks	Period per week				
			End Sem.	Mid Sem. MST (Two tests average)	Quiz, Assig-nment	End Sem	Term work: Lab work & sessional	Term work: Assignment/ quiz		L	T	P		
1	EC-601	Industrial Electronics	70	20	10	-	-	-	100	3	1	-	04	
2	EC -602	Cellular Mobile Communication	70	20	10	-	-	-	100	3	1	-	04	
3	EC-603	Digital Signal Processing	70	20	10	30	10	10	150	3	1	2	06	
4	EC-604	Antenna & Wave Propagation	70	20	10	30	10	10	150	3	1	2	06	
5	EC-605	VLSI Circuits & Systems	70	20	10	30	10	10	150	3	1	2	06	
6	EC-606	Software Lab - IV	-	-	-	30	10	10	50	0	0	2	02	
7	EC-607	Self study (Internal Assessment)	-	-	-	-	-	50	50	0	0	2	02	Grand Total
8.	EC-608	Seminar / Group Discussion/	-	-	-	-	-	50	50	0	0	2	02	
		Total	350	100	50	120	40	140	800	15	5	12	32	800

School Of Engineering & Technology

B.E. VII Semester (Electronics Engineering)

Subject wise distribution of marks and corresponding credits **(Grading System)**

S.No.	Subject Code	Subject Name & Title	Maximum Marks Allotted							Credits Allotted Subject wise			Total Credits	Remark
			Theory Slot			Practical Slot			Total Marks	Period per week				
			End Sem.	Mid Sem. MST (Two tests average)	Quiz, Assig-nment	End Sem	Term work: Lab work & sessional	Term work: Assignment/ quiz		L	T	P		
1	EC-701	**Elective -I**	70	20	10	-	-	-	100	3	1	-	04	
2	EC -702	**Satellite Communication**	70	20	10	-	-	-	100	3	1	-	04	
3	EC-703	**Optical Communication**	70	20	10	30	10	10	150	3	1	2	06	
4	EC-704	**Microwave Engg.**	70	20	10	30	10	10	150	3	1	2	06	
5	EC-705	**VLSI Design**	70	20	10	30	10	10	150	3	1	2	06	
6	EC-706	**Minor Project & Seminar**	-	-	-	60	20	20	100	0	0	4	04	
7	EC-707	**Industrial Training (Two Week)**	-	-	-	30	10	10	50	0	0	2	02	Grand Total
		Total	350	100	50	180	60	60	800	15	5	12	32	800

MST: Mid Semester Tests Taken at Least twice Per Semester

L: Lecture - T: Tutorial - P: Practical

Elective I

EC-7011 Wireless Communication

EC-7012 Digital Image Processing EC-7013 Neural Networks

School Of Engineering & Technology
Vikram university Ujjain
B.E. VIII Semester (Electronics Engineering)
Subject wise distribution of marks and corresponding credits **(Grading System)**

S.No.	Subject Code	Subject Name & Title	Maximum Marks Allotted							Credits Allotted Subject wise			Total Credits	Remark
			Theory Slot			Practical Slot			Total Marks	Period per week				
			End Sem.	Mid Sem. MST (Two tests average)	Quiz, Assig-nment	End Sem	Term work Lab work & sessional	Term work Assignment/ quiz		L	T	P		
1	Refer Table Below	Elective -II	70	20	10	-	-	-	100	3	1	-	04	
2	EC -802	Advanced Communication System	70	20	10	-	-	-	100	3	1	-	04	
3	EC-803	Computer Networks	70	20	10	30	10	10	150	3	1	2	06	
	EC-804	TV & Radar Engg.	70	20	10	30	10	10	150	3	1	2	06	
5	EC-805	Major Project	-	-	-	100	100	50	250	0	0	10	10	
6	EC-806	Seminar & Group Discussion	-	-	-	-	-	50	50	0	0	2	02	Grand Total
		Total	280	80	40	160	120	120	800	12	4	16	32	800

MST: Mid Semester Tests Taken at Least twice Per Semester

L: Lecture - T: Tutorial - P: Practical

School Of Engineering & Technology

Vikram university Ujjain

Semester III Branch- Electronics & Communication Engineering **(Grading System)**

Subject wise distribution of marks and corresponding credits

S.No.	Subject Code	Subject Name & Title	Maximum Marks Allotted							Credits Allotted Subject wise			Total Credits	Remark
			Theory Slot			Practical Slot			Total Marks	Period per week				
			End Sem.	Mid Sem. MST (Two tests average)	Quiz, Assig-nment	End Sem	Term work: Lab work & sessional	Term work: Assignment/ quiz		L	T	P		
1	BE-301	**Mathematics -II**	70	20	10	-	-	-	100	3	1	-	04	
2	EC-302	**Computer Organization & Architecture**	70	20	10	-	-	-	100	3	1	-	04	
3	EC-303	**Electronic Instrumentation**	70	20	10	30	10	10	150	3	1	2	06	
4	EC-304	**Electronic Devices & Circuits**	70	20	10	30	10	10	150	3	1	2	06	
5	EC-305	**Network Analysis**	70	20	10	30	10	10	150	3	1	2	06	
6	EC-306	Software Lab-I	-	-	-	30	10	10	50	0	0	2	02	
7	EC-307	Self Study (Internal Assessment)	-	-	-	-	-	50	50	0	0	2	02	Grand Total
8.	EC-308	Seminar / Group Discussion (Internal Assessment)	-	-	-	-	-	50	50	0	0	2	02	
		Total	350	100	50	120	40	140	800	15	5	12	32	800

School Of Engineering & Technology

Vikram University ,Ujjain

B.E. IV Semester

Electronics & Communication Engineering) **Grading System**

Subject wise distribution of marks and corresponding credits

S.No.	Subject Code	Subject Name & Title	Maximum Marks Allotted							Credits Allotted Subject wise			Total Credits	Remark
			Theory Slot			Practical Slot			Total Marks	Period per week				
			End Sem.	Mid Sem. MST (Two tests average)	Quiz, Assig-nment	End Sem	Term work: Lab work & sessional	Term work: Assignment/ quiz		L	T	P		
1	BE-401	Mathematics III	70	20	10	-	-	-	100	3	1	-	04	
2	EC-402	Electromagnetic Theory	70	20	10	-	-	-	100	3	1	-	04	
3	EC-403	Digital Electronics	70	20	10	30	10	10	150	3	1	2	06	
4	EC-404	Linear Integrated Circuits	70	20	10	30	10	10	150	3	1	2	06	
5	EC-405	Analog Communication	70	20	10	30	10	10	150	3	1	2	06	
6	EC-406	Software Lab-II	-	-	-	30	10	10	50	0	0	2	02	
7	EC-407	Self study (Internal Assessment)	-	-	-	-	-	50	50	0	0	2	02	Grand Total
8.	EC-408	Seminar / Group Discussion (Internal Assessment)	-	-	-	-	-	50	50	0	0	2	02	
		Total	350	100	50	120	40	140	800	15	5	12	32	800

School Of Engineering & Technology, Vikram University, Ujjain
V Semester (Grading System)

S.No.	Subject Code	Subject Name & Title	Maximum Marks Allotted							Credits Allotted Subject wise			Total Credits	Remark
			Theory Slot			Practical Slot			Total Marks	Period per week				
			End Sem.	Mid Sem. MST (Two tests average)	Quiz, Assig-nment	End Sem	Term work: Lab work & sessional	Term work: Assignm ent/ quiz		L	T	P		
1	EC-501	Voice & Data Communication	70	20	10	-	-	-	100	3		-	04	
2	EC.-502	Control Systems	70	20	10	-	-	-	100	3		-	04	
3	EC-503	Digital Communication	70	20	10	30	10	10	150	3		2	06	
4	EC-504	Microprocessors & Microcontrollers	70	20	10	30	10	10	150	3		2	06	
5	EC-505	Communication Network and Transmission Lines	70	20	10	30	10	10	150	3		2	06	
6	EC-506	Software Lab - III				30	10	10	50	-	-	2	02	
7	EC-507	Self study (Internal Assessment)						50	50			2	02	Grand Total
8.	EC-508	Seminar / Group Discussion/	-	-	-	-	-	50	50	-	-	2	02	
		Total	350	100	50	120	40	140	800	15	5	12	32	800

MST: Mid Semester Tests Taken at Least twice Per Semester **L: Lecture - T: Tutorial - P: Practical**

School Of Engineering & Technology

Vikram University ,Ujjain

B.E. VI Semester (Electronics & Communication Engineering)

Subject wise distribution of marks and corresponding credits **(Grading System)**

S.No.	Subject Code	Subject Name & Title	Maximum Marks Allotted							Credits Allotted Subject wise			Total Credits	Remark
			Theory Slot			Practical Slot			Total Marks	Period per week				
			End Sem.	Mid Sem. MST (Two tests average)	Quiz, Assig-nment	End Sem	Term work Lab work & sessional	Term work Assignment/ quiz		L	T	P		
1	EC-601	Industrial Electronics	70	20	10	-	-	-	100	3	1	-	04	
2	EC -602	Cellular Mobile Communication	70	20	10	-	-	-	100	3	1	-	04	
3	ECI-603	Digital Signal Processing	70	20	10	30	10	10	150	3	1	2	06	
4	EC-604	Antenna & Wave Propagation	70	20	10	30	10	10	150	3	1	2	06	
5	EC-605	VLSI Circuits & Systems	70	20	10	30	10	10	150	3	1	2	06	
6	EC-606	Software Lab - IV	-	-	-	30	10	10	50	0	0	2	02	
7	EC-607	Self study (Internal Assessment)	-	-	-	-	-	50	50	0	0	2	02	Grand Total
8.	EC-608	Seminar / Group Discussion/	-	-	-	-	-	50	50	0	0	2	02	
		Total	350	100	50	120	40	140	800	15	5	12	32	800

School Of Engineering & Technology

Vikram university Ujjain

B.E. VII Semester (Electronics & Communication Engineering)

Subject wise distribution of marks and corresponding credits **(Grading System)**

S.No.	Subject Code	Subject Name & Title	Maximum Marks Allotted							Credits Allotted Subject wise			Total Credits	Remark
			Theory Slot			Practical Slot			Total Marks	Period per week				
			End Sem.	Mid Sem. MST (Two tests average)	Quiz, Assig-nment	End Sem	Term work Lab work & sessional	Term work Assignment/ quiz		L	T	P		
1	EC-701	Elective -I	70	20	10	-	-	-	100	3	1	-	04	
2	EC -702	Satellite Communication	70	20	10	-	-	-	100	3	1	-	04	
3	EC-703	Optical Communication	70	20	10	30	10	10	150	3	1	2	06	
4	EC-704	Microwave Engg.	70	20	10	30	10	10	150	3	1	2	06	
5	EC-705	VLSI Design	70	20	10	30	10	10	150	3	1	2	06	
6	EC-706	Minor Project & Seminar	-	-	-	60	20	20	100	0	0	4	04	
7	EC-707	Industrial Training (Two Week)	-	-	-	30	10	10	50	0	0	2	02	Grand Total
		Total	350	100	50	180	60	60	800	15	5	12	32	800

MST: Mid Semester Tests Taken at Least twice Per Semester

L: Lecture - T: Tutorial - P: Practical

Elective –I

EC-7011 Wireless Communication

EC-7012 Digital Image Processing EC-7013 Neural Networks

School Of Engineering & Technology

Vikram university Ujjain

B.E. VIII Semester (Electronics & Communication Engineering)

Subject wise distribution of marks and corresponding credits **(Grading System)**

S.No.	Subject Code	Subject Name & Title	Maximum Marks Allotted							Credits Allotted Subject wise			Total Credits	Remark
			Theory Slot			Practical Slot			Total Marks	Period per week				
			End Sem.	Mid Sem. MST (Two tests average)	Quiz, Assig-nment	End Sem	Term work: Lab work & sessional	Term work: Assignment/ quiz		L	T	P		
1	Refer Table Below	Elective -II	70	20	10	-	-	-	100	3	1	-	04	
2	EC_-802	Advanced Communication System	70	20	10	-	-	-	100	3	1	-	04	
3	EC-803	Computer Networks	70	20	10	30	10	10	150	3	1	2	06	
4	EC-804	TV & Radar Engg.	70	20	10	30	10	10	150	3	1	2	06	
5	EC-805	Major Project	-	-	-	100	100	50	250	0	0	10	10	
6	EC-806	Seminar & Group Discussion	-	-	-	-	-	50	50	0	0	2	02	Grand Total
		Total	280	80	40	160	120	120	800	12	4	16	32	800

MST: Mid Semester Tests Taken at Least twice Per Semester

L: Lecture - T: Tutorial - P: Practical

Elective –II

EC-8011	Advanced Data Network
EC-8012	Microwave Circuits
EC-8013	Principles of Management & Managerial Economics
EC-8014-New	Introduction to Microcontrollers for Embedded system

School of Engineering and Technology (SoET)

Swami Vivekanand Snatak Bhawan,

Vikram University, Dewas Road, Ujjain (M.P)

Programme: Bachelor Of Engineering

Program Outcomes (POs): (Bachelor of Engineering)

- Ability to develop the understanding and knowledge of the basic theory of engineering & technology with good foundation on theory, practical and applications.
- To acquire necessary and state-of-the-art skills to take up industry challenges. The objectives and outcomes are carefully designed to suit to the above-mentioned purpose.
- Ability to design and conduct engineering experiments, as well as to analyze and interpret data.
- Ability to identify, formulates, solve and analyze the problems in various disciplines of engineering.
- Ability to formulate, to model, to design solutions, procedure and to use software tools to solve real world problems and evaluate.
- Ability to communicate effectively in term of oral and written communication skills.
- Ability to use techniques, skills and modern technological/scientific/engineering software/tools for professional practices.
- Ability to enrich skills so as to facilitate greater employability.

Program Specific Outcomes(PSOs):

Mechanical Engineering:

- The Mechanical Engineering branch provides students both the skills & knowledgeto analyze, design and develop machining systems to solve the engineering problems by integrating thermal, design and manufacturing.
- Students learn to design a system and conduct experiments to find suitable solution and identify, visualize, formulate and solve engineering problemsin the field of Mechanical Engineering.

9.7.21

- Students develop their skills to solve problems and assess social, environmental issues with ethics and manage different projects in multidisciplinary areas.

Civil Engineering:

- The Civil branch provides students both the skills & knowledgeof practical exposure, and making them well versed with the field of construction.
- Students learn specific engineering problems of Construction, Survey, Basic construction materials, Advanced construction material, Environment, Irrigation works, Drafting and design with software approach, Hydraulic structures, and engineering fundamentals to be applied in the real world to get better solutions to enhance the life style and take the development and construction phase to the next level.
- Students develop their skills to solve problemsenvironmental concerned issues with ethics. The projects and researches work will to take the civil engineering towards sustainable environment.

Electronics Engineering:

- The Electronics Engineering branch provides students both the skills & knowledge of hardware field and software field.
- Students learn specific engineering problems of communication, networking, electrical & electronics circuits, signal processing, computer programming, embedded systems, VLSI design and technology by applying the knowledge of basic sciences, engineering mathematics and engineering fundamentals.
- Students develop their skills to solve problems and assess social, environmental issues with ethics and manage different projects in multidisciplinary areas.

Electrical Engineering:

- Graduates will demonstrate the ability to apply fundamental knowledge of mathematics, science, and domain knowledge of electrical circuits, fields, control systems, machines, power systems, electronics, programming, power electronics and drives, modern software tools to understand, analyze and design electrical systems.

- Design, develop and implement electrical and electronics and allied interdisciplinary projects to meet the demands of industry and to provide solutions to the current real time problems
- Graduates will be responsible ethical professional with understanding of society linkages and sensitivity towards environment.

Course Outcomes (COs):

Course Outcome for all courses in B.E./ B.Tech I year is given as follows:-

Course outcome of All Branches of Engineering: BE I Year

- To understand the theoretical principles molecular structure, bonding, Water And Its Industrial Applications, IC engine, Diesel engine, Lubricants & polymerization.
- To Identify the application of partial differentiation and apply for evaluating maxima, minima, working methods of multiple integral, the concept of matrices and apply for solving linear simultaneous equations.
- Students will be enabled to understand the basic objective of the course with Reading, Writing,Listening, Thinking and Speaking .
- Students learn the theoretical & practical aspects of Electrical circuit, transformers,rotating electrical machines,digital electronics & electronic circuits.
- Students learn the visual aspects of engineering designs, 3-D view & drawing of Different objects.
- To understand the practical aspects of quantum physics, wave optics, nuclear& solid state physics.
- To understand the energy, environment, ecology, societies, ethics & human values.
- Students learn the theoretical aspects of basic mechanics of thermodynamics, fluids & materials.
- Students learn the basic concepts of building materials, surveying, mapping & sensing.
- Sudents learn the basic hardware & software knowledge of computers.

BE-101 Engineering Chemistry

Unit I

WATER AND ITS INDUSTRIAL APPLICATIONS :

Sources, Impurities, Hardness & its units, Industrial water characteristics, softening of water by various methods (External & Internal treatment), Boiler trouble causes, effect &
remedies, Characteristics of municipal water & its treatment, Numerical problems based on softening methods.

Unit II

FUELS & COMBUSTION:

Fossil fuels & classification, Calorific value, Determination of calorific value by Bomb calorimeter Proximate and Ultimate analysis of coal and their significance, calorific value Computation based on ultimate analysis data, Carbonization, Manufacturing of coke & recovery of by products. Knocking, relationship between' knocking & structure of hydrocarbon, improvement of anti knocking characteristics of IC engine fuels, Diesel engine fuels, Cetane number, combustion and it related numerical problems.

Unit III

A. LUBRICANTS:

Introduction, Mechanism of lubrication, Classification of lubricants, Properties and Testing of lubricating oils, Numerical problems based on testing methods.

B. CEMENT & REFRACTORIES:

Manufacture , IS-code, Setting and hardening of cement, Refractory : Introduction, classification and properties of refractories .

Unit IV

HIGH-POLYMER :

Introduction, types and classification of polymerization, Reaction. Mechanism, Natural & Synthetic Rubber; Vulcanization of Rubber, Preparation, Properties & uses of the following- Polythene, PVC, PMMA, Teflon, Poly acrylonitrile, PVA, Nylon 6, Nylon 6:6, Terylene, Phenol formaldehyde, Urea -Formaldehyde Resin, Glyptal, Silicone Resin, Polyurethanes; Butyl Rubber, Neoprene, Buna N, Buna S.

Unit V

A. INSTRUMENTAL TECHNIQUES IN CHEMICAL ANALYSIS :

Introduction, Principle, Instrumentation and applications of IR, NMR,UV, Visible,Gas Chromatography, Lambert's and Beer's Law

B. WATER ANALYSIS TECHNIQUES :

Alkalinity, hardness (Complexo-metric), Chloride, Free chlorine, DO, BOD and COD, Numerical problems based on above techniques.

Reference Books:

1.Chemistry for Environmental Engineering & Science- Sawyer, McCarty and Parkin -McGraw Hill, Education Pvt. Ltd., New Delhi

2Engineering Chemistry - B.K. Sharma, Krishna Prakashan Media (P) Ltd., Meerut.

3Basics of Engineering Chemistry - S. S. Dara & A.K. Singh, S. Chand & Company Ltd., Delhi

4Applied Chemistry - Theory and Practice, O.P. Viramani, A.K. Narula, New Age International Pvt. Ltd. Publishers, New Delhi
5Polymer Science - Ghosh, Tata McGraw Hill.
6Engg. Chemistry -Shashi Chawla, Dhanpat Rai & company pvt. Ltd, Delhi.
7Engg. Chemistry -Jain & Jain, Dhanpat Rai & company pvt. Ltd, New Delhi
8A Text book of Engg. Chemistry- Agrawal, C.V, Murthy C.P, Naidu, A, BS Publication, Hyderabad.

Engineering Chemistry Practical

NOTE: At least 10 of the following core experiments must be performed during the session.

1. **Water Testing**

(i) Determination of Total hardness by Complexometric titration method.

(ii) Determination of mixed alkalinity

(a) OH^{-} & $C0_3^{=}$

(b) $CO_3^{=}$ & HCO_3^{-}

(iii) Chloride ion estimation by Argentometric method.

2. **Fuels & lubricant testing:**

(i) Flash & fire points determination by

a) Pensky Martin Apparatus,

b) Abel's Apparatus,

c) Cleveland's open cup Apparatus.

d) Calorific value by bomb calorimeter

(ii) Viscosity and Viscosity index determination by

a) Redwood viscometer No. 1

b) Redwood viscometer No.2

(iii) Proximate analysis of coal

a) Moisture content

b) Ash content

c) Volatile matter content c) Carbon residue

(iv) Steam emulsification No & Anline point determination

(v) Cloud and Pour point determination of lubricating oil

3. **Alloy Analysis**

(i) Determination of percentage of Fe in an iron alloy by redox titration using N-Phenyl anthranilic acid as internal indicator.

(ii) Determination of Cu and or Cr in alloys by Iodometric Titration.

(iii) Determination of % purity of Ferrous Ammonium Sulphate & Copper Sulphate.

BE-102 Engineering Mathematics-I

UNIT I

DIFFERENTIAL CALCULUS :

Expansion of functions by Maclaurin's and Taylor's theorem. Partial differentiation, Euler's theorem and its application in approximation and errors, Maxima and Minima of function of two variables, Curvature : Radius of curvature, centre of curvature.

Unit II

INTEGRAL CALCULUS :

Definite Integrals : Definite Integrals as a limit of a sum , its application in Summation of series, Beta and Gamma Functions , Double and Triple Integrals, Change of Order of Integration, Area,Volume and Surfaces using double and triple Integral.

Unit III

DIFFERENTIAL EQUATIONS :

Solution of Ordinary Differential Equation of first order and first degree for Exact differential Equations, Solution of Ordinary Differential Equation of first order and higher degree (solvable for p, x and y, Clairauts Equation), Linear Differential Equations with Constant Coefficients, Cauchy's Homogeneous differential Equation, Simultaneous differential Equations, Method of Variation of Parameters

Unit IV

MATRICES :

Rank, Solution of Simultaneous equation by elementary transformation, Consistency of System of Simultaneous Linear Equation, Eigen Values and Eigen Vectors, Cayley-Hamilton Theorem and its Application to find the inverse

Unit V

Algebra of Logic, Boolean Algebra, Principle of Duality, Basic Theorems, Boolean
Expressions and Functions. Elementary Concept of Fuzzy Logic
Graph Theory : Graphs, Subgraphs, Degree and Distance, Tree, cycles and Network,

References:

(i) Advance Engg. Mathematics. By Ramana, Tata McGraw hill.
(ii) Higher Engineering Mathematics by BS Grewal, Khanna Publication
(iii) Advance Engineering Mathematics by D.G.Guffy
(iv) Engineering Mathematics by S S Sastri. P.H.I.
(v) Mathematics for Engineers by S.Arumungam, SCITECH Publuication
(vi) Advanced Engineering Mathematics by Erwin Kreyszig, Wiley India

B.E.- 103 Communication Skills

Unit I - Languages and skills of communication

Linguistic techniques, Modern usages, Reading comprehension, English phonetic symbols/sings, Oral presentation, Audition Communication, Processes of Communication, Verbal and Non Verbal Communication, Barriers to Communication.

Unit II - Application of linguistic ability

Writing of definitions of Engineering terms, Objects, Processes and Principles (Listening) Topics of General Interest, Reproduction from business, daily life, travel, health, buying and selling, company structure, systems etc.

Unit III - Letter Writing:

Applications, Enquiry, Calling quotations, Tenders, Order and Complaint.

Unit IV

Precise Writing, Noting and drafting, Technical Description of simple engineering objects and processes (writing), Report writing, precise writing, Note writing, Slogan writing comment, Speech advertising.

Unit V

Writing Technical reports of the type of observation report, Survey report, Report of trouble, Laboratory Report and Project Report on the subjects of engineering. (Speaking) Vocabulary, Presentations, Demonstrations, Conversation - Telephone media, socializing, cultural events, debates, speech.

Communicative Language Lab. BE 103 MARKS :
50

<u>Course objective</u> : The language lab focuses on the production and practice of sounds of English through audio - visual aids and Computer software. It intends to enable the students to speak English correctly with confidence and intends to help them to overcome their inhibitions and self - consciousness while speaking in English.

Topics to be covered in the Language laboratory sessions :

1. Basic Grammar & Vocabulary (Synonyms /Antonyms, Analogies, sentence completion, correctly spelt words, idioms, proverbs, common errors).
2. phonetic symbols and pronunciation.
3. Listening skills (Including Listening Comprehension)3
4. Reading Skills (Including Reading Comprehension)
5. Writing Skills (Including structuring resume and cover letter)
6. Speaking Skills
7. Body Language
8. Oral Presentation : Preparation and delivery using audio - visual aids with stress n body language and voice modulation (Topic to be selected by the teacher.)

Final Assessment Should be based on Assignment, presentation and interview.

Reference Books :-

1. Business Correspondence and Report Writing - By Sharma; TMH.
2. Living English Structure - By W.S. Allen; Longmans.
3. English Grammar - Ehrlich, Schaum Series; TMH.
4. Spoken English for India - By R. K. Bansal and IB Harrison Orient Longman.
5. New International Business English - by Joans and Alexander; OUP.
6. Effective Technical Communication - Rizvi; TMH.

B.E.- 104 Basic Electrical & Electronics Engineering

Unit I

Electrical circuit analysis- Voltage and current sources, dependent and independent sources, source conversion, DC circuits analysis using mesh & nodal method, Thevenin's & superposition theorem, star-delta transformation. 1-phase AC circuits under sinusoidal steady state, active, reactive and apparent power, physical meaning of reactive power, power factor, 3-phase balanced and unbalanced supply, star and delta connections.

Unit II

Transformers-Review of laws of electromagnetism, mmf, flux, and their relation, analysis of magnetic circuits. Single-phase transformer, basic concepts and construction features, voltage, current and impedance transformation, equivalent circuits, phasor diagram, voltage regulation, losses and efficiency, OC and SC test.

Unit III

Rotating Electric machines- Constructional details of DC machine, induction machine and synchronous machine, Working principle of 3-Phase induction motor, Emf equation of 3-Phase induction motor, Concept of slip in 3-Phase induction motor, Explanation of Torque-slip characteristics of 3-Phase induction motor, Classification of self excited DC motor and generator.

Unit IV

Digital Electronics-Number systems used in digital electronics, decimal, binary, octal, hexadecimal, their complements, operation and conversion, floating point and signed numbers, Demorgan's theorem, AND, OR, NOT, NOR, NAND, EX-NOR, EX-OR gates and their representation, truth table, half and full adder circuits, R-S flip flop, J-K flip flop.

Unit v

ELECTRONIC COMPONENTS AND CIRCUITS- Introduction to Semiconductors, Diodes, V-I characteristics, Bipolar junction transistors (BJT) and their working, introduction to CC, CB & CE transistor configurations, different configurations and modes of operation of BJT, DC biasing of BJT.

References:

1. Vincent Del Toro, Electrical Engineering Fundamentals, PHI Learning, II Edition
2. S.Ghosh, Fundamentals of Electrical and Electronics Engineering, PHI, II Edition.
3. Millman, Halkias & Parikh, Integrated Electronics, Mc Graw Hill, II Edition
4. Nagrath & Kothari, Basic Electrical Engineering, III Edition TMH.
5. J.S. Katre, Basic Electronics Engg, Max Pub. Pune.
6. Hughes, Electrical and Electronic Technology, Pearson Education IX Edition

List Of Experiments

1. Verificatiions of Thevenin's Superposition theorem.
2. Study of Transformer, name plate rating, determination of rayio and polarity.
3. Determination of equivalent circuit parameters of a single phase transformer by O.C. and S.C. tests and estimation of voltage regulation and efficiency at various loading conditions and verification by load test.
4. Seperation of resistance and inductance of choke coil.
5. Measurement of various line & phase quantities for a 3-phase circuit.
6. Identification of different Electronics components.
7. Observing input and output waveforms of rectifiers.
8. Transistor application as amplifier and switch.
9. Verification of truth table for various gates.

B.E.- 105 Engineering Graphics

Unit I

Scales: Representative factor, plain scales, diagonal scales, scale of chords.

Conic sections: Construction of ellipse, parabola, hyperbola by different methods; Normal and Tangent.
Special Curves: Cycloid, Epi-cycloid, Hypo-cycloid, Involutes, Archimedean and logarithmic spirals.

Unit II

Projection: Types of projection, orthographic projection, first and third angle projection, **Projection of points and lines,** Line inclined to one plane, inclined with both the plane, True Length and True Inclination, Traces of straight lines.

Unit III

Projection of planes and solids: Projection of Planes like circle and polygons in different positions; Projection of polyhedrons like prisms, pyramids and solids of revolutions like cylinder, cones in different positions.

Unit IV

Section of Solids: Section of right solids by normal and inclined planes; Intersection of cylinders.
Development of Surfaces: Parallel line and radial - line method for right solids.

Unit V

Isometric Projections: Isometric scale, Isometric axes, Isometric Projection from orthographic drawing.
Computer Aided Drafting (CAD): Introduction, benefit, software's basic commands of drafting entities like line, circle, polygon, polyhedron, cylinders; transformations and editing commands like move, rotate, mirror, array; solution of projection problems on CAD.

References

1. Visvesvaraya Tech. University; A Premier on Computer Aided Engg drawing; VTU Belgaum
2. Bhatt N.D.; Engineering Drawing, Charotar
3. Venugopal K.;Engineering Graphics; New Age
4. John KC; Engg. Graphics for Degree; PHI.
5. Gill P.S.; Engineering Drawing; kataria
6. Jeyopoovan T.; Engineering drawing & Graphics Using AutoCAD; Vikas
7. Agrawal and Agrawal; Engineering Drawing;TMH
8. Shah MB and Rana BC; Engg.drawing; Pearson Education
9. Luzadder WJ and Duff JM; Fundamental of Engg Drawing; PHI

10 Jo lhe DA; Engg. Drawing an Introduction; TMH
11 Narayana K.L.; Engineering Drawing; Scitech

List of Practical:

Sketching and drawing of geometries and projections based on above syllabus

Term work: A min. of 30 hand drawn sketches (on size A4 graphic sketch Book) plus 5 CAD-printouts on size A4 sheets plus 10 sheets of size A2 or 6 sheets of size A1, (50% marks to be allotted for this record + 25% marks for attendance +25%marks for Teachers Assessmen

Practical Marks to be allotted based on written test and viva.

Note: To cover above syllabus, each Institute must have CAD software and a computer lab (6 to 12 hrs/month/student).

B.E.- 106 Work Shop Practice

Unit I

Introduction: Manufacturing Processes and its Classification, Casting, Machining, Plastic deformation and metal forming, Joining Processes, Heat treatment process, Assembly process. Powder Metallurgy, introduction to computers in manufacturing. Black Smithy Shop

Use of various smithy tools. Forging operations:Upsetting, Drawing down, Fullering, Swaging, Cutting down, Forge welding, Punching and drafting. Suggested Jobs : Forging of chisel., forging of Screw Driver

Unit II

Carpentry Shop:

Timber : Type, Qualities of timber disease, Timber grains, Structure of timber, Timber, Timber seasoning, Timber preservation .Wood Working tools: Wood working machinery, joints & joinery. Various operations of planning using various carpentry planes sawing & marking of various carpentry joints.

Suggested Jobs :Name Plate ,Any of the Carpentry joint like mortise or tennon joint

Unit III

Fitting Shop:

Study and use of Measuring instruments, Engineer steel rule, Surface gauges caliper, Height gauges, feeler gauges, micro meter. Different types of files, File cuts, File grades, Use of surface plate, Surface gauges drilling tapping Fitting operations: Chipping filling, Drilling and tapping.Suggested Jobs Preparation of job piece by making use of filling, sawing and chipping , drilling and tapping operations.

Unit IV

Foundry:

Pattern Making: Study of Pattern materials, pattern allowances and types of patterns. Core box and core print, .Use and care of tools used for making wooden patterns. Moulding:

Properties of good mould & Core sand, Composition of Green , Dry and Loam sand. Methods used to prepare simple green and bench and pit mould dry sand bench mould using single piece and split patterns.

Unit V

Welding: Study and use of tools used for Brazing, Soldering, Gas & Arc welding. Preparing Lap & Butt joints using gas and arc welding methods, Study of TIG & MIG welding processes . Safety precautions.

Reference Books:

1. Bawa HS; Workshop Practice, TMH
2. Rao PN; Manufacturing Technology- Vol.1& 2, TMH
3. John KC; Mechanical workshop practice; PHI
4. Hazara Choudhary; Workshop Practices -, Vol. I & II. 5 Jain.

B.E.- 201 Engineering Physics

Unit I

Quantum Physics

Group and particle velocities & their relationship. Uncertainty principle with elementary proof and applications (determination of position of a particle by a microscope, non existence of electron in nucleus, diffraction of an electron beam by a single slit). Compton scattering. Wave function and its properties, energy and momentum operators, time dependent and time independent Schrodinger wave equation. Application of time independent Schrodinger wave equation to particle trapped in a one dimensional square potential well (derivation of energy eigen values and wave function)

Unit II

Wave Optics

Interference: Fresnel's biprism, Interference in thin films (due to reflected and transmitted lght), interference from a wedge shaped thin film, Newton's rings and Michelson's

interferometer experiments and their applications. Diffraction at single slit, double slit and n-slits (diffraction grating). Resolving power of grating and prism. Concept of polarized light, Brewster's laws, Double refraction, Nicol prism, quarter & half wave plate.

Unit III

Nuclear Physics

Nuclear liquid drop model (semi empirical mass formula), nuclear shell model, Linear Particle acceleratos: Cyclotron, general description of Synchrotron, Synchrocyclotron, and Betatron. Geiger-Muller Counter, Motion of charged particles in crossed electric and magnetic fields. Uses of Bainbridge and Auston mass Spectrographs.

Unit IV

Solid State Physics

Qualitative discussion of Kronig Penny model (no derivation), Effective mass, Fermi-Dirac statistical distribution function, Fermi level for Intrinsic and Extrinsic Semiconductors, Zener diode, tunnel diode, photodiode, solar-cells, Hall effect.

Superconductivity: Meissner effect, Type I and Type II superconductors, Di-electric polarization, Complex permittivity, dielectric losses

UNIT V

Laser and Fiber Optics

Laser: Stimulated and spontaneous processes, Einstein's A & B Coefficients, transition probabilities, active medium, population inversion, pumping, Optical resonators, characteristics of laser beam. Coherence, directionality and divergence. Principles and working of Ruby, Nd:YAG, He-Ne & Carbon dioxide Lasers with energy level diagram.. Fundamental idea about optical fiber, types of fibers, acceptance angle & cone, numerical aperture, V-number, propagation of light through step index fiber (Ray theory) pulse dispersion, attenuation, losses & various uses. Applications of lasers and optical fibers.

Reference Books: -

1. Optics By Ghatak, TMH
2. Engineering Physics- V. S. Yadava, TMH
3. Optics by Brijlal and Subhraininyan.
4. Engineering physics by M.N. Avadhanulu and. S. Chand &Co.(2004)
5. Atomic and Nuclear physics by Brijlal and Subraminiyan.
6. Concepts of Modern Physics- Beiser, TMH
7. Solid State Physics by Kittel ,Wiley India
8. Fundamentals of Physics-Halliday, Wiley India

List of suggestive core experiments: -

1. Biprism, Newton's Rings, Michelsons Interferometer.
2. Resolving Powers -Telescope, Microscope, and Grating.
3. G.M. Counter
4. Spectrometers-R.I., Wavelength, using prism and grating
5. Optical polarization based experiments: Brewster's angle, polarimeter etc.
6. Measurements by LASER-Directionality, Numerical aperture, Distance etc.
7. Uses of Potentiometers and Bridges (Electrical)..
8. Experiments connected with diodes and transistor.
9. Measurement of energy band gap of semiconductor.
10. To study Hall effect.
11. Solar cell.
12. To find the width of s single slit by f He-Ne Laser.
13. To determine the numeral aperture (NA) of a Optical Fibre.

B.E.- 202 Energy , Environment , Ecology & Society

Unit -I

Energy- Sources of Energy : Renewable & Non Renewable, Fossil fuel, Biomass Geothermal, Hydrogen, Solar, Wind, hydal, nuclear sources.

Unit -II

Ecosystem - Segments of Environment: Atmosphere, hydrosphere, Lithosphere, biosphere. Cycles in Ecosystem - Water, Carbon, Nitrogen. Biodiversity: Threats and conservation,

Unit -III

Air Pollution & Sound Pollution -

Air Pollution: Air pollutants, classification, (Primary & secondary Pollutants) Adverse effects of pollutants. Causes of Air pollution chemical, photochemical, Green house effect, ozone layer depletion, acid Rain. Sound Pollution: Causes, controlling measures, measurement of sound pollution (deciblage), Industrial and non - industrial.

Unit -IV

Water Pollution- Water Pollution: Pollutants in water, adverse effects. Treatment of Domestic & Industrial water effluent.

Soil Pollution - Soil Profile, Pollutants in soil, their adverse effects, controlling measures.

Unit -V

Society, Ethics & Human values- Impact of waste on society. Solid waste management (Nuclear, Thermal, Plastic, medical, Agriculture, domestic and e-waste). Ethics and moral values, ethical situations, objectives of ethics and its study . Preliminary studies regarding Environmental Protection Acts , introduction to value education, self exploration, sanyam & swasthya.

References:

1. Harris, CE, Prichard MS, Rabin's MJ, "Engineering Ethics"; Cengage Pub.
2. Rana SVS ; "Essentials of Ecology and Environment"; PHI Pub.
3. Raynold, GW "Ethics in information Technology"; Cengage.
4. Svakumar; Energy Environment & Ethics in society; TMH
5. AK De "Environmental Chemistry"; New Age Int. Publ.
6. BK Sharma, "Environmental Chemistry" ; Goel Publ. House.
7. Bala Krishnamoorthy; "Environmental management"; PHI
8. Gerard Kiely, "Environmental Engineering" ; TMH
9. Miller GT JR; living in the Environment Thomson/cengage
10. Cunninghan WP and MA; principles of Environment Sc; TMH
11. Pandey, S.N. & Mishra, S.P. Environment & Ecology, 2011, Ane Books , Pvt. Ltd, New Delhi
12. Joseph, B. Environmental Studies, 2009 Tata Mcgraw Hill, Edu India Ltd. New Delhi.
13. Gour R.R, Sangal, R &Bagaria, G.P. , Excel Books, A-45, Naraina Phase-I ,New Delhi.-110028

B.E.- 203 Basic Mechanical Engineering

UNIT- 1

Materials: Classification of engineering material, composition of cast iron and carbon steels on iron-carbon diagram and their mechanical properties; Alloy steel and their applications; stress-strain diagram, Hooks law and modulus of elasticity. Tensile, shear, hardness and fatigue testing of materials.

UNIT-2

Measurement: Temperature, pressure, velocity, flow, strain, force and torque measurement, concept of measurement error & uncertainly analysis, measurement by Vernier caliper, micrometer, dial gauges, slip gauges, sine-bar and combination set; introduction to lath, drilling, milling and shaping machines.

UNIT-3

Fluids: Fluid properties, pressure, density and viscosity; pressure variation with depth, static and kinetic energy; Bernauli's equation for incompressible fluids, viscous and turbulent flow, working principle of fluid coupling, pumps, compressors, turbines, positive displacement machines and pneumatic machines. Hydraulic power & pumped storage plants for peak load management as compared to base load plants.

UNIT-4

Thermodynamics: First and second law of thermodynamics; steam properties, steam processes at constant pressure, volume, enthalpy & entropy, classification and working of boilers, efficiency & performance analysis, natural and induced draught, calculation of chimney height. Refrigeration, vapor absorption & compression cycles, coefficient of perform (COP), refrigerant properties & eco friendly refrigerants.

UNIT-5

Reciprocating Machines: Steam engines, hypothetical and actual indicator diagram; Carnot cycle and ideal efficiency; Otto and diesel cycles; working of two stroke & four stroke petrol & diesel IC engines

Reference Books:-

1. Narula; Material Science; TMH
2. Agrawal B & CM; Basic Mechanical Engg. Wiley India
3. Nag PK, Tripathi et al; Basic Mechanical Engg; TMH
4. Rajput; Basic Mechanical Engg;

5. Sawhney GS; Fundamentals of Mechanical Engg; PHI

6. Nakra and Chaudhary; Instrumentation & measurement; TMH

7. Nag PK; Engineering Thermodynamics; TMH

8. Ganesan; Combustion Engines; TMH

List of Suggestive core Experiments(Please Expand it)

1. Tensile testing of standard mild steel specimen.
2. Experiments on Bernoulli's theorem.
3. Flow measurements by ventury and orifice meters.
4. Linear and angular measurement using, Vernier; micrometer, slip gauge, dial gauge and sine-bar.
5. Study of different types of boilers and mountings.
6. Experiment on mini-boiler (50 Kg/Hour)
7. To find COP of a refrigeration unit.
8. Study of different IC engines & measurement of B.H.P. using rope/belt dynamometer.

B.E.- 204 Basic Civil Engineering & Engineering Mechanics

Uniit I

Building Materials & Construction

Stones, bricks, cement, lime, timber-types, properties, test & uses, laboratory tests concrete and mortar Materials: Workability, Strength properties of Concrete, Nominal proportion of Concrete preparation of concrete, compaction, curing.

Elements of Building Construction, Foundations conventional spread footings, RCC footings, brick masonry walls, plastering and pointing, floors, roofs, Doors, windows, lintels, staircases - types and their suitability

Unit - II Surveying & Positioning:

Introduction to surveying Instruments - levels, thedolites, plane tables and related devices. Electronic surveying instruments etc. Measurement of distances - conventional and EDM methods, measurement of directions by different methods, measurement of elevations by different methods. Reciprocal leveling.

Unit -III Mapping & Sensing:

Mapping details and contouring, Profile Cross sectioning and measurement of areas, volumes, application of measurements in quantity computations, Survey stations, Introduction of remote sensing and its applications.

Engineering Mechanics Unit - IV

Forces and Equilibrium: Graphical and Analytical Treatment of Concurrent and non-concurrent Co- planner forces, free Diagram, Force Diagram and Bow's notations, Application of Equilibrium Concepts: Analysis of plane Trusses: Method of joints, Method of Sections. Frictional force in equilibrium problems

Unit - V

Centre of Gravity and moment of Inertia: Centroid and Centre of Gravity, Moment Inertia of Area and Mass, Radius of Gyration, Introduction to product of Inertia and Principle Axes.

Support Reactions, Shear force and bending moment Diagram for Cantilever & simply supported beam with concentrated, distributed load and Couple.

Reference Books:

1. S. Ramamrutam &R.Narayanan; Basic Civil Engineering, Dhanpat Rai Pub.
2. Prasad I.B., Applied Mechanics, Khanna Publication.
3. Punmia, B.C., Surveying, Standard book depot.
4. Shesha Prakash and Mogaveer; Elements of Civil Engg & Engg. Mechanics; PHI
5. S.P,Timoshenko, Mechanics of stricture, East West press Pvt.Ltd.
6. Surveying by Duggal - Tata McGraw Hill New Delhi.
7. Building Construction by S.C. Rangwala- Charotar publications House, Anand.
8. Building Construction by Grucharan Singh- Standard Book House, New Delhi
9. Global Positioning System Principles and application- Gopi, TMH
10. R.C. Hibbler - Engineering Mechanics: Statics & Dynamics.
11. A. Boresi & Schmidt- Engineering Mechines- statics dynamics, Thomson' Books

12. R.K. Rajput, Engineering Mechanics S.Chand& Co.

List of suggestive core Experiments:

Students are expected to perform minimum ten experiments from the list suggested below by preferably selecting experiments from each unit of syllabus.

S.No. Title

1. To perform traverse surveying with prismatic compass, check for local attraction and determine corrected bearings and to balance the traverse by Bowditch's rule.
2. To perform leveling exercise by height of instrument of Rise and fall method.
3. To measure horizontal and vertical angles in the field by using Theodolite.
4. To determine (a) normal consistency (b) Initial and Final Setting time of a cement Sample.
5. To determine the workability of fresh concrete of given proportions by slump test or compaction factor test.
6. To determine the Compressive Strength of brick .
7. To determine particle size distribution and fineness modulus of course and fine Aggregate.
8. To verify the law of Triangle of forces and Lami's theorem.
9. To verify the law of parallelogram of forces.
10. To verify law of polygon of forces
11. To find the support reactions of a given truss and verify analytically.
12. To determine support reaction and shear force at a given section of a simply Supported beam and verify in analytically using parallel beam apparatus.
13. To determine the moment of inertia of fly wheel by falling weight method.
14. To verify bending moment at a given section of a simply supported beam.

B.E.- 205 Basic Computer Engineering

UNIT I

Computer: Definition, Classification, Organization i.e. CPU, register, Bus architecture, Instruction set, Memory & Storage Systems, I/O Devices, and System & Application Software. Computer Application in eBusiness, Bio-Informatics, health Care, Remote Sensing & GIS, Meteorology and Climatology, Computer Gaming, Multimedia and Animation etc.

Operating System: Definition, Function, Types, Management of File, Process & Memory.

Introdcution to MS word, MS powerpoint, MS Excel

UNIT II

Introduction to Algorithms, Complexities and Flowchart, Introduction to Programming, Categories of Programming Languages, Program Design, Programming Paradigms, Characteristics or Concepts of OOP, Procedure Oriented Programming VS object oriented Programming.

Introduction to C++: Character Set, Tokens, Precedence and Associativity, Program Structure, Data Types, Variables, Operators, Expressions, Statements and control structures, I/O operations, Array, Functions,

UNIT III

Object & Classes, Scope Resolution Operator, Constructors & Destructors, Friend Functions, Inheritance, Polymorphism, Overloading Functions & Operators, Types of Inheritance, Virtual functions. Introduction to Data Structures.

UNIT IV

Computer Networking: Introduction, Goals, ISO-OSI Model, Functions of Different Layers. Internetworking Concepts, Devices, TCP/IP Model. Introduction to Internet, World Wide Web, E-commerce **Computer Security Basics:** Introduction to viruses, worms, malware, Trojans, Spyware and Anti-Spyware Software, Different types of attacks like Money Laundering, Information Theft, Cyber Pornography, Email spoofing, Denial of Service (DoS), Cyber Stalking, ,Logic bombs, Hacking Spamming, Cyber Defamation , pharming Security measures Firewall, Computer Ethics & Good Practices, Introduction of Cyber Laws about Internet Fraud, Good Computer Security Habits,

UNIT V

Data base Management System: Introduction, File oriented approach and Database approach, Data Models, Architecture of Database System, Data independence, Data dictionary, DBA, Primary Key, Data definition language and Manipulation Languages.

Cloud computing: definition, cloud infrastructure, cloud segments or service delivery models (IaaS, PaaS and SaaS), cloud deployment models/ types of cloud (public, private, community and hybrid clouds), Pros and Cons of cloud computing

List of Experiment

1. Study and practice of Internal & External DOS commands.
2. Study and practice of Basic linux Commands - ls, cp, mv, rm, chmod, kill, ps etc.

3. Study and Practice of MS windows - Folder related operations, My-Computer, window explorer, Control Panel,
4. Creation and editing of Text files using MS- word.
5. Creation and operating of spreadsheet using MS-Excel.
6. Creation and editing power-point slides using MS- power point
7. Creation and manipulation of database table using SQL in MS-Access. 08.WAP to illustrate Arithmetic expressions
9. WAP to illustrate Arrays.
10. WAP to illustrate functions.
11. WAP to illustrate constructor & Destructor
12. WAP to illustrate Object and classes.
13. WAP to illustrate Operator overloading
14. WAP to illustrate Function overloading
15. WAP to illustrate Derived classes & Inheritance
16. WAP to insert and delete and element from the Stack
17. WAP to insert and delete and element from the Queue
18. WAP to insert and delete and element from the Linked List

Recommended Text Books:

1. Fundamentals of Computers : E Balagurusamy, TMH
2. Basic Computer Engineering: Silakari and Shukla, Wiley India
3. Fundamentals of Computers : V Rajaraman, PHI
4. Information Technology Principles and Application: Ajoy Kumar Ray & Tinku Acharya PHI.

Recommended Reference Books:

1. Introduction of Computers : Peter Norton, TMH
2. Object Oriented Programming with C++ :E.Balagurusamy, TMH
3. Object Oriented Programming in C++: Rajesh K.Shukla, Wiley India
4. Concepts in Computing: Kenneth Hoganson, Jones & Bartlett.
5. Operating Systems - Silberschatz and Galvin - Wiley India
6. Computer Networks:Andrew Tananbaum, PHI
7. Data Base Management Systems, Korth, TMH
8. Cloud Computing, Kumar, Wiley India

B.E.- 206 Communicative Language

Course objective:

This course intends to impart practical training in the use of English Language for Communicative purposes and aims to develop students' personality through Language Lab.

Topics to be covered in the Language laboratory sessions:

1. Introducing oneself, family, social roles, personal image design, building relationships, body language, concept of time and space.
2. Public Speaking and oral skills with emphasis on conversational practice, Role plays, extempore speech, JAM (Just a minute sessions), describing objects and situations, giving directions, debate, telephonic etiquette.
3. Reading Comprehension: Intensive reading skills, rapid reading, and reading aloud (Reading material to be selected by the teacher).
4. Translation from English to Hindi and vice versa.
5. Oral Presentation: preparation and delivery (Topic to be selected by the teacher.)

Assessment Criterion:

Oral Presentation	10
Assignment	20
Viva Voice	20

Course outcome of Mechanical Engineering: BE II Year

Course Outcome for Mechanical Engineering in B.E./ B.Tech II year is given as follows:-

- Analyze the concept of partial differential equation,Laplace transform & vector calculus.
- Students learn the metallurgy, metal cutting, pattern making, forging and welding.
- To understand the practical aspects of stress & strain, pressure vessels, bending and deflection of beam, torsion in shaft,springs and theories of failure.
- To understand the theoretical & practical aspects of Thermodynamics.
- To understand design joints,drawing conventions, Assembly Machine Drawing and Compute Aided Drafting software for 2D and 3D Modeling.
- Analyze the concept of functions of complex variables, differential equation models & probability.
- To understand the theoretical aspects material science and metallurgy.
- To understand the theoretical & practical aspectsof kinematics of machines, gear & gear train, cam & follower and gyroscope.
- Students learn about the Steamgenerators, Steam nozzles, Steamcondensers, Air compressors, Phase Change Cycles and Gas dynamics.
- To understand the theoretical & practical aspects of fluid mechanics.

B.E. 301 - ENGINEERING MATHEMATICS II

Unit I

Fourier Series: Introduction of Fourier series , Fourier series for Discontinuous functions, Fourier series for even and odd function, Half range series Fourier Transform: Definition and properties of Fourier transform, Sine and Cosine transform.

Unit II

Laplace Transform: Introduction of Laplace Transform, Laplace Transform of elementary functions, properties of Laplace Transform, Change of scale property, second shifting property, Laplace transform of the derivative, Inverse Laplace transform & its properties, Convolution theorem, Applications of L.T. to solve the ordinary differential equations

Unit III

Second Order linear differential equation with variable coefficients : Methods one integral is known, removal of first derivative, changing of independent variable and variation of parameter, Solution by Series Method

Unit IV

Linear and Non Linear partial differential equation of first order: Formulation of partial differential equations, solution of equation by direct integration, Lagrange's Linear equation, charpit's method. Linear partial differential equation of second and higher order: Linear homogeneous and Non homogeneous partial diff. equation of nth order with constant coefficients. Separation of variable method for the solution of wave and heat equations

Unit V

Vector Calculus: Differentiation of vectors, scalar and vector point function, geometrical meaning of Gradient, unit normal vector and directional derivative, physical interpretation of divergence and Curl. Line integral, surface integral and volume integral, Green's, Stoke's and Gauss divergence theorem

References

(i) Advanced Engineering Mathematics by Erwin Kreyszig, Wiley India
(ii) Higher Engineering Mathematics by BS Grewal, Khanna Publication
(iii) Advance Engineering Mathematics by D.G.Guffy
(iv) Mathematics for Engineers by S.Arumungam, SCITECH Publuication
(v) Engineering Mathematics by S S Sastri. P.H.I.

AU/IP/ME-302 Production Process

Unit I

Metrology: Standards of Measurements, Linear and angular instruments; slip gauges, comparators, sine bar, angle gauges, clinometers, tape gauge, screw thread measurements limit gauging, Gauge design; fits and tolerance. Rolling: General description of machines and process; Rolling of structural sections plates and sheets; construction of halls; hot and cold rolling techniques

Unit II

Metal cutting : Principles of metal cutting, tool geometry ,Tool life plots , Mach inability, Tool wear , Cutting force analysis ,Cutting tool materials & Cutting fluids ,Economics of metal machining .

Unit III

Pattern Making: Pattern and pattern making, pattern allowances; pattern design considerations, core, core boxes, types of patterns.

Foundry: molding and core sands and their properties molding machines, centrifugal casting, dye casting shell molding; cupola description and operation. Lost wax molding; continuous casting.

Unit IV Forging: Theory and application of forging processes description; principle of toleration of drop and horizontal forging machines; General principle of designs.

Press working: Description and operation of processes, process of shearing, punching, piercing, blanking, trimming, perfecting, notching, lancing, embossing, coining, bending, forging and drawing press, tool dies, auxiliary equipment, safety devices, stock feeders, scrap cutters, forces, pressure and power requirements, requirements of stock material.

Unit V

Welding: Gas welding, Electric arc welding, A.C. and D.C. welding machines and their characteristics. Flux, Electrodes, Pressure welding, electric resistance welding spot, seam and built welding, submerged arc welding; thermit and TIG & MIG Welding, Brazing Gas cutting

Spinning: Introduction of spinning.

References:

1. Anderson and Tetro; Shop Theory;TMH
2. Kaushik JP; Manufacturing Processes; PHI
3. Bawa; Manufacturing Processes; TMH
4. Rao PN; Manufacturing Tech- Foundry, forming welding; TMH
5. Rao PN; Manufacturing Tech- Metal cutting and machine tools; TMH
6. Chapman; Workshop Technology :
7. Begeman; Manufacturing Process : John Wiley
8. Raghuvanshi; Workshop Technology :; Dhanpat Rai.
9. Ravi B; Metal Casting- CAD analysis; PHI.
10. Hajra Choudhary; Workshop Technology:, Vol I
11. Pandya & Singh;Production Engineering Science:.

AU/IP/ME-303 Strength & Mechanics of materials

UNIT I

Mechanical properties of materials: Ductility, malleability, hardness, toughness, fatigue, creep; behavior of materials under tension, compression, bending, shear; ductile and brittle materials, failure of MS and CI in tension and torsion

Stress and strain: stresses in members of a structure, axial loading, normal stress, shear stress, bearing stress, analysis of simple structures, stepped rods, members in series and parallel: stress strain diagram, Hooke’s law, modulus of elasticity, elastic and plastic behavior of materials, deformation under axial loading, statically indeterminate problems, stress due to temperature, Poisson’s ratio, Bulk modulus, shear strain, relation among elastic constants, residual stress, fiber reinforced composite materials, strain energy under axial loads and stresses due to impact of falling weights.

UNIT II

Transformation of stress and strain, principal stresses, normal and shear stress, Mohr’s circle and its application to two and three dimensional analysis, ductile and brittle failures, transmission shaft under combined bending and torsion; stresses in thin walled pressure vessel

UNIT III

Bending: pure bending, symmetric member, deformation and stress, bending of composite sections, eccentric axial loading, shear force and BM diagram, relationship among load, shear and BM, shear stresses in beams, strain energy in bending, deflection of beams, equation of elastic curve, Macaulay’s method and Area moment method for deflection of beams.

UNIT IV

Torsion in shafts: stresses in a shaft, deformation in circular shaft, angle of twist, stepped-hollow, thin walled-hollow transmission shafts Leaf springs; helical springs, open and closed coil, stress in spring wire, deflection of helical spring, springs in series and parallel.

UNIT V

Theories of failures: maximum normal stress & shear stress theory; maximum normal and shear strain energy theory; maximum distortion energy theory; application of theories to different materials and loading conditions Columns: stability of structures, Euler’s formula for columns with different end conditions, Rankin’s formula.

References:

1. Beer FP, Johnson ER, Dewolf JT : Mechanics of Materials; TMH
2. Rattan; Strength of materials; TMH
3. Nash William; Schaum’s Outline Series; Strength of Materials; TMH.
4. Negi ; strength of materials; TMH
5. Singh Arbind K; Mechanics of Solids; PHI
6. Sadhu Singh; Strength of Materials; Khanna Pub.
7. Kamal K and Ghai RC; Advanced Mechanics of Materials; Khanna Pub.

List of experiments (Pl. expand it):

1. Standard tensile test on MS and CI test specimen
2. Direct/ cross Shear test on MS and CI specimen
3. Transverse bending test on wooden beams to obtain modulus of rupture
4. Fatigue test
5. Brinell Hardness tests
6. Vicker hardness test
7. Izod/ Charpy impact test

AU/IP/ME-304 Thermodynamics

Unit I

Basic concepts: Thermodynamics, Property, Equilibrium, State, Process, Cycle, Zeroth law of thermodynamics, statement and significance, concept of an Ideal gas, Gas laws, Avogadro's hypothesis, Heat and work transfer. First law of thermodynamics- Statement of first law of thermodynamics, first law applied to closed system, first law applied to a closed system undergoing a cycle, processes analysis of closed system, flow process, flow energy, steady flow process, Relations for flow processes, limitations of first law of thermodynamics.

Unit II

Second law of thermodynamics, heat engine, heat reservoir, Refrigerator, heat pump, COP, EPR, Available energy, Carnot's theorem, Carnot's cycle, efficiency of Carnot's cycle, statement of second law Reversible and irreversible processes, consequence of second law, Entropy, Entropy change for ideal gas, T-S diagrams, Availability and Irreversibility. Gibbs and Helmholtz functions

Unit III

Real gas, Deviation with ideal gas, Vander-wall’s equation, evaluation of its constants, limitations of the equation. The law of corresponding states Compressibility factor, Generalized compressibility chart, P-V-T surface of a Real gas, Thermodynamics relations, Maxwell relations and there applications.

Unit IV

Pure Substance, Phase, Phase-transformations, formation of steam, properties of steam, PVT surface, HS,TS,PV,PH,TV diagram, processes of vapor measurement of dryness fraction, Use of steam table and Mollier chart.

Unit V

Air standard cycles, Carnot, Otto, Diesel, Dual cycles and there comparison, two stroke and four stroke engines, Brayton cycle, non reactive gas mixture, PVT relationship, mixture of ideal gases, properties of mixture of ideal gases, internal energy, Enthalpy and specific heat of gas mixtures, Enthalpy of gas-mixtures.

References:

1. P.K.Nag; Engineering Thermodynamics; TMH
2. Van GJ; Thermodynamics; John Wylen
3. Cengel Y; Thermodynamics; TMH
4. Arora CP; Thermodynamics; TMH
5. Thermal Engineering by R Yadav
6. Engineering Thermodynamics by Omkar Singh New Age International.
7. Engineering Thermodynamics by Ratha Krishanan PHI India Pvt. Ltd.
8. Engineering Thermodynamics by M. Achuthan, PHI India.

List of Experiments (Pl. expand it):

1. To find mechanical equivqlent of heat using Joules apparatus
2. To study working of impulse and reaction steam turbine by models.\
3. To study working of Gas turbines by models and to identify various processes of Brayton Cycle.
4. To calculate COP of vapour compression refrigeration system and to plot on T-s, p-H diagrams.
5. To plot specific fuel consumstion versus rpm diagrams for diesel and petrol engines
   Theory classes must be supplemented with laboratory classes.

AU/IP/ME-305 Machine Drawing & design

UNIT I:
Drawing conventions; drawing and dimensioning IS codes, sectional views and sectioning, surface finish and tolerances, representation of machine parts such as external and internal threads, slotted heads, square ends, and flat radial ribs, slotted shaft, splined shafts, bearings, springs, gears. Rivet heads and Riveted joints, types of welded joints and representation.

UNIT II
Assembly Machine Drawing: Basic concept, plotting technique, assembly and blow up of parts, bill of materials, product data; Cotter and Knuckle joints, pedestal and footstep bearings, crosshead, stuffing box, IC engines parts - piston and connecting rods; lath machine parts.

UNIT III
Introduction to Compute Aided Drafting software for 2D and 3D Modeling, Basic design concepts, design process, stages/phases in design, flowchart, problem formulation, design considerations (strength, manufacturing, maintenance, environment, economics and safety); design for recycle and reuse, Design and safety factors for steady and variable loads, impact and fatigue considerations, reliability and optimization, standardization in design..

UNIT IV
Design of components subject to static loads: riveted joints, welded joints threaded joints, pin, key knuckle, and cotter joints

References:

1. Bhat, ND; Machine Drawing; Charotar
2. Singh A; Machine Drawing; TMH
3. Narayana and Reddy; Machine Drawing; New age, Delhi.
4. Agarwal and agrawal; Engineering Drawing; TMH
5. Shigley JE et al; Mechanical Engineering Design, TMH
6. John KC; Text Book Of Machine Drawing; PHI Learning
7. Kulkarni SG; Machine Design; TMH
8. Mubeen and Mubeen; Machine Design.
9. Bhandari VB; Design of Machine elements; TMH
10. Sharma PC, Agarwal DK; Machine Design; Katson
11. Luzzader WJ, Duff JM; Fundamental of Engg Drawing Interactive Graphics; PHI.
12. PSG Design data book
13. Mahadevan and Reddy’s Mechanical design data book

List of Experiments (Pl. expand it):
1. Computer Aided Drafting of simple machine parts
2 3D modeling of simple solid shapes
3 Design and drawing of parts contained in the syllabus

ME-306 Computer Programming (Java)

UNIT-I
Basic Java Features - C++ Vs JAVA, JAVA virtual machine, Constant & Variables, Data Types, Class, Methods, Objects, Strings and Arrays, Type Casting, Operators, Precedence relations, Control Statements, Exception Handling, File and Streams, Visibility, Constructors, Operator and Methods Overloading, Static Members, Inheritance: Polymorphism, Abstract methods and Classes

UNIT–II
Java Collective Frame Work - Data Structures: Introduction, Type-Wrapper Classes for Primitive Types, Dynamic Memory Allocation, Linked List, Stack, Queues, Trees, Generics: Introduction, Overloading Generic Methods, Generic Classes, Collections: Interface Collection and Class Collections, Lists, Array List and Iterator, Linked List, Vector.
Collections Algorithms: Algorithm sorts, Algorithm shuffle, Algorithms reverse, fill, copy, max and min Algorithm binary Search, Algorithms add All, Stack Class of Package java. Util, Class Priority Queue and Interface Queue, Maps, Properties Class, Un-modifiable Collections.

UNIT–III
Advance Java Features - Multithreading: Thread States, Priorities and Thread Scheduling, Life Cycle of a Thread, Thread Synchronization, Creating and Executing Threads, Multithreading with GUI, Monitors and Monitor Locks. Networking: Manipulating URLs, Reading a file on a Web Server, Socket programming, Security and the Network, RMI, Networking, Accessing Databases with JDBC: Relational Database, SQL, MySQL, Oracle

UNIT–IV
Advance Java Technologies - Servlets: Overview and Architecture, Setting Up the Apache Tomcat Server, Handling HTTP get Requests, Deploying a web Application, Multitier Applications, Using JDBC from a Servlet, Java Server Pages (JSP): Overview, First JSP Example, Implicit Objects, Scripting, Standard Actions, Directives, Multimedia: Applets and Application: Loading, Displaying and Scaling Images, Animating a Series of Images, Loading and playing Audio clips

UNIT–V Advance Web/Internet Programming (Overview): J2ME, J2EE, EJB, XML.

References:

1. Deitel & Deitel, ”JAVA, How to Program”; PHI, Pearson.
2. E. Balaguruswamy, “Programming In Java”; TMH Publications
3. The Complete Reference: Herbert Schildt, TMH
4. Peter Norton, “Peter Norton Guide To Java Programming”, Techmedia.
5. Merlin Hughes, et al; Java Network Programming , Manning Publications/Prentice Hall

List of Program to be made (Expandable)
1. Installation of J2SDK
2. Write a program to show Concept of CLASS in JAVA
3. Write a program to show Type Casting in JAVA
4. Write a program to show How Exception Handling is in JAVA
5. Write Programs to show Inheritance and Polimorphism.
6. Write a program to show Interfacing between two classes
7. Write a program to Add a Class to a Package
8. Write a program to demonstrate AWT.
9. Write a Program to show Data Base Connectivity Using JAVA

10. Write a Program to show "HELLO JAVA " in Explorer using Applet
11. Write a Program to show Connectivity using JDBC
12. Write a program to demonstrate multithreading using Java.
13. Write a program to demonstrate applet life cycle.

ME-307 Self Study (Internal Assessment)

Objective of Self Study: is to induce the student to explore and read technical aspects of his area of interest / hobby or new topics suggested by faculty.

Evaluation will be done by assigned faculty based on report/seminar presentation and viva.

ME-308 Seminar / Group Discussion(Internal Assessment)

Objective of GD and seminar is to improve the MASS COMMUNICATION and CONVINCING/ understanding skills of students and it is to give student an opportunity to exercise their rights to express themselves.

Evaluation will be done by assigned faculty based on group discussion and power point presentation.

B.E. 401 - ENGINEERING MATHEMATICS III

Unit I

Functions of complex variables : Analytic functions, Harmonic Conjugate, Cauchy-Riemann Equations, Line Integral, Cauchy’s Theorem, Cauchy’s Integral Formula, Singular Points, Poles & Residues, Residue Theorem , Application of Residues theorem for evaluation of real integrals

Unit II

Errors & Approximations, Solution of Algebraic & Trancedental Equations (Regula Falsi , Newton-Raphson, Iterative, Secant Method), Solution of simultaneous linear equatins by Gauss Elimination, Gauss Jordan, Crout’s methods , Jacobi’s and Gauss-Siedel Iterative methods

Unit III

Difference Operators, Interpolation (Newton Forward & Backward Formulae, Central Interpolation Formulae, Lagrange’s and divided difference formulae) , Numerical Differentiation and Numerical Integration.

Unit IV

Solution of Ordinary Differential Equations(Taylor’s Series, Picard’s Method, Modified Euler’s Method, Runge-Kutta Method, Milne’s Predictor & Corrector method), Correlation and Regression, Curve Fitting (Method of Least Square).

Unit V

Concept of Probability : Probability Mass function, Probability density function. Discrete Distribution: Binomial, Poisson’s, Continuous Distribution: Normal Distribution, Exponential Distribution ,Gamma Distribution ,Beta Distribution ,Testing of Hypothesis l:Students t-test, Fisher’s z-test, Chi-Square Method

Reference:

(i) Numerical Methods using Matlab by J.H.Mathews and K.D.Fink, P.H.I.
(ii) Numerical Methods for Scientific and Engg. Computation by MKJain, Iyengar and RK Jain, New Age International Publication
(iii) Mathematical Methods by KV Suryanarayan Rao, SCITECH Publuication
(iv) Numerical Methods using Matlab by Yang,Wiley India
(v) Pobability and Statistics by Ravichandran ,Wiley India
(vi) Mathematical Statistics by George R., Springer

AU/IP/ME-402 Material Science and Metallurgy

Unit I

Crystal Atoms of Solid: Structure of atom binding in solids metallic, Vander walls, ionic and covalent, Space lattice and crystal system arrangement of atoms in BCC, FCC and HCP crystal. Manufacture of Refractory and Ferrous Metals: Properties uses and selection of acid, basic and natural refractory, metallurgical coke, Properties, types, uses and brief description of the manufacturing processes for iron and steel making.

Unit II

Plastic deformation of Metals: Point and line defects in crystals, their relation to mechanical properties, deformation of metal by slip and twinning stress strain curves of poly crystalline materials viz. mild steel cast iron and brass yield point phenomenon. Cold and hot working of metals and their effect on mechanical properties, annealing of cold worked metals, principles of re-crystallization and grain growth phenomenon, fracture in metal and alloys, ductile and brittle fracture, fatigue failure

Unit III

Alloy Formation and Binary Diagram: Phase in metal system solution and inter-metallic compounds. Hume-Rottery's rules, solidification of pure metals and alloy equilibrium diagrams of isomorphous, eutectic peritectic and eutectoid system, non-equilibrium cooling and coring iron, iron carbon equilibrium diagram.

Unit IV

Heat Treatment of Alloys Principles of Heat Treatment of Steel: TTT curves heat treating processes, normalizing, annealing spherodizing, hardening, tempering, case hardening, aus-tempering, mar-tempering, precipitation hardening process with reference to Al, Cu alloys

Unit V

Properties of Material: Creep Fatigue etc., Introduction to cast iron and steel, Non Ferrous metals base alloys, Bronze, Brasses, Duralumin, and Bearing Metals. Plastics, Composites and ceramics: Various types of plastics, their properties and selection. Plastic molding technology, FRP, GRP resins adhesive, elastomers and their application. Powder Metallurgy: Property and Applications of Powder Metallurgy, Various process and methods of making products by powder Metallurgy techniques.

References:

1. Narula GK, KS and GuptaVK; Material science; TMH
2. Raghavan V; Material Science and Engineering, PHI Publication.
3. Raghavan V; Physical Metallurgy Principles and Practice; PHI
4. Rajendran V and Marikani; Material science; TMH
5. Sriniwasan R; Engineering materials and Metallurgy; TMH
6. Navneet Gupta, Material Science & Engineering, Dhanpat Rai.
7. B. K. Agrawal, Introduction to Engineering Materials, TMH.

AU/IP/ME-403 Theory of M/C and Mechanism

Unit 1:

Mechanisms and Machines: Mechanism, machine, plane and space mechanisms, kinematic pairs, kinematic chains and their classification, degrees of freedom, Grubler's criterion, kinematic inversions of four bar mechanism and slider crank mechanism, equivalent linkages, pantograph, straight line motion mechanisms, Davis and Ackermann's steering mechanisms, Hooke's joint.

Unit 2:

Kinematic analysis of plane mechanisms using graphical and Cartesian vector notations: Planar kinematics of a rigid body, rigid body motion, translation, rotation about a fixed axis, absolute general plane motion. General case of plane motion, relative velocity method, velocity and acceleration analysis, instantaneous center and its application, Kennedy's theorem, relative motion, Coriolis component of acceleration; velocity and acceleration analysis using complex algebra (Raven's) method.

Unit 3 :Gears: Classification of gears, nomenclature, involutes and cycloidal tooth profile properties, synthesis of tooth profile for spur gears, tooth system, conjugate action, velocity of sliding, arc of contact, path of contact, contact ratio, interference and undercutting, helical, spiral, bevel and worm gears.

Unit 4:

Cams: Classification of followers and cams, radial cam nomenclature, analysis of follower motion (uniform, modified uniform, simple harmonic, parabolic, cycloidal), pressure angle, radius of curvature, synthesis of cam profile by graphical approach, cams with specified contours.

Gear Trains: Simple, compound, epicyclic gear trains; determination of gear speeds using vector, analytical and tabular method; torque calculations in simple, compound and epicyclic gear trains.

Unit 5:

Gyroscopic Action in Machines: angular velocity and acceleration, gyroscopic torque/ couple; gyroscopic effect on naval ships; stability of two and four wheel vehicles, rigid disc at an angle fixed to a rotating shaft.

References:

1. Rattan SS; Theory of machines; TMH
2. Ambekar AG; Mechanism and Machine Theory; PHI.
3. Sharma CS; Purohit K; Theory of Mechanism and Machines; PHI.
4. Thomas Bevan; Theory of Machines; Pearson/ CBS PUB Delhi.
5. Rao JS and Dukkipati; Mechanism and Machine Theory; NewAge Delhi.
6. Dr.Jagdish Lal; Theory of Machines; Metropolitan Book Co; Delhi –
7. Ghosh,A,.Mallik,AK; Theory of Mechanisms & Machines, 2e,;East West Press, Delhi.

List of experiments (expandable)

1.To study all inversions of four-bar mechanisms using models

2.Draw velocity and acceleration polygons of all moving link joints in slider crank mechanism

3.Determination of velocity and acceleration in above using method of graphical differentiation

4.To study working of differential gear mechanism.

5.To study working of sun and planet epicycle gear train mechanism using models

6.To plot fall and rise of the follower versus angular displacement of cam and vice versa.

7.Study of universal gyroscope

8.Analytical determination of velocity and acceleration in simple mechanism using Roven's M.

ME-404 Thermal Engg and gas dynamics

Unit I Steam generators: classification, conventional boilers, high-pressure boilers-lamont, benson, loeffler and velox steam generators, performance and rating of boilers, equivalent evaporation, boiler efficiency, heat balance sheet, combustion in boilers, super critical boilers, fuel and ash handling, boiler draught, overview of boiler codes.

Unit II Phase Change Cycles: Vapor Carnot cycle and its limitation, Rankin cycle, effect of boiler and Condenser pressure and superheat on end moisture and efficiency of ranking cycle, modified Rankin cycle, reheat cycle, perfect regenerative cycle, Ideal and actual regenerative cycle with single and multiple heaters, open and closed type of feed water heaters, regenerative-reheat cycle, supercritical pressure and binary-vapor cycle, work done and efficiency calculations.

Unit III (A) Gas dynamics: speed of sound, in a fluid mach number, mach cone, stagnation properties, one-dimensional isentropic flow of ideal gases through variable area duct-mach number variation, area ratio as a function of mach number, mass flow rate and critical pressure ratio, effect of friction, velocity coefficient, coefficient of discharge, diffusers, normal shock.

(b) Steam nozzles: isentropic flow of vapors, flow of steam through nozzles, condition for maximum discharge, effect of friction, super-saturated flow.

Unit IV Air compressors: working of reciprocating compressor, work input for single stage compression different, compression processes, effect of clearance, volumetric efficiency real indicator diagram, isentropic & isothermal and mechanical efficiency, multi stage compression, inter - cooling, condition for minimum work done, classification and working of rotary compressors.

Unit V Steam condensers, cooling towers and heat exchangers: introduction, types of condensers, back pressure and its effect on plant performance air leakage and its effect on performance of condensers, various types of cooling towers, design of cooling towers, classification of heat exchangers, recuperates and regenerators .parallel flow, counter flow and cross flow exchangers, fouling factor, introduction to LMTD approach to design a heat exchanger.

References:

1. Nag PK; Power plant Engineering; TMH
2. Thermodynamics by Gordon J. Van Wylen
3. P.K.Nag; Basic and applied Thermodynamics; TMH
4. Ganesan; Gas turbines; TMH
5. Heat Engines by V.P. Vasandani & D. S. Kumar
6. R. Yadav Steam and Gas Turbines
7. R.Yadav Thermal Engg.
8. Kadambi & Manohar; An Introduction to Energy Conversion Vol II. Energy conversion cycles

List of Experiments (Please Expand it) (Thermal Engg and gas dynamics):

1. Study of working of some of the high pressure boilers like Lamont or Benson
2. Study of Induced draft/forced and balanced draft by chimney
3. Determination of Calorific value of a fuel
4. Study of different types of steam turbines
5. Determination of efficiencies of condenser
6. Boiler trail to chalk out heat balance sheet
7. Determination of thermal efficiency of steam power plant
8. Determination of Airflow in ducts and pipes.
9. To find out efficiencies of a reciprocating air compressor & study of multistage Compressors
10. Find Out heat transfer area of a parallel flow/counter flow heat exchanger.

AU/IP/ME-405 Fluid Mechanics

Unit-I Review of Fluid Properties: Engineering units of measurement, mass, density, specific weight, volume and gravity, surface tension, capillarity, viscosity, bulk modulus of elasticity, pressure and vapor pressure. Fluid Static's : Pressure at a point, pressure variation in static fluid, Absolute and gauge pressure, manometers, Forces on plane and curved surfaces (Problems on gravity dams and Tainter gates); buoyant force, Stability of floating and submerged bodies, Relative equilibrium.

Unit-II Kinematics of Flow : Types of flow-ideal & real , steady & unsteady, uniform & non-uniform, one, two and three dimensional flow, path lines, streak-lines, streamlines and stream tubes; continuity equation for one and three dimensional flow, rotational & irrotational flow, circulation, stagnation point, separation of flow, sources & sinks, velocity potential, stream function, flow netstheir utility & method of drawing flow nets.

Unit-III Dynamics of Flow: Euler's equation of motion along a streamline and derivation of Bernoulli's equation, application of Bernoulli's equation, energy correction factor, linear momentum equation for steady flow; momentum correction factor. The moment of momentum equation, forces on fixed and moving vanes and other applications. Fluid Measurements: Velocity measurement (Pitot tube, Prandtl tube, current meters etc.); flow measurement (orifices, nozzles, mouth pieces, orifice meter, nozzle meter, venturi-meter, weirs and notches).

Unit-IV Dimensional Analysis and Dynamic Similitude: Dimensional analysis, dimensional homogeneity, use of Buckingham-pi theorem, calculation of dimensionless numbers, similarity laws, specific model investigations (submerged bodies, partially submerged bodies, weirs, spillways, rotodynamic machines etc.)

Unit-V Laminar Flow: Introduction to laminar & turbulent flow, Reynolds experiment & Reynolds number, relation between shear & pressure gradient, laminar flow through circular pipes, laminar flow between parallel plates, laminar flow through porous media, Stokes law, lubrication principles.

References: -

1. Modi & Seth; Fluid Mechanics; Standard Book House, Delhi
2. Streeter VL, Wylie EB, Bedford KW; Fluid Mechanics; TMH
3. Som and Biswas; Fluid Mechnics and machinery; TMH
4. Cengal; Fluid Mechanics; TMH
5. White ; Fluid Mechanics ; TMH
6. Gupta; Fluid Mechanics; Pearson
7. JNIK DAKE; Essential of Engg Hyd; Afrikan Network & Sc Instt. (ANSTI)
8. R Mohanty; Fluid Mechanics; PHI

List of Experiments (Pl. expand it):

1. To determine the local point pressure with the help of pitot tube.
2. To find out the terminal velocity of a spherical body in water.
3. Calibration of Orifice meter and Venturi meter
4. Determination of Cc, Cv, Cd of Orifices
5. Calibration of Nozzle meter and Mouth Piece
6. Reynolds experiment for demonstration of stream lines & turbulent flow
7. Determination of meta-centric height
8. Determination of Friction Factor of a pipe
9. To study the characteristics of a centrifugal pump.
10. Verification of Impulse momentum principle.

ME-406 Dot Net

UNIT I Introduction .NET framework, features of .Net framework, architecture and component of .Net, elements of .Net.

UNIT II Basic Features Of C# Fundamentals, Classes and Objects, Inheritance and Polymorphism, Operator Overloading, Structures. **Advanced Features Of C#** Interfaces, Arrays, Indexers and Collections; Strings and Regular Expressions, Handling Exceptions, Delegates and Events.

UNIT III Installing ASP.NET framework, overview of the ASP .net framework, overview of CLR, class library, overview of ASP.net control, understanding HTML controls, study of standard controls, validations controls, rich controls. **Windows Forms:** All about windows form, MDI form, creating windows applications, adding controls to forms, handling Events, and using various Tolls

UNIT IV Understanding and handling controls events, **ADO.NET-** Component object model, ODBC, OLEDB, and SQL connected mode, disconnected mode, dataset, data-reader **Data base controls:** Overview of data access data control, using grid view controls, using details view and frame view controls, ado .net data readers, SQL data source control, object data source control, site map data source.

UNIT V XML: Introducing XML, Structure, and syntax of XML, document type definition (DTD), XML Schema, Document object model, Presenting and Handling XML. xml data source, using navigation controls, introduction of web parts, using java script, Web Services

References:

1. C# for Programmers by Harvey Deitel, Paul Deitel, Pearson Education
2. Balagurusamy; Programming in C#; TMH
3. **Web** Commerce **Technology** Handbook by Daniel **Minoli**, Emma **Minoli** , TMH
4. Web Programming by Chris Bates, Wiley
5. XML Bible by Elliotte Rusty Harold ,
6. ASP .Net Complete Reference by McDonald, TMH.
7. ADO .Net Complete Reference by Odey, TMH

List of Experiments/ program (Pl. expand it):

1. Working with call backs and delegates in C#
2. Code access security with C#.
3. Creating a COM+ component with C#.
4. Creating a Windows Service with C#
5. Interacting with a Windows Service with C#
6. Using Reflection in C#
7. Sending Mail and SMTP Mail and C#
8. Perform String Manipulation with the String Builder and String Classes and C#:
9. Using the System .Net Web Client to Retrieve or Upload Data with C#
10. Reading and Writing XML Documents with the XML Text-Reader/-Writer Class and C#
11. Working with Page and forms using ASP .Net.
12. Data Sources access through ADO.Net,
13. Working with Data readers , Transactions
14. Creating Web Application.

Course outcome of Mechanical Engineering: BE III Year

Course Outcome for Mechanical Engineering in B.E./ B.Tech III year is given as follows:-

- Students learn about theEntrepreneurship and Management Concepts.
- To understand the theoretical aspects turbo machinery like: steam turbine, water turbine, centrifugal pumps, rotary fans, blowers and compressors.
- To understand the theoretical & practical aspects of mechanical measurement and control system.
- Students learn about the design of machine components like: shafts, brakes, clutch, springs and bearings.
- Students have an idea while designing the various machine members like shafts, bearings, gears, belts & chains and various I.C. Engine Components & Machine tool parts.
- Students learn various Management Functions like Planning, Organizing, Staffing, Leading, Motivation and Control aspects.
- Studentslearn aboutgeneral layout, operation and maintenance of different types of power plant.
- To understand the theoretical & practical aspects of machining process like cutting, grinding, milling, drilling, broaching, shaping and gear cutting.
- Students will understand the power generated inside the engine and transmitted to the wheels and also learn about design and working of fuel supply system, like, carburetor, fuel pumps, MPFI system.
- To understand the theoretical & practical aspects heat and mass transfer like: conduction, natural and forced convection, radiation, pool boiling and condensation.

AU/IP/ME/TX/CM- 501 - Entrepreneurship and Management Concepts

Unit-I: **System Concepts:** Types, definition & characteristics; supra & subsystems, key component; boundary & interface complexity; feedback (pull) & feed forward (push) controls, open flexible-adaptive system, computer as closed system, law of requisite variety; system coupling, stresses and entropy; functional & cross functional system; Steven Alter's nine element work system model and its comparison with IPO (input-processing-output) model, structure and performance of work systems leading to customer delight.

Unit-II: **Management:** Importance, definition and functions; schools of theories, knowledge driven learning organization and e-business; environment, uncertainty and adaptability; corporate culture, difficulties and levels of planning, BCG matrix, SWOT analysis, steps in decision making, structured and unstructured decision; dimensions of organizations, size/specialization, behavior formalization, authority centralization, departmentalization, spam and line of control, technology and Minzberg organization typology, line, staff & matrix organization, coordination by task force, business process reengineering and process of change management, HR planning placement and training, MIS; attitudes and personality trait, overlap and differences between leader & manager, leadership grid, motivation, Maslow's need hierarchy and Herzberg two factor theory, expectation theory, learning process, team work and stress management.

Unit-III: **Marketing:** Importance, definition, core concepts of need want and demand, exchange & relationships, product value, cost and satisfaction (goods and services) marketing environment; selling, marketing and societal marketing concepts; four P's, product, price, placement, promotion; consumer, business and industrial market, market targeting, advertising, publicity, CRM and market research.

Finance: Nature and scope, forms of business ownerships, balance sheet, profit and loss account, fund flow and cash flow statements, breakeven point (BEP) and financial ratio analysis, pay-back period, NPV and capital budgeting.

Unit-IV: Productivity and Operations: Productivity, standard of living and happiness, types of productivity, operations (goods and services) Vs project management, production processes and layouts, steps in method improvement, time measurement, rating and various allowances; standard time and its utility, predetermined motion and time method, product and process specification, TQM, cost of quality, introduction to lean manufacturing (JIT), QFD, TPM & six sigma quality.

Unit V: Entrepreneurship : Definition and concepts, characteristics, comparison with manager, classification, theories of entrepreneur, socio, economic, cultural and psychological; entrepreneur traits and behavior, roles in economic growth, employment, social stability, export promotion and indigenization, creating a venture, opportunity analysis competitive and technical factors, sources of funds, entrepreneur development program.

References:

1- Daft R; The new era of management; Cengage.
2- Bhat Anil, Arya kumar; Management: Principles ,Processes and Practices; Oxford higher edu.
3- Davis & Olson; Management Information System; TMH.
4- Steven Alter; Information systems, Pearson, www.stevenalter.com
5- Kotler P; Marketing management;
6- Khan, Jain; Financial Management;
7- ILO; Work study; ILO.
8- Mohanty SK; Fundamental of Entrepreneurship; PHI.

ME- 502- Turbo Machinery

Unit I: **Energy transfer in turbo machines**: application of first and second laws of thermodynamics to turbo machines, moment of momentum equation and Euler turbine equation, principles of impulse and reaction machines, degree of reaction, energy equation for relative velocities, one dimensional analysis only.

Unit II: **Steam turbines**: impulse staging, velocity and pressure compounding, utilization factor, analysis for optimum U.F Curtis stage, and Rateau stage, include qualitative analysis, effect of blade and nozzle losses on vane efficiency, stage efficiency, analysis for optimum efficiency, mass flow and blade height. **Reactions staging**: Parson's stages, degree of reaction, nozzle efficiency, velocity coefficient, stator efficiency, carry over efficiency, stage efficiency, vane efficiency, conditions for optimum efficiency, speed ratio, axial thrust, reheat factor in turbines, problem of radial equilibrium, free and forced vortex types of flow, flow with constant reaction, governing and performance characteristics of steam turbines.

Unit III: Water turbines: Classification, Pelton, Francis and Kaplan turbines, vector diagrams and work-done, draft tubes, governing of water turbines. **Centrifugal Pumps**: classification, advantage over reciprocating type, definition of mano-metric head, gross head, static head, vector diagram and work done. **Performance and characteristics**: Application of dimensional analysis and similarity to water turbines and centrifugal pumps, unit and specific quantities, selection of machines, Hydraulic, volumetric, mechanical and overall efficiencies, Main and operating characteristics of the machines, cavitations.

Unit IV: Rotary Fans, Blowers and Compressors: Classification based on pressure rise, centrifugal and axial flow machines. **Centrifugal Blowers** Vane shape, velocity triangle, degree of reactions, slip coefficient, size and speed of machine, vane shape and stresses, efficiency, characteristics, fan laws and characteristics. **Centrifugal Compressor** – Vector diagrams, work done, temp and pressure ratio, slip factor, work input factor, pressure coefficient, Dimensions of inlet eye, impeller and diffuser. **Axial flow Compressors**- Vector diagrams, work done factor, temp and pressure ratio, degree of reaction, Dimensional Analysis, Characteristics, surging, Polytrophic and isentropic efficiencies.

Unit V: Power Transmitting turbo machines: Application and general theory, their torque ratio, speed ratio, slip and efficiency, velocity diagrams, fluid coupling and Torque converter, characteristics, **Positive displacement machines** and turbo machines, their distinction. Positive displacement pumps with fixed and variable displacements, **Hydrostatic systems** hydraulic intensifier, accumulator, press and crane.

References:

1. Venkanna BK; turbomachinery; PHI
2. Shepherd DG; Turbo machinery
3. Csanady; Turbo machines
4. Kadambi V Manohar Prasad; An introduction to EC Vol. III-Turbo machinery; Wiley Eastern Delhi
5. Bansal R. K; Fluid Mechanics & Fluid Machines;
6. Rogers Cohen & Sarvan Multo Gas Turbine Theory
7. Kearton W. J; Steam Turbine: Theory & Practice

ME- 503- Mechanical Measurement & control

Unit-I:Basic Concepts of Measurement: General measurement system; Experimental test plan: variables, parameters, noise and interference, replication and repetition; Calibration: Static calibration, dynamic calibration, static sensitivity, range, accuracy, precision and bias errors, sequential and random tests; Presenting data: Rectangular coordinate format, semi-log, full-log formats. Measurement System Behavior: General model for a dynamic measurement system and its special cases: zero order, first order, and second order system, determination of time constant and settling time, phase linearity.

Unit-II: Statistics: Least square regression analysis and data outlier detection; Normal distribution and concept of standard deviation of the mean in finite data set, Uncertainty Analysis: Measurement errors; error sources: calibration, data acquisition, data reduction; Design stage uncertainty analysis; combining elemental errors; Bias & Precision errors; Error propagation, Higher order uncertainty analysis.

Unit-III: Temperature Measurement: Temperature standards, Temperature scales; Thermometry based on thermal expansion: Liquid in glass thermometers, Bimetallic Thermometers; Electrical resistance thermometry: Resistance Temperature Detectors, Thermistors; Thermoelectric Temperature Measurement: Temperature measurement with thermocouples, thermocouple standards. Pressure and Velocity Measurement: Relative pressure scales, pressure reference instruments, barometer, manometer, deadweight tester, pressure gauges and transducers, total and static pressure measurement in moving fluids Flow measurement: Pressure differential meters: Orifice meter, Venturi meter, roto-meter.

Unit-IV: Strain Measurement: Stress and strain, resistance strain gauges, gauge factor, strain gauge electrical circuits, multiple gauge bridge, bridge constant, apparent strain and temperature compensation, bending compensation. Motion, Force and Torque Measurement: Displacement measurement: Potentiometers, Linear variable differential transformers, rotary variable differential transformer; Velocity measurement: moving coil transducers; angular velocity measurement: electromagnetic techniques, stroboscopic measurement; Force measurement: load cells, piezoelectric load cells; Torque measurement: measurement of torque on rotating shafts, Power estimation from rotational speed and torque.

Unit-V: Introduction to control systems: Examples of control systems. Open loop and closed loop control, Mathematical modeling of dynamic systems: Transfer function, impulse response function, block diagram of closed loop system, block diagram reduction, Transient and steady state response analyses: First order systems, unit step and unit impulse response of first order systems, second order systems, unit step and unit impulse response of second order systems, transient response specifications, modeling of mechanical systems, modeling of electrical systems, signal flow graphs, modeling of fluid systems, liquid level systems, hydraulic systems, modeling of thermal systems.

References:

1. Nakra and Chowdhry; Measurement and Control; TMH
2. Figiola RS & Beasley DE; Theory and Design for Mechanical Measurements; 3e John Wiley
3. Katsuhiko Ogata; Modern Control Engineering, 4e Pearson Education, New Delhi
4. Gopal; Control Systems Principles and Design; Tata McGraw Hill, New Delhi.
5. Backwith and Buck; Mechanical Measurements.
6. Swahney; Metrology and Instrumentation;

List of Experiment (Expandable)(Measurement & control)**:**

1- Study of various temperature measuring devices; thermo couple, RTD, gas thermo meters.
2- Measuring velocity of fluid flow by Ventura meter/ orifice meter/ pitot-tube.
3- Measuring torque and power generated by a prime mover by using pony brake dynamometer.
4- Study of various pressure measuring devices like manometers, mercury in glass pressure gauge.
5- To develop a measuring device for fluid level measurement.

ME/AU- 504- Machine Component Design

Note: PSG Design data book and/ or Mahadevan and Reddy's Mechanical design data book are to be provided/ permitted in exam hall (duly verified by authority)

Unit I: Stress concentration and fatigue: causes of stress concentration; stress concentration in tension, bending and torsion; reduction of stress concentration, theoretical stress concentration factor, notch sensitivity, fatigue stress concentration factor, cyclic loading, endurance limit, S-N Curve, loading factor, size factor, surface factor. Design consideration for fatigue, Goodman and modified Goodman's diagram, Soderberg equation, Gerber parabola, design for finite life, cumulative fatigue damage factor.

Unit II: Shafts: Design of shaft under combined bending, twisting and axial loading; shock and fatigue factors, design for rigidity; Design of shaft subjected to dynamic load; Design of keys and shaft couplings.

Unit III: Springs: Design of helical compression and tension springs, consideration of dimensional and functional constraints, leaf springs and torsion springs; fatigue loading of springs, surge in spring; special springs, **Power Screws** design of power screw and power nut, differential and compound screw, design of simple screw jack.

Unit IV: Brakes & Clutches: Materials for friction surface, uniform pressure and uniform wear theories, Design of friction clutches: Disk , plate clutches, cone & centrifugal clutches.
Design of brakes: Rope, band & block brake, Internal expending brakes, Disk brakes.

Unit V Journal Bearing: Types of lubrication, viscosity, hydrodynamic theory, design factors, temperature and viscosity considerations, Reynold's equation, stable and unstable operation, heat dissipation and thermal equilibrium, boundary lubrication, dimensionless numbers, Design of journal bearings, **Rolling-element Bearings:** Types of rolling contact bearing, bearing friction and power loss, bearing life; Radial, thrust & axial loads; Static & dynamic load capacities; Selection of ball and roller bearings; lubrication and sealing.

References:

1. Shingley J.E; Machine Design; TMH
2. Sharma and Purohit; Design of Machine elements; PHI
3. Wentzell Timothy H; Machine Design; Cengage learning
4. Mubeen; Machine Design; Khanna Publisher
5. Ganesh Babu K and Srithar k; Design of Machine Elements; TMH
6. Sharma & Agrawal; Machine Design; Kataria & sons
7. Maleev; Machnine Design;

List of Experiment (Pl. expand it):
Designing and sketching of components contained in the syllabus

ME- 505- Dynamics of Machines

Unit 1: Dynamics of Engine Mechanisms: Displacement, velocity and acceleration of piston; turning moment on crankshaft, turning moment diagram; fluctuation of crankshaft speed, analysis of flywheel.

Unit 2: Governor Mechanisms: Types of governors, characteristics of centrifugal governors, gravity and spring controlled centrifugal governors, hunting of centrifugal governors, inertia governors.

Unit 3: Balancing of Inertia Forces and Moments in Machines: Balancing of rotating masses, two plane balancing, determination of balancing masses (graphical and analytical methods), balancing of rotors, balancing of internal combustion engines (single cylinder engines, in-line engines, V-twin engines, radial engines, Lanchester technique of engine balancing.

Unit 4: **Friction:** Frictional torque in pivots and collars by uniform pressure and uniform wear rate criteria. Boundary and fluid film lubrication, friction in journal and thrust bearings, concept of friction circle and axis, rolling friction. Clutches: Single plate and multi plate clutches, Cone clutches.

Unit 5 Belt drives; Velocity ratio, limiting ratio of tension; power transmitted; centrifugal effect on belts, maximum power transmitted by belt, initial tension, creep; chain and rope drives;
Brakes: Band brake, block brakes, Internal and external shoe brakes, braking of vehicles.
Dynamometer: Different types and their applications.
Dynamic Analysis of Cams: Response of un-damped cam mechanism (analytical method), follower response analysis by phase-plane method, jump and cross-over shock.

References:

1. Ambekar, AG; Mechanism and Machine Theory; PHI
2. Rattan SS; Theory of machines; TMH
3. Sharma and Purohit; Design of Machine elements; PHI
4. Bevan; Theory of Machines;
5. Ghosh and Mallik; Theory of Mechanisms and Machines; Affiliated East-West Press, Delhi
6. Norton RL; kinematics and dynamics of machinery; TMH
7. Grover; Mechanical Vibrations
8. Balaney; Theory of Machines by
9. Theory of Vibrations by Thomson

List of Experiment (Pl. expand it):

1- Study of various models of governors.
2- Study of gyroscopic motion and calculation of value of gyroscopic couple.
3- Study of various types of Cams and followers and drawing the cam profile with the help of test kit.
4- Study of various first order vibration systems.
5- To study working of friction clutches using models

<u>**ME- 506- RDBMS Lab**</u>

UNIT-I

Introduction : Advantage of DBMS approach, various view of data, data independence, schema and sub-schema, primary concepts of data models, Database languages, transaction management, Database administrator and users, data dictionary, overall system architecture. **ER model:** basic concepts, design issues, mapping constraint, keys, ER diagram, weak and strong entity sets, specialization and generalization, aggregation, inheritance, design of ER schema, reduction of ER schema to tables.

UNIT-II

Domains, Relations and keys: domains, relations, kind of relations, relational database, various types of keys, candidate, primary, alternate and foreign keys.
Relational Algebra & SQL: The structure, relational algebra with extended operations, modifications of Database, idea of relational calculus, basic structure of SQL, set operations, aggregate functions, null values, nested sub queries, derived relations, modification of Database, join relation, DDL in SQL.

UNIT-III

Relational Dependencies and Normalization: basic definitions, trivial and non trivial dependencies, closure set of dependencies and of attributes, irreducible set of dependencies, introduction to normalization, non loss decomposition, FD diagram, first second, third Normal forms, dependency preservation, BCNF, multivalued dependencies and forms normal form dependeny and fifth normal forms. **Distributed Database:** basic idea, distributed data storage, data replication, data fragmentationhorizontal, vertical and mixed frangmentation.

UNIT-IV

Emerging Fields in DBMS : object oriented Database-basic idea and the model, object structure, object class, inheritance, multiple inheritance, object identity, data warehousing-terminology, definitions, characteristics, data mining and it's overview, Database on www, multimedia Database-difference with conventional DBMS, issues, similarity based retrived continuous media data, multimedia data formats, video servers.

Unit V

Storage structure and file organizations: Overview of physical storage media, magnetic disksperformance and optimization, basic idea of RAID, organization, organization of records in files, basic concepts of indexing, ordered indices, basic idea of B-tree and B+-tree organization.
Network and hierarchical models: basic idea, data structure diagrams, DBTG model, implementations, tree structure diagram, implementation techniques, comparision of the three models.

References:

1. A Silberschatz, H.F. Korth, Sudersan "Database System Concept"=, MGH Publication.
2. C.J. Date "An introduction to Database System"=6th ed.
3. Elmasri & Navathe "Foundamentals of Database system"- III ed.

AU/IP/ME/TX- 601 – Operations Management

Unit 1 **Operations Management (OM):** Definition, history, industrial and IT revolution (ERP); tangible and service products continum, employment shift from agriculture, manufacturing to service; customer orientation; basic process formats on product volume-variety graph; concept of raw process time, critical WIP, bottle neck thruput and cycle-time with example of Penny-Fab-1,2; Little's law, best and worst case performance, thruput and cycle time formula in practical-worst-case; criteria of performance, decision area, business strategy, environment scan, SWOT, Porters' five forces, core competency, competitive priorities of cost, quality, time and flexibility, order winners; production strategy of Make To Order-MTO, MTS and ATO (assemble to order); productivity, standard of living and happiness.

Unit 2 Product:-Life Cycle and PLC management; design steps, evolution and innovation, traditional v/s concurrent design, form and functional design, simplification and standardization, differentiation/mass customization, modular design, design for mfg and environment (DFM, DFE), technologies used in design. Service characteristics and classification based on people-things v/s direct-indirect service actions, service triangle of customer, provider and system; technical and functional (delivery) service quality and other service performance factors, Valerie's service quality model; globalization of services.

Unit 3 Processes: transformation and value addition, selection based on cost, quality and flexibility considerations; reliability, bath-tub curve, series and parallel components, MTBF; availability and maintainability, preventive maintenance, TPM; value analysis; replacement models; Quality-definition, Taguchi loss function, cost of quality, chain action of improving quality to productivity to motivation and low cost; product and process specs; the funnel-marble experiment and variance reduction, process capability, six sigma and its implementation by DMAIC, QFD, TQM and ISO-9000.

Unit 4 Plant-facilities: Impact of organization strategies on choice of region and site, existing or new organization, decision-affecting factors for location, load distance, dimensional and factor analysis methods, Brown-Gibson model, foreign locations, non-profit govt. services (health, school) locations. facility layout objectives and factors, basic layouts, merits and optimization; subjective relationship ranking method, computer programs CRAFT and 3-d modeling; problems of inventories flow and operators in process layout and inflexibility in product layout, flexible cellular layout, group technology; capacity and equipment selection, importance of spare capacity to reduce Q-length and cycle time.

Unit 5 Programs/ procedures of production control (PPC): corporate and production planning process, aggregate plan, master production schedule and material planning; matching supply to demand fluctuations over time horizon, Forecasting elements, time series, regression, causal and Delphi methods; use of LP in aggregate plan and HMMS model, assembly line balancing, elemental task, station time and cycle time, balance delays; sequencing, Johnson method for n-job 2/3 m/c, NP hard job-shop sequencing, heuristic dispatch rules; synchronous mfg, TOC, drum-buffer-rope and focus on bottleneck as control point; JIT lean mfg, Kanban and CONWIP shop floor controls, Kaizen.

References:

1. Chary SN; Production and Operations Management; TMH
2. Hopp W and Spearman M; Factory Physics; TMH
3. Gitlow Howard et al; Quality Management; TMH
4. Stevenson W J; Operations Management; TMH

5. Khanna RB; Production and Operations Management; PHI
6. Vollman, Berry et al; Manufacturing planning and control for SCM; TMH.
7. Chase Richard B et al; Operations management; SIE-TMH
8. Adam EE and Ebert RJ; Production and Operations Management Concepts…; PHI Learning.

ME- 602 – Power Plant Engineering

Unit I: Introduction to methods of converting various energy sources to electric power, direct conversion methods renewable energy sources, solar, wind, tidal, geothermal, bio-thermal, biogas and hybrid energy systems, fuel cells, thermoelectric modules, MHD-Converter.

Unit II: Fossil fuel steam stations: Basic principles of sitting and station design, effect of climatic factors on station and equipment design, choice of steam cycle and main equipment, recent trends in turbine and boiler sizes and steam conditions, plant design and layout, outdoor and indoor plant, system components, fuel handling, burning systems, element of feed water treatment plant, condensing plant and circulating water systems, cooling towers, turbine room and auxiliary plant equipment., instrumentation, testing and plant heat balance.

Unit III: Nuclear Power Station: Importance of nuclear power development in the world and Indian context, Review of atomic structure and radio activity, binding energy concept, fission and fusion reaction, fissionable and fertile materials, thermal neutron fission, important nuclear fuels, moderators and coolants, their relative merits, thermal and fast breeder reactors, principles of reactor control, safety and reliability features.

Unit IV: Hydro-Power Station: Elements of Hydrological computations, rainfall run off, flow and power duration curves, mass curves, storage capacity, salient features of various types of hydro stations, component such as dams, spillways, intake systems, head works, pressure tunnels, penstocks, reservoir, balancing reservoirs, Micro and pico hydro machines, selection of hydraulic turbines for power stations, selection of site.

Unit V: Power Station Economics: Estimation and prediction of load. Maximum demand, load factor, diversity factor, plant factor and their influence on plant design, operation and economics; comparison of hydro and nuclear power plants typical cost structures, simple problems on cost analysis, economic performance and tariffs, interconnected system and their advantages, elements of load dispatch in interconnected systems.

References:

1- Nag PK; Power plant Engg; TMH
2- Al-Wakil MM; Power plant Technology; TMH
3- Sharma PC; Power plant Engg; Kataria and sons, Delhi
4- Domkundwar; Power Plant Engg; Dhanpatrai & sons.
5- Rajput RK; A text book of Power plant Engg.; Laxmi Publications.
6- Yadav R; Steam and gas turbine and power plant engg by

IP/ME- 603 – Metal Cutting and CNC M/C

Unit I: Lathe: Classification of machine tools and their basic components; lathe- specification, components & accessories, various operations on lathes, capstan & turret lathes, tool layout, methods of thread production, machining time, single point cutting tools, tool signature and nomenclature

Unit II: Grinding: Types of grinding machines, surface, cylindrical and internal grinding, grinding wheels, specifications, wheel turning and dressing without eccentricity, centre-less grinding.

Unit III: Milling: Vertical, horizontal and universal type machines, specifications and classifications of milling machines, universal dividing head plain and different indexing, gear cutting, milling cutters.

Drilling & Broaching: Fixed spindle, radial and universal drilling machines, drilling time, broaching principle, broaches and broaching machines.

Unit IV: Shapers: Classification and specifications, principle parts, quick return mechanism, shaper operations, speed feed, depth of cut, machining time. Surface qualities, equipment used for rating surfaces, rms. CLA value, causes for surface irregularities.
Gear Cutting: Die casting, methods of forming gears, generating process, Gear shaping, gear shaving, gear grinding gear testing.

Unit V: Mechatronics: Introduction to control systems, analog control, transfer function, procedure for writing transfer function, signal flow diagram, introduction to electronic components like switches, magnetic type, electromagnetic type, transducers and other sensors, servo motors, basics of CD-ROM players, PLC, applications, CNC machines.

References:
1. Rao PN; Manufacturing Technology vol I and II; TMH
2. Hazra Chadhary; Workshop Tech.II; Media Promoter and Pub
3. Lindberg RA; Processes and Materials of Manufacturing; PHI.
4. Raghuvanshi;BS; Work shop technology Vol-I, II; Dhanpat Rai Delhi
5. Alciatori DG, Histand MB; Introduction to Mechatronics and Measurement system; TMH
6. HMT; Production Processes; TMH

List of Experiment (Pl. expand it):
1. To make a job on lathe machine with all operations like turning, step turning, drilling , tapper turning ,
thread cutting and knurling .
2. Study of center less grinding machine/ tool and cutter type grinding machine.
3. Study of horizontal/ universal milling machine, diving head and indexing mechanism of it.
4. To cut a spur gear on milling machine using rapid indexing method.
5. Study of radial drilling machine and preparing a job on it.
6. To study a sapping machine to learn about working of quick return mechanism.

ME- 604 – Internal Combustion Engines

Unit I: Internal Combustion Engine: S.I. and C.I. engines of two and four stroke cycles, real cycle analysis of SI and CI engines, determination of engine dimensions, speed, fuel consumption, output, mean effective pressure, efficiency, factors effecting volumetric efficiency, heat balance, performance characteristics of SI and CI engines, cylinder arrangement, firing order, power balance for multi-cylinder engines, valve timing.

Unit II: Combustion in SI engines: Flame development and propagation, ignition lag, effect of air density, temperature, engine speed, turbulence and ignition timings, physical and chemical aspects of detonation, effect of engine and fuel variables on knocking tendency, knock rating of volatile fuels, octane number, H.U.C.R., action of dopes, pre-ignition, its causes and remedy, salient features of various type combustion chambers, valve timing and firing order.

Unit III: Combustion in C.I. Engines: Times base indicator diagrams and their study, various stages of combustion, delay period, diesel knock, octane number, knock inhibitors, salient features of various types of combustion chambers, fuel, ignition, cooling, exhaust and lubrication systems; Simple problems on fuel injection, various types of engines, their classification and salient features. Rotary I. C. engines, their principles of working.

Unit IV: I.C. Engine System: Fuels, ignition systems, cooling, exhaust/scavenging and lubrication system. Fuel metering in SI engine: Fuel injection in SI engine (MPFI & TBI), Theory of carburetion, simple problems on carburetion. Fuel metering in CI engines: Fuel injection in CI engine and simple problems, various types of engines, their classification and salient features.
Fuels: Conventional fuels and alternate fuels, engine exhaust emission, carbon monoxide, un-burnt hydro carbon, oxides of nitrogen, smoke, density, measurement and control, hydrogen as alternate fuel.

Unit V: Supercharging: Effect of attitude on mixture strength and output of S.I. engines, low and high pressure super charging, exhaust, gas turbo-charging, supercharging of two stroke engines.

References:
1. Ganeshan V; Internal Combusion engines; TMH
2. Mathur ML & Sharma RP; A. Course in IC engines; DhanpatRai
3. Gupta HN; Fundamentals of IC Engines; PHI
4. Srinivasan S; Automotive Engines; TMH
5. Halderman JD and Mitchell CD; Automotive Engines theory and servicing; Pearson
6. DomKundwar; Internal Combustion Engines ; Dhanpat Rai Publications
7. Taylor GF; Internal Combustion Engines Theory & Practice; MIT Press
8. Richard Stone; Introduction to IC Engines; Society of Automotive Engr (Palgrave Mc Millan)

List of Experiments (Pl. expand it):
1. Determination of Valve timing diagram
2. Load test on Petrol Engine
3. Heat Balance of SI engine
4. Heat Balance of CI Engine
5. Study of Battery Ignition system and Electronic Ignition System
6. Study of Diesel fuel pump
7. Study of Diesel fuel injectors

8. Study of a Carburetors
9. Study of Fuel Injection system in SI Engine
10. Study of lubricating system in CI Engines

ME- 605 – Heat & Mass Transfer

Unit-1 Basic Concepts: Modes of heat transfer, Fourier's law, Newton's law, Stefan Boltzman law; thermal resistance and conductance, analogy between flow of heat and electricity, combined heat transfer process; **Conduction:** Fourier heat conduction equation, its form in rectangular, cylindrical and spherical coordinates, thermal diffusivity, linear one dimensional steady state conduction through a slab, tubes, spherical shells and composite structures, electrical analogies, critical-insulation-thickness for pipes, effect of variable thermal conductivity.

Unit 2 Extended surfaces (fins): Heat transfer from a straight and annular fin (plate) for a uniform cross section; error in measurement of temperature in a thermometer well, fin efficiency, fin effectiveness, applications; **Unsteady heat conduction:** Transient and periodic conduction, heating and cooling of bodies with known temperatures distribution, systems with infinite thermal conductivity, response of thermocouples.

Unit 3 Convection: Introduction, free and forced convection; principle of dimensional analysis, Buckingham 'pie' theorem, application of dimensional analysis of free and forced convection, empirical correlations for laminar and turbulent flow over flat plate and tubular geometry; calculation of convective heat transfer coefficient using data book.

Unit 4 Heat exchangers: Types- parallel flow, counter flow; evaporator and condensers, overall heat transfers coefficient, fouling factors, log-mean temperature difference (LMTD), method of heat exchanger analysis, effectiveness of heat exchanger, NTU method;
Mass transfer: Fick's law, equi-molar diffusion, diffusion coefficient, analogy with heat transfer, diffusion of vapour in a stationary medium.

Unit 5 Thermal radiation: Nature of radiation, emissive power, absorption, transmission, reflection and emission of radiation, Planck's distribution law, radiation from real surfaces; radiation heat exchange between black and gray surfaces, shape factor, analogical electrical network, radiation shields.
Boiling and condensation: Film wise and drop wise condensation; Nusselt theory for film wise condensation on a vertical plate and its modification for horizontal tubes; boiling heat transfer phenomenon, regimes of boiling, boiling correlations.

References:

1. Sukhatme SP; Heat and mass transfer; University Press Hyderabad
2. Holman JP; Heat transfer; TMH
3. Nag PK; heat and Mass Transfer; TMH
4. Dutta BK; Heat Transfer Principles And App; PHI Learning
5. Mills AF and Ganesan V; Heat transfer; Pearson
6. Cengel Yunus A; Heat and Mass transfer;TMH
7. Yadav R; Heat and Mass Transfer; Central India pub-Allahabad
8. Baehr HD;Stephan K; Heat and Mass Transfer; MacMillan Pub
9. Incropera FP and Dewitt DP; Heat and Mass transfer; Wiley

List of Experiments (Pl. expand it):

1 Conduction through a rod to determine thermal conductivity of material
2 Forced and free convection over circular cylinder
3 Free convection from extended surfaces
4 Parallel flow and counter flow heat exchanger effectiveness and heat transfer rate
5 Calibration of thermocouple
6 Experimental determination of Stefen-Boltzman constant

ME- 606 – Computer Aided Engineering (CAE)

Unit 1 Methods to solve engineering problems- analytical, numerical, experimental, their merits and comparison, discretization into smaller elements and effect of size/ shape on accuracy, importance of meshing, boundary conditions, Computer Aided Engineering (CAE) and design, chain-bumping-stages vs concurrent-collaborative design cycles, computer as enabler for concurrent design and Finite Element Method (FEM), degree of freedom (DOF), mechanical systems with mass, damper and spring, stiffness constant K for tensile, bending and torsion; Practical applications of FEA in new design, optimization/ cost-cutting and failure analysis,

Unit 2 Types of analysis in CAE, static (linear/ non linear), dynamic, buckling, thermal, fatigue, crash NVH and CFD, review of normal, shear, torsion, stress-strain; types of forces and moments, tri-axial stresses, moment of inertia, how to do meshing, 1-2-3-d elements and length of elements; force stiffness and displacement matrix, Rayleigh-Ritz and Galerkin FEM; analytical and FEM solution for single rod element and two rod assembly.

Unit 3 Two-dimension meshing and elements for sheet work and thin shells, effect of mesh density and biasing in critical region, comparison between tria and quad elements, quality checks, jacobian, distortion, stretch, free edge, duplicate node and shell normal.

Unit 4 Three-dimension meshing and elements, only 3 DOF, algorithm for tria to tetra conversion, floating and fixed trias, quality checks for tetra meshing, brick meshing and quality checks, special elements and techniques, introduction to weld, bolt, bearing and shrink fit simulations, CAE and test data correlations, post processing techniques

Unit 5 Review of linear optimization, process and product optimization, design for manufacturing (DFM) aspects in product development, use of morphing technique in FEA, classical design for infinite life and design for warranty life, warranty yard meetings and functional roles, climatic conditions and design abuses, case studies.

References:

1. Gokhle Nitin; et al; Practical Finite Element Analysis; Finite to Infinite, 686 Budhwar Peth, Pune.
2. Logan DL ; A First Course in Finite element Method; Cegage
3. Krishnamoorthy; Finite Element Analysis, theory and programming; TMH
4. Buchanan; Finite Element Analysis; Schaum series; TMH
5. Seshu P; Textbook of Finite Element Analysis; PHI.
6. Chennakesava RA; Finite Element Methods-Basic Concepts and App; PHI Learning
7. Reddy JN; An introduction to finite element method; TMH
8. Desai Chandrakant S et al; Introduction to finite element Method; CBS Pub
9. Hutton D; Fundamentals of Finite Element Analysis; TMH
10. Zienkiewicz; The finite element Method; TMH
11. Martin and Grahm; Introduction to finite element Analysis (Theory and App.)
12. Rao, S.S., The Finite Element Method in Engineering; Peragamon Press, Oxford.
13. Robert DC., David DM et al, Concepts and Application of Finite Element Analysis; John Wiley.
14. Chandrupatla, T.R. an Belegundu, A.D., Introduction to Finite Elements in Engineering,PHI

Course outcome of Mechanical Engineering: BE IV Year

Course Outcome for Mechanical Engineering in B.E./ B.Tech IV year is given as follows:-

- Students learn about time study, motion study, method study, ergonomics & value engineering.
- To learn aboutsolar energy, wind energy, biomass, hydropower system, geothermal energy, ocean energy and tidal energy.
- To analyze the response of machine members or structures in forced vibration with different excitation frequenciesand also determine natural frequencies of single and two degrees of freedom systems.
- To compare and select the proper automotive system for the vehicle, analyze the performance of the vehicle and diagnose the faults of automobile vehicles.
- To understand Operations Research features, models, applications and methods such as linear programming, transportation, sequencing, assignment, replacement, games theory and dynamic programming.
- Students learn to design suitable energy monitoring system to analyze and optimize the energy consumption.
- Students learn about the design of machine parts like: pressure vessels, gears, IC engine components, belt, chain and rope drives.
- To understand the principles and applications of refrigeration systems, performance of vapour compression refrigeration system and psychrometry, air conditioning processes and different air conditioning systems.
- Students learn about various elements of computers, computer graphics, product cycle in manufacturing industry, drafting and modeling systems, NC part programming, group technologyand computer aided process planning and use of computer integrated manufacturing systems in industries.

ME-701 Elective –I (ME-701 (A) – Design of Heat Exchangers)

UNIT 1: Introduction: Types of heat exchangers heat transfer laws applied to heat exchangers convection Coefficients, resistance caused by the walls and by fouling, overall heat transfer coefficient.

Unit 2: Thermal & hydraulic design of commonly used heat exchangers : LMTD & NTU Methods, correction factors**,** Double pipe heat exchangers , shell and tube heat exchangers, condensers , Evaporators ,Cooling and dehumidifying coils ,cooling towers, evaporative condensers ,design of air washers, desert coolers.

Unit 3: TEMA standard: Tubular heat exchangers TEMA standard heat-exchanger-nomenclature, selection criteria for different types of shells and front and rear head ends; geometrical characteristics of TEMA heat exchangers.

Unit 4: Review of mechanical Design, Materials of Construction, corrosion damage, testing and inspection.

Unit 5: Heat Pipe: Basics & its mathematical model, micro Heat Exchangers0, Use of Software in heat exchanger design.

References:

1. Kern D Q, Kraus A D; Extended Surface Heat Transfer; TMH.
2. Kays, Compact Heat Exchangers and London, TMH.
3. Kokac, Heat Exchangers- Thermal Hydraulic fundamentals and design;TMH.
4. Tubular Exchanger Manufacturer Association (TEMA), and other codes

ME-701 Elective –I (ME-701 (B) – Computer Aided engineering and FEM

Unit-I Introduction : Structural analysis, objectives, static, Dynamic and kinematics analyses, Skeletal and continuum structures, Modeling of infinite d.o.f. system into finite d.o.f. system, Basic steps in finite element problem formulation, General applicability of the method.

Unit-II Element Types and Characteristics : Discretization of the domain, Basic element shapes, Aspect ratio, Shape functions, Generalized co-ordinates and nodal shape functions; ID bar and beam elements, 2D rectangular and triangular elements; axis-symmetric elements.

Unit-III Assembly of Elements and Matrices : Concept of element assembly, Global and local coordinate systems, Band width and its effects, Banded and skyline assembly, Boundary conditions, Solution of simultaneous equations, Gaussian elimination and Choleksy decomposition methods, Numerical integration, One and 2D applications.

Unit-IV Higher Order and iso-parametric Elements: One dimensional quadratic and cubic elements, Use of natural co-ordinate system, Area co-ordinate system continuity and convergence requirements, 2D rectangular and triangular requirement.

Unit-V Static Analysis: Analysis of trusses and frames, Analysis of machine subassemblies, Use commercial software packages, Advantages and limitations

Unit-VI Dynamic Analysis: Hamilton's principle, Derivation of equilibrium, Consistent and lumped mass matrices, Derivation of mass matrices for ID elements, Determination of natural frequencies and mode shapes, Use of commercial software packages.

References:

1. Gokhle Nitin; et al; Practical Finite Element Analysis; Finite to Infinite, 686 Budhwar Peth, Pune.
2. Logan DL ; A First Course in Finite element Method; Cegage
3. Krishnamoorthy; Finite Element Analysis, theory and programming; TMH
4. Buchanan; Finite Element Analysis; Schaum series; TMH
5. Seshu P; Textbook of Finite Element Analysis; PHI.
6. Chennakesava RA; Finite Element Methods-Basic Concepts and App; PHI Learning
7. Reddy JN; An introduction to finite element method; TMH
8. Desai Chandrakant S et al; Introduction to finite element Method; CBS Pub
9. Hutton D; Fundamentals of Finite Element Analysis; TMH
10. Zienkiewicz; The finite element Method; TMH
11. Martin and Grahm; Introduction to finite element Analysis (Theory and App.)
12. Rao, S.S., The Finite Element Method in Engineering; Peragamon Press, Oxford.
13. Robert DC., David DM et al, Concepts and Application of Finite Element Analysis; John Wiley.
14. Chandrupatla, T.R. an Belegundu, A.D., Introduction to Finite Elements in Engineering,PHI

ME-701 Elective –I (ME-701 (C) – Industrial Robotics

Unit I Introduction: Need and importance, basic concepts, structure and classification of industrial robots, terminology of robot motion, motion characteristics, resolution, accuracy, repeatability, robot applications.

Unit II End Effectors and Drive systems: Drive systems for robots, salient features and comparison, different types of end effectors, design, applications.

Unit III Sensors: Sensor evaluation and selection □ Piezoelectric sensors □ linear position and displacement sensing, revolvers, encoders, velocity measurement, proximity, tactile, compliance and range sensing. Image Processing and object recognition.

Unit IV Robot Programming: Teaching of robots, manual, walk through, teach pendant, off line programming concepts and languages, applications.

Unit V Safety and Economy of Robots: Work cycle time analysis, economics and effectiveness of robots, safety systems and devices, concepts of testing methods and acceptance rule for industrial robots.

References:

1. Mittal RK, Nagrath IJ; Robotics and Control; TMH
2. Groover M.P,Weiss M, Nagel,OdreyNG; Industrial Robotics-The Appl□; TMH
3. Groover M.P; CAM and Automation; PHI Learning
4. Spong Mark and Vidyasagar; Robot Modelling and control; Wiley India
5. Yoshikava ; Foundations of Robotics- analysis and Control; PHI Learning;
6. Murphy ; Introduction to AI Robotics; PHI Learning
7. FU KS, Gonzalez RC, Lee CSG; Robotics □Control, sensing□; TMH
8. Shimon, K; Handbook of Industrial Robots; John Wiley & Sons,.
9. Ghosal Ashitava; Robotics Fundamental concepts and analysis; Oxford
10. Saha S; Introduction to Robotics; TMH
11. Yu Kozyhev; Industrial Robots Handbook; MIR Pub.

ME-701 Elective –I (ME-701 (D) – Work Study and Ergonomics

Unit 1 Method study: purpose of work study, its objectives, procedure and applications; method study definition and basic procedure, selection of job, various recording techniques like outline process charts, flow process charts, man machine charts, two handed process charts, string diagram, flow diagram, multiple activity chart, simo, cyclographs and chrono-cyclographs; critical examination, development, installation and maintenance of improved method; principles of motion economy and their application in work design; micro motion study, memo motion study and their use in methods study.

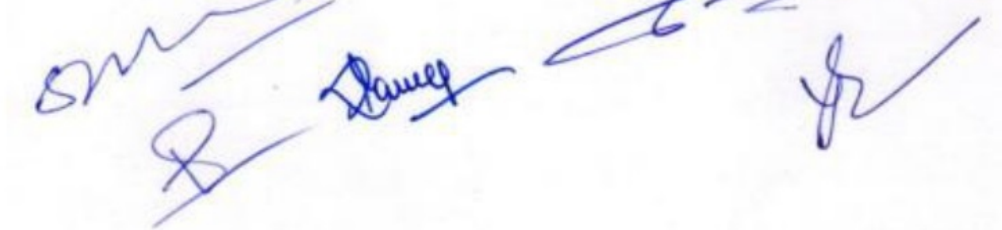
Unit 2 Work measurement: Introduction & definition, objectives and basic procedure of work measurement; application of work measurement in industries; time study: basic procedure, equipments needed, methods of measuring time, selection of jobs, breaking a job into elements; numbers of cycles to be timed; rating and methods of rating, allowances, calculation of standard time.
Work sampling: Basic procedure, design of work sampling study conducting work sampling study and establishment of standard-time.

Unit 3 Job evaluation and incentive schemes: Starlight line, Tailor, Merrick and Gantt incentive plans
Standard data system; elemental and non-elemental predetermined motion systems, work factors system; Methods Time Measurement (MTM), MOST

Unit 4 Human factor engineering: Definition and history of development of human factors engineering, types & characteristics of man-machine-system, relative capabilities of human being and machines; development and use of human factor data; information input and processing: Introduction to information theory; factors effecting information reception and processing; coding and selecting of sensory inputs.

Unit 5 Display systems and anthropometric data: Display- types of visual display, visual indicators and warning signals; factorial and graphic display; general principles of auditory and tactral display, characteristics and selection.

Reference:
1. ILO; work-study; International Labour Organization
2. Khan MI; Industrial Ergonomics; PHI Learning
3. Barrnes RM; Motion and Time Study; Wiley pub
4. Megaw ED; Contenmprory ergonomics; Taylor & fracis
5. Sandera M and Mc Cormick E; Human Factors in Engg and design; MGHill
6. Currie RM; Work study; BIM publications
7. Mynard; Hand book of Industrial Engg;



ME-702 Elective –II (ME-702 (A) – Renewable Energy System

UNIT-I **Solar Radiation**: Extra-terrestrial and terrestrial, radiation measuring instrument, radiation measurement and predictions. **Solar thermal conversion**: Basics, Flat plate collectors-liquid and air type. Theory of flat plate collectors, selective coating, advanced collectors, Concentrators: optical design of concentrators, solar water heater, solar dryers, solar stills, solar cooling and refrigeration.
Solar photovoltaic: Principle of photovoltaic conversion of solar energy; Technology for fabrication of photovoltaic devices; Applications of solar cells in PV generation systems; Organic PV cells.

UNIT-II **Wind energy** characteristics and measurement: Metrology of wind speed distribution, wind speed statistics, Weibull, Rayleigh and Normal distribution, Measurement of wind data, Energy estimation of wind regimes; **Wind Energy Conversion**: Wind energy conversion principles; General introduction; Types and classification of WECS; Power, torque and speed characteristics; power curve of wind turbine, capacity factor, matching wind turbine with wind regimes; Application of wind energy.

UNIT-III **Production of biomass,** photosynthesis-C3 & C4 plants on biomass production; Biomass resources assessment; Co2 fixation potential of biomass; Classification of biomass; Physicochemical characteristics of biomass as fuel **Biomass conversion** routes: biochemical, chemical and thermo chemical Biochemical conversion of biomass to energy: anaerobic digestion, biogas production mechanism, technology, types of digesters, design of biogas plants, installation, operation and maintenance of biogas plants, biogas plant manure-utilization and manure values. Biomass Gasification: Different types, power generation from gasification, cost benefit analysis of power generation by gasification.

UNIT-IV **Small Hydropower Systems**: Overview of micro, mini and small hydro system; hydrology; Elements of turbine; Assessment of hydro power; selection and design criteria of turbines; site selection and civil works; speed and voltage regulation; Investment issue load management and tariff collection; Distribution and marketing issues. **Ocean Energy:** Ocean energy resources, ocean energy routs; Principle of ocean thermal energy conversion system, ocean thermal power plants. Principles of ocean wave energy and Tidal energy conversion.

UNIT-IV **Geothermal energy**: Origin of geothermal resources, type of geothermal energy deposits, site selection geothermal power plants; **Hydrogen Energy**: Hydrogen as a source of energy, Hydrogen production and storage. **Fuel Cells**: Types of fuel cell, fuel cell system and sub-system, Principle of working, basic thermodynamics

References:

1. Kothari, Singal & Rajan; Renewable Energy Sources and Emerging Technologies, PHI Learn
2. Khan, B H, Non Conventional Energy, TMH.
3. Sukhatme and Nayak, Solar Energy, Principles of Thermal Collection and Storage, TMH.
4. Tiwari and Ghosal, Renewable Energy Resources: basic principle & application, Narosa Publ
5. Koteswara Rao, Energy Resources, Conventional & Non-Conventional, BSP Publication.
6. Chetan Singh Solanki, Solar Photovoltaics: Fundamental, technologies and Application,PHI L
7. Abbasi Tanseem and Abbasi SA; Renewable Energy Sources; PHI Learning
8. Ravindranath NH and Hall DO, Biomass, Energy and Environment, Oxford University Press.
9. Duffie and Beckman, Solar Engineering of Thermal Process, Wiley
10. Nikolai, Khartchenko; Green Power; Tech Book International
11. Tester, Sustainable Energy-Choosing Among Options, PHI Learning.
12. Godfrey Boyle, Renewable Energy: Power for a sustainable future, Oxford OUP.

ME-702 Elective –II (ME-702 (B) – Project Management

Unit 1 Concepts of project management:: Meaning, definition and characteristics of a project, technical and socio-cultural dimensions; project life cycle phases, project planning and graphic presentation; work breakdown structure, manageable tasks; size of network; blow down NW; identity and logic dummy activity; Fulkerson rule for numbering NW; time-scaled NW

Unit-2 NW analysis: PERT network; mean time and variances; probability to complete PERT project in specified time; CPM network; Event Occurrence Time (EOT); activity start/ finish times; forward and reverse path calculations, concept and calculation of floats; resource allocation and critical-chain; overview of MS-project-2000.

Unit-3 Project duration and control: Importance and options to accelerate project completion; timecost tradeoff; fixed variable and total costs; use of floats and cost optimization; project performance measures; project monitoring info and reports; project control process; Gant chart and control chart; cost-schedule S-graph; planned cost of work schedule (PV), budgeted/ earned cost of work completed (EV) and actual cost of work completed (AC); schedule and cost variances (SV, CV) forecasting final project costs.

Unit-4 Project organization, culture and leadership: projects within functional organization; dedicated project/ task-force teams; staff, matrix and network organization; choosing appropriate project organization; Organization culture; ten characteristics; cultural dimensions supportive to projects; social network and management by wandering around (MBWA); different traits of a manager and leader; managing project teams; five stage team development model; shared vision; conflicts; rewards; rejuvenating project teams; project stakeholders; concept of project partnering.

Unit-5 Strategic planning and project appraisal: Capital allocation key criteria; Porters competitive strategy model; BCG matrix; Strategic Position Action Evaluation (SPACE); time value of money; cash flows; payback period; IRR; cost of capital; NPV; social cost benefit analysis; UNIDO approach; project risks and financing.

References:

1. Prasana Chandra: Projects: planning Implementation control; TMH.
2. Gray Clifford F And Larson EW; Project The managerial Process; TMH
3. Panneerselven and Serthil kumar; Project management, PHI
4. Burke ; Project Management-Planning and control technics; Wiley India
5. Kamaraju R; Essentials of Project Management; PHI Learning
6. Jack R. Meredith, Project Management: a managerial approach, Wiley.
7. Choudhary ;Project Management; TMH
8. Srinath LS; PERT And CPM Principles and Appl; East West Press
9. Richman L; Project Management: Step By Step; PHI Learning
10. United Nations Industrial Development Organisation, Guide to practical project appraisal - social benefit cost analysis in developing countries, oxford & ibh

ME-702 Elective –II (ME-702 (C) – Total Quality Management and SQC

Unit 1 Evolution of total quality management, historical perspective, teamwork, TQM and ISO 9000; information technology and Business Process Re-engineering (BPR); TPM and quality awards; aids and barriers to quality mgt, creating vision and initiating transformation, establishing programs for education and self coordination, policy setting and review, flowchart of policy mgt and relation with daily mgt. improvements, measurement of key indicators; quality mgt leader; cross functional teams and

Unit 2 Process- definition, variation and feedback, funnel-marble experiment- rules of adjustment and its effects, quality- definition, goalpost and kaizen view, quality of design, conformance and performance; Taguchi loss function, cost of quality, chain action of improving quality to productivity to motivation and low cost; Deming's theory of mgt, fourteen points and variance reduction; attributes enumerative and variables analytic studies.

Unit 3 SQC-Control charts: basic discrete and continuous distributions, measures of central tendency, variability and shapes, sampling, size and central value theorem, control chart structure, process plotting and stability, study of out-of-control evidences, defect detection and prevention, use of control charts in evaluating past, present and future trends; attribute control charts, count and classification charts, construction and interpretation of p , np , c and u charts, PDSA cycle(plan, do, study, act), and R charts, and s charts, individual and moving range chart, trial control limits and out of control points.

Unit 4 Process diagnostics: Between and Within Group variations, periodic and persistent disturbances, control chart patterns-natural, level-shift, cycle, wild, multi-universe, relationship and other out of control patterns; diagnosing a process, brainstorming; cause-effect, Ishikava, interrelationship, systematic and matrix diagrams; change concepts and waste elimination

Unit 5 Process improvement: Performance and technical specifications, attribute-process and variable-process capability studies; unstable and stable process capability studies and examples; attribute and variable improvement studies; Inspection: acceptance sampling(AS)- lot formation, single, double and multiple/sequential sampling plans, operating characteristic (OC) curve, producer and consumer risk, theoretical invalidation of AS, kp rule for stable and chaotic processes.

References:

1. Gitlow HS, Oppenheim et al; Quality Management; TMH
2. Gryna FM; Juran□s Quality Planning and Analysis; TMH
3. Crosby Philips; Quality is still free; New Amer Library
4. Kulkarni VA and Bewoor AK; Quality Control; Wiley
5. Jankiraman B and Gopal RK; Total Quality Management- Text and Cases; PHI Learning
6. Sugandhi L and Samual A; Total Quality Management; PHI Learning
7. Subburaj R; Total Qality Management; TMH
8. Naidu Babu and Rajendran; TQM; New age International pub;
9. Chase Richard B et al; Operations management; SIE-TMH
10. Chary SN; Production and Operations Management; TMH

ME-702 Elective –II (ME-702 (D) – MIS ERP and e Business

UNIT 1 Management Information System (MIS) definition, Objectives and benefits, MIS as strategic tool, obstacles and challenges for MIS, functional and cross functional systems, hierarchical view of CBIS, structured and unstructured decision, Operation and mgt support, Decision process and MIS, info system components and activities, Value chain and MIS support.

UNIT 2 System concepts: types, definition, characteristics, feedback (Pull) and feed-forward (Push) control, system stress and entropy, computer as closed system, law of requisite variety, open and flexible (Adaptive) systems, work system model and comparison with input-process-output model, five views of work system: structure, performance, infrastructure, context and risk and their effect on product performance.

UNIT 3 Info concepts: define data, info, knowledge, intelligence and wisdom, Information characteristics
and attributes, info measurement and probability, characteristics of human as info processor.

UNIT 4 Planning and control Concepts: terminologies, difficulties in planning, system analysis and development plan-purpose and participants, info planning, (SDLC) system development life cycle for inhouse and licensed sw, system investigation, analysis of needs, design and implementation phases, training of Operational personnel, evaluation, Control and Maintenance of Information Systems.

UNIT 5 E-business components and interrelationship, Evolution of Enterprise Resource Planning (ERP) from MRP, Supply chain management (SCM) and Customer relationship management (CRM), Integrated data model, strategic and operational issues in ERP, Business Process Re-Engineering (BPR), significance and functions, information technology and computer NW support to MIS.

References

1. Davis and Olson, Management Information Systems, TMH
2. James O□ Brian, Management Information Systems, TMH
3. Oz, Management Information Systems, Cengage
4. Alter Stevenson, Information Systems: Foundation of E-Business; (Prentice-Hall,USA)
5. Jayaraman, Business Process Re-Engineering, TMH.
6. Garg. V.K.; ERP, PHI
7. Kelkar SA; Management Information Systems A Concise Study; PHI Learning.
8. Radhakrishnan R and Balasuramanian S; Business Process Reengineering; PHI Learning.
9. Alex Leon ; ERP, TMH
10. Jawadekar WS; MIS- text and cases; TMH
11. Jaiswal M and Mital M; MIS; Oxford higher Edu India

ME-703- Mechanical Vibration and Noise Engineering

Unit 1: Fundamental Aspects of Vibrations: Vibration, main causes, advantages and disadvantages; engineering applications of vibration and noise; vector method of representing harmonic motion; characteristics of vibration, harmonic analysis and beats phenomenon, work done by harmonic forces on harmonic motion; periodic, non-harmonic functions- Fourier series analysis; evaluation of coefficients of Fourier series; elements of vibratory system; lumped and distributed parameter systems.
Undamped Free Vibrations: Derivation of differential equation of motion: the energy method, the method based on Newton□s second law of motion, and Rayleigh□s method. Solution of differential equation of motion: Natural frequency of vibration. Systems involving angular oscillations: the compound pendulum.

Unit 2: Damped Free Vibrations: Viscous damping: coefficient of damping; damping ratio; under damped, over damped and critically damped systems; logarithmic decrement; frequency of damped free vibration; Coulomb or dry friction damping; frequency, decay rate and comparison of viscous and Coulomb damping; solid and structural damping; slip or interfacial damping.

Unit 3: Harmonically excited Vibration: One degree of freedom- forced harmonic vibration; vector representation of forces; excitation due to rotating and reciprocating unbalance; vibration Isolation, force and motion transmissibility; absolute and relative motion of mass (Seismic Instruments).
Whirling Motion and Critical Speed : Whirling motion and Critical speed : Definitions and significance .Critical -speed of a vertical , light □flexible shaft with single rotor : with and without damping .Critical speed of a shaft carrying multiple discs (without damping), Secondary critical speed.

Unit 4: Systems With Two Degrees of Freedom : Un-damped free vibration of 2 d.o.f and Principal modes of vibration; torsion vibrations; Forced, Un-damped vibrations with harmonic excitation ; Coordinate coupling; Dynamic vibration absorber; torsion Vibration Absorber; Pendulum type of dynamic vibration.

Unit 5: Noise Engineering -Subjective response of sound: Frequency and sound dependent human response; the decibel scale; relationship between, sound pressure level (SPL), sound power level and sound intensity scale; relationship between addition, subtraction and averaging, sound spectra and Octave band analysis; loudness; weighting networks; equivalent sound level, auditory effects of noise; hazardous noise, exposure due to machines and equipments; hearing conservation and damage risk criteria, daily noise doze.
Noise: Sources, Isolation and Control: Major sources of noise on road and in industries, noise due to construction equipments and domestic appliances, industrial noise control, strategies- noise control at source (with or without sound enclosures), noise control along the path (with or without partitions and acoustic barriers); noise control at the receiver, ear defenders, earplugs, semi-insert protectors.

References:
1- Ambekar A.G.,' Mechanical Vibrations and Noise Engineering; PHI
2- Meirovitch Leonard; Element of Vibration Analysis; TMH
3- Dukikipati RV Srinivas J Text book of Mechanical Vibrations; PHI
4- Kelly SG and kudari SK; Mechanical Vibrations; Schaum Series;TMH
5- Thomson , W.T., Theory of Vibration with Applications , C.B.S Pub & distributors .

6- Singiresu Rao, “Mechanical Vibrations □ , Pearson Education .
7- G.K. Grover, “ Mechanical Vibration , Nem chand and Bross , Roorkee .

List of experiments (please expand it);

Mechanical Vibration and Noise Engineering-AU/ ME 703

1- To find out effect of load on natural frequency of vibrations of a lever pin supported at one end carrying adjustable load on a vertical screwed bar and spring supported at some intermediate point (i) When the dead weight of rods is neglected and (ii) when their dead weight is taken into account .
2- To find out frequency of damped free vibration and rate of decay of vibration-amplitude in the system.
3- To find out natural frequency and damped free frequency of a torsion pendulum and , hence to find out coefficient of damping of the oil ;
4- To observe the phenomenon of □whirl□ in a horizontal light shaft and to determine the critical speed of the shaft.
5- To observe the mode shapes of a spring-connected, double pendulum and hence to demonstrate the phenomenon of beats.
6- To demonstrate the principle of tuned Undamped Dynamic Vibration Absorber and to determine the effect of mass-ratio (of main and auxiliary mass) on the spread of the resulting natural frequencies ;
7- To take measurements of sound Pressure Level (SPL) and to carry out octave band analysis of a machine using Noise Level Meter.

ME-704- Automobile Engineering

Unit-I: Chassis & Body Engg: Types, Technical details of commercial vehicles, types of chassis, lay out, types of frames, testing of frames for bending & torsion on unutilized body frame, vehicle body and their construction, driver□s visibility and methods for improvement, safety aspects of vehicles, vehicle aerodynamics, optimization of body shape, driver□s cab design, body materials, location of engine, front wheel and rear wheel drive, four wheel drive.

Unit-II: Steering System: front axle beam, stub axle, front wheel assembly, principles of types of wheel alignment, front wheel geometry viz. camber, Kingpin inclination, castor, toe-in and toe-out, condition for true rolling motion, centre point steering, directional stability of vehicles, steering gear, power steering, slip angle, cornering power, over steer & under steer, gyroscopic effect on steering gears.

Unit-III: Transmission System: Function and types of clutches, single plate, multi-plate clutch, roller & spring clutch, clutch lining and bonding, double declutching, types of gear Boxes, synchroniser, gear materials, determination of gear ratio for vehicles, gear box performance at different vehicle speed, automatic transmission, torque converters, fluid coupling, principle of hydrostatic drive, propeller shaft, constant velocity universal joints, differential gear box, rear axle construction.

Unit-IV: Suspension system : Basic suspension movements, Independent front & rear suspension, shock absorber, type of springs: leaf spring, coil spring, air spring, torsion bar, location of shackles, power calculations, resistance to vehicle motion during acceleration and breaking, power & torque curve, torque & mechanical efficiency at different vehicle speeds, weight transfer, braking systems, disc theory, mechanical, hydraulic & pneumatic power brake systems, performance, self-energisation, airbleeding of hydraulic brakes, types of wheels and tyres, tyre specifications, construction and material properties of tyres & tubes.

Unit-V: Electrical and Control Systems: storage battery, construction and operation of lead acid battery, testing of battery, principle of operation of starting mechanism, different drive systems, starter relay switch, regulator electric fuel gauge, fuel pump, horn, wiper, Lighting system, head light dazzling, signaling devices, battery operated vehicles, choppers. importance of maintenance, scheduled and unscheduled maintenance, wheel alignment, trouble Shooting probable causes & remedies of various systems, microprocessor based control system for automobile, intelligent automobile control systems.

Unit-VI: Emission standards and pollution control: Indian standards for automotive vehicles-Bharat I and II, Euro-I and Euro-II norms, fuel quality standards, environmental management systems for automotive vehicles, catalytic converters, fuel additives, and modern trends in automotive engine efficiency and emission control.

References:

1. Crouse , Automotive Mechanics TMH.
2. Srinivasan S; Automotive engines; TMH
3. Gupta HN; Internal Combustion Engines; PHI;
4. Joseph Heitner, Automotive Mechanics, Principles and Practices, CBS Pub.
5. Kripal Singh, Automotive Engineering Khanna Pub.
6. Newton & Steeds , Automotive Engineering
7. Emission standards from BIS and Euro □I and Euro-III

List of experiments (please expand it):
Study of chassis, suspension, steering mechanisms, transmission, gear-box, differential systems, and electrical systems of various light and heavy automotive vehicles;

ME-705- Operations Research and Supply Chain

Unit 1 Linear system and distribution models: Mathematical formulation of linear systems by LP, solution of LP for two variables only, special cases of transportation and assignment and its solution, Vogel□s forward looking penalty method, cell evaluation degeneracy, use of SW Lindo, Tora, Excell.

Unit 2 Supply chain (SCM): Definition, importance, expenditure and opportunities in SCM; integration of inbound, outbound logistics and manufacturing to SCM, flow of material money and information, difficulties in SCM due to local v/s system wide (global) optimization and uncertainties in demand and transportation; Bull-whip effect; customer value; IT, info-sharing and strategic partnerships; plant and warehouse-network configuration; supply contracts and revenue sharing; outsourcing; transportation, cross docking and distribution, forecasting models in SCM; coordination and leadership issues; change of purchasing role and vendor rating, variability from multiple suppliers.

Unit 3 Inventory models: Necessity of inventory in process and safety stock, problem of excess inventory and cycle time (=WIP/ Throughput), JIT/ lean mfg; basic EOQ/ EPQ models for constant review Q-system(S,s); periodic review, base stock P-system; service level, lead time variance and safety stock;; ABC, VED and other analysis based on shelf life, movement, size, MRP technique and calculations, lot sizing in MRP, linking MRP with JIT; evolution of MRP to ERP to SCM and e-business.

Unit 4(a) **Waiting Line Models** Introduction, Input process, service mechanism, Queue discipline, single server (M/M/1) average length and times by Little□s formula, optimum service rate; basic multiple server models (M/M/s)
(b) **Competitive strategy**: concept and terminology, assumptions, pure and mixed strategies, zero sum games, saddle point, dominance, graphical, algebraic and LP methods for solving game theory problems.

Unit 5: (a) **Decision analysis**: decision under certainty, risk probability and uncertainty; Hurwicz criteria; AHP- assigning weight and consistency test of AHP
(b**) Meta-heuristics** Definition of heuristic and meta-heuristic algorithms; introduction to Tabu search, Simulated Annealing and Genetic algorithms and solution of traveling salesman and non linear optimization problems.

References:

1. Hillier FS and Liberman GJ; Introduction to Operations Research concept and cases; TMH
2. Simchi-Levi, Keminsky; Designing and managing the supply chain; TMH.
3. Srinivasan G; Quantitative Models In Operations and SCM; PHI Learning
4. Mohanty RP and Deshmukh SG; Supply Chain Management; Wiley India
5. Taha H; Operations research; PHI
6. Sen RP; Operations Research-Algorithms and Applications; PHI Learning
7. Sharma JK; Operations Research; Macmillan
8. Ravindran , Philips and Solberg; Operations research; Wiley India
9. Vollman, Berry et al; Manufacturing planning and control for SCM; TMH.
10. Bowersox DJ, Closs DJ, Cooper MB; Supply Chain Logisti Mgt; TMH
11. Burt DN, Dobler DW, StarlingSL; World Class SCM; TMH
12. Bronson R ;Theory and problems of OR; Schaum Series; TMH

List of experiments (please expand it):

1. Use computer and software to solve problems contained in the syllabus
2. Case studies in SCM

ME-706- Minor Project

Provision of Minor project is made as preparation phase-I for major project or to take it as an independent small project. For details of project see ME-805- Major project

ME-707- Industrial Training

Objective of Industrial Training

The objective of undertaking industrial training is to provide work experience so that student's engineering knowledge is enhanced and employment prospects are improved. The student should take this course as a window to the real World and should try to learn as much as possible from real life experiences by involving and interacting with industry staff. Industrial training also provides an opportunity to students to select an engineering problem and possibly an industry guide for their Major Project in final semester.

Scheme of Studies:

Duration: Minimum 2 weeks in summer break after VI semester, assessment to be done in VII semester

Scheme of Examination:

For the assessment of industrial training undertaken by the students, following components are considered with their weightage.

(a) Term Work in Industry	**Marks Allotted**
Attendance and General Discipline	5
Daily diary Maintenance	5
Initiative and participative attitude during training	10
Assessment of training by Industrial Supervisor	10
Total	30*

(b) Practical/Oral Examination (Viva-Voce) in Institution	**Marks Allotted**
1. Training Report	15
2. Seminar and cross questioning (defense)	15
Total	30

* - Marks of various components in industry should be awarded by the I/c of training in Industry but in special circumstances if not awarded by the industry then faculty in charge /T.P.O. will give the marks.

During training students will prepare a first draft of training report in consultation with section in charge. After training they will prepare final draft with the help of T.P.O. /Faculty of the Institute. Then they will present a seminar on their training and they will face viva-voce on training in the Institute.

Learning through Industrial Training

During industrial training students must observe following to enrich their learning:

- Industrial environment and work culture.
- Organizational structure and inter personal communication.
- Machines/equipment/instrument-their working and specifications.
- Product development procedure and phases.
- Project Planning, monitoring and control.
- Quality control and assurance.
- Maintenance system
- Costing system
- Stores and purchase systems.
- Layout of Computer/EDP/MIS centers.
- Roles and responsibilities of different categories of personnel.
- Customer services.
- Problems related to various areas of work etc.

Students are supposed to acquire the knowledge on above by-

- Direct Observations without disturbing personnel at work.
- Interaction with officials at the workplace in free/ tea time
- Study of Literature at the workplace (e.g. User Manual, standards, processes, schedules, etc.)
- “Hand’s on” experience
- Undertaking/assisting project work.
- Solving problems at the work place.
- Presenting a seminar
- Participating in group meeting/discussion.
- Gathering primary and secondary data/information through various sources, storage, retrieval and analysis of the gathered data.
- Assisting official and managers in their working
- Undertaking a short action research work.
- Consulting current technical journals and periodicals in the library.
- Discussion with peers.

Daily Diary- Industrial Training

Name of the Trainee---------------------------------- College ----------------------------------
Industry / work place -- Week No--------------------
Department /Section -- Date ----------------------------

Dates Brief of observations made, work done, problem/project undertaken, discussion held, literature consulted etc.

Signature of Supervisor (TPO/Faculty) | Signature of Trainee | Signature of Official in charge for Trg. In Indutry.

Supervision of Industrial Training

Faculty and TPO are supposed to plan industrial training in such a manner that students get exposure on most of the above area in the field.
One faculty member or TPO will plan industrial training of students in consultation with training manager of the industry (work place) as per the predefined objectives of training.
Monitoring visits will be made by training and placement officer/faculty in-charge for the group of students, of the college during training.

Guidance to the faculty / TPO for Planning and implementing the Industrial Training

Keeping in view the need of the contents, the industrial training program, which is spread to minimum 2 weeks duration, has to be designed in consultation with the authorities of the work place; Following are some of the salient points:

- Spelling out the objectives of the industrial training in behavioral terms and same is informed in advance to the 1) students, 2) authorities of the work place and 3) supervising faculty members.
- Discussing and preparing students for the training for which meetings with the students has to be planned.
- Meeting with industrial personnel and orienting them regarding the objective of the training and the expectations of the program.
- Correspondence with the authorities of the work place.
- Orientation classes for students on how to make the training most beneficial- monitoring daily diary, writing weekly reports, how to interact with various categories of industrial personnel, how to behave and undertake responsibilities, how to gather information form the workplace, ethics etc.
- Guiding students to make individual plans (week wise/ day wise) to undertake industrial training.,
- Developing a system of maintaining training records, by teachers for every batch of students for convenient retrieval.
- Inviting industrial personnel to deliver lectures on some aspects of training.

Action plan for planning stages at the Institutional Level

S.No.	Activity	Commencing Week	Finishing week	Remark
1.	Meeting with Principal			
2.	Meeting with colleagues			
3.	Correspondence with work place(Industry concerned)			
4.	Meeting with authorities of work place			
5.	Orientation of students for industry training			
6.	Scrutinizing individual training plan of students.			
7.	Commencement of individual training			
8.	First monitoring of industrial training			
9.	Second monitoring of industrial training			
10.	Finalization of Training report			
11.	Evaluation of performance at industry level			
12.	Evaluation of Industry Program in the Institutions.			

ME-801(A) – Energy Management & Audit.

UNIT-I Energy Management: Concept of energy management, energy demand and supply, economic analysis; Duties and responsibilities of energy managers.
Energy Conservation: Basic concept, energy conservation in Household, Transportation, Agricultural, service and Industrial sectors, Lighting, HAVC.

UNIT-II Energy Audit: Definition, need and types of energy audit; Energy management (Audit) approach: Understanding energy cost, bench marking, energy performance, matching energy use to requirement, maximizing system efficiencies, optimizing the input energy requirement; Fuel & energy substitution; Energy audit instruments; Energy conservation Act; Duties and responsibilities of energy manager and auditors.

UNIT-III Material energy balance: Facility as an energy system; Method for preparing process flow; material and energy balance diagrams.
Energy Action Planning: Key elements, force field analysis; Energy policy purpose, perspective, content, formulation, rectification

UNIT-IV Monitoring and Targeting: Definition monitoring & targeting; Data and information analysis.
Electrical Energy Management: energy conservation in motors, pumps and fan systems; energy efficient motors.

UNIT-IV Thermal energy management: Energy conservation in boilers, steam turbine and industrial heating system; Application of FBC; Cogeneration and waste heat recovery; Thermal insulation; Heat exchangers and heat pump; Building Energy Management.

References:

1. Murphy & Mckay, Energy Management, BSP Books Pvt. Ltd.
2. Smith CB; Energy Management Principle, Pergamon Press, New York.
3. Rajan GG, Optimising Energy Efficiency in Industry, TMH.
4. Callaghan P O, Energy Management, McGraw-Hill Book Company.
5. Amit Kumar Tyagi, Handbook on Energy Audit and Management, Tata Energy Research Institute.
6. Bureau of Energy Efficiency, Study material for energy Managers and Auditors: Paper I to V.
7. Hamies; Energy Auditing and Conservation: Method, Measurement□, Hemisphere, Washington.
8. Witty, Larry C, Industrial Enegy Management Utilisation, Hemisphere Publishers, Washington
9. Kreith & Goswami, Energy Management and Conservation Handbook, CRC Press.

ME-801(B) – Tools Design and Machine Tools

Unit I Basic Features and Kinematics of Machine Tools: Features of basic machine tools; construction and operation, types of machine tools, machine tools motions, transmission-rotation in to rotation, rotation in to translation, kinematic-structures of machine tools: elementary, complex and compound structure, kinematic-features of gear shapers and gear hobbing machine.

Unit II Regulation of Speed: Design of gear boxes- need for variation of speed, selection of speed range, laws of stepped regulation, standardization of speeds, speed diagram, analysis of productivity loss, kinematic advantage of GP, structural diagrams, ray diagram and speed chart.
Gear Drives: Belt and cone pulley, slip gear type, north gear drive, draw key gear drive, clutch type, mechanical step less drives, electrical drives; hydraulic drive.

Unit III Design of Metal working Tools: Design of press working tools, shearing, piercing, blanking, dies, compound die design principles for forging dies, bending, forming drawing dies, tooling for forging - design principles for forging dies, drop forging, upset forging, design principles and practice for rolling,
roll press design.

Unit IV Design of Jigs and Fixtures: Principles of location, locating method and devices, principles of clamping, clamping devices, drilling jigs, types, drill bushes, fixture and economics, types of fixture, milling, grinding, broaching, assembly fixtures indexing jig and fixtures, indexing devices.

Unit V Design of Gauges and Inspection Features: Design of gauges for tolerance for dimensions and form inspection; dies and mould design for Ppastics & rubber parts:
compression molding, transfer molding, blow molding.

References:

1. Mehta N.K.; Machine Tool Design and Numerical Control; TMH
2. Sen G.C, Bhattacharya A; Principles of Machine Tools; New Central Book Agency.
3. Donaldson; Tool Design T.M.H.
4. Jain KC and Chitale AK; Text Book Of Production Engineering; PHI Learning
5. Juneja, Sekhon and Seth; Fundamentals of Metal Cutting and Machine Tools; New Age.
6. Krar SF, Gill AR, Smid P; Technology of Machine Tools;TMH
7. Sharma P.C; Production Engineering; Chand S
8. Wilson; Fundamentals of Tool Design; ASTME
9. Paqwin J.R; Die Design Handbook; The Industrial Press-NY
10. ASTME; Die Design Hand Book; McGraw Hill
11. Archinov; Metal Cutting & Cutting Tool Design; MIR Publishers Moscow
12. Kempster M.H.A; Introduction to Jig and Tool Design; FLBS.

ME-801(C) – Reliability & Maintenance

Unit 1 Basic Concepts of Reliability: Probability distributions used in maintenance engineering- Binomial, Poisson, Exponential, Normal, Log-normal, Gamma and Weibull distribution; failure rate, hazard rate, failure modes, MTTR, MTBF, MTTF

Unit 2 System Reliability Models: System reliability□n-component series systems, m-component parallel systems and combined system; standby systems; K-out-of-m systems; redundancy techniques in system design; event space, decomposition (Key Stone), cut and tie sets, Markov analysis, reliability and quality, unreliability, maintainability, availability

Unit 3 Maintenance Concepts and Strategies: Introduction, maintenance functions and objectives, maintenance planning and scheduling, maintenance organization.
General Introduction to Maintenance Types: Breakdown, emergency, corrective, predictive, and preventive; maintenance prevention; design-out maintenance, productive maintenance, shutdown maintenance and scheduled maintenance.

Unit 4 Condition Based Maintenance: Principles of CBM, pillars of condition monitoring, CBM implementation and benefits; condition monitoring techniques- visual monitoring, vibration monitoring, wear debris monitoring, corrosion monitoring, performance monitoring

Unit 5 Reliability Centered Maintenance (RCM):- Concept, methodology, benefits;
Total Productive Maintenance: Evolution of TPM, TPM objectives, concept, pillars of TPM.
Failure Modes and Effects Analysis **(FMEA)/** Failure Modes, Effects and Criticality Analysis **(FMECA)**: Overview, elements of FMECA, applications and benefits, risk evaluation, risk priority numbers, criticality analysis, process FMEA, qualitative and quantitative approach to FMECA; design FMEA and steps for carrying out design FMEA

References:
1. Ebeling CE; An Introduction To Reliability & Maintainability Engg; TMH
2. Srinath L.S; Reliability Engineering; East West Press.
3. Naikan; Reliability engg and life testing; PHI
4. Kapur KC and Lamberson LR; Reliability in Engineering Design; Wiley India
5. Telang AD and Telang A; Comprehensive Maintanance Management; PHI
6. Mishra R.C; Reliability and Maintenance Engineering; New age International publisher.
7. Balaguruswamy; Reliability Engg; TMH
8. Dhillon; Engg Maitainability- How to design for Reliability and easy maintenance; PHI
9. Davidson John; The Reliability of mechanical system; Institution of Mech. Engineers, London
10. Patrick D.T and O.'Connor; Practical Reliability Engineerin; John Wiley and Sons
11. Modarre M; Reliability and Risk Analysis, Marcel Dekker Inc CRC Press

ME-801(D) – Simulation & Process Modeling.

Unit 1: Introduction to modeling and simulation: Modeling and simulation methodology, system modeling, concept of simulation; gaming; static, continuous and discrete event simulation.

Unit 2: Basic concept of probability, generation and characteristics of random variables, continuous and discrete variables and their distributions; mapping uniform random variables to other variable distributions; linear, nonlinear and stochastic models

Unit 3; Introduction to Queuing Theory: Characteristics of queuing system, Poisson's formula, birthdeath system, equilibrium of queuing system, analysis of M/M/1 queues. Introduction to multiple server Queue models M/M/c Application of queuing theory in manufacturing and computer system

Unit 4; System Dynamics modeling: Identification of problem situation, preparation of causal loop diagrams and flow diagrams, equation writing, level and rate relationship, Simulation of system dynamics models.

Unit 5: Verification and validation: Design of simulation experiments, validation of experimental models, testing and analysis. Simulation languages comparison and selection, study of simulation software - Arena, Pro-model, SIMULA, DYNAMO, STELLA, POWERSIM.

References:

1. Law AM and Kelton WD; Simulation Modeling and Analysis; TMH
2. Gordon G., System simulation, PHI Learningl
3. Banks J; Hand book of Simulation; John Wiley.
4. Taha H, Operations Research; PHI.
5. Hillier FS, Liberman GJ; Introduction to OR; TMH.
6. Deo N; System Simulation with Digital Computer; PHI Learning
7. Harrell C, Ghosh B, Bowden R; Simulation Using Promodel; MG Hill
8. Seila, Ceric and Tadikmalla; Applied Simulation Modeling, Cengage
9. Payer T., Introduction to system simulation, McGraw Hill.
10. Sushil, System Dynamics, Wiley Eastern Ltd.
11. Spriet JA; Computer Aided Modeling and Simulation, Academic Press INC; USA

ME-802 – Machine Design

Note: PSG Design data book and/ or Mahadevan and Reddy's Mechanical design data book are to be provided/ permitted in exam hall (duly verified by authority)

Unit I Design of Belt, Rope and Chain Drives: Methods of power transmission, selection and design of flat belt and pulley; Selection of V-belts and sheave design; Design of chain drives, roller chain and its selection; Rope drives, design of rope drives, hoist ropes.

Unit II Spur and Helical Gears: Force analysis of gear tooth, modes of failure, beam strength, Lewis equation, form factor, formative gear and virtual number of teeth; Gear materials; Surface strength and wear of teeth; strength against wear; Design of straight tooth spur and Helical Gears.
Bevel Gears: Application of bevel, formative gear and virtual number of teeth; Force analysis; Lewis equation for bevel gears; Strength against wear; Design of bevel gear.

Unit III Design of I.C. Engine Components: General design considerations in I C engines; design of cylinder; design of piston and piston-rings; design of connecting rod; design of crankshaft.

Unit IV Design of Miscellaneous Components: design of Flanged coupling; Rigid coupling, Design of Pressure vessels subjects to internal pressure, external pressure, design of penetration, design of flanges, cone cylinder junctions ,Materials, Fabrication.

Unit V Optimization: Basic concept of optimization, classification of optimization, optimization techniques, engineering applications of optimization. Classical optimization techniques: unconstrained optimization single-variable optimization, multivariable optimization, solution by direct search method, solution by Lagrange-multipliers method.

References:
1. Shigley J.E.; Machine Design; TMH
2. BhandariVB; Design of Machine Elments; TMH
3. Sharma CS and Purohit K; Design of Machine Elements; PHI Learning.
4. Hall and Somani; Machine Design; Schaum Series; TMH
5. Wentzell TH; Machine Design; Cegage Learning
6. Sharma & Agrawal; Machine Design; Katson
7. Kulkarni SG; Machine Design; TMH
8. Abdul Mubeen; Machine Design; Khanna Publishers
9. Juvinall RC, Marshek KM; Fundamentals of Machine Component Design; Wiley
10. Norton R; Design Of Machinery; TMH

List of Experiment (Pl. expand it):
Designing and sketching of components contained in the syllabus

ME-803 – Refrigeration & Air Conditioning

Unit-I Introduction: Principles and methods of refrigeration, freezing; mixture cooling by gas reversible expansion, throttling, evaporation, Joule Thomson effect and reverse Carnot cycle; unit of refrigeration, coefficient of performance, vortex tube & thermoelectric refrigeration, adiabatic demagnetization; air refrigeration cycles- Joule's cycle Boot-strap cycle, reduced ambient cycle and regenerative cooling cycles.

Unit-II Vapour compression system: Vapor compression cycle, p-h and t-s diagrams, deviations from theoretical cycle, sub-cooling and super heating, effects of condenser and evaporator pressure on cop; multi-pressure system: removal of flash gas, multiple expansion & compression with flash inter cooling; low temperature refrigeration: production of low temperatures, cascade system, dry ice, production of dry ice, air liquefaction system,.

Unit-III (a) **Vapour absorption system**: Theoretical and practical systems such as aqua-ammonia, electrolux & other systems; (b) **Steam jet refrigeration**: Principles and working, simple cycle of operation, description and working of simple system, (c) **refrigerants:** nomenclature & classification, desirable properties, common refrigeration, comparative study, leak detection methods, environment friendly refrigerants and refrigerant mixtures, brine and its properties

Unit-IV Psychrometric: Calculation of psychrometric properties of air by table and charts; psychrometric processes: sensible heating and cooling, evaporative cooling, cooling and dehumidification, heating and humidification, mixing of air stream, sensible heat factor; principle of air conditioning, requirements of comfort air conditioning, ventilation standards, infiltrated air load, fresh air load human comfort, effective temperature & chart, heat production & regulation of human body,

Unit-V Air conditioning loads: calculation of summer & winter air conditioning load, bypass factor of coil, calculation of supply air rate & its condition, room sensible heat factor, grand sensible heat factor, effective sensible heat factor, dehumidified air quantity. Problems on cooling load calculation. Air distribution and ventilation systems

References:

1. Arora CP; Refrigeration and Air Conditioning; TMH
2. Sapali SN; Refrigeration and Air Conditioning; PHI
3. Ananthanarayan; Basic Refrigeration and Air conditioning; TMH
4. Manohar Prasad; Refrigeration and Air Conditioning; New Age Pub
5. Ameen; Refrigeration and Air Conditioning; PHI
6. Pita ; Air conditioning Principles and systems: an energy approach; PHI
7. Stoecker W.F, Jones J; Refrigeration and Air conditioning; McGH, Singapore
8. Jordan RC and Priester GB Refrigeration and Air Conditioning, PHI USA
9. Arora RC; Refrigeration and Air conditioning; PHI Learning

List of Experiments (Please Expand it):
Refrigeration and Air Conditioning AU/ ME 803

1. General Study of vapor compression refrigeration system.
2. General Study of Ice Plant
3. General Study and working of cold storage
4. General Study Trane Air Condition (Package Type).
5. General Study of Electrolux Refrigeration

6. General Study One tone Thermax refrigeration unit.
7. General Study of Water cooler
8. General Study of Psychrometers (Absorption type)
9. General Study of Leak Detectors (Halide Torch).
10. General Study and working of Gas charging Rig.
11. General Study of window Air Conditioner.
12. General Study and working of Vapor compression Air conditioning Test rig.
13. Experimentation on Cold Storage of Calculate COP & Heat Loss.
14. Experimentation on Vapor compression Air Conditioning test rig.
15. Changing of Refrigerant by using Gas Charging Kit.

ME-804 – CAD/CAM/CIM

Unit 1 Introduction: Information requirements of mfg organizations; business forecasting and aggregate production plan; MPS, MRP and shop floor/ Production Activity Control (PAC); Mfg as a system, productivity and wealth creation; production processes on volume-variety axes; importance of batch and job shop production; CIM definition and CIM wheel, evolution and benefits; CIM as a subset of Product Life Cycle (PLC) mgt; design for mfg (DFM) and concurrent engg; product design in conventional and CIM environment; terms like CAD, CAE, CAM, CAP, CAPP, CATD and CAQ.

Unit 2 Graphics and standards: Raster scan, coordinate systems for model (M/ WCS) user and display; database for graphic modeling; PDM, PIM, EDM; define EDM, features of EDM; basic transformations of geometry- translation, scaling, rotation and mirror; introduction to modeling software; need for CAD data standardization; developments in drawing data exchange formats; GKS, PHIGS, CORE, IGES, DXF STEP DMIS AND VDI; ISO standard for exchange of Product Model data-STEP and major area application protocols.

Unit 3 Geometric Modeling: Its use in analysis and mfg; 2D and 3D line, surface and volume models; linear extrusion and rotational sweep; Constructive Solid Geometry (CSG); basics of boundary presentation- spline, Bezier, b-spline, and NURBS; sculpture surfaces, classification, basics of coons, Bezier, b-spline and ruled surfaces; tweaking, constraint based parametric modeling; wire-frame modeling, definition of point, line and circle; polynomial curve fitting; introduction to rapid prototyping.

Unit 4 Numeric control and part programming: Principles of NC machines, CNC, DNC; NC modes of point to point, -line and 2D, 3D contouring; NC part programming; ISO standard for coding, preparatory functions(G)- motion, dwell, unit, preset, cutter compensation, coordinate and plane selection groups; miscellaneous (M) codes; CLDATA and tool path simulation; ISO codes for turning tools and holders; ATC, modular work holding and pallets; time and power estimation in milling, drilling and turning; adaptive control, sequence control and PLC; simple part programming examples.

Unit 5 Group Technology: Importance of batch and job shop production; merits of converting zigzag process layout flow to smooth flow in cellular layout, Production Flow Analysis (PFA) and clustering methods; concept of part families and coding; hierarchical, attribute and hybrid coding; OPITZ, MICLASS and DCLASS coding; FMS; material handling; robots, AGV and their programming; agile mfg; Computer Aided Process Planning (CAPP), variant/ retrieval and generative approach

References:

1. S.Kant Vajpay; Principles of CIM; PHI
2. Rao PN; CAD/CAM;TMH
3. Groover MP; Automation, Production Systems & CIM; P.H.I.
4. Rao PN, Tiwari NK, Kundra TK; Computer Aided Manufacturing; TMH
5. Alavudeen A, Venkteshwarn N; Computer Integrated Mfg; PHI
6. Radhakrishnan P, Subramanian S and Raju V; CAD/CAM/CIM; New age Pub

List of Experiments (please expand it):

1. 2D and 3D modeling on CAD software

2. Use of CAM software for writing CNC programs
3. Study of automatic and semi automatic control system and writing the electrical analogy.
4. Production & layout for GT for group of jobs to be manufactured
5. A case study / tutorial using CAPP Software
6. Writing M & G codes for given operations.
7. Robot and AGV programming

ME- 805 Major Project

Objectives of the course Minor/Major Project are:

- To provide students with a comprehensive experience for applying the knowledge gained so far by studying various courses.
- To develop an inquiring aptitude and build confidence among students by working on solutions of small industrial problems.
- To give students an opportunity to do some thing creative and to assimilate real life work situation in institution.
- To adapt students for latest development and to handle independently new situations.
- To develop good expressions power and presentation abilities in students.

The focus of the Major Project is on preparing a working system or some design or understanding of a complex system using system analysis tools and submit it the same in the form of a write up i.e. detail project report. The student should select some real life problems for their project and maintain proper documentation of different stages of project such as need analysis market analysis, concept evaluation, requirement specification, objectives, work plan, analysis, design, implementation and test plan. Each student is required to prepare a project report and present the same at the final examination with a demonstration of the working system (if any)

Working schedule The faculty and student should work according to following schedule:
Each student undertakes substantial and individual project in an approved area of the subject and supervised by a member of staff.The student must submit outline and action plan for the project execution (time schedule) and the same be approved by the concerned faculty.

Action plan for Major Project work and its evaluation scheme #(Suggestive)

Task/Process	Week	Evaluation	Marks For Term Work#
Orientation of students by HOD/Project Guide	1st	-	-
Literature survey and resource collection	2nd	-	-
Selection and finalization of topic before a committee*	3rd	Seminar-I	10
Detailing and preparation of Project (Modeling, Analysis and Design of Project work	4th to 5th	-	10
Development stage			
Testing, improvements, quality control of project	6th to 10th 11th	-	25
Acceptance testing	12th	-	10
Report Writing	13th to 15th	-	15
Presentation before a committee (including user manual, if any)	16th	- Seminar-II	30

* Committee comprises of HOD, all project supervisions including external guide from industry (if any)

The above marking scheme is suggestive, it can be changed to alternative scheme depending on the type of project, but the alternative scheme should be prepared in advance while finalizing the topic of project before a committee and explained to the concerned student as well.

NOTE: At every stage of action plan, students must submit a write up to the concerned guide:

Course outcome of Civil Engineering: BE II Year

Course Outcome for Civil Engineering in B.E./ B.Tech II year is given as follows:-

- To study the basics of construction and to know the conventional way of design and learn the best ways of construction from them.
- Students learn about the earth, age and origin. Geology helped to know more about our earth.
- To understand various construction materials, its identification and to find suitable materials to be used as per the construction site need.
- To understand the construction procedure to apply for any construction work, knowing advance construction material. Supervising field and to deal with the issues. To look after quality of work, which plays very important role.
- Tostudy about railways, road work, bridges and tunnel about their basic terminologies and design concept.
- Analyze the concept of functions of complex variables, differential equation models & probability.
- To how the purpose of surveying, how to perform survey accurately, collecting data and analyze it for final approach.
- To make know about various latest materials and use of conventional materials, test procedures, gather test result for analysis.
- To understand the dynamics of fluid to be applied for hydraulic structures, knowing behavior and properties of fluid.
- To help students why planning is important, how to do planning, laws related to planning, terminologies related to planning.

B.E. 301 - ENGINEERING MATHEMATICS II

Unit I

Fourier Series: Introduction of Fourier series , Fourier series for Discontinuous functions, Fourier series for even and odd function, Half range series Fourier Transform: Definition and properties of Fourier transform, Sine and Cosine transform.

Unit II

Laplace Transform: Introduction of Laplace Transform, Laplace Transform of elementary functions, properties of Laplace Transform, Change of scale property, second shifting property, Laplace transform of the derivative, Inverse Laplace transform & its properties, Convolution theorem, Applications of L.T. to solve the ordinary differential equations

Unit III

Second Order linear differential equation with variable coefficients : Methods one integral is known, removal of first derivative, changing of independent variable and variation of parameter, Solution by Series Method

Unit IV

Linear and Non Linear partial differential equation of first order: Formulation of partial differential equations, solution of equation by direct integration, Lagrange's Linear equation, charpit's method. Linear partial differential equation of second and higher order: Linear homogeneous and Non homogeneous partial diff. equation of nth order with constant coefficients. Separation of variable method for the solution of wave and heat equations

Unit V

Vector Calculus: Differentiation of vectors, scalar and vector point function, geometrical meaning of Gradient, unit normal vector and directional derivative, physical interpretation of divergence and Curl. Line integral, surface integral and volume integral, Green's, Stoke's and Gauss divergence theorem

References

(i) Advanced Engineering Mathematics by Erwin Kreyszig, Wiley India
(ii) Higher Engineering Mathematics by BS Grewal, Khanna Publication
(iii) Advance Engineering Mathematics by D.G.Guffy
(iv) Mathematics for Engineers by S.Arumungam, SCITECH Publuication
(v) Engineering Mathematics by S S Sastri. P.H.I.

CE- 302 Transportation Bridges and Tunnels

Unit I

Introduction, Tractive resistances & Permanent way: Principles of Transportation, transportation by Roads, railways, Airways, Waterways, their importance and limitations, Route surveys and alignment, railway track, development and gauges, Hauling capacity and tractive effort.
i) Rails: types, welding of rails, wear and tear of rails, rail creep.
ii) Sleepers: types and comparison, requirement of a good sleeper, sleeper density.
iii) Rail fastenings: types, Fish plates, fish bolts, spikes, bearing plates, chain keys, check and guard rails.
iv) Ballast: Requirement of good ballast, various materials used as ballast, quantity of ballast, different methods of plate laying, material trains, calculation of materials required, relaying of track

Unit II

Geometric Design; Station & Yards; Points and Crossings & Signaling and interlocking: Formation, cross sections, Super elevation, Equilibrium, Cant and Cant deficiency, various curves, speed on curves. Types, locations, general equipments, layouts, marshalling yards, Definition, layout details, design of simple turnouts, Types of signals in stations and yards, principles of signaling and inter-locking.

Unit-III

Bridge Site Investigation and Planning; Loading Standards &Component parts: Selection of site, alignment, collection of bridge design data: essential surveys, hydraulic design, scour, depth of bridge foundation, Economical span, clearance, afflux, type of road & railway bridges. : Design loads and forces, Impact factor, Indian loading standards for Railways Bridges and Highway Bridges, Bridge super structure and sub-structures, abutments, piers, wing walls, return walls, approaches, floors & flooring system, choice of super structure.

Unit-IV

Bridge Foundations, Construction, Testing and Strengthening of Bridges : Different types of foundation: piles and wells, sinking of wells, coffer-dams. Choice of bridges and choice of materials, details of construction underwater and above water, sheet piles coffer dams, Erection of bridges, girders, equipments and plants. inspection and Data collection, strengthening of bridges, Bridge failure.

Unit-V

Tunnels: 1. Selection of route, Engineering surveys, alignment, shape and size of tunnel, bridge action, pressure relief phenomenon, Tunnel approaches, Shafts, pilot shafts 2, Construction of tunnels in soft soil, hard soil and rock, Different types of lining, methods of lining, Mucking operation, Drainage and ventilation, Examples of existing important tunnels in India and abroad.

References

1. Chakraborty and Das; Principles of transportation engineering; PHI
2. Rangwala SC; Railway Engineering; Charotar Publication House, Anand
3. Rangwala SC; Bridge Engineering; Charotar Publication House, Anand
4. Ponnuswamy; Bridge Engineering; TMH
5. Railway Engineering by Arora & Saxena - Dhanpat Rai & Sons

6. Railway Track by K.F. Antia
7. Principles and Practice of Bridge Engineering S.P. Bindra - Dhanpat Rai & Sons
8. Bridge Engineering - J.S. Alagia - Charotar Publication House, Anand
9. Railway, Bridges & Tunnels by Dr. S.C. Saxena
10. Harbour, Docks & Tunnel Engineering - R. Srinivasan
11. Essentials of Bridge Engg. By I.J. Victor; Relevant IS & IRS codes

CE/FT- 303 Strength of Materials

Unit 1

Simple Stress and Strains: Concept of Elastic body, stress and Strain, Hooke's law, various types of stress and strains, Elastic constants, Stresses in compound bars, composite and tapering bars, Temperature stresses. Complex Stress and Strains: Two dimensional and three dimensional stress system. Normal and tangential stresses, Principal Planes, Principal Stresses and strains, Mohr's circle of stresses, Combined Bending and Torsion, Theories of failure.

Unit 2

Bending & Deflection: Theory of simple bending: Concept of pure bending and bending stress, Equation of bending. Neutral axis, Section-Modulus, Determination of bending stresses in simply supported, Cantilever and Overhanging beams subjected to point load and uniformly distributed loading. Bending & shear stress distribution across a section in Beams. Deflection of beams: Double Integration Method. Conjugate Beam Method, Macaulay's Method Area Moment Method.

Unit 3

Torsion of Shafts: Concept of pure torsion, Torsion equation, Determination of shear stress and angle of twist of shafts of circular section, Hollow shafts, Open and closed coil springs, Leaf Spring, Spiral Spring, Pressure Vessels: Thin and Thick walled cylinders and spheres. Stress due to internal pressure, Change in diameter and volume, Compound cylinders and shrink fittings.

Unit 4

Unsymmetrical Bending: Principal moment of Inertia, Product of Inertia, Bending of a beam in a plane which is not a plane of, symmetry. Shear center; Curved beams: Pure bending of curved beams of rectangular, circular and trapezoidal sections, Stress distribution and position of neutral axis.

Unit 5

Columns and Struts: Euler's buckling load for uniform section, various end conditions, slenderness Ratio, Stress in columns, Rankine formulae, Eccentric loading on columns.

Reference

1. Nash; Strength of Materials (Schaum), TMH.
2. Rattan SS; strength of Materials; TMH
3. Negi; Strength of materials; TMH
4. Sadhu Singh; Strength of Materials, ,
5. Ramamrutham; Strength of Materials, ,
6. Subramaniam; Strength of Materials; R; Oxford
7. National Building Code of India, Part-IV

List of Experiments

The experimental work to cover tension, compression, bending and impact test etc. on steel, cast iron, RCC and timber, Fire Resistant Test of Structures and Combustibility of Building Materials Test as per I.S.I. and other experiments based on the syllabus.

CE- 304 Engineering Geology

Unit 1
Introduction and Physical Geology: Objects and scope of geology. The crust and the interior of the earth, origin and age of the earth, Sub-aerial and sub-terrain weathering, denudation and deposition, wind, river, glacial and marine erosion, volcanoes , soil formation, soil profile, geological classification of soil and concept of earthquake Plate- tectonics.

Unit 2
Mineralogy and Crystallography: Fundamentals of mineralogy, study of common rock forming minerals, ores and minerals of economic importance to civil engineering., elements of crystallography and introduction to crystal systems.

Unit 3 (1)
Petrology: Composition of earth's crust, study of igneous, sedimentary and metamorphic rocks and their formation, characteristics classification, Rocks of civil engineering importance.
(2) Geology of India: Physical features of India, Brief geological history of India, occurrence of important ores and minerals in India.

Unit 4
Structural Geology: Structures related to rocks, Dip, Strike and outcrops, Classification and detailed studies of geological structures i.e. folds, Faults, Joints, Unconformity and their importance in Civil Engineering.

Unit 5
Applied Geology: Introduction to applied geology and its use in civil engg., properties of rocks, selection of sites for roads, bridges, dams, reservoirs and tunnels. Prevention of engineering structures from seismic shocks, stability of hill sides, water bearing strata, artesian wells, Use of remote-sensing techniques in selection of above sites.

Reference:
1. Prabin Singh – "Engineering and General Geology"
2. Gulati ; Geotechnical Engineering; TMH
3. P.K. Mukerjee – " A text Book of Geology"
4. S.K. Garg – " A text Book of Physical and Engineering Geology"

List of Experiment (Expandable)
1. Identification of simple rock forming minerals and important ores.
2. Identification of rock
3. Simple map Exercises.
4. Field Visit / Geological Excursion

CE/FT - 305 Building Design & Drawing

Unit 1
Drawing of Building Elements – Drawing of various elements of buildings like various types of footing, open foundation, raft, grillage, pile and well foundation, Drawing of frames of doors, window, various types of door, window and ventilator, lintels and arches, stairs and staircase, trusses, flooring, roofs etc.

Unit 2
Building Planning – Provisions of National Building Code, Building bye-laws, open area, set backs, FAR terminology, principle of architectural composition (i.e. unity, contrast, etc.), principles of planning, orientation.

Unit 3 Building Services – Introduction of Building Services like water supply and drainage, electrification, ventilation and lightening and staircases, fire safety, thermal insulation, acoustics of buildings.

Unit 4
Design and Drawing of Building – Design and preparation of detailed drawings of various types of buildings like residential building, institutional buildings and commercial buildings, detailing of doors, windows, ventilators and staircases etc.

Unit 5
Perspective Drawing – Elements of perspective drawing involving simple problems, one point and two point perspectives, energy efficient buildings.

References
1. Malik & Meo; Building Design and Drawing By
2. Shah, Kale & Patki; Building Design and Drawing; TMH
3. Gurucharan Singh & Jgdish Singh Building Planning, Design and Scheduling

List of Experiments (Expandable)
1. Sketches of various building components.
2. One drawing sheet of various building components containing doors, windows ventilators, lintels and arches stairs foundations etc.
3. One drawing sheet each for services and interiors of buildings.
4. One drawing sheet containing detailed planning of one/two bed room residential building (common to all student)
5. One drawing sheet each of residential and institutional building (Each student perform different drawing).
6. Use of AutoCAD for preparation of drawings.

CE- 306 Computer Programming

UNIT-I
Basic Java Features - C++ Vs JAVA, JAVA virtual machine, Constant & Variables, Data Types, Class, Methods, Objects, Strings and Arrays, Type Casting, Operators, Precedence relations, Control Statements, Exception Handling, File and Streams, Visibility, Constructors, Operator and Methods Overloading, Static Members, Inheritance: Polymorphism, Abstract methods and Classes

UNIT–II
Java Collective Frame Work - Data Structures: Introduction, Type-Wrapper Classes for Primitive Types, Dynamic Memory Allocation, Linked List, Stack, Queues, Trees, Generics: Introduction, Overloading Generic Methods, Generic Classes, Collections: Interface Collection and Class Collections, Lists, Array List and Iterator, Linked List, Vector. Collections Algorithms: Algorithm sorts, Algorithm shuffle, Algorithms reverse, fill, copy, max and min Algorithm binary Search, Algorithms add All, Stack Class of Package java. Util, Class Priority Queue and Interface Queue, Maps, Properties Class, Un-modifiable Collections.

UNIT–III
Advance Java Features - Multithreading: Thread States, Priorities and Thread Scheduling, Life Cycle of a Thread, Thread Synchronization, Creating and Executing Threads, Multithreading with GUI, Monitors and Monitor Locks. Networking: Manipulating URLs, Reading a file on a Web Server, Socket programming, Security and the Network, RMI, Networking, Accessing Databases with JDBC: Relational Database, SQL, MySQL, Oracle

UNIT–IV
Advance Java Technologies - Servlets: Overview and Architecture, Setting Up the Apache Tomcat Server, Handling HTTP get Requests, Deploying a web Application, Multitier Applications, Using JDBC from a Servlet, Java Server Pages (JSP): Overview, First JSP Example, Implicit Objects, Scripting, Standard Actions, Directives, Multimedia: Applets and Application: Loading, Displaying and Scaling Images, Animating a Series of Images, Loading and playing Audio clips

UNIT–V
Advance Web/Internet Programming (Overview): J2ME, J2EE, EJB, XML.

References:

1. Deitel & Deitel, "JAVA, How to Program"; PHI, Pearson.
2. E. Balaguruswamy, "Programming In Java"; TMH Publications
3. The Complete Reference: Herbert Schildt, TMH
4. Peter Norton, "Peter Norton Guide To Java Programming", Techmedia.
5. Merlin Hughes, et al; Java Network Programming , Manning Publications/Prentice Hall

List of Program to be perform (Expandable)
1. Installation of J2SDK
2. Write a program to show Concept of CLASS in JAVA
3. Write a program to show Type Casting in JAVA
4. Write a program to show How Exception Handling is in JAVA
5. Write a Program to show Inheritance
6. Write a program to show Polymorphism

7. Write a program to show Interfacing between two classes
8. Write a program to Add a Class to a Package
9. Write a program to demonstrate AWT.
10. Write a program to Hide a Class
11. Write a Program to show Data Base Connectivity Using JAVA
12. Write a Program to show “HELLO JAVA ” in Explorer using Applet
13. Write a Program to show Connectivity using JDBC
14. Write a program to demonstrate multithreading using Java.
15. Write a program to demonstrate applet life cycle.

CE-307 Self Study (Internal Assessment)

Objective of Self Study: is to induce the student to explore and read technical aspects of his area of interest / hobby or new topics suggested by faculty.

Evaluation will be done by assigned faculty based on report/seminar presentation and viva.

CE-308 Seminar / Group Discussion(Internal Assessment)

Objective of GD and seminar is to improve the MASS COMMUNICATION and CONVINCING/ understanding skills of students and it is to give student an opportunity to exercise their rights to express themselves.

Evaluation will be done by assigned faculty based on group discussion and power point presentation.

B.E. 401 - ENGINEERING MATHEMATICS III

Unit I

Functions of complex variables : Analytic functions, Harmonic Conjugate, Cauchy-Riemann Equations, Line Integral, Cauchy's Theorem, Cauchy's Integral Formula, Singular Points, Poles & Residues, Residue Theorem , Application of Residues theorem for evaluation of real integrals

Unit II

Errors & Approximations, Solution of Algebraic & Trancedental Equations (Regula Falsi , Newton-Raphson, Iterative, Secant Method), Solution of simultaneous linear equatins by Gauss Elimination, Gauss Jordan, Crout's methods , Jacobi's and Gauss-Siedel Iterative methods

Unit III

Difference Operators, Interpolation (Newton Forward & Backward Formulae, Central Interpolation Formulae, Lagrange's and divided difference formulae), Numerical Differentiation and Numerical Integration.

Unit IV

Solution of Ordinary Differential Equations(Taylor's Series, Picard's Method, Modified Euler's Method, Runge-Kutta Method, Milne's Predictor & Corrector method), Correlation and Regression, Curve Fitting (Method of Least Square).

Unit V

Concept of Probability : Probability Mass function, Probability density function. Discrete Distribution: Binomial, Poisson's, Continuous Distribution: Normal Distribution, Exponential Distribution ,Gamma Distribution ,Beta Distribution ,Testing of Hypothesis |:Students t-test, Fisher's z-test, Chi-Square Method

Reference:

(i) Numerical Methods using Matlab by J.H.Mathews and K.D.Fink, P.H.I.
(ii) Numerical Methods for Scientific and Engg. Computation by MKJain, Iyengar and RK Jain, New Age International Publication
(iii) Mathematical Methods by KV Suryanarayan Rao, SCITECH Publuication
(iv) Numerical Methods using Matlab by Yang,Wiley India
(v) Pobability and Statistics by Ravichandran ,Wiley India
(vi) Mathematical Statistics by George R., Springer

CE- 402 Concrete Technology

Unit I

Introduction Classification, properties, grades, advantage & disadvantages of concrete, Ingredients of concrete, types of cement, aggregates, water, admixtures, Inspection & testing of materials as per Indian Standard Specifications.

Unit II

Properties of Fresh and Hardened Concrete : Introduction, Workability, Testing of concrete, Factors affecting, Rheology of concrete, Compressive & Tensile strength, Stress and strain characteristics, Shrinkage and temperature effects. Creep of concrete, Permeability, durability, thermal properties & micro-cracking of concrete.

Unit III

Design of Concrete Mix : Various classical methods of concrete mix design, I.S. code method, basic considerations and factors influencing the choice of mix design, acceptance criteria for concrete, concrete mixes with Surkhi and other Pozzolanic materials, design of plastic concrete mix, computer aided design of concrete mix.

Unit IV

Production and Quality Control of Concrete : Production of crushed stone aggregate, batching equipments for production and concreting, curing at different temperatures, Concreting underwater, hot & cold weather condition, statistical quality control, field control, non-distructive testing, repair technology for concrete structures, Inspection & Testing of Concrete.

Unit V

Special Concretes : Light weight concrete, Ready mix concrete, Vacuum concrete, Ferrocement, Fiber reinforced concrete, Polymer concrete composites, Shotcrete, Guniting, Rubble concrete, Resin concrete, Prestressed concrete, Heat resistant concrete, Mass concrete, Temperature control of mass concrete.

References:

1. Varshney RS; Concrete Technology; Oxfored & IBH publishing co.
2. Gambhir ML; Concrete Technology – TMH
3. Sinha SN; Reinforced Concrete Technology; TMH
4. New Building Materials Published by B.M.T.P.C., New Delhi
5. Hand books on Materials & Technology - Published by BMTPC & HUDCO
6. Mohan Rai & M.P. Jai Singh; Advances in Building Materials & Construction
7. Jackson N; Civil Engineering materials.
8. Properties of Concrete - A.M. Neville - Pearson Education

CE- 403 Surveying

Unit-I
Traversing by theodolite, Field work checks, traverse computations, latitude and departures, adjustments, computations of co-ordinates, plotting & adjusting or traverse, Omitted measurements, Measurement EDM, Trigonometrical leveling.
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Unit-II
Tachometry: Tachometric systems and principles, stadia system, uses of anallatic lens, tangential system, sublense system, instrument constant, field work reduction, direct-reading tacheometers, use of tacheometry for traversing and contouring.

Unit-III
Curves: Classification and use; elements of circular curves, calculations, setting out curves by offsets and by theodolites, compound curves, reverse curves, transition curves, cubic spiral and lemniscate, vertical curves, setting out.

Unit-IV
Control Surveys: Providing frame work of control points, triangulation principle, co naissance, selection and marking of stations, angle measurements and corrections, baseline measurement and corrections, computation of sides, precise traversing.

Unit-V Hydrographic Surveying: Soundings, methods of observations, computations and plotting. Principles of photographic surveying: aerial photography, tilt and height distortions, Remote sensing, simple equipments, elements of image interpretation, image-processing systems.

Reference

1. T.P. Kanetkar, Surveying & Levelling, Vol. I & II.
2. Duggal; Surveying vol I and II; TMH
3. Basak; Surveying and Leveling; TMH
4. R.E.Devis, Surveying theory & Practice, Mc.Graw Hill, New York
5. David Clark & J Clendinning, Plane & Geodetic surveying Vol. I & II, constable & Co. London.
6. S.K. Roy, Fundamentals of surveying, prentice - Hall of India New Delhi
7. B.C. Punmia, Surveying Vol. I, II, III, Laxmi Publications New Delhi
8. K.R. Arora, Surveyhing Vol. I & II, standard book House, New Delhi

List of Experiments/ Field work (Expandable):
1. Theodolite traversing
2. Profile leveling, contouring & cross sectioning
3. Determination of tachometric constants & uses of tachometer in various field works
4. Curve setting by different methods.

CE- 404 Construction Materials & Techniques

A) Construction Materials:

Unit-I

Stones : Occurrence, varieties, Characteristics and their testing, uses, quarring and dressing of stones. Timber : Important timbers, their engineering properties and uses, defects in timber, seasoning and treatment, need for wood substitutes, Alternate materials for shuttering doors/windows, Partitions and structural members etc. Brick and Tiles: Manufacturing , characteristics, Classification and uses, Improved brick from inferior soils, Hand molding brick table, Clay-fly ash brick table, Flooring tiles and other tiles and their characteristics.

Unit-II

Advance Construction Materials : Use of fly ash in mortars, concrete, Fly ash bricks, stabilized mud blocks, non-erodible mud plinth, D.P.C. materials, Building materials made by Industrial & agricultural waste, clay products P.V.C. materials, advance materials for flooring, doors & windows, facia material, interiors materials for plumbing, sanitation & electrification.

(B) Construction Techniques:

Unit-III

Foundation: Type of soils, bearing capacity, soil slablisation and improvement of bearing capacity, settlement and safe limits. Spread foundations, wall footings, grillage, foundations well foundation, causes of failure and remedial measures; under reamed piles, foundation on shrinkable soils, black cotton soil, timbering for trenches, dewatering of foundations. Hyperbolic parabolied footing, Brick arch foundation. Simple methods of foundation design, Damp proof courses, Repairs Techniques for foundations.

Unit-IV

Masonry and Walls : Brick masonry, Bonds, Jointing, Stone masonry, casting and laying, masonry construction, Brick cavity walls, code provisions regarding load bearing and non load bearing walls. Common defects in construction and their effect on strength and performance of walls, designed Brick masonry, precast stone masonry block, Hollow concrete block, plastering and pointing, white and color washing, distempering, dampness and its protection, Design of hollow block masonry walls. Doors, Windows and Ventilators: Types based on material etc., size location, fittings, construction sunshades, sills and jambs, RCC doors/windows frames. Stairs types, rule of proportionality etc., Repairs techniques for masonry, walls, doors & windows.

Unit-V

Floors and Roofs : Types, minimum thickness, construction, floor finishes, Flat roofs, RCC jack arch, reinforced brick concrete, solid slab and timber roofs, pitched roofs, false ceiling, roof coverings, Channel unit, cored unit, Waffle unit, Plank and Joist, Brick panel, L-Panel, Ferrocement roofing units, water proofing .Services : Water supply & Drainage, Electrification, Fire protection, thermal insulation, Air Conditioning, Acoustics & Sound insulation, Repairs to damaged & cracked buildings, techniques and materials for low cost housing., Repairs techniques for floors & roofs.

References:

1. Mohan Rai & M.P. Jai Singh; Advance in Building Materials & Construction,.
2. S.C. Rangwala; Engineering Materials
3. Sushil Kumar; Building Construction,
4. B.C. Punmia; Building Construction ,.
5. Building Construction, Metchell
6. Construction Technology, Chudley R.
7. Civil Engineering Materials, N. Jackson.
8. Engineering Materials, Surendra Singh.

List of Experiments:

1. Tests on Bricks
2. Tests on Aggregates
3. Tests on Cement
4. Determination of compressive strength of concrete with different cement grades.
5. Determination of workability of concrete by slump test
6. Determination of workability by compacting factor apparatus.
7. Determination of workability by Vee Bee consistometer.
8. Nondestructive testing of concrete by Rebound hammer test
9. Nondestructive testing of concrete by ultrasonic Method.
10. Test for the effect of admixtures on the concrete compressive strength
11. Testing of microconcrete
12. Design of concrete mix.

CE- 405 Fluid Mechanics

Unit-I
Review of Fluid Properties: Engineering units of measurement, mass, density, specific weight, specific volume, specific gravity, surface tension, capillarity, viscosity, bulk modulus of elasticity, pressure and vapor pressure. Fluid Static's : Pressure at a point, pressure variation in static fluid, Absolute and gauge pressure, manometers, Forces on plane and curved surfaces (Problems on gravity dams and Tainter gates); buoyant force, Stability of floating and submerged bodies, Relative equilibrium.

Unit-II
Kinematics of Flow : Types of flow-ideal & real , steady & unsteady, uniform & nonuniform, one, two and three dimensional flow, path lines, streaklines, streamlines and stream tubes; continuity equation for one and three dimensional flow, rotational & irrotational flow, circulation, stagnation point, separation of flow, sources & sinks, velocity potential, stream function, flow nets- their utility & method of drawing flow nets.

Unit-III
Dynamics of Flow: Euler's equation of motion along a streamline and derivation of Bernoulli's equation, application of Bernoulli's equation, energy correction factor, linear momentum equation for steady flow; momentum correction factor. The moment of momentum equation, forces on fixed and moving vanes and other applications. Fluid Measurements: Velocity measurement (Pitot tube, Prandtl tube, current meters etc.); flow measurement (orifices, nozzles, mouth pieces, orifice meter, nozzle meter, venturimeter, weirs and notches).

Unit-IV
Dimensional Analysis and Dynamic Similitude: Dimensional analysis, dimensional homogeneity, use of Buckingham-pi theorem, calculation of dimensionless numbers, similarity laws, specific model investigations (submerged bodies, partially submerged bodies, weirs, spillways, rotodynamic machines etc.)

Unit-V Laminar Flow: Introduction to laminar & turbulent flow, Reynolds experiment & Reynolds number, relation between shear & pressure gradient, laminar flow through circular pipes, laminar flow between parallel plates, laminar flow through porous media, Stokes law, lubrication principles.

References: -
1. Modi & Seth; Fluid Mechanics; Standard Book House, Delhi
2. Som and Biswas; Fluid Mechnics and machinery; TMH
3. Cengal; Fluid Mechanics; TMH
4. White ; Fluid Mechanics ; TMH
5. Essential of Engg Hyd. By JNIK DAKE; Afrikan Network & Sc Instt. (ANSTI)
6. A Text Book of fluid Mech. for Engg. Student by Franiss JRD
7. R Mohanty; Fluid Mechanics By; PHI
8. Fluid Mechanics; Gupta Pearson.

List of Experiment (Expandable):
1. To determine the local point pressure with the help of pitot tube.
2. To find out the terminal velocity of a spherical body in water.
3. Calibration of Venturimeter

4. Determination of Cc, C_v, C_d of Orifices
5. Calibration of Orifice Meter
6. Calibration of Nozzle meter and Mouth Piece
7. Reynolds experiment for demonstration of stream lines & turbulent flow
8. Determination of metacentric height
9. Determination of Friction Factor of a pipe
10. To study the characteristics of a centrifugal pump.
11. Verification of Impulse momentum principle.

IT- 406 Computer Programming -II

UNIT I
Introduction .NET framework, features of .Net framework, architecture and component of .Net, elements of .Net.

UNIT II
Basic Features Of C# Fundamentals, Classes and Objects, Inheritance and Polymorphism, Operator Overloading, Structures. Advanced Features Of C# Interfaces, Arrays, Indexers and Collections; Strings and Regular Expressions, Handling Exceptions, Delegates and Events.

UNIT III
Installing ASP.NET framework, overview of the ASP .net framework, overview of CLR, class library, overview of ASP.net control, understanding HTML controls, study of standard controls, validations controls, rich controls. Windows Forms: All about windows form, MDI form, creating windows applications, adding controls to forms, handling Events, and using various Tolls

UNIT IV
Understanding and handling controls events, ADO.NET- Component object model, ODBC, OLEDB, and SQL connected mode, disconnected mode, dataset, data-reader Data base controls: Overview of data access data control, using grid view controls, using details view and frame view controls, ado .net data readers, SQL data source control, object data source control, site map data source.

UNIT V
XML: Introducing XML, Structure, and syntax of XML, document type definition (DTD), XML Schema, Document object model, Presenting and Handling XML. xml data source, using navigation controls, introduction of web parts, using java script, Web Services

References:

1. C# for Programmers by Harvey Deitel, Paul Deitel, Pearson Education
2. Balagurusamy; Programming in C#; TMH
3. Web Commerce Technology Handbook by Daniel Minoli, Emma Minoli , TMH
4. Web Programming by Chris Bates, Wiley
5. XML Bible by Elliotte Rusty Harold ,
6. ASP .Net Complete Reference by McDonald, TMH.
7. ADO .Net Complete Reference by Odey, TMH

List of Experiments/ program (Expandable):
1. Working with call backs and delegates in C#
2. Code access security with C#.
3. Creating a COM+ component with C#.
4. Creating a Windows Service with C#
5. Interacting with a Windows Service with C#
6. Using Reflection in C#
7. Sending Mail and SMTP Mail and C#
8. Perform String Manipulation with the String Builder and String Classes and C#:
9. Using the System .Net Web Client to Retrieve or Upload Data with C#

10. Reading and Writing XML Documents with the XML Text-Reader/-Writer Class and C#
11. Working with Page using ASP .Net.
12. Working with Forms using ASP .Net
13. Data Sources access through ADO.Net,
14. Working with Data readers , Transactions
15. Creating Web Application.

Course outcome of Civil Engineering: BE III Year

Course Outcome for Civil Engineering in B.E./ B.Tech III year is given as follows:-

- To let students understand the historical background of roads, planning systems, design of roads, details of road alignment, terminologies of highway, airport design concept. Transportation as a means of communication.
- To make them know about how previously direction was chosen, how astronomy is related to civil engineering. Various surveys like photogrammetry. Modern equipment used in civil engineering. Various technologies like Remote sensing, GPS etc.
- To understand the theoretical & practical aspects of fluids both in static and dynamics, losses in pipes, flow through pipes, turbines and pumps. To deal with day to day life such as in water supplies.
- Students learn about the architecture of the members of building such as slab, beam, and columns. Their design and codes standard. Their drawing reading, design, approach and establishment of structural elements.
- To understand the theoretical & practical aspects of how various loads come to various structural members, how to make design more versatile, solving the things in calculative manner to obtain better results.

CE 501 – Transportation Engineering - II

Unit - I

High way planning, Alignment & Geometric Design: Principles of highway planning, road planning in India and financing of roads, classification patterns. Requirements, Engg. Surveys for highway location.

Cross sectional elements- width, camber, super-elevation, sight distances, extra widening at curves, horizontal and vertical curves, numerical problems.

Unit – II

Bituminous & Cement Concrete Payments: Design of flexible pavements, design of mixes and stability, WBM, WMM, BM, IBM, surface dressing, interfacial treatment- seal coat, tack coat, prime coat, wearing coats, grouted macadam, bituminous concrete specification, construction and maintenance. Advantages and disadvantages of rigid pavements, general principles of design, types, construction, maintenance and joints, dowel bars, tie bars. Brief study of recent developments in cement concrete pavement design, fatigue and realiability.

Unit – III

Low Cost Roads, Drainage of Roads, Traffic Engg. & Transportation Planning: Principles of stabilization, mechanical stabilization, requirements, advantages, disadvantages and uses, quality control, macadam roads-types, specifications, construction, maintenance and causes of failures.

Surface and sub-surface drainage, highway materials: properties and testing etc. Channelised and unchannelised intersections, at grade & grade separated intersections, description, rotary-design elements, advantages and disadvantages, marking, signs and signals, street lighting. Principles of planning, inventories, trip generation, trip distribution, model split, traffic assignment, plan preparation.

Unit - IV

Airport Plaaning, Runway & Taxiway: Airport site selection. air craft characteristic and their effects on runway alignments, windrose diagrams, basic runway length and corrections, classification of airports.

Geometrical elements: taxi ways and runways, pattern of runway capacity.

Unit - V

Airport, Obstructions, Lightning & Traffic control: Zoning regulations, approach area, approach surface-imaginary, conical, horizontal. Rotating beacon, boundary lights, approach lights, runway and taxiway lighting etc. instrumental lending system, precision approach radar, VOR enroute traffic control.

List of Experiments:

1. Aggregate Crushing Value Test
2. Determination of aggregate impact value

3. Determination of Los Angeles Abrasion value
4. Determination of California Bearing Ratio values
5. Determination of penetration value of Bitumen
6. Determination of Viscosity of Bituminous Material
7. Determination of softening point of bituminous material
8. Determination of ductility of the bitumen
9. Determination of flash point and fire point of bituminous material
10. Determination of Bitumen content by centrifuge extractor
11. Determination of stripping value of road aggregate
12. Determination of Marshall stability value for Bituminous mix
13. Determination of shape tests on aggregate

Reference Books & Study Materials:

1. Highway Engineering by Gurucharan Singh
2. Principles of Pavement Design by E.J. Yoder & M.W. Witzech
3. Highway Engineering by O’Fleherty
4. Highway Engineering by S.K. Khanna & C.E.G. Justo
5. Airport Planning & Design by S.K. Khanna & M. G. arora
6. Foresch, Charles “Airport Planning”
7. Horonjeff Robert “The Planning & Design of Airports”
8. Sharma & Sharma, Principles and Practice of Highway Engg.
9. Haung, Analysis and Design of Pavements
10. Relevant IRC & IS codes
11. Laboratory Mannual by Dr. S.K. Khanna
12. Highway Engg. By Hews & Oglesby
13. Highway Material by Walker

CE- 502 Advanced Surveying

UNIT-I

Modern equipments for surveying : Digital levels and theodolites, Electronic Distance measurement(EDM), Total Station and Global Positioning Systems (GPS), Digital Plannimeter .

UNIT-II

Surveying Astronomy: Definitions of astronomical terms, coordinate systems for locating heaven ly bodies, geographic, g eodetic, geocentric, Cartesian, local and projected coordinates for earth resources mapping, convergence of meridian, parallel of latitude, shortest distance between two points on the earth, determination of latitude and lon gitude.

UNIT-III

GPS Surveying: Introduction & components of GPS, Space segment, control seg ment and user segment, Elements of Satellite based surveys-Map datums, GPS receivers, GPS observation methods and their advantages over conventional methods.

Digital Terrain Model (DTM) : Topographic representation of the terrain and generation of DTM on computers using spot heights and contour maps.

UNIT-IV

Photogrammetry : Principle, definitions and classifications of terrestrial and aerial photogrammentry, flight planning for aerial photography, scale and relief displacements of vertical aerial photographs, stereoscopic vision on vertical photographs, computation of position, length and elevations of objects using photographs and photo mosaic.

UNIT-V

Remote Sensing: Principle, components, classification, remote sensing data acquisition process, different types of remote sensing satellite imagery with special relevance to Indian Remote Sensing Satellites (IRS) and applications. Geographic Information Systems (GIS) : Definition, components and advantages.

Surveying Project - Student will go for one week Surveying Camp to carry out Project Work.

SUGGESTED TEXT BOOKS AND REFERENCES :

1. Surveying and Leveling-Part-I & II by T.P. Kanetkar and S.V. Kulkarini, Pune Vidyarthi Griha Prakashan,
Pune
2. Engineering Surveying : Theory and Examination Problems for Students by W. Schofield, Butterworth,
Heinemann,Oxford.
3. Surveying: Problems Solving with theory and objective type questions by A.M. Chandra, New Age
International Publishers N. Delhi.
4. Advance Surveying by A.M. Chandra, New Age International Publishers N. Delhi.
5. Surveying Vol. II by S.K. Duggal, Tata McGraw Hill Publishing Company Ltd. New Delhi.
6. Remote Sensing and image interpretation by Lillesand T.M. and Kiefer R.W.

CE- 503 Fluid Mech. - II

Unit-I

Turbulent flow : Laminar and turbulent boundary layers and laminar sublayer, hydrodynamically smooth andrough boundaries, velocity distribution in turbulent flow, resistance of smooth and artificially roughened pipes,commercial pipes, aging of pipes.

Pipe flow problems : Losses due to sudden expansion and contraction, losses in pipe fittings and valves,concepts of equivalent length, hydraulic and energy gradient lines, siphon, pipes in series, pipes in parallel,branching of pipes.

**Pipe Network : *Water Hammer (only quick closure case). transmission of power. ***Hardy Cross Method

Unit-II

Uniform flow in open channels : Channel geometry and elements of channel section, velocity distribution,energy in open channel flow, specific energy, types of flow, critical flow and its computations, uniform flow and its computations, Chezy's and Manning's formulae, determination of normal depth and velocity, Normal and critical slopes, Economical sections, Saint Vegnet equation.

Unit-III

Non uniform flow in open channels : Basic assumptions and dynamic equations of gradually varied flow,characteristics analysis and computations of flow profiles, rapidly varied flowhydraulic
jump in rectangular channels and its basic characteristics, surges in open channels & channel flow routing, venturi flume.

Unit-IV

Forces on immersed bodies: Types of drag, drag on a sphere, a flat plate, a cylinder and an aerofoil development of lift, lifting vanes, magnus effect.

Unit-V

Fluid Machines:

Turbines : Classifications, definitions, similarity laws, specific speed and unit quantities, Pelton turbine-their construction and settings, speed regulation, dimensions of various elements, Action of jet, torque, power and efficiency for ideal case, characteristic curves. Reaction turbines: construction & settings, draft tube theory, runaway speed, simple theory of design and characteristic curves, cavitation.

Pumps:

Centrifugal pumps : Various types and their important components, manometric head, total head, net positive suction head, specific speed, shut off head, energy losses, cavitation, principle of working and characteristic curves.

Reciprocating pumps: Principle of working, Coefficient of discharge, slip, single acting and double acting pump, Manometric head, Acceleration head.

List of Experiment

1. Study the performances characteristics of Pelton Wheel
2. Study the performances characteristics of Francis Turbine

3. Study the performances charactristics of Kaplan Turbine
4. Caliration of multistage (Two) Pump & Study of characteristic of variable speed pump
5. To study the performance & details of operation of Hyd. Ram
6. Determination of coefficient of discharge for a broad crested weir & to plot water surface Profile over weir
7. Study of the characteristic of the Reciprocating pump

Suggested Books & Study Material:

1. Fluid Mechanics - Modi & Seth - Standard Book house, Delhi
2. Open Channel Flow by Rangaraju - Tata Mc Graw - Hill Publishing Comp. Ltd., New Delhi
3. Fluid Mechanics - A.K. Jain - Khanna Publishers, Delhi
4. Fluid Mechanics, Hydraulics & Hydraulic Machanics - K.R. Arora - Standard Publishers Distributors 1705-B, Nai Sarak, Delhi-6
5. Hyd. of open channels By Bakhmetiff B.A. (McGraw Hill, New York)
6. Open Channel Hyd. By Chow V.T. (McGraw Hill, New York)
7. Engineering Hydraulics By H. Rouse
8. Centrifugal & Axial Flow Pump By Stempanoff A.J. New York
9. Relevant IS codes.

CE- 504 Structural Design & Drawing – I (RCC)

Unit - I.

Basic Principles of Structural Design : Assumptions, Mechanism of load transfer, Various properties of concrete and reinforcing steel, Introduction to working stress method and limit state methods of design, partial safety factor for load and material. Calculation of various loads for structural design of singly reinforced beam, Partial load factors.

Unit - II.

Design of Beams: Doubly reinforced rectangular & Flanged Beams, Lintel, Cantilever, simply supported and continuous beams, Beams with compression reinforcement: Redistribution of moments in continuous beams, Circular girders: Deep beams. Design of beam for shear and bond.

Unit-III.

Design of Slabs: Slabs spanning in one direction. Cantilever, Simply supported and Continous slabs, Slabs spanning in two directions, Circular slabs, Waffle slabs, Flat slabs, Yield line theory.

Unit -IV.

Columns & Footings: Effective length of columns, Short and long cloumns- Square, Rectangular and Circular columns, Isolated and combined footings, Strap footing, Columns subjected to axial loads and bending moments (sections with no tension), Raft foundation.

Unit -V.

Staircases: Staircases with waist slab having equal and unequal flights with different support conditions,Slabless tread-riser staircase.

NOTE :- All the designs for strength and serviceability should strictly be as per the latest version of IS:456. Use of SP-16 (Design aids)

Suggested Books: -

1. Plain & Reinforced Concrete Vol. I & II – O.P. Jain & Jay Krishna
2. Limit State Design by P.C.Varghese ; Prentice Hall of India, New Delhi
3. Design of Reinforced Concrete Elements by Purushothman; Tata McGraw Hill, New Delhi
4. Reinforced Cement Concrete by Gupta & Mallick, Oxford and IBH
5. Reinforced Cement Concrete by P. Dayaratnam, Oxford and IBH
6. Plain & reinforced concrete - Rammuttham
7. Plain & reinforced concrete – B.C. Punnia
8. Structural Design & Drawing by N.K.Raju.

CE- 505 Theory of Structures -I

Unit. I

Virtual work and Energy Principles: Principles of Virtual work applied to deformable bodies, strain energy and complementary energy, Energy theorems, Maxwell's Reciprocal theorem, Analysis of Pin-Jointed frames for static loads.

Unit. II

Indeterminate Structures-I : Static and Kinematics indeterminancy, Analysis of Fixed and continuous beams by theorem of three moments, Effect of sinking and rotation of supports, Moment distribution method (without sway)

Unit. III

Indeterminate Structures - II : Analysis of beams and frames by slope Deflection method, Column Analogy method.

Unit. IV

Arches and Suspension Cables: Three hinged arches of different shapes, Eddy's Theorem, Suspension cable, stiffening girders, Two Hinged and Fixed Arches - Rib shortening and temperature effects.

Unit. V

Rolling loads and Influence Lines: Maximum SF and BM curves for various types of Rolling loads, focallength, EUDL, Influence Lines for Determinate Structures- Beams, Three Hinged Arches.

Reference Books:

1. Ghali A & Neville M., Structural Analysis - A Unified classical and matrix Approach, Chapman and Hall, New York.
2. Wang C.K. Intermediate structural analysis, McGraw Hill, New York.
3. Kinney Streling J. Indeterminate structural Analysis, Addison Wesley.
4. Reddy C.S., Basic Structural Analysis, Tata McGraw Hill Publishing Company, New Delhi.
5. Norris C.H., Wilbur J.B. and Utkys. Elementry Structural Analysis, McGraw Hill International, Tokyo

CE 601 – Theory of Structures –II

Unit. I

Moment distribution method in analysis of frames with sway, analysis of box frames, analysis of portals with inclined members, analysis of beams and frames by Kani's method.

Unit. II

Plastic analysis of beams and frames.

Unit. III

Analysis of tall frames, wind and earthquake loads, codal provisions for lateral loads. Approximate analysis of multistory frames for vertical and lateral loads.

Unit. IV

Matrix method of structural analysis: force method and displacement method..

Unit. V

Influence lines for intermediate structures, Muller Breslau principle, Analysis of Beam-Columns.

Reference Books :-

1. Wang C.K. Intermediate structural analysis, McGraw Hill, New York.
2. Kinney Streling J. Indeterminate structural Analysis, Addison Wesley.
3. Reddy C.S., Basic Stgructural Analysis, Tata McGraw Hill Publishing Company, New Delhi.
4. Norris C.H., Wilbur J.B. and Utkys. Elementary Structural Analysis, McGraw Hill International, Tokyo.
5. Weaver W & Gere JM, Matrix Methods of Framed Structures, CBS Publishers & Distributors, Delhi

CE 602 – Water Resources and Irrigation Engineering

Unit - I

Irrigation water requirement and Soil-Water-Crop relationship: Irrigation, definition, necessity, advantages and disadvantages, types and methods. Irrigation development.

Soils - types and their occurrence, suitability for irrigation purposes, wilting coefficient and field capacity, optimum water supply, consumptive use and its determination. Irrigation methods-surface and subsurface, sprinkler and drip irrigation.

Duty of water, factors affecting duty and methods to improve duty, suitability of water for irrigation, crops and crop seasons, principal crops and their water requirement, crop ratio and crop rotation, intensity of irrigation.

Unit - II

Ground Water and Well irrigation:

Confined and unconfined aquifers, aquifer properties, hydraulics of wells under steady flow conditions, infiltration galleries. Ground water recharge-necessity and methods of improving ground water storage. Water logging-causes, effects and its prevention. Salt efflorescence-causes and effects. reclamation of water logged and salt affected lands. Types of wells, well construction, yield tests, specific capacity and specific yield, advantages and disadvantages of well irrigation.

Unit-III

Hydrology : Hydrological cycle, precipitation and its measurement, recording and non recording rain gauges, estimating missing rainfall data, rain gauge net works, mean depth of precipitation over a drainage area, mass rainfall curves, intensity-duration curves, depth-area duration curves, Infiltration and infiltration indices, evaporation stream gauging, run off and its estimation, hydrograph analysis, unit hydrograph and its derivation from isolated and complex storms,
S-curve hydrograph, synthetic unit hydrograph.

Unit - IV

Canals and Structures: Types of canals, alignment, design of unlined and lined canals, Kennedy's and Lacey's silt theories, typical canal sections, canal losses, lining-objectives, materials used, economics.Introductions to Hydraulic Structures viz.Dams,Spillways,Weirs, ,Barrages,Canal Regulation Structures.

Unit-V

Floods: Types of floods and their estimation by different methods, probability and frequency analysis, flood routing through reservoirs and channels, flood control measures, economics of flood control,

Suggested Books :-

1. Irrigation & Water Power Engg. by Punmia & Pandey B.B.Lal
2. Engg. Hydrology by K. Subhramanya - Tata Mc Graw Hills Publ. Co.
3. Engg. Hydrology - J.NEMEC - Prentice Hall
4. Hydrology for Engineers Linsley, Kohler, Paulnus - Tata Mc.Graw Hill.
5. Hydrology & Flood Control by Santosh Kumar - Khanna Publishers
6. Engg. Hydrology by H.M. Raghunath

CE 603 – Environmental Engg. - I

Unit - I

Estimation of ground and surface water resources. quality of water from different sources, demand & quantity of water, fire demand, water requirement for various uses, fluctuations in demand, forecast of population.

Unit - II

Impurities of water and their significance, water-borne diseases, physical, chemical and bacteriological analysis of water, water standards for different uses. Intake structure, conveyance of water, pipe materials, pumps - operation & pumping stations.

Unit - III

Water Treatment methods-theory and design of sedimentation, coagulation, filtration, disinfection, aeration & water softening, modern trends in sedimentation & filtration, miscellaneous methods of treatment.

Unit - IV

Layout and hydraulics of different distribution systems, pipe fittings, valves and appurtenances, analysis of distribution system. Hardy cross method, leak detection, maintenance of distribution systems, service reservoir capacity and height of reservoir.

Unit - V

Rural water supply schemes, financing and management of water supply project, water pollution control act, conservancy & water carriage system, sanitary appliance and their operation, building drainage system of plumbing.

Suggested Books and Reading Materials:-

1. Water Supply Engineering by B.C. Punmia - Laxmi Publications (P) Ltd. New Delhi
2. Water Supply & Sanitary Engg. by G.S. Birdi - Laxmi Publications (P) Ltd. New Delhi
3. Water & Waste Water Technology by Mark J.Hammer - Prentice - Hall of India, New Delhi
4. Environmental Engineering - H.S. Peavy & D.R.Rowe-Mc Graw Hill Book Company,New Delhi
5. Water Supply & Sanitary Engg. by S.K. Husain
6. Water & Waste Water Technology - G.M. Fair & J.C. Geyer
7. Relevant IS Codes

List of Experiments:

1. To study the various standards for water
2. To study of sampling techniques for water
3. Measurement of turbidity
4. To determine the coagulant dose required to treat the given turbid water sample
5. To determine the conc. of chlorides in a given water samples
6. Determination of hardness of the given sample
7. Determination of residual chlorine by “Chloroscope”
8. Determination of Alkalinity in a water samples
9. Determination of Acidity in a water samples
10. Determination of Dissolved Oxygen (DO) in the water sample

CE 604 – Geo Tech Engg. I

Unit - I

Basic Definitions & Index Properties: Definition and scope of soil mechanics, Historical development. Formation of soils. Soil composition. Minerals, Influence of clay minerals on engineering behaviour. Soil structure. Three phase system. Index properties and their determination. Consistency limits. Classification systems based on particle size and consistency limits.

Unit - II

Soil Water and Consolidation: Soil water, Permaeability Determination of permeability in laboratory and in field. Seepage and seepage pressure. Flownets, uses of a flownet, Effective, neutral and total stresses.

Compressibility and consolidation, Relationship between pressure and void ratio, Theory of one dimensional consolidation. Consolidation test, Fitting Time curves. Normally and over consolidated clays. Determination of preconsolidation pressure, settlement analysis. Calculation of total settlement.

Unit - III

Stress Distribution in Soils and Shear Strength of Soils: Stress distribution beneath loaded areas by Boussinesq and water gaurd's analysis. Newmark's influence chart. Contact pressure distribution.

Mohr - Coulomb's theory of shear failure of soils, Mohr's stress circle, Measurement of shear strength, Shear box test, Triaxial compression test, unconfined compression test, Value shear test, Measurement of pore pressure, pore pressure parameters, critical void ratio, Liquefaction.

Unit - IV

Stability of Slopes: Infinite and finite slopes. Types of slope failures, Rotational slips. Stability number. Effect of ground water. Selection of shear strength parameters in slope stability analysis. Analytical and graphical methods of stability analysis. Stability of Earth dams.

Unit - V

Lateral Earth Pressure: Active, passive and earth pressure at rest. Rankine, Coulomb, Terzaghi and Culmann's theories. Analytical and graphical methods of determination of earth pressures on cosion-less and cohesive soils. Effect of surcharge, water table and wallfriction. Arching in soils. Reinforced earth retaining walls.

LABORATORY WORK : Laboratory work will be based on the above course as required for soil investigators of engineering projects.

List of Experiments:

1. Determination of Hygroscopic water content
2. Particle - size analysis
3. Determination of Specific gravity of soil particles
4. Determination of plastic limit
5. Determination of liquid limit
6. Determination of shrinkage limit
7. Permeability tests
8. Direct shear test
9. Consolidation test

Suggested Books: -

1. Soil Mech. & Found. Engg. by Dr. K.R. Arora - Std. Publishers Delhi.
2. Soil Mech. & Found. by Dr. B.C.Punmia- Laxmi Publications, Delhi.
3. Modern Geotech Engg. by Dr.l Aram Singh - IBT Publishers, Delhi.
4. Geotech Engg. by C. Venkatramaiah - New Age International Publishers, Delhi
5. Soil Mech. & Found. Engg. by S.K. Garg- Khanna Publishers, Delhi.
6. Soil Testing for Engg. by T.W. Lambe - John Wiley & Soms. Inc.
7. Relevant I.S. Codes

CE 605 – Structural Design & Drawing – II (Steel)

Unit - I

Various loads and mechanism of the load transfer, partial load factors, structural properties of steel, Design of structural connections -Bolted, Rivetted and Welded connections.

Unit - II

Design of compression members, Tension members, Roof Trusses - Angular & Tubular, Lattice Girders.

Unit-III

Design of simple beams, Built-up beams, Plate girders and gantry girders.

Unit - IV

Effective length of columns, Design of columns-simple and compound, Lacings & battens. Design of footings for steel structures, Grillage foundation.

Unit - V

Design of Industrial building frames, multistory frames, Bracings for high rise structures, Design of transmission towers.

NOTE: - All the designs for strength and serviceability should strictly be as per the latest version of IS:800.

Reference Books :-

i) Design of steel structures by Arya & Azmani Nemchand & Bros, Roorkee
ii) Design of steel structures by P.Dayaratnam
iii) Design of steel structures Vol. I & II by Ramchandra
iv) Design of steel structures by L.S. Negi
v) Design of steel structures by Ramammutham
iv) Design of steel structures by Punmia

Course outcome of Civil Engineering: BE IV Year

Course Outcome for Civil Engineering in B.E./ B.Tech IV year is given as follows:-

- To learn the concept of soil mechanics, soil stabilization, design of foundations, load coming onto structure.
- Student learn the theoretical aspects of design of network planning, construction management, delay of construction project, project approach.
- To understand the theoretical & practical aspects of pavement designs, concept of design, application.
- Project given to students for better realistic approach, to develop creative design ideas as per today's need of construction, research work for more gain of knowledge, training programs.

CE 701 – Design of Hydraulic Structure

Unit - I

Reservoir Planning: Investigations, Capacities, Zones of storage, Mass Inflow and Mass Demand curves, Life of Reservoir.

Earth Dams: Types, causes of failure and design criteria, soils suitabllity for earth dam construction, construction methods, foundation requirements, typical earth dam sections, estimation of seepage through and below the dam, seepage control, stability of slopes by slip circle method of analysis, pore pressures, sudden draw down, steady seepage and construction pore pressure condition.

Unit - II

Gravity dams: Design Criteria, forces acting on gravity dams, elementary profile, low and high gravity dams, stability analysis, practical profile, evaluation of profile by method of zoning, foundation treatment, construction joints, galleries in gravity dams.

Unit - III

Spillways: Ogee spillway and its design, details of syphon, shaft, chute and side channel spillways, emergency spillways.design of outlets and rating curves

Energy dissipators: Principles of energy dissipation Energy dissipators based on tail water rating curve and jump height curves Spillway crest gates - vertical lift and radial gates, their design principles. Design of canal regulating structures, Design of Channel transitions,Design of Sarda type Falls, Design of cross drainage works viz Syphon aquaduct and Canal syphon.

Unit – IV

Structures on Pervious formations: Bligh's creep theory,limitations, Khoslas's theory of independent variable,Khosla's corrections,Design of Weir and Barrages :design of waterways and crest levels,design of impervious floors and protection works.

Unit - V

Canal Structures and Hydropower Plants: Design of canal falls, Regulators, Cross drainage works, Introduction of Hydropower development, , general features of hydro-electric schemes, selection of turbines.

Reference Books: -

1. Engineering for Dams (Volumes I, II & III) by Creager, Justin & Hinds
2. Hydroelectric Hand Book by Creager
3. Hydraulic Structures by Varshney
4. Irrigation & Water Power Engg. by Punmia & Pandey B.B.Lal
5. Water Power Engineering by Dandekar

CE 702 – Advanced Structural Design – II (RCC)

Unit - I
Design of Multistory Buildings - Sway and nonsway buildings, Shear walls and other bracing elements.

Unit II
Earth Retaining Structures: Cantilever and counter fort types retaining walls.

Unit - III
Water Tanks: Tanks on ground and underground tanks: Square, rectangular, circular tanks, Overhead tanks: square, rectangular, circular & intze tanks.

Unit - IV
Silos and Bunkers

Unit - V
T-beam & Slab bridges- for highway loading (IRC Loads).
Prestressing concepts materials, systems of prestressing & losses Introduction to working & limit State Design.

Suggested Books: -

1. R.C.C. by O.P. Jain Vol. II
2. R.C.C. by B.C. Punmia
3. Essentials of Bridge engineering – D.J. Victor
4. Bridge Engineering - Ponnuswamy
5. Advanced R.C.C. Design by N.K. RAJU
6. N.Krishna Raju, Prestressed Concrete, Tata Mc Graw Hill, New Delhi.
7. Pre stresses concrete – T.Y. Lin

CE 703 – Environmental Engg. - II

Unit - I

Sewerage schemes and their importance, collection & conveyance of sewage, storm water quantity, fluctuation in sewage flow, flow through sewer, design of sewer, construction & maintenance of sewer, sewer appurtenances, pumps & pumping stations.

Unit -II

Characteristics and analysis of waste wate, rcycles of decomposition, physical, chemical & biological parameters. Oxygen demand i.e. BOD & COD, TOC, TOD, Th OD, Relative Stability, population equivalent, instrumentation involved in analysis, natural methods of waste water disposal i.e. by land treatment & by dilution, self purification capacity of stream, Oxygen sag analysis.

Unit -III

Unit operations for waste water treatment, preliminary treatment such as screens, grit chamber, floatation tank, sedimentation and chemical clarification, role of micro-organism in biological treatment, Sewage filtration- theory & design.

Unit - IV

Methods of Biological Treatment (Theory & Design) - Activated Sludge process, Oxidation ditch, stabilization ponds, aerated lagoon, anaerobic lagoons, septic tank & imhoff tank, sources & treatment of sludge, sludge thickening and digestion sludge drying beds, sludge disposal.

Unit - V

Advanced Waste Water treatment - Diatomaceorus earth filters, ultrafiltration, Adsorption by activated carbon, Phosphorus removal, Nitrogen removal, Physico chemical waste water treatment, Solid waste disposal - classification, composition, collection, & disposal methods. Rural sanitation - collection & disposal of refuse, sullage & night soil

Laboratory work shall be based on the topics of environmental engineering I & II and consist of experiments of water and waste water quality as per facility available in the institution.

List of Experiment

1. To study the various standards for waste water
2. To study the sampling techniques for waste water
3. To determine the alkalinity in water sample
4. To determine the acidity in water sample
5. Determination of Dissolved Oxygen in the water and waste water sample
6. Determination of Biological Oxygen demand of a waste water sample
7. Determination of Chemical Oxygen demand of a waste water sample
8. Determination of various types of solids in the waste water sample
9. Determination of bacterial number by membrane filter Technique
10. Determination of bacterial colonies by standard plat count method

Reference Books :-

1. Water Supply & Sanitary Engg. - G.S. Birdie - Dhanpat Rai Publishing Company,
2. (P) Ltd. New Delhi
3. Waste Water Engg. by B.C. Punmia - Laxmi Publication (P) Ltd. New Delhi
4. Environmental Engg. - M.L. Davis & D.A. Cornwell - Mc Graw Hill Company
5. Chemistry for Environmental Engg. - Sawyer & Mc Carty - Mc Graw Hill Book Company New Delhi
6. Water & Waste Water Technology - Mark J Hammer - Prentice - Hall of India, New Delhi
7. Waste Water Engineering - Metcalf & Eddy - Mc Graw Hill Book Company New Delhi

CE 704 – Quantity surveying & Costing

Unit – I

Introduction: Purpose and importance of estimates, principles of estimating. Methods of taking out quantities of items of work. Mode of measurement, measurement sheet and abstract sheet; bill of quantities.Types of estimate, plinth area rate, cubical content rate, preliminary, original, revised and supplementary estimates for different projects.

Unit – II

Rate Analysis: Task for average artisan, various factors involved in the rate of an item, material and labour requirement for various trades; preparation for rates of important items of work. Current schedule of rates. (C.S.R.)

Unit – III

Detailed Estimates: Preparing detailed estimates of various types of buildings, R.C.C. works, earth work calculations for roads and estimating of culverts Services for building such as water supply, drainage and electrification.

Unit – IV

Cost of Works: Factors affecting cost of work, overhead charges, Contingencies and work charge establishment, various percentages for different services in building. Preparation of DPR.

Unit – V

Valuation: Purposes, depreciation, sinking fund, scrap value, year's purchase, gross and net income, dual rate interest, methods of valuation, rent fixation of buildings.

Suggested Books:

1. Quantity Surveying & Costing – B.N. Datta
2. Estimating & Costing for Civil Engg. – G.S. Birdi
3. Quantity surveying & costing – Chakraborty
4. Estimating & Costing – S.C. Rangawala

Practical & Sessional Works:

1. Preparation of detailed estimate.
2. Detailed estimate for services of plumbing and water supply or Electrification work.
3. Detailed estimate for earth work for the road construction or arched culvert.
4. Rate analysis for at least 8 items of construction.
5. Preparation of DPR of Civil Engineering Project.

CE- 705 Elective- I (CE- 7101 Computational Methods in Structural Engineering)

Unit - I.

Matrix formulation for the principle of virtual work and energy principles, principle of contragradience, stiffness and flexibility matrices, Degree of Freedom. Axial, bending, shear and torsional deformations.

Local and Global Element stiffness matrices for bar, beam, shaft, grid, shear wall, beamcolumn, beam with rigid ends, beam on elastic foundation and elements with special boundary conditions. nonprismatic and curved elements, forces and displacements in general coordinate axes, structure stiffness matrix.

Unit - II.

Basics of the Direct Stiffness method - Analysis of pinjointed frames, rigid jointed structures, plane grids and composite structures for different loads including temperature, shrinkage, prestressing forces. Elastic stability analysis of 2-D rigid jointed frames, (Sway & Nonsway)

Unit - III.

Concepts of Bandwidth, various storage schemes & equation solvers; Reduction in order of stiffness matrix - use of substructures, static condensation method, Exploiting symmetry, skew symmetry and cyclic symmetry in structures, Imposition of Constraints – Lagrange Multiplier and Penalty Methods.

Unit - IV.

Analysis of continuum structures - Fundamental equations of theory of elasticity (2D), basic concepts of Finite Element Analysis, derivation of generalised element stiffness matrix and load vectors, convergence requirements, stiffness matrices for various elements using shape functions, Triangular and Rectangular elements. (PSPS)

Unit - V.

Two Dimensional Iso parametric elements, shape functions for Simplex. Lagrangian and Serendipidity family elements in natural coordinates, computation of stiffness matrix for isoparametric elements, degrading of elements, plate bending elements.

Reference Books :-

1. Ghali A & Neville M., Structural Analysis - A Unified Classical and Matrix Approach, Chapman and Hall, New York.
2. Weaver William & Gere James M., Matrix Analysis of Framed structures, CBS Publishers and Distributors, New Delhi.
3. Cook R.D., Concepts and Applications of Finite Element Analysis, Wiley, New York.
4. Gallagher R., Finite Element Analysis Fundamentals, Prentice-Hall, Englewood Cliffs, NJ.
5. Rubenstein M.F., Matrix Computer Analysis of structures, Prentice Hall, Englewood Cliffs, N.J.
6. Zeinkiewicz O.C & Taylor R.L., The Finite Element Method, McGraw Hill, London

CE- 705 Elective- I (CE- 7102 Traffic Engineering)

Unit -I.

Traffic Characteristics : (i) Road user's characteristics - general human characteristics, physical, mental and emotional factors, factors affecting reaction time, PIEV theory. (ii) Vehicular characteristics: Characteristics affecting road design-width, height, length and other dimensions. weight, power, speed and braking capacity of a vehicle.

Unit -II.

Traffic Studies : (i)Spot Speed Studies and Volume Studies.(ii) Speed and Delay Studies purpose, causes of delay, methods of conducting speed and delay studies. (iii) Origin and destination Studies (O & D) : Various methods, collection and interpretation of data, planning and sampling. (iv) Traffic Capacity Studies: Volume, density, basic practical and possible capacities, level of service. (v) Parking Studies: Methods of parking studies cordon counts, space inventories, parking practices.

Unit -III.

Traffic Operations and Control : (i) Traffic regulations and various means of control.(ii) One way streets- advantages and limitations. (iii) Traffic signals- isolated signals, coordinated signals, simultaneous, alternate, flexible and progressive signal systems. Types of traffic signals, fixed time signals, traffic actuated signals, speed control signals, pedestrian signals, flashing signals, clearance interval and problems on single isolated traffic signal.

Unit -IV.

Street Lighting : (i) Methods of light distribution. (ii) Design of street lighting system. (iii) Definitions- Luminaire, foot candle, Lumen, utilization and maintenance factors. (iv) Different types of light sources used for street lighting. (v) Fundamental factors of night vision.

Unit -V.

Accident Studies & Mass Transportation : (i) Accident Studies : Causes of accidents, accident studies and records, condition and collision diagram, preventive measures. (ii) Expressways and freeways, problems on mass transportation and remedial measures, brief study of mass transportation available in the country.

Reference Books :-

1. Traffic Engineering and Transport Planning by L.R. Kadiyali, Khanna Publishers, Delhi
2. Traffic Engineering by Matson, W.S.Smith & F.W. Hurd
3. G.J. Pingnataro, Principles of Traffic Engineering
4. D.R.Drew, Traffic Flaw Theory
5. W.R. Mchsne and R.P. Roess "Traffic Engg"
6. Wohl & Martin, Traffic System Analysis for Engineering & Planners

CE- 705 Elective- I (CE- 7103Industrial Waste Treatment)

Unit - I.

Problem of Water Pollution: Effects of wastes on streams and sewage treatment plant. Natural purification of streams. oxygen sag curve. allowable organic load on streams classification of stream, stream standards and effluent standards. requirement of water for different purposes.

Unit - II.

Measurement of Waste Water Volume: Sampling of waste waters, grab and composite samples. analysis of waste water. biochemical oxygen demand. chemical oxygen demand and pH value of waste, toxicity of waste by bioassay method. Pretreatment of Wastes: Volume and strength reduction, salvage of materials, recovery of by products, reuse of waste water.

Unit - III.

Conventional Methods of Treatment of Waste Water: Removal of suspended solids, removal of inorganic and organic dissolved solids, studge disposal, advance methods of treatment, such as reverse osmosis, ion exchange, electrodialysis, algal harvesting etc. low cost treatment plants. common effluent treatment plant, design and operation.

Unit - IV.

Combined Treatment of Waste Water Sewage: Energy requirement optimization and bedget, municipal regulation, sewer rental charge, instrumentation in waste water treatment plants, collection of data, operation and maintenance of plants, water pollution control board.

Unit - V.

Brief study of industrial processes and treatment methods of waste water from common industries, such as textile, dairy, paper and pulp, tannery, distillery. Hazardeous wastes- Impact handing and disposal.

Reference Books :-

1. "Liquid Waste of Industries - Theories, Practice and Treatment" - N.L. Nemerow, WEsley Publishing Co.
2. Treatment of Industrial Waste - E.B. Besselievre & Max Schwartz - Mc Graw Hill Book Company
3. "Waste Water Engg. - Treatment Disposal & Reuse" - Metcalf & Eddy - Tata Mc Graw Will, New Delhi
4. Waste Water Treatment - Arceivala - Tata Mc Graw Will, New Delhi
5. Industrial Pollution Control, hand book - Lund H.F. Tata Mc Graw Will, New Delhi

CE- 705 Elective- I (CE- 7104 Cost Effective & ECO-Friendly Construction)

UNIT-I
Concepts of energy efficient & environment friendly materials and techniques.

Cost effective materials :- Soil, Fly ash, Ferrocement, Lime, Fibres, Stone Dust, Red mud, Gypsum, Alternate Wood, Polymer.

Energy Efficient & Environment friendly building material products :-

Walls - Stabilised and sun dried, soil blocks & bricks, Solid & Hollow concrete blocks, stone masonry blocks, Ferrocement partitions.
Roofs - Precast R.C. Plank & Joists roof, Precast channel roof, Precast L-panel roof, Precast Funicular shells, Ferrocement shells, Filler Slab, Seasal Fibre roof, Improved country tiles, Thatch roof, M.C.R. tile.

UNIT-II
Cost effective construction techniques and equipments :-

(a) Techniques :- Rat trap bond construction, Energy Efficient roofings, Ferrocement technique, Mud Technology.
(b) Equipments :- Brick moulding machine, Stablilised soil block making machine and plants for the manufacturing of concrete blocks, M.C.R. tile making machine, Ferrocement wall panel & Roofing channel making machine, R.C.C. Chaukhat making m/c.

UNIT-III
Cost effective sanitation :-
(a) Waste water disposal system
(b) Cost effective sanitation for rural and urban areas
(c) Ferrocement Drains

UNIT-IV
Low Cost Road Construction :-
Cost effective road materials, stabilization, construction techniques tests, equipment used for construction, drainage, maintenance.

UNIT-V
Cost analysis and comparison :-
(a) All experimental materials
(b) All experimental techniques

CE- 705 Elective- I (CE- 7105 Environmental Impact Assessment)

UNIT-I

Concept of EIA : Introduction of EIA, Utility and scope of EIA, Significant Environmental Impacts, Stage of EIA, Environmental Inventory, Environmental Impact Statement (EIS)

UNIT-II

Methods of Impact Identification : Environmental Indices and indicators for describing the affected environment, matrix methodologies, network, checklist, and other method.

UNIT-III

Impact analysis : Framework, statement predication and assessment of impact of air, water, noise and socio-economic environment.

UNIT-IV

Preparation of written documentation : Initial planning phase, detailed planning phase, writing phase, organizing relevant information, co-ordination of team writing effort.

UNIT-V

Public Participation in Environmental Decision making : Basic definitions, Regulatory requirements, Advantages & disadvantages of Public Participation, Selection of Public participation techniques, Practical considerations for implementation.

CE 706 – Minor Project

Each candidate shall work on an approved project of a public building or any other civil engineering work and shall submit design and a set of drawings.

OR

Shall submit a detailed report of experimental work/ software package on any specific problem of importance.

CE 801 – Geo. Technical Engg.II

Branch: Civil Engineering-VIII Semester
Course: CE801 Geo Tech. Engg. - II
Unit - I
Shallow Foundations : Type of foundations shallow and deep. Bearing capacity of foundation on cohesion less and cohesive soils. General and local shear failures. Factors effecting B.C. Theories of bearing capacity - Prandle, Terzaghi, Balla, Skempton, Meyerh of and Hansan. I.S. code on B.c. Determination of bearing capacity. Limits of total and differential settlements. Plate load test.

Unit - II
Deep Foundation : Pile foundation, Types of piles, estimation of individual and group capacity of piles in cohesion less and cohesive soils. Static and dynamic formulae.. Pile load test, Settlement of pile group, Negative skin friction, under- reamed piles and their design. Piles under tension, inclined and lateral load Caissons. Well foundation. Equilibrium of wells. Analysis for stability tilts and shifts, remedial measures.

Unit - III
Soil Improvement Techniques : Compaction. Field and laboratory methods, Proctor compaction tests, Factors affecting compaction. Properties of soil affected by compaction. Various equipment for field compaction and their suitability. Field compaction control. Lift thickness.
Soil stabilisation : Mechanical, Lime, Cement, Bitumen, Chemical, Thermal, Electrical-stabilisation and sabilisation by grouting. Geo-synthetics, types, functions, materials and uses.

Unit - IV
Soil Exploration and Foundations on Expansive and Collapsible soils : Methods of soil exploration. Planning of exploration programme for buildings, highways and earth dams. Disturbed and undisturbed samples and samplers for collecting them.
Characteristics of expansive and collapsible soils, their treatment, Construction techniques on expansive and collapsible soils. CNS layer.
Unit - V
Sheet piles/Bulkheads and Machine foundation : Classification of sheet piles/bulkheads. Cantilever and anchored sheet piles, Cofferdams, materials, types and applications.
Modes of vibration. Mass-spring analogy, Natural frequency. Effect of vibration on soils. Vibration isolation. Criteria for design. Design of block foundation for impact type of machine.

LABORATORY WORK: Laboratory work will be based on the course of Geotech. Engg. I & II as required for soil investigations of engineering projects and not covered in the lab. Work of Geotech. Engg. I.

LIST OF EXPERIMENTS
1. Indian Standard Light Compaction Test/Std. Proctor Test
2. Indian Standard Heavy Compaction Test/Modified Proctor Test
3. Determination of field density by Core Cutter Method
4. Determination of field density by Sand Replacement Method
5. Determination of field density by Water Displacement Method
6. The corifiled Compression Test
7. Triaxial compression test
8. Lab. Vane Shear test

9. CBR Test
10. Demonstration of
Plate Load Test
SPT & DCPT

Reference Books :--

1. Soil Mechanics & Foundation Engg. by Dr. K.R. Arora - Std. Publishers Delhi
2. Soil Mechanics & Foundation Engg. by B.C. Punmia - Laxmi Publiscations Delhi
3. Modern Geotech. Engg. by Dr. Alam Singh-IBT Publishers Delhi.
4. Geotech. Engg. by C.Venkatramaiah-New AGE International Publishers, Delhi
5. Found. Engg. by GALeonards McGraw Hill Book Co. Inc.
6. Relevant IS Code

CE 802 – Construction Planning & Management

Branch: Civil Engineering-VIII Semester
Course: CE802 Construction Planning & Management

Unit -I
Preliminary and detailed investigation methods: Methods of construction, form work and centering.
Schedule of construction, job layout, principles of construction management, modern management techniques like CPM/PERT with network analysis.

Unit -II
Construction equipments: Factors affecting selection, investment and operating cost, output of various equipments, brief study of equipments required for various jobs such as earth work, dredging, conveyance, concreting, hoisting, pile driving, compaction and grouting.

Unit -III
Tenders & Contracts: Different types of Tenders & Contracts, notice inviting tenders, contract document, departmental method of construction, rate list, security deposit and earnest money, conditions of contract, arbitration, administrative approval, technical sanction.

Unit -IV
Specifications & Public Works Accounts: Importance, types of specifications, specifications for various trades of engineering works.
Various forms used in construction works, measurement book, cash book, materials at site account, imprest account, tools and plants, various types of running bills, secured advance, final bill.

Unit-V
Site Organization & Systems Approach to Planning: Accommodation of site staff, contractor's staff, various organization charts and manuals, personnel in construction, welfare facilities, labour laws and human relations, safety engineering.
Problem of equipment management, assignment model, transportation model and waiting line modals with their applications, shovel truck performance with waiting line method.

Reference Books :-
1. Construction Equipment by Peurify
2. CPM by L.S. Srinath
3. Construction Management by S. Seetharaman
4. CPM & PERT by Weist & Levy
5. Construction, Management & Accounts by Harpal Singh
6. Tendering & Contracts by T.A. Talpasai

CE 803 – Advanced Structural Design II (Steel)

Branch: Civil Engineering-VIII Semester
Course: CE803 Advanced Structural Design- II (Steel)

Unit – I
Plate girder bridges (Riveted and welded)

Unit – II
Trussed girder bridges for railways and highways (IRC & IRS holding). Bearings for bridges.

Unit – III
Water Tanks: Pressed steel tanks, tanks with ordinary plates, square, rectangular, circular with hemispherical bottom and conical bottom.

Unit - IV
Chimneys: Guyed and self supporting steel stacks.

Unit – V
Bunkers, Silos & Towers

Reference Books :-

1. Design of Steel Structures – Ramammutham
2. Design of Steel Structures – Punia
3. Steel Str. by Ramchandra Vol II
4. Steel Str. by Arya & Ajmani
5. Design of steel structures – L.S. Negi

CE -8041 Structural Dynamics & Earthquake Engineering

Unit - I.

Single DOF systems - Undamped and Damped, Response to Harmonic and periodic excitations, Response to Arbitrary, Step, Ramp and Pulse Excitations.

Unit - II.

Numerical Evaluation of Dynamic Response - Time stepping methods, methods based an Interpolation of Excitation, Newmark's and Wilson - q method, Analysis of Nonlinear Response, Introduction to frequency domain analysis.

Unit - III.

Elements of seismology - Definitions of the basic terms related to earthquake (magnitude, intensity, epicenter, focus etc.), seismographs Earthquake Response of structures - Nature of dynamic loading resulting from earthquake, construction of Response spectrum for Elastic and Inelastic systems.

Unit - IV.

Multiple DOF systems : Stiffness and Flexibility matrices for shear buildings, free and forced vibrations-undamped and damped, Modal and Response History Analysis, Systems with distributed mass & elasticity.

Unit - V.

Earthquake Resistant Design of Structures, Design of structures for strength & servicability, Ductility and energy absorption, Provisions of IS : 1893 and IS : 4326 for aseismic design of structures, Code for ductile detailing IS : 13920.

Reference Books :--

1. Chopra A.K., Dynamics of structures - Theory and Applications to Earthquake Enginering,Prentice Hall of India, New Delhi.
2. Berg G.V. Elements of Structural Dynamics, Prentice Hall of India, Englewood Cliffs, NJ
3. Paz Mario, Structural Dynamics, CBS Publishers, Delhi
4. Clough R.W. & Penzien J., Dynamics of structures McGraw Hill, New York.

CE -8042 Pavement Design

Unit -I.
Equivalent Single Wheels Load concepts and applications, Relationship between wheel arrangements and loading effects, tyre contact area, Effect of load repetition, Effect of transient loads, Impact of moving loading, Factors to be considered in Design of pavements, Design wheel load, soil, climatic factors, pavement component materials, Environmental factors, Special factors such as frost, Freezing and thawing.

Unit -II.
Flexible Pavements : Component parts of the pavement structures and their functions, stresses in flexible pavements, Stress distribution through various layers, Boussinesque's theory , Burmister's two layered theory, methods of design, group index method, CBR method, Burmister's method and North Dakota cone method.

Unit -III.
Rigid Pavements : Evaluation of subgrade, Modulus-K by plate bearing test and the test details, Westergaard's stress theory stresses in rigid pavements, Temperature stresses, warping stresses, frictional stresses, critical combination of stresses, critical loading positions.

Unit -IV.
Rigid pavement design : IRC method, Fatigue analysis, PCA chart method. AASHTO Method, Reliability analysis.
PAVEMENT JOINTS : Types of joints, contraction and warping joints, dowel bars and tie bars, Temperature reinforcements, filling and sealing of joints.

Unit -V.
Evaluation and Strengthening of Existing Pavements : Benkleman beam method, Serviceability Index Method.
Rigid and flexible overlays and their design procedures.

Reference Books :--
1. Principles of pavement design by E.J.Yoder & M.W. Witczak
2. AASHO, "AASHO Interim Guide for Design of Pavement Structures", Washington, D.C.
3. Portland Cement Association, Guidlines for Design of Rigid Pavements, Washington
4. DSIR, Conc. Roads Design & Construction
5. Srinivasan M. "Modern Permanent Way"

CE- 8043 Air Quality Monitoring & Control

Unit - I

Air pollution problem: Economics and social aspects, historical episodes of air pollution. Sources of Air
pollution, effects of air pollution on health, animal, plants and materials

Unit - II

Role of meteorological condition, properties of typical air pollutants, air diffusion and concentration pollutants.
general diseases caused by air pollutants. toxicity of various pollutants. Plums patterns and height of chimneys.

Unit - III

Atmospheric chemistry, formation of secondary pollutants – PNN, PBN, Photolytic cycles, general diseases and
toxicity of pollutants

Unit - IV

Sampling and Analyzing of Air Pollutants: Instruments pollution survey, standards of air pollution.
Principle of air pollution control, site selection and zoning, various control methods, process and equipment changes, design and operation of various air pollution control equipments.

Unit - V

Air pollution control legislation, public education pollution standards, status of air pollution control in various countries.
Industrial Hygiene: Concept and importance, factory Involved in environmental hazards, industrial ventilation occupational diseases, control methods.

Reference Books :--

1. "Air Pollution" - Faith W.L, John Wiley & Sons
2. "Air Pollution" - Mc Cabe L.C., Mc. Graw Hill, International
3. Air Pollution - Stern A.C., Academic Press N. York
4. Fundamentals of Air Pollutions - Raju BSN Oxford & IBH Publishing Co. Pvt. Ltd.
5. "Air Pollution" - Rao M.N. & Rao HVN - Tata Mc Graw Hill
6. Air Pollution – Wark and Warner

CE- 8044 Energy Efficient & Greeen Building

UNIT-I

Energy efficient Green Buildings - The green Building concept, rating systems in India and world, GRIHA, LEED, etc. , green building rating agencies and some top green buildings in the world, sustainable practices used in the design and construction phases of Energy Efficient Green Buildings. Green Rating for Integrated Habitat Assessment (GRIHA), Energy Efficient Solar Homes & Buildings, Energy Savings in Homes, IGBC certification.

UNIT-II

Energy Conscious Buildings - CLIMATE AND BUILDINGS IN INDIA, Introduction ,Factors affecting climate, Climatic zones and their characteristics, Implications of climate on building design ,Urban climate ,Microclimate, Tools for analyzing weather data, Illustrative example, References.

Codes: National Building Code, Energy Conservation Building Codes, Key barriers to 'building green in India, Overcoming the barriers, implementation approach, etc.

UNIT-III

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PRINCIPLES OF ENERGY CONSCIOUS DESIGN OF BUILDINGS IN INDIA – Introduction Building Envelope, Site, Orientation, Building Configuration, Building Components, Passive Heating, Direct Gain ,Indirect Gain, Thermal storage wall, Roof top collectors, Isolated Gain, Solarium (Attached greenhouse / sunspace), Passive Cooling, Ventilation Cooling, Cross ventilation, Wind tower, Induced ventilation, Nocturnal cooling ,Evaporative Cooling ,Passive downdraft evaporative cooling (PDEC) ,Roof surface evaporative cooling (RSEC) ,Direct

evaporative cooling using drip-type (desert) coolers 3.4.3 Nocturnal ,Radiation Cooling, Desiccant Cooling, Earth Coupling, Earth-air pipe system ,Daylighting ,Basic Principles of Daylighting ,Daylighting Systems, Building Materials ,Embodied Energy of Building Materials ,Alternative Building Materials

UNIT -IV

THERMAL PERFORMANCE OF BUILDINGS - Introduction, Heat Transfer, Solar Radiation, Simplified Method for Performance Estimation ;Example Computer-based Tools

DESIGN GUIDELINES: Description of Buildings, Methodology, General Recommendations, Specific Guidelines.

UNIT-V

Zero Energy Buildings - Opportunities and challenges in designing a Net zero building ,Energy efficient solar homes/buildings, Design aspects ,Climatic zones ,Passive design features and ,. their advantages, Orientation of building, Sunshades, Window design, Double glazed windows Building insulation, Roof treatment ,Evaporative cooling ,Landscaping ,Surface to volume ratio Passive heating ,Earth air tunnel ,Solar chimney, Wind tower, Applicable passive features for various climatic zones, Energy-efficient lighting, Indoor lighting ,Outdoor lighting ,Energy-efficient air conditioners, Selecting the right size, Selecting an efficient AC ,Installing an AC, Renewable energy devices/systems, Solar water heating system Building integrated PV system, Other renewable energy devices/systems.

CE 8045 : DESIGN OF PRESTRESSED CONCRETE STRUCTURES

Unit – 1.

Introduction, Principles of prestressing, Different methods of prestressing – post tensioning and pre-tensioning.

Prestressed concrete materials. Need for high strength concrete and High concrete tensile steel. Creep and shrinkage of concrete, relaxation of steel. Losses of prestress friction and anchorage of steel.

Unit – 2.

Flexural strength of prestressed concrete section. Analysis of prestress, Resultant stress at a section, Line of Thrust, Load Balancing. Cracking moments.

Shear strength and torsional strength of prestressed concretes section. Principle stresses and principal shear stresses, Ultimate shear resistance.

Unit – 3.

Stress-pattern in anchorage zones. Transmission length. End zone reinforcement. Stress distribution in end block.

Unit – 4.

Design of members for flexure. Code recommendations. Rectangular and I-section. Working out of section dimensions for concrete and prestressing forces for steel. Application to design of slabs and continuous beams and Bridge girders. Design for concrdant table and tendon profiles.

Unit – 5.

Design of tension and compression members, Design for combined bending and compressive, Different approaches for design, Introduction to design of transmission poles, roof truss members, purlin, railway sleepers.

Books & References Recommended:

1. Lin T.Y., *Design of Prestressed Concrete Structures*.
2. Varatnam P., *Prestressed Concrete Structures*.
3. Ramaruthan S., *Prestressed Concrete*.
4. Graduate I.I., *Prestressed Concrete*.
5. Krishna Raju, *Prestressed Concrete*.
6. Evans R.H. and Bennett R.S., *Prestressed Concrete*.
7. *IS-1343.*
8. Mullick S.K. and Rangaswamy R.S., *The Mechanics of Prestressed Concrte Design.*
9. Sinha and Raj, Prestressed Concrete.

CE-8047 Advance Water Resources Engg

Unit - 1

Optimal Raingauge Network Design, Adjustment of Precipitation Data, Depth Area-Duration Analysis, Design Storm, Probable Maximum Precipitation, Probable Maximum Flood, Flood Frequency Analysis, Risk Analysis,

Unit - 2

Flood Management, Flood Routing through Reservoirs, Channels Routing Muskingum Method, Introduction to Stochastic Models in Hydrology like AR, ARMA, ARIMA etc. Concept of Correlogram.

Unit - 3

System Analysis: Need, Water Resources Systems, Optimisation Techniques, Linear Programming, Feasible Solutions, Graphical Method, Simplex Method, Use of of LP in Water Resources, Introduction to Reservoir Operation, Rule curves, Linear Decision Rule

Unit - 4

Dynamic Programming, its utility in Resource Allocation and other Decision Making Problems, Optimal Operating, Policies, Use of D. P. in Reservoir, Operation.

Unit-5

Network Methods, Project Optimality Analysis. Updating of Network, Utility in Decision Making.

Book Recommended:

Test Books

1. Subramany K., *Engg. Hydrology.*
2. Philiphs & Ravindran: *Operations Research*
3. *Hire D.S. & Gupta: Operation Research*

Reference Books

1. Loucks D.P., Stedinder I.R. & Haith D.A : *Water Resources Systems Engg.*
2. *Kottegoda N. T., Stochastic Water Resources Technology.*
3. *Singh V.P. : Elementary Hydrology*

CE 804 – Major Project

Branch: Civil Engineering-VIII Semester
Course: CE805 Major Project - I

Each candidate shall work on an approved Civil Engg. Project and shall submit design and a set of drawings on the project.

Course outcome of Electronics Engineering: BE II Year

Course Outcome for Electronics Engineering in B.E./ B.Tech II year is given as follows:-

- Analyze the concept of partial differential equations ,Laplace transform & vector calculus.
- Students learn the internal computer concepts & microprocessor.
- To understand the practical aspects of oscilloscope,measurements, errors & bridges.
- To understand the theoretical & practical aspects of semiconductors & MOS circuits.
- To understand basics of electrical circuits with nodal and mesh analysis, network theorems & RLC circuits.
- Analyze the concept of functions of complex variables, differential equation models & probability.
- To understand the fundamental principles of electromagnetic theory.
- To analyze the binary number system, logic gates and semiconductor memories.
- To understand the theoretical & practical aspects of low& high frequency amplifiers.
- To understand the theoretical & practical aspects of modulation techniques.

B.E. 301 - ENGINEERING MATHEMATICS II

Unit I

Fourier Series: Introduction of Fourier series , Fourier series for Discontinuous functions, Fourier series for even and odd function, Half range series Fourier Transform: Definition and properties of Fourier transform, Sine and Cosine transform.

Unit II

Laplace Transform: Introduction of Laplace Transform, Laplace Transform of elementary functions, properties of Laplace Transform, Change of scale property, second shifting property, Laplace transform of the derivative, Inverse Laplace transform & its properties, Convolution theorem, Applications of L.T. to solve the ordinary differential equations

Unit III

Second Order linear differential equation with variable coefficients : Methods one integral is known, removal of first derivative, changing of independent variable and variation of parameter, Solution by Series Method

Unit IV

Linear and Non Linear partial differential equation of first order: Formulation of partial differential equations, solution of equation by direct integration, Lagrange's Linear equation, charpit's method. Linear partial differential equation of second and higher order: Linear homogeneous and Non homogeneous partial diff. equation of nth order with constant coefficients. Separation of variable method for the solution of wave and heat equations

Unit V

Vector Calculus: Differentiation of vectors, scalar and vector point function, geometrical meaning of Gradient, unit normal vector and directional derivative, physical interpretation of divergence and Curl. Line integral, surface integral and volume integral, Green's, Stoke's and Gauss divergence theorem

References

(i) Advanced Engineering Mathematics by Erwin Kreyszig, Wiley India
(ii) Higher Engineering Mathematics by BS Grewal, Khanna Publication
(iii) Advance Engineering Mathematics by D.G.Guffy
(iv) Mathematics for Engineers by S.Arumungam, SCITECH Publuication
(v) Engineering Mathematics by S S Sastri. P.H.I.

EC- 302 Computer System Organization

Unit-I

Computer Basics and CPU: Von Newman model, various subsystems, CPU, Memory, I/O, System Bus, CPU and Memory registers, Program Counter, Accumulator, Instruction register, Micro operations, Register Transfer Language, Instruction Fetch, decode and execution, data movement and manipulation, Instruction formats and addressing modes of basic computer.

Unit-II

Control Unit Organization: Hardwired control unit, Micro and nano programmed control unit, Control Memory, Address Sequencing, Micro Instruction formats, Micro program sequencer, Microprogramming, **Arithmetic and Logic Unit**: Arithmetic Processor, Addition, subtraction, multiplication and division, Floating point and decimal arithmetic and arithmetic units, design of arithmetic unit.

Unit-III

Input Output Organization: Modes of data transfer – program controlled, interrupt driven and direct memory access, Interrupt structures, I/O Interface, Asynchronous data transfer, I/O processor. Data transfer – Serial / parallel, synchronous/asynchronous, simplex/half duplex and full duplex.

Unit-IV

Memory organization: Memory Maps, Memory Hierarchy, Cache Memory -Organization and mappings. Associative memory. Virtual memory, Memory Management Hardware.

Unit-V

Multiprocessors: Pipeline and Vector processing, Instruction and arithmetic pipelines, Vector and array processors, Interconnection structure and inter-processor communication.

References:

1. Morris Mano: Computer System Architecture, PHI.

2. William Stallings: Computer Organization and Architecture, PHI

3. Carl Hamacher: Computer Organization, TMH

4. Tanenbaum: Structured Computer Organization, Pearson Education

EC - 303 Electronic Instrumentation

Unit-I

Measurement and Error: Accuracy and Precision, Sensitivity, Linearity, Resolution, Hysterisis, Loading Effect. Measurements of Current, Voltage, Power and Impedance: DC and AC Ammeter, DC Voltmeter-Chopper type and solid-state, AC voltmeter using Rectifier, Average, RMS, Peak Responding voltmeters, Multi-meter, Power meter, Bolometer and Calorimeter.

Unit-II

Cathode Ray Oscilloscope (CRO): Different parts of CRO, Block diagram, Electrostatic focusing, Electrostatic deflection, Post deflection acceleration, Screen for CRTs, Graticules, Vertical and Horizontal deflection system, Time base circuit, Oscilloscope Probes, Applications of CRO, Special purpose CROs-Multi input, Dual trace, Dual beam, Sampling, Storage (Analog and Digital), Oscilloscope.

Unit-III

AC Bridges: Maxwell's bridge (Inductance and Inductance-Capacitance), Hay's bridge, Schering bridge (High voltage and Relative permittivity), Wein bridge, Wagner earth detector, Impedance measurement by Q-meter. **Non-Electrical Quantities (Transducer):** Classification of Transducers, Strain gauge, Displacement Transducer- Linear Variable Differential Transformer (LVDT) and Rotary Variable Differential Transformer (RVDT), Temperature Transducer- Resistance Temperature Detector (RTD), Thermistor, Thermocouple, Piezo-electric transducer, Optical Transducer- Photo emissive, Photo conductive, Photo voltaic, Photo-diode, Photo Transistor, Nuclear Radiation Detector.

Unit-IV

Signal generator & Display: Signal and Function Generators, Sweep Frequency Generator, Pulse and Square Wave Generator, Beat Frequency Oscillator, Digital display system and indicators, Classification of Displays, Display devices, Light Emitting diodes(LED), Liquid Crystal Display(LCD).

Unit-V

Digital Measurement and Instruments: Advantages of Digital Instrument over Analog Instrument, Digital-to-analog conversion (DAC) - Variable resistive type, R-2R ladder Type, Binary ladder, Weighted converter using Op-amp and transistor, Practical DAC. Analog-to-digital Conversion (ADC) -Ramp Technique, Dual Slope Integrating Type, Integrating Type (voltage to frequency), Successive Approximations, digital voltmeters and multi-meters, Resolution and sensitivity of digital meter, PLC structure, principle of operation, response time and application.

References:

1. H. S. Kalsi: Electronics Instrumentation, TMH.

2. K. Sawhney: Instrumentation and Measurements, Dhanpat Rai and Co.

3. Helfric and Cooper: Modern Electronic Instrumentation and Measurement Techniques; Pearson.

List of Experiments:

All experiments (wherever applicable) should be performed through the following steps.

Step 1: Circuit should be designed/drafted on paper.

Step 2: The designed/drafted circuit should be simulated using Simulation Software

Step 3: The designed/drafted circuit should be tested on the bread board and compare the results with the simulated results.

Step 4: The bread board circuit should be fabricated on PCB by one batch using PCB machine.

1. Study of CRO and Function Generator.

2. Displacement measurement by LVDT.

3. Force measurement by strain gauge.

4. Measurement of Capacitor, Self-induction using Q-meter.

5. Temperature measurement by thermistor, RTD and thermocouple.

6. Optical Transducer- Photo conductive, Photo voltaic, Photo-diode, Photo-Transistor

7. Design of digital to analog converter.

8. PLC operation and applications (for example: relay, timer, level, traffic light etc.)

EC - 304 Electronic Devices

Unit-I

Semiconductor intrinsic and extrinsic, p-type and n-type, energy band diagrams, majority and minority carrier, charge density in semiconductor, generation and recombination of charges, process of diffusion, diffusion and drift currents, Hall effects and its applications. p-n junction, depletion layer, potential barrier, electric field, forward and reverse biased junction, current components in p-n diode, current equation, V-I characteristics, cut in voltages of Si and Ge diode, transition and diffusion capacitance, power dissipation,.

Unit-II

Diode Applications: p-n junction diode as rectifier, clipper and clamper, The diode as a circuit element, The Load line concept, The Pieceswise linear diode modal, Clipping circuits, Clipping at two independent levels, Comparators, Sampling Gate, Rectifiers, Other full wave circuits, Capacitor filter additional diodes circuits.

Unit-III

Diodes Family: Characteristics and application of Zener diode, avalanche diode, Varactor diode, Schottky diode, Tunnel Diode, PIN diode, LED, photodiodes, phototransistors,

Unit-IV

Bipolar junction transistor - Construction, basic operation, current components and equations,. CB, CE and CC-configuration, input and output characteristics, Early effect, region of operation, active, cutoff and saturation region Ebers-Moll model, , power dissipation in transistor (Pdmax rating), Photo transistor, Uni-junction Transistor (UJT) : Principle of operation, characteristics.

Unit-V

FET construction- Construction, n channel and p channel, characteristics, parameters, Equivalent model and voltage gain, Enhancement and depletion MOSFET and its Characteristics, analysis of FET in various configuration.

References:

1. Boylestad and Nashelsky: Electronic Devices and Circuit Theory, Pearson Education

2. Millman and Halkias: Integrated electronics, TMH

3. Graham Bell: Electronic Devices and Circuits, PHI

4. Sendra and Smith: Microelectronics, Oxford Press.

5. Donald A Neamen: Electronic Circuits Analysis and Design, TMH

List of Experiments (Expandable):

All experiments (wherever applicable) should be performed through the following steps.

Step 1: Circuit should be designed/drafted on paper.

Step 2: The designed/drafted circuit should be simulated using Simulation Software

Step 3: The designed/drafted circuit should be tested on the bread board and compare the results with the simulated results.

Step 4: The bread board circuit should be fabricated on PCB by one batch using PCB machine.

1. V-I characteristics of various Diodes (p-n, Zener, Varactor, Schottky, Tunnel, Photodiode etc)
2. Characteristics of Transistors (BJT and FET)
3. Study of Power electronic devices (Diac, Triac, SCR, Power MOSFET, IGBT etc).

EC - 305 Network Analysis

Unit-I

Introduction to circuit elements R, L, C and their characteristics in terms of linearity and time dependence, KCL and KVL analysis, dual networks, analysis of magnetically coupled circuits, Dot convention, coupling co-efficient, Tuned circuits, Series and parallel resonance, voltage and current sources, controlled sources.

Unit-II

Network topology, Concept of Network graph, Tree, tree branches and links, cut set and tie set schedules. Network Theorems – Thevenin, Norton, Superposition, Reciprocity, Compensation, Maximum power transfer and Millmans theorems, problems with controlled sources.

Unit-III

Transient analysis: Transients in RL, RC and RLC circuits, initial conditions, time constants, networks driven by constant driving sources and their solutions.

Steady state analysis: - Concepts of phasors and vectors, impedance and admittance. Node and mesh analysis of RL, RC and RLC networks with sinusoidal and other driving sources. Resonance Circuits.

Unit-IV

Frequency domain analysis – Laplace transform solution of Integral-differential equations. Transform of waveform – step, ramp, Gate and sinusoidal functions. Initial and final value theorem. Network Theorems in frequency domain. Fourier Series, Trigonometric & exponential form of fourier series, Fourier series of basic functions.

Unit-V

Network function & Two port networks concept of complex frequency.Network functions of one and two ports, poles and zeros network of different kinds. Necessary conditions for driving point & transfer function.

Two port parameters– Z, Y, ABCD, hybrid parameters, their inverse and image parameters, relationship between parameters. Interconnection of two port networks, Terminated two port networks.

References:

1. M.E. Van Valkenburg: Network Analysis, PHI

2. Mesereau and Jackson: Circuit Analysis- A system Approach, Pearson.

3. Hayt W.H. & J.E. Kemmerly: Engineering Circuit Analysis, TMH

4. Decarlo lin: Linear circuit Analysis, Oxford

5. William D Stanley : Network Analysis with Applications, Pearson Education

6. Roy Choudhary D: Network and systems, New Age Pub

7. Chakraborti: Circuit Theory, Dhanpat Rai.

List of experiments (Expandable)

All experiments (wherever applicable) should be performed through the following steps.

Step 1: Circuit should be designed/drafted on paper.

Step 2: The designed/drafted circuit should be simulated using Simulation Software.

Step 3: The designed/drafted circuit should be tested on the bread board and compare the results with the simulated results.

Step 4: The bread board circuit should be fabricated on PCB by one batch using PCB machine.

1. To Verify Thevenin Theorem.
2. To Verify Superposition Theorem.
3. To Verify Reciprocity Theorem.
4. To Verify Maximum Power Transfer Theorem.
5. To Verify Millman’s Theorem.
6. To Perform Open Circuit Test on Two Port Network.
7. To Perform Short Circuit Test on Two Port Network.
8. To Find Frequency Response of LRC Series Circuit.
9. To Find Frequency Response of LRC parallel Circuit

<u>**EC - 306 Software Lab- I**</u>

<u>**CIRCUIT SIMULATION/ PCB DESIGNING SOFTWARE**</u>

Study of circuit simulation software (any one- TINA-PRO/ PSPICE/ CIRCUIT MAKER/ GPSIM/ SAPWIN etc).

Overview and Study of the key features and applications of the software.

Application of the software in the field of Electronic Devices, Electronic Instrumentation and Network Analysis.

Design, Optimization and simulation of

1. Basic Electronic circuits (examples rectifiers, clippers, clampers, diode, transistor characteristics etc).
2. Transient and steady state analysis of RL/ RC/ RLC circuits, realization of network theorems.
3. Use of virtual instruments built in the software.

Study of PCB layout software

Overview and use of the software in optimization, designing and fabrication of PCB pertaining to above circuits simulated using above simulation software or other available. Students should simulate and design the PCB for atleast two circuits they are learning in the current semester.

EC -307 Self Study (Internal Assessment)

Objective of Self Study: is to induce the student to explore and read technical aspects of his area of interest / hobby or new topics suggested by faculty.

Evaluation will be done by assigned faculty based on report/seminar presentation and viva.

EC -308 Seminar / Group Discussion(Internal Assessment)

Objective of GD and seminar is to improve the MASS COMMUNICATION and CONVINCING/ understanding skills of students and it is to give student an opportunity to exercise their rights to express themselves.

Evaluation will be done by assigned faculty based on group discussion and power point presentation.

B.E. 401 - ENGINEERING MATHEMATICS III

Unit I

Functions of complex variables : Analytic functions, Harmonic Conjugate, Cauchy-Riemann Equations, Line Integral, Cauchy's Theorem, Cauchy's Integral Formula, Singular Points, Poles & Residues, Residue Theorem , Application of Residues theorem for evaluation of real integrals

Unit II

Errors & Approximations, Solution of Algebraic & Trancedental Equations (Regula Falsi , Newton-Raphson, Iterative, Secant Method), Solution of simultaneous linear equatins by Gauss Elimination, Gauss Jordan, Crout's methods , Jacobi's and Gauss-Siedel Iterative methods

Unit III

Difference Operators, Interpolation (Newton Forward & Backward Formulae, Central Interpolation Formulae, Lagrange's and divided difference formulae), Numerical Differentiation and Numerical Integration.

Unit IV

Solution of Ordinary Differential Equations(Taylor's Series, Picard's Method, Modified Euler's Method, Runge-Kutta Method, Milne's Predictor & Corrector method), Correlation and Regression, Curve Fitting (Method of Least Square).

Unit V

Concept of Probability : Probability Mass function, Probability density function. Discrete Distribution: Binomial, Poisson's, Continuous Distribution: Normal Distribution, Exponential Distribution ,Gamma Distribution ,Beta Distribution ,Testing of Hypothesis |:Students t-test, Fisher's z-test, Chi-Square Method

Reference:

(i) Numerical Methods using Matlab by J.H.Mathews and K.D.Fink, P.H.I.
(ii) Numerical Methods for Scientific and Engg. Computation by MKJain, Iyengar and RK Jain, New Age International Publication
(iii) Mathematical Methods by KV Suryanarayan Rao, SCITECH Publuication
(iv) Numerical Methods using Matlab by Yang,Wiley India
(v) Pobability and Statistics by Ravichandran ,Wiley India
(vi) Mathematical Statistics by George R., Springer

PROGRAMME: Electronics and Communication Engineering
COURSE: EC-402 Electromagnetic Theory

Course Contents

Unit I

Review of vector calculus: orthogonal coordinate systems, gradient, divergence and curl. Laplacian operator for scalar and vectors. Vector integral and differential identities and theorems. Phasor representation of harmonic variation of scalar and vectors

Static electric fields, Columb's law, electric flux density and electric field intensity, permittivity, dielectric constant, field of distributed charges in free space, potential function, Laplace's and Poisson's equations, electric dipole, stored electric energy density. Boundary conditions at abrupt discontinuities between two media including conducting boundaries, surface charge distribution capacitance between two isolated conductors

Unit II

Solution of Laplace's equations in systems of dielectric and conducting boundaries, uniqueness theorem, two dimensional boundary condition problems, solution by symmetry, conformal transformation of functions, image theory etc. fields in parallel wire, parallel plane and coaxial systems.

Static currents and magnetic fields- flow of charge in conductive media, lossy conductive medium, current density, specific conductivity, mobility, explanation of Ohm's law employing mobility.

Magnetic effects of current flow, Biot-Savart's law in vector form magnetic field intensity, magnetic flux, and permeability, closed loop currents, Ampere's circuital law in integral and differential vector form, magnetic vector potential and related equations. Problems related to straight wire toroidal and cylindrical solenoids, inductance. Boundary conditions on magnetic field, equivalent surface currents for abrupt discontinuity of magnetic field.

Unit III

Time varying fields – Faraday's law in integral and differential forms, displacement current concept, Maxwell's equations in differential and integral forms, wave equations in source free region electric and magnetic stored energy density, continuity equation, Poynting vector theorem.

Time harmonic fields, r.m.s. phasor representation of field vectors, Maxwell's equations for TH field, average energy density, complex Poynting vector, duality concept.

Helmholtz wave equation, general solution in free space in various coordinates, plane polarized wave in free space, properties of plane waves, wave front, power flow, stored energy density.

Unit IV

Circular and elliptic polarization, resolution in terms of linear polarized waves and vice- versa.

Plane waves in lossy medium, low loss dielectric, good conducting and ionized media, complex permittivity, loss tangent, skin depth, transmission line analogy, boundary conditions at perfect conductor surface, surface current density Interference of two plane waves traveling at oblique directions.

Unit V

Reflection and refraction of plane waves at dielectric media and conducting Surfaces, Brewster's angle, total internal reflection, resultant fields and power flow in both media. Frequency dispersive propagation, phase velocity and group velocity. Magnetic vector potential for sources in free space, retarded potential, radiation principles, boundary condition at infinity

References:

1. Mathew N.O Sadiku: Elements of Electromagnetic, Oxford University Press
2. William H. Hayt: Engineering Electromagnetic, TMH.
3. John D. Kraus: Electromagnetics, Mc. Graw Hill.
4. Jordan Balmian: Electromagnetic wave and Radiating System, PHI.
5. David K. Cheng: Electromagnetic Fields and Wave, Addison Wesley.
6. Ramo, Whinnerry and VanDuzzer " Fields and waves in communication electronics ", Wiley 1984
7. Harrington RF, "Electromagnetic fields" Mc Graw Hill

PROGRAMME: Electronics and Communication Engineering
COURSE: EC-403 Digital Electronics

Course Contents

Unit-I
Review of Number systems and Binary codes, Binary arithmetic – addition, subtraction, multiplication and division algorithms. **Boolean algebra**: theorems and functions, Simplification of Boolean functions, minimization techniques, Karnaugh's map method, Quine and McCluskey's method, realization of various binary functions using AND ,OR , NOT,XOR logic gates.

Unit-II
Universal gates: NAND, NOR, realization of boolean function using universal gates. Half and full adder, half and full subtractor, Series and parallel adder, BCD adders, lookahead carry generator. Decoders, Encoders, multiplexers and de-multiplexers. Analysis and design of combination circuits, realization of various Boolean functions using NAND, NOR gates and multiplexers.

Unit-III
Multivibrators: Astable, Monostable and bistable multivibrators, 555 timer chip and its application in multivibrators. **Flip-Flops**: R-S, Clocked R-S, T, D, J-K, race around problem, Master-slave J-K., State and Excitation Tables. **Shift registers and counters** :synchronous and asynchronous counters, Binary ripple counter, up-down counter, Johnson and ring counter. Analysis and Design of Sequential Circuits.

Unit-IV
Semiconductor memories: Organization and construction of RAM, SRAM, DRAM, RAMBUS ROM, PROM, EPROM, EEPROM, PAL and PLAs etc

Unit-V
Logic families: RTL, DTL, TTL, ECL, IIL, PMOS, NMOS and CMOS logic etc. Interfacing between TTL and MOS, vice-versa.

References:
1. M. Mano : Digital Logic and Computer Design, Pearson Education
2. W.H. Gothman : Digital Electronics, PHI.
3. Millman and Taub : Pulse, Digital and Switching Waveforms, MGH
4. Salivahanan and Ari Vahagan : Digital Circuits and Design, Vikas Publishing House
5. Leach and Malvino : Digital Principles and Applications, TMH

List of Experiments (Expandable):
All experiments (wherever applicable) should be performed through the following steps.
Step 1: Circuit should be designed/drafted on paper.
Step 2: The designed/drafted circuit should be tested on the bread board.
Step 3: The bread board circuit should be fabricated on PCB by one batch using PCB machine.

1. To test and study of operation of all logic Gates for various IC's.
2. Implementation of AND, OR, NOT, NOR, X-OR and X-NOR Gates by NAND and NOR Universal gates.
3. Binary Addition by Half Adder and Full Adder circuit.
4. Binary Subtraction by Half Subtractor and Full Subtractor circuit.
5. Design a BCD to excess-3 code converter.
6. Verification of the Demorgan's Theorem.
7. Study of RS, JK, T & D flip-flops.
8. Multiplexer/Demultiplexer based boolean function realization.
9. Study and Application of 555 timer (Astable, Monostable, Schmitt trigger, VCO

PROGRAMME: Electronics and Communication Engineering
COURSE: EC-404 Electronic Circuits

Course Contents

Unit-I
Amplifier Basics, Transistor as an amplifier, load line, Q-point and its selection criteria, designing of fixed bias and self-bias, stability of biasing circuits, calculation of stability factor.
Transistor at low frequency: frequency response, bandwidth, h-parameter analysis of CC, CB and CE configuration, simplified model, gain and impedance calculation of single stage amplifier.
Transistor at high frequency, high frequency model (hybrid-π), Parameters and their definition, Miller capacitance and its effect on voltage gain,

Unit-II
Feedback amplifier: positive and negative feedback loop gain, effect of negative feedback on gain stability, distortion, bandwidth, input and output impedance of amplifier, types of feedback (voltage, current, series and shunt) and their analysis.
Oscillators: condition of sustained oscillation, RC phase shift, LC (Hartley and Collpit) Oscillators, Wein Bridge, Negative resistance (Tunnel diode and UJT) oscillators, crystal oscillators.

Unit III
Power amplifier, classification, operation, analysis and design of Class A, Class B, Class-AB, Class C, transformer coupled, push pull and complementary symmetry amplifiers, power dissipation in transistors (Pdmax rating) and efficiency calculations.
Tuned amplifier and its applications, Q factor, selectivity and bandwidth, effect of loading, double tuning (synchronous and stagger)

Unit IV
Cascade amplifiers, Calculation of gain, Input and output impedance, Effect of Cascading on bandwidth, Transformer, RC and direct-coupled amplifier and their performance.
Darlington connection, equivalent circuit and Calculation of gain and impedances, Cascade amplifier: advantage, circuit diagram and analysis, feedback pair and applications of BIFET, Bootstrapping technique.
Differential amplifier - configuration, transfer characteristics, DC analysis, h-parameter analysis, differential and common mode gain, CMRR, constant current source and current mirror, level shift.

Unit-V
Operational amplifier (IC741), specifications, ideal and practical characteristics, frequency response, unity gain bandwidth, limitations, slew rate and its effect on full power bandwidth, input offset voltage, bias and offset currents, compensation.
Applications of Op-Amp: Inverting and non-inverting amplifier Analog computation, summer (inverting and non-inverting), averager, integrator, differentiator, scalar, sign changer, phase changer, multiplier, buffer, Differential amplifier, instrumentation amplifier, comparator, Schmitt trigger, precision rectifier, log and antilog amplifier, voltage-to-current and current-to-voltage converter.

References:
1. Millman and Halkias : Integrated electronics, TMH
2. Gayakwad ; OPAMP and Linear Integrated Circuits, Pearson Education
3. Boylestad and Nashelsky : Electronic Devices and Circuit Theory, PHI
4. Sendra and Smith : Microelectronics, Oxford Press
5. Graham Bell : Electronic Devices and Circuits , PHI
6. Donald A Neamen : Electronic Circuits Analysis and Design, TMH

List of Experiments (Expandable):

All experiments (wherever applicable) should be performed through the following steps.

Step 1: Circuit should be designed/drafted on paper.

Step 2: The designed/drafted circuit should be tested on the bread board

Step 3: The bread board circuit should be fabricated on PCB by one batch using PCB machine.

1. Characteristics of Op-Amp (input offset voltage, slew rate, CMRR, BW, input bias current.
2. Linear application of Op-Amp (voltage follower, inverting and non-inverting amplifier and their frequency response, adder, substractor, differential amplifier, integrator and differential frequency response)
3. To design and construct a shunt and series regulator and find line and load regulation.
4. Design and performance evaluation of transistor amplifiers in CE, CB and CC configuration
5. Design and performance evaluation of FET amplifiers.

PROGRAMME: Electronics and Communication Engineering
COURSE: EC-405 Analog Communication

Course Contents

Unit-I

Signal Analysis: Vectors and signals, orthogonal functions, Fourier series, Complex Fourier spectrum, Fourier Transform, Time domain and frequency domain representation of a signal, Existence of the FT, FT of some useful functions like exponential signal single sided & double sided, Gate function, singularity functions, FT of various functions, Properties of FT, Convolution, Convolution with Impulse Function.

Signal Energy and Power: Spectral Density of various types of signals, Spectra (Parseval's Theorem), Density Spectra of Periodic Gate and Impulse train.

Linear Time Invariant (LTI) Systems Casual and Non Causal System, Distortion less System, Impulse Response of Distortion less System, Ideal Filter and Practical Filter.

Unit-II

Modulation Techniques: Need and types of modulation techniques, Amplitude Modulation, Frequency Spectrum, Power Distribution, Modulation by Complex Signal, Low Level and High Level AM Modulators, Linear Integrated Circuit AM Modulators, Suppressed Carrier Generation (Balance/Chopper and Square Law Modulation), SSB Generator (Phase and Frequency Discrimination Method), VSB Transmission and Application. Detection of AM signals: Envelope Detector Circuit, RC Time Constant, Synchronous Detection Technique, Error in Synchronous Detection, SSB signal detection, PLL and its use in demodulation.

Unit-III

Angle Modulation: Frequency and Phase Modulation Frequency spectrum, bandwidth requirement, Frequency and Phase Deviation, Modulation Index, NBFM and WBFM, Multiple frequencies FM. FM Modulators: Direct (Parameter Variation Method) and Indirect (Armstrong) Method of frequency modulation. FM Detector: Slope Detector, Foster Seely Discriminator, Ratio Detector and PLL detectors.

Unit-IV

Radio Transmitters: AM transmitter, block diagram and working of Low Level and High Level Transmitters, Trapezoidal Pattern and Carrier Shift, SSB Transmitters, FM transmitters - Frequency Multiplication Applied to FM Signals, FM transmitters.

Radio Receivers: Block Diagram of Radio Receiver, Receiver Characteristics (Selectivity, Fidelity and Sensitivity), AM Receiver, RF Receiver, Super-heterodyne Receiver, RF Amplifier, Frequency Mixer, AVC and AFC, Image Signal, Intermediate Frequency Selection, Diversity Reception, FM Receiver.

Unit-V

Noise : Sources and types of noise and their power density, White Noise, Noise from Single and Multiple noise source for Linear Systems, Super Position of Power Spectrum, Equivalent Noise Bandwidth, Noise Figure, and Equivalent Noise Temperature, their Relationship, Calculation of Noise Figure and Noise Temperature for Cascade Systems,

References:

1. B.P. Lathi : Communication Systems, BS Publication
2. Taub and Schilling : Principles of communication Systems, TMH
3. Singh and Sapre : Communication Systems, TMH
4. S Haykin : Communication Systems, John Wiley and Sons Inc
5. B.P. Lathi : Signal, Systems and Communication Systems, BS Publication

List of Experiments (Expandable):

All experiments (wherever applicable) should be performed through the following steps.

Step 1: Circuit should be designed/drafted on paper.

Step 2: The designed/drafted circuit should be tested on the bread board.

Step 4: The bread board circuit should be fabricated on PCB by one batch using PCB machine.

1. Analysis of AM Modulation and Demodulation Techniques (Transmitter and Receiver), Calculation of Parameters
2. Analysis of FM Modulation and Demodulation (Transmitter and Receiver) and Calculation of Parameters
3. To Construct and Verify Pre-emphasis and De-emphasis and Plot the Waveforms.
4. Study of Super-heterodyne Receiver and Characteristics of Radio Receiver.
5. To Construct Frequency Multiplier Circuit and to Observe the Waveform
6. Study of AVC and AFC.
7. Study of PLL chip (566) and its use in various systems

PROGRAMME: Electronics and Communication Engineering
COURSE: EC-406 Software Lab-II

Course Contents

<u>ADVANCED SIMULATION/ VERIFICATION SOFTWARE</u>

Study of simulation/ verification software (any one- LAB-VIEW/KTECHLAB/ GNU CIRCUIT ANALYSIS PACKAGE/ LOGISIM/ MULTISIM/ SCILAB etc).

Overview and Study of the key features and applications of the software.
Application of the software in the field of Electronic Circuits, Digital Electronics and Analog Communication.
Design, Optimization, simulation and verification of

1. Electronic circuits (example amplifiers, oscillators etc).
2. Realization and verification of various digital electronic circuits (example logic gates, adders, subtractors etc)
3. Realization of various signals and communication link etc.

Students should simulate and verify atleast six circuits they are learning in the current semester.

Course outcome of Electronics Engineering: BE III Year

Course Outcome for Electronics Engineering in B.E./ B.Tech III year is given as follows:-

- To analyze the concepts of telephone systems and data communications
- To analye various time domain and frequency domain techniques to assess the system performance, controllability and observability using state space representation.
- To understand the theoretical & practical aspects of random variables, analog systems & digital modulation techniques.
- Students learn about the architecture & assembly language programming of 8086 microprocessor & 8051 microcontroller.
- To understand the theoretical & practical aspects of communication networks & transmission lines.
- Students learn about the power supplies, thyristors and SCR families and PLC
- Students analyze the concept of services, interferences, cell splitting, GSM & CDMA technologies of cellular phones.
- To perform time, frequency domain analysis of signal & systems and the digital signal processing using z- transform, DFT and FFT algorithm.
- To understand the theoretical & practical aspects of radiation pattern, different types of antenna their synthesis and propagation of radio waves.
- To understand the theoretical & practical aspects of VLSI circuits & systems.

EC-501 Voice and Data Communication

Unit I

Telephone instruments and signals

Introduction, the subscriber loop, standard telephone set, basic call procedure, call progress tones and signals, cordless telephones, caller identification, electronic telephones.

Telephone circuit

Introduction, the local subscriber loop, channel noise and units of power measurements, transmission parameters, voice frequency circuit arrangements, crosstalk.

Unit II

Public telephone network

Introduction, transmission system environment, public telephone network, instruments, local loops, trunk circuits, - local central and operator-assisted exchanges, automated central office switches and exchanges, telephone numbering plan, telephone services, telephone switching hierarchy, common channel signaling system.

Multiplexing of telephone channels

Introduction, time division multiplexing, T1 digital carrier, digital hierarchy, digital carrier line encoding, T carrier systems, digital carrier frame synchronization, bit versus word interleaving, statistical TDM, codecs and combo chips, frequency division multiplexing, FDM hierarchy, composite baseband signal, formation of master group, wavelength division multiplexing.

Unit III

Multiplexing of telephone channels

Introduction, time division multiplexing, T1 digital carrier, digital hierarchy, digital carrier line encoding, T carrier systems, digital carrier frame synchronization, bit versus word interleaving, statistical TDM, codecs and combo chips, frequency division multiplexing, FDM hierarchy, composite baseband signal, formation of mastergroup, wavelength division multiplexing.

Unit IV

Data Communications

Components, protocols and standards, standards organizations, line configuration, topology, transmission mode, digital signals, digital to digital encoding, digital data transmission, DTE-DCE interface, interface standards, modems, cable modem, transmission media- guided and unguided, transmission impairment, performance, wavelength and Shannon capacity.

Unit V

Error detection and correction

Types of error, error detection- redundancy check (longitudinal, vertical and cyclic), checksum, error correction-hamming code.

Switching

Circuit switching (space-division, time division and space-time division), packet switching (virtual circuit and datagram approach), message switching.

References:

1. Tomasi: Advanced Electronic Communication Systems, PHI Learning.
2. Forouzan: Data Communications and Networking, TMH.
3. Tomasi: Introduction to Data Communication Systems, Pearson Education.
4. William Stallings: Data and Computer Communications, Pearson Education
5. Brijendra Singh: Data Communications and Networks, PHI Learning.

EC- 502 Control Systems

Unit-I

Control system

Terminology and classification of control system, examples of control system, mathematical modeling of mechanical and electrical systems, differential equations, block diagram representation and reduction, signal flow graph techniques.

Feedback characteristics of control systems

Feedback and non-feedback systems, reduction of parameter variations by use of feedback, control over system dynamics and effects of disturbances by the use of feedback, linearization effect of feedback, regenerative feedback.

Unit-II

Time response analysis

Standard test signals, time response of 1st order system, time response of 2nd order system, steady-state errors and error constants, effects of additions of poles and zeros to open loop and closed loop system.

Time domain stability analysis

Concept of stability of linear systems, effects of location of poles on stability, necessary conditions for stability, Routh-Hurwitz stability criteria, relative stability analysis, Root Locus concept, guidelines for sketching Root-Locus.

Unit-III

Frequency response analysis

Correlation between time and frequency response, Polar plots, Bode Plots, all-pass and minimum-phase systems, log-magnitude versus Phase-Plots..

Frequency domain stability analysis

Nyquist stability criterion, assessment of relative stability using Nyquist Criterion (phase margin, gain margin and stability), closed-loop frequency response.

Unit-IV

Approaches to system design

Design problem, types of compensation, design of phase-lag, phase lead and phase lead-lag compensators in time and frequency domain, proportional, derivative, integral and PID compensation.

Digital control systems

System with digital controller, difference equations, the z-transform, pulse transfer function, inverse z-transform, the s and z domain relationship.

Unit-V

Concept of state, state variables and state model,

State space representation of systems, block diagram for state equation, transfer function decomposition, solution of state equation, transfer matrix, relationship between state equation and transfer function, controllability and observability.

References:

1. Nagrath and Gopal: Control System Engineering, New Age International Publishers.
2. Kuo: Automatic Control Systems, PHI Learning.
3. Varmah: Control Systems, TMH.
4. Distefano (Schaum series): Control Systems, TMH
5. Manke: Linear Control System, Khanna Publishers.
6. Stefani, Shahian: Design of feedback control systems, Oxford University Press.
7. Ogata: Modern Control Engineering, PHI Learning.

EC- 503 Digital Communications

Unit-I

Random variables

Cumulative distribution function, Probability density function, Mean, Variance and standard deviations of random variable, Gaussian distribution, Error function, Correlation and autocorrelation, Central-limit theorem, Error probability, Power Spectral density of digital data.

Unit-II

Digital conversion of Analog Signals

Sampling theorem, sampling of band pass signals, Pulse Amplitude Modulation (PAM), types of sampling (natural, flat-top), equalization, signal reconstruction and reconstruction filters, aliasing and anti-aliasing filter, Pulse Width Modulation (PWM), Pulse Position Modulation (PPM).

Digital transmission of Analog Signals

Quantization, quantization error, Pulse Code Modulation (PCM), companding, scrambling, TDM-PCM, Differential PCM, Delta modulation, Adaptive Delta modulation, vocoders.

Unit-III

Digital Transmission Techniques

Phase shift Keying (PSK)- Binary PSK, differential PSK, differentially encoded PSK, Quadrature PSK, M-ary PSK.Frquency Shift Keying (FSK)- Binary FSK (orthogonal and non-orthogonal), M-ary FSK.
Comparison of BPSK and BFSK, Quadrature Amplitude Shift Keying (QASK), Minimum Shift Keying (MSK).

Unit-IV

Other Digital Techniques

Pulse shaping to reduce inter channel and inter symbol interference- Duobinary encoding, Nyquist criterion and partial response signaling, Quadrature Partial Response (QPR) encoder decoder.
Regenerative Repeater- eye pattern, equalizers.

Optimum Reception of Digital Signals

Baseband signal receiver, probability of error, maximum likelihood detector, Bayes theorem, optimum receiver for both baseband and passband receiver- matched filter and correlator, probability of error calculation for BPSK and BFSK.

Unit-V

Information Theory

Source Coding: Introduction to information theory, uncertainty and information, average mutual information and entropy, source coding theorem, Huffman coding, Shannon-Fano-Elias coding,
Channel Coding: Introduction, channel models, channel capacity, channel coding, information capacity theorem, Shannon limit.

References:

1. Taub and Schilling: Principles of Communication Systems, TMH.
2. Lathi: Modern Digital and Analog Communication Systems, Oxford University Press.
3. Simon Haykins: Communication Systems, John Wiley.
4. Ranjan Bose: Information Theory, Coding and Cryptography, TMH.
5. Das, Mallik, Chatterjee: Principles of Digital Communication, New Age International
6. Skylar and Ray: Digital Communications, Pearson Education.
7. Rao: Digital Communications, TMH.

List of Experiments:

1. Study of Sampling Process and Signal Reconstruction and Aliasing.
2. Study of PAM, PPM and PDM.
3. Study of PCM Transmitter and Receiver.
4. Time Division Multiplexing (TDM) and Demultiplexing.
5. Study of ASK, PSK and FSK Transmitter and Receiver.

EC- 504 Microprocessors and Microcontrollers

Unit I

Architecture of 8086 Microprocessor

BIU and EU, register organization, pin diagram, memory organization, clock generator 8284, buffers and latches, 8288 bus controller, maximum and minimum modes.

Unit II

Assembly Language Programming of 8086

Instruction formats, addressing modes, instruction set, assembly language programming, ALP tools- editor, assembler, linker, locator, debugger, emulator.

8086 based multiprocessor systems

Interconnection topologies, coprocessors 8087 NDP, I/O processors 8089 IOP, bus arbitration and control, lightly and tightly coupled systems.

Unit III

Peripheral devices and their interfacing

Memory interfacing, Programmable input/output ports 8255, Programmable interval timer 8253, keyboard/ display controller 8279, CRT controller 8275, Programmable communication interface 8251 USART.

Unit IV

Interrupts of 8086

Interrupts and interrupt service routine, interrupt cycle, maskable and non-maskable interrupts, interrupt programming. Programmable interrupt controller 8259.

DMA in 8086

Basic DMA operation, modes of DMA transfer, DMA controller 8257.

Unit V

8051 Microcontroller

Features, architecture, Pin Diagram, memory organization, external memory interfacing, instruction syntax, data types, subroutines, addressing Modes, instruction set, ALP of 8051. Applications of 8051.

References:

1. Ray and Bhurchandi: Advanced microprocessors and peripherals, TMH.
2. Brey: The Intel Microprocessors, Architecture, Programming and Interfacing, Pearson Education.
3. Senthil Kumar: Microprocessors and interfacing, Oxford University press.
4. Bahadure: Microprocessors 8086 and Pentium family, PHI Learning.
5. Udayashankara and Mallikarjunaswamy: 8051 Microcontroller, TMH.
6. Mazidi and Mazidi: The 8051 Microcontroller and Embedded Systems, Pearson Education
7. D. V. Hall: Microprocessors and Interfacing, TMH.

List of Experiments:

1. Assembly Language Programs of Microprocessor 8086.
2. Assembly Language Programs of Microcontroller 8051.
3. Assembly Language Programs for Interfacing Chips.

EC– 505 Communication Networks and Transmission Lines

Unit I

Characteristic Parameters of symmetrical and asymmetrical two port networks and their design

Image impedance, iterative impedance, characteristic impedance, propagation coefficient, image transfer coefficient , iterative transfer coefficient, Lattice and Bridged T networks, reactive matching networks, matching techniques, insertion loss, symmetrical and asymmetrical attenuators and their design.

Unit II

Passive LC Filters

Analysis and design of Low pass, high pass, band pass and band elimination filters, m-derived filters, composite filters, Filter specifications, Butterworth approximation, Chebyshev approximation, elliptic function approximation, frequency transformation.

Unit III

Positive real function

LC, RL, RC, and RLC network synthesis, Foster and Cauer network, minimum positive real function, Brune's method, Bott-Duffin method, Synthesis-Coefficient.

Unit IV

Transmission line fundamentals

Lumped parameter equivalent, voltage and current on a transmission line, infinite line, characteristic impedance and propagation constant, waveform distortion, attenuation and phase equalizers, distortion-less line, loading, liner reflection on a line, reflection coefficient, input and transfer impedances, open circuit and short circuit line, reflection factors, reflection loss, insertion loss, T and π equivalents of a line, location of line fault, construction and design of two wire line and coaxial cable.

Unit V

Line at radio frequencies

Parameters of line and coaxial cable at radio frequencies, dissipation-less line, voltage and current on a dissipation-less line, standing waves, standing wave ratio, input impedance of open circuit and short circuit, power and impedance measurement on lines, eighth-wave, quarter-wave and half wave line, circle diagram, Smith chart, solution of problems using Smith chart, single and double stub matching .introduction to micro-strip lines and its analysis.

References:

1. Ryder: Networks and Transmission Lines, PHI Learning.
2. Valkenberg: Introduction to Modern Network synthesis, Wiley India.
3. Suresh: Electric Circuits and Networks, Pearson Education.
4. Raju: Electromagnetic field theory and Transmission Lines, Pearson Education.
5. Ganesan: Transmission Lines and Waveguides, TMH.
6. Rao: Electromagnetic Waves and Transmission Lines, PHI learning.

List of Experiments:

1. To set up the standing waves formation on a transmission line and observe their maxima and minima using frequency domain method.
2. To measure the characteristic impedance of transmission lines using frequency domain method and to differentiate between the matched and unmatched lines.
3. To measure the VSWR, reflection coefficient and return loss in a transmission line.
4. To measure the dielectric constant of insulator in the transmission line.
5. To measure the velocity of propagation and wavelength in the given transmission line.
6. To study the attenuation characteristics of signal along a transmission line and observe its variation with frequency. Also calculate the phase constant and propagation constant.
7. To study the effect of reactive loads on transmission lines.
8. To study the difference between lossy and loss less line.
9. To study the physical dimensions of transmission line and estimation of characteristic impedance.
10. To study behavior of infinite and short lines.
11. To study the operation of Balun transformer.
12. To study the loading of transmission lines and estimate the cut off frequency of a loaded line.
13. To study the use of coaxial lines as tuned circuits and delay lines.
14. To study the input and output impedance of any RF circuits and match it to 50/75 ohms.
15. Simulation of various filters

EC– 506 Software Lab-III

Study of simulation software (any one Scilab/ MatLab etc.)
Introduction to Scilab / Matab, Study of Scilab / Matlab programming environment, Modeling, Design and development of Programs.
Overview and Study of the key features and applications of the software.
Application of the software in the field of Control Systems, Data Communications and Communication Systems.

1. Programs Related to Control System- open-loop and closed loop control system, frequency response plots, determining transient response, specifications of second order system, effect of PID controller on control system, Bode plot, Nyquist plot and Root Locus plot, state space analysis.
2. Programs Related to Communication Systems--Simulation of a Communication System (Generation, addition of noise and Detection), AM, FM, PM, PAM, PCM, PSK, FSK etc.
3. Programs related to Data Communications- simulations of CRC, LRC, VRC, hamming codes, line encoding techniques.

References:

1. Rudra Pratap: Getting Started with MATLAB, Oxford University Press.
2. http://www.scilab.in
3. http://ekalavya.it.iitb.ac.in/contents.do?topic=Scilab
4. Vinu V. Das: Programming in Scilab, New Age Publisher.
5. Chapman Stephen J.: MATLAB Programming for Engineers, Thomson Cengage
6. Proakis: Contemporary Communication System Using MATLAB; Thomson Cengage.
7. Kuo: Automatic Control Systems, PHI Learning.
8. Singh and Chaudhari: Matlab Programming, PHI Learning

EC – 601 Industrial Electronics

Unit-I

Power Supplies

Power supply, rectifiers (half wave, full wave), performance parameters of power supplies, filters (capacitor, inductor, inductor-capacitor, pi filter), bleeder resistor, voltage multipliers .

Regulated power supplies (series and shunt voltage regulators, fixed and adjustable voltage regulators, current regulator), switched regulator (SMPS), comparison of linear and switched power supply, switch mode converter (flyback, buck, boost, buk-boost, cuk converters).

Unit-II

Thyristors

Silicon controlled rectifies (SCR), constructional features, principle of operation, SCR terminology, turn-on methods, turn-off methods, triggereing methods of SCR circuits, types of commutation, comparison of thyristors and transistors, thermal characteristics of SCR, causes of damage to SCR, SCR overvoltage protection circuit, seies and parrel operation of sCRs, Line commutated converters (half wave rectifier with inductive and resistive load, single phase and three phase full wave rectifiers).

Unit-III

Other members of SCR family

Triacs, Diacs, Quadracs, recovery characteristics, fast recovery diodes, power diodes, power transistor, power MOSFET, Insulated gate bipolar transistor (IGBT), loss of power in semiconductor devices, comparison between power MOSFET, power transistor and power IGBT.

Unit-IV

Applications of OP-AMP

Basics of OP-AMP, relaxation oscillator, window comparator, Op-comp as rectangular to triangular pulse converter and vice- versa, Wien bridge oscillator, function generator, frequency response of OP-AMP, simplified circuit diagram of OP-AMP, power supplies using OP-AMP, filters (low-pass, high pass) using OP-AMP.

Unit-V

Programmable Logic Controller (PLC)

Functions, applications, advantages and disadvantages of PLC over conventional relay controllers, comparison of PLC with process control computer system, factors to be considered in selecting PLC, functional block diagram of PLC, microprocessor in PLC, memory, input and output modules (interface cards), sequence of operations in a PLC, status of PLC, event driven device, ladder logic language, simple process control applications of PLC, Programming examples.

References:

1. Bishwanath Paul: Industrial Electronics and control, PHI Learning.
2. Rashid: Power Electronics- Circuits, devices and applications, Pearson Education.
3. Singh and Khanchandani: Power Electronics, TMH
4. Bhimbra: Power Electronics, Khanna Publishers.
5. Moorthi: Power Electronics, Oxford University Press.
6. Webb: Programmable Logic Controllers- Principles and Applications, PHI Learning.
7. Petruzulla: Programmable Logic Controllers, TMH.

EC-602 Cellular Mobile Communications

Unit-I

Introduction to cellular mobile system

A basic cellular system, performance criteria, uniqueness of mobile radio environment, operation of cellular systems, planning of cellular system.

Elements of cellular radio system design

General description of problem, concept of frequency reuse channels, co-channel interference reduction factor, desired C/I in an omni-directional antenna system, hand off mechanism, cell splitting, components of cellular systems.

Unit-II

Cell coverage for signal and traffic

General introduction, mobile point-to-point model, propagation over water or flat open area, foliage loss, propagation in near- in distance, long distance propagation, path loss from point-to-point prediction model, cell site antenna heights and signal coverage cells, mobile-to-mobile propagation.

Cell site antennas and mobile antennas

Equivalent circuits of antennas, gain and pattern relationship, sum and difference patterns, antennas at cell site, unique situations of cell site antennas, mobile antennas.

Unit-III

Cochannel interference reduction

Cochannel interference, real time cochannel interference measurement at mobile radio transceivers, design of antenna systems - omni directional and directional, lowering the antenna height, reduction of cochannel interference, umbrella- pattern effect, diversity receiver, designing a system to serve a predefined area that experiences cochannel interference.

Types of Noncochannel interference

Adjacent channel interference, near-end-far-end interference, effect on near-end mobile units, cross-talk, effects of coverage and interference by applying power decrease, antenna height decrease, beam tilting, effects of cell site components, interference between systems, UHF TV interference, long distance interference.

Unit-IV

Frequency management and Channel Assignment

Frequency management, frequency spectrum utilization, setup channels, channel assignment, fixed channel assignment, non-fixed channel assignment algorithms, additional spectrum, traffic and channel assignment, perception of call blocking from the subscribers

Handoffs and dropped calls

Value of implementing handoffs, initiation of handoff, delaying a handoff, forced handoff, queuing of handoff, power- difference handoff, mobile assisted handoff and soft handoff, cell-site handoff and intersystem handoff, dropped call rate formula.

Unit-V

Digital Cellular Systems

GSM- architecture, layer modeling, transmission, GSM channels and channel modes, multiple access scheme.

CDMA- terms of CDMA systems, output power limits and control, modulation characteristics, call processing, hand off procedures.

Miscellaneous mobile systems- TDD systems, cordless phone, PDC, PCN, PCS, non cellular systems.

References:

1. Lee: Cellular and Mobile Telecommunication- Analog & digital systems, TMH.
2. Rappaport: Wireless Communications- principles and practice, Pearson Education.
3. Lee: Mobile communications design fundamentals, Wiley India.
4. Faher Kamilo: Wireless Digital Communication, PHI Learning.
5. Raj Kamal: Mobile Computing, Oxford University Press.

EC – 603 Digital Signal Processing

Unit – I

Discrete-Time Signals and Systems

Discrete-time signals, discrete-time systems, analysis of discrete-time linear time-invariant systems, discrete time systems described by difference equation, solution of difference equation, implementation of discrete-time systems, stability and causality, frequency domain representation of discrete time signals and systems.

Unit - II

The z-Transform

The direct z-transform, properties of the z-transform, rational z-transforms, inversion of the z transform, analysis of linear time-invariant systems in the z- domain, block diagrams and signal flow graph representation of digital network, matrix representation.

Unit - III

Frequency Analysis of Discrete Time Signals

Discrete fourier series (DFS), properties of the DFS, discrete Fourier transform (DFT), properties of DFT, two dimensional DFT, circular convolution.

Unit - IV

Efficient Computation of the DFT

FFT algorithms, decimation in time algorithm, decimation in frequency algorithm, decomposition for 'N' composite number.

Unit - V

Digital filters Design Techniques

Design of IIR and FIR digital filters, Impulse invariant and bilinear transformation, windowing techniques-rectangular and other windows, examples of FIR filters, design using windowing.

References:

1. Oppenheim and Schafer: Digital Signal Processing, PHI Learning.
2. Johnny R. Johnson: Introduction to Digital Signal Processing, PHI Learning.
3. Proakis: Digital Signal Processing, Pearson Education.
4. Rabiner and Gold: Theory and Application of Digital Signal Processing, PHI Learning.
5. Ingle and Proakis: Digital Signal Processing- A MATLAB based Approach, Thompson, Cengage Learning.

List of Experiments:

1. Generation, analysis and plots of discrete-time signals.
2. Implementation of operations on sequences (addition, multiplication, scaling, shifting, folding etc).
3. Implementation of Linear time-invariant (LTI) systems and testing them for stability and causality.
4. Computation and plot of DTFT of sequences, verification of properties of DTFT.
5. Computation and plots of z-transforms, verification of properties of z-transforms.
6. Computation and plot of DFT of sequences, verification of properties of DFT.
7. Computation and plots of linear/circular convolution of two sequences.
8. Computation of radix-2 FFT- Decimation in time and Decimation in frequency.
9. Implementation of IIR and FIR filter structures (direct, cascade, parallel etc).
10. Implementation of various window design techniques (Rectangular, Bartlett, Hann, Hamming etc).

EC – 604 Antennas and Wave Propagation

Unit I
Radiation
Potential function and the Electro magnetic field, potential functions for Sinusoidal Oscillations, retarded potential, the Alternating current element (or oscillating Electric Dipole), Power radiated by a current element, Application to short antennas, Assumed current distribution, Radiation from a Quarter wave-monopole or Half wave dipole, sine and cosine integral, Electromagnetic field close to an antenna, Solution of the potential equations, Far-field Approximation.

Unit II
Antenna Fundamentals
Introduction, network theorems, directional properties of dipole antennas, travelling –wave antennas and effect of feed on standing-wave antennas, two –element array, horizontal patterns in broad-cast arrays, linear arrays, multiplication of patterns ,effect of earth on vertical patterns, Binomial array, antenna gain, effective area.

Unit III
Types of antennas
Babinet's principles and complementary antenna, horn antenna, parabolic reflector antenna, slot antenna, log periodic antenna, loop antenna, helical antenna, biconical antenna, folded dipole antenna, Yagi-Uda antenna, lens antenna, turnstile antenna. Long wire antenna: resonant and travelling wave antennas for different wave lengths, V-antenna, rhombic antenna, beverage antenna, microstrip antenna.

Unit IV
Antenna array synthesis
Introduction, retarded potentials, array structures, weighting functions, linear array analysis, different forms of linear arrays, Schelknoff unit circle, linear array synthesis, sum and difference patterns, Dolph-Chebychev synthesis of sum pattern, Taylor synthesis of sum patterns, Bayliss synthesis of difference patterns, planar arrays, arrays with rectangular boundary.

Unit V
Propagation of radio waves
Fundamentals of electromagnetic waves, effects of the environment, modes of propagation.
Ground wave propagation- Introduction, plane earth reflection, space wave and surface wave, transition between surface and space wave, tilt of wave front due to ground losses.
Space wave propagation- Introduction, field strength relation, effects of imperfect earth, curvature of earth and interference zone, shadowing effect of hills and buildings, absorption by atmospheric phenomena, variation of field strength with height, super refraction, scattering, tropospheric propagation, fading, path loss calculations.
Sky wave propagation- Introduction, structural details of the ionosphere, wave propagation mechanism, refraction and reflection of sky waves by ionosphere, ray path, critical frequency, MUF, LUF, OF, virtual height, skip distance, relation between MUF and skip distance.

References:

1. Jordan and Balmain: Electromagnetic Waves and Radiating System, PHI Learning.
2. Krauss: Antennas and wave propagation, TMH.
3. Balanis: Antenna Theory Analysis and Design, Wiley India Pvt. Ltd.
4. Harish and Sachidananda: Antennas and wave propagation, Oxford University Press.
5. Raju: Antennas and Wave Propagation, Pearson Education.
6. Kennedy: Electronic Communication Systems, TMH.

List of Experiments:
1. To Plot the Radiation Pattern of an Omni Directional Antenna.
2. To Plot the Radiation Pattern of a Directional Antenna.
3. To Plot the Radiation Pattern of a Parabolic Reflector Antenna.
4. To Plot the Radiation Pattern of a Log Periodic Antenna.
5. To Plot the Radiation Pattern of a Patch Antenna.
6. To Plot the Radiation Pattern of a Dipole/ Folded Dipole Antenna.

7. To Plot the Radiation Pattern of a Yagi (3-EL/4EL) Antenna.
8. To Plot the Radiation Pattern of a Monopole/ WHIP/ Collinear Antenna.
9. To Plot the Radiation Pattern of a Broad site Antenna.
10. To Plot the Radiation Pattern of a Square Loop Antenna.

EC – 605 VLSI Circuits and Systems

Unit I
Introduction
Introduction to CMOS VLSI circuit, VLSI design flow, Design strategies ,Hieraráchy, regularity, modularity, locality, MOS Transistor as a Switches, CMOS Logic, Combinational circuit, latches and register, Introduction of CAD Tool , Design entry, synthesis, functional simulation.

Unit II
Specification of sequential systems
Characterizing equation & definition of synchronous sequential machines. Realization of state diagram and state table from verbal description, Mealy and Moore model machines state table and transition diagram. Minimization of the state table of completely and incompletely specified sequential machines.

Unit III
Asynchronous Sequential Machine
Introduction to asynchronous sequential machine, Fundamental mode and Pulse mode asynchronous sequential machine, Secondary state assignments in asynchronous sequential machine, races and hazards.

Unit IV
State Machine
Algorithmic state machine and fundamental concept of hardware/ firmware algorithms. Controllers and data system designing.

Unit V
Fault Detection in combinational circuit
Types of faults, Fault detection using Boolean Difference and path sensitization method.
Concept of PROM, PLA, PAL, CPLD and FPGA, PALASM software applications.

Refrences:

1. Neil Weste: Principle of CMOS VLSI Design, TMH.
2. Kohavi: Switching & Finite Automata Theory, TMH.
3. Lee: Digital Circuits and Logic Design, PHI Learning..
4. Roth Jr.: Fundamentals of Logic Design, Jaico Publishing House.
5. Parag K. Lala: Fault Tolerant and Fault Testable Hardware Design, BS Publication.

EC – 606 Software Lab- IV

VHDL
Hardware abstraction, Basic language elements: identifiers, data objects, data types, operators, behavioral modeling, data flow modeling, structural modeling, simulation and analysis.

VERILOG
Overview of digital design with Verilog, Hierarchical Modeling: basic concepts, models and ports, gate level modeling, data flow modeling, behavioral modeling, logic synthesis with Verilog HDL, simulation.

Experiments:
Design and simulation of following using Verilog/ VHDL .
Logic gates: NAND, NOR, XOR, XNOR.
Half adder, full adder, subtractor, latches, multiplexers- 2:1, 4:1, 8:1, comparators, decoders- 2:4, 3:8, 4:16.
4-bit ripple carry full adder,4-bit Ripple carry counter, parity generator, up/down counters.

References:

1. Samir palnitkar: Verilog HDL- A Guide to Digital Design and Synthesis, Pearson Education.
2. Bhasker: A Verilog HDL Primer –synthesis, Pearson Education
3. Pedroni: Circuit Design with VHDL, PHI Learning.
4. Perry: VHDL- Programming by example, TMH.

Course outcome of Electronics Engineering: BE IV Year

Course Outcome for Electronics Engineering in B.E./ B.Tech IV year is given as follows:-

- To learn the applications of wireless services, channel models, diversity & transceivers.
- Student learn the theoretical aspects ofsatellite systems, geostationary orbit, polarization, space links & satellite services.
- To understand the theoretical & practical aspects of optical communication and learn about optical sources, receivers, optical fibers and its technologies.
- Analyze different types of waveguides and microwave components, tubes and vacuum tubes.
- To analyze device modeling, circuit simulation & CMOS processing technologies in VLSI systems.
- To learn the management and managerial economics to be ready for future endeavour of life.
- To understand the spread spectrum modulation, OFDM & advance communication systems.
- To recognize the technological trends of computer networking& evaluate the challenges in building networks and solutions to those.
- To understand the theoretical & practical aspects of basic television systems, colour television & basic radar engineering.

EC 701 Elective – I (EC – 7011 Wireless Communication)

Unit-I
Introduction
Applications and requirements of wireless services: history, types of services, requirements for the services, economic and social aspects.
Technical challenges in wireless communications: multipath propagation, spectrum limitations, limited energy, user mobility, noise and interference-limited systems.
Propagation mechanism: free space loss, reflection and transmission, diffraction, scattering by rough surfaces, wave guiding.

Unit-II
Wireless Propagation channels
Statistical description of the wireless channel: time invariant and variant two path models, small-scale fading with and without a dominant component, Doppler spectra, temporal dependence of fading, large scale fading.
Wideband and directional channel characteristics: causes of delay dispersion, system theoretic description of wireless channels, WSSUS model, condensed parameters, ultra wideband channels, directional description.

Unit-III
Channel models: Narrowband, wideband and directional models, deterministic channel-modeling methods.
Channel sounding: Introduction, time domain measurements, frequency domain analysis, modified measurement methods, directionally resolved measurements.
Antennas: Introduction, antennas for mobile stations, antennas for base stations.

Unit-IV
Transceivers and signal processing: Structure of a wireless communication link: transceiver block structure, simplified models. Modulation formats, demodulator structure, error probability in AWGN channels, error probability in flat-fading channels, error probability in delay and frequency-dispersive fading channels.

Unit V
Diversity: Introduction, microdiversity, macrodiversity and simulcast, combination of signals, error probability in fading channels with diversity reception, transmit diversity.
Equalizers: Introduction, linear equalizers, decision feedback equalizers, maximum likelihood sequence estimation (Viterbi detector), comparison of equalizer structures, fractional spaced equalizers, blind equalizers.

References:

1. Molisch: Wireless Communications, Wiley India.
2. Taub and Schilling: Principles of Communication Systems, TMH.
3. Haykin: Mordern Wireless Communication, Pearson Education.
4. Upena Dalal: Wireless Communication, Oxford University Press.
5. Rappaport: Wireless Communication, Pearson Education.
6. Price: Wireless Communication and Networks, TMH.
7. Palanivelu and Nakkereeran : Wireless and Mobile Communication, PHI Learning.
8. Chidambara Nathan: Wireless Communication, PHI Learning.

EC 701 Elective – I (EC – 7012 Digital Image Processing)

Unit-I
Digital Image Processing (DIP)
Introduction, examples of fields that use DIP, fundamental steps in DIP, components of an image processing system.
Digital Image Fundamentals: elements of visual perception, image sensing and acquisition, image sampling and quantization, basic relationships between pixels.

Unit-II
Image Transforms
Two-dimensional (2D) impulse and its shifting properties, 2D continuous Fourier Transform pair, 2D sampling and sampling theorem, 2D Discrete Fourier Transform (DFT), properties of 2D DFT.
Other transforms and their properties: Cosine transform, Sine transform, Walsh transform, Hadamard transform, Haar transform, Slant transform, KL transform.

Unit-III
Image Enhancement
Spatial domain methods: basic intensity transformation functions, fundamentals of spatial filtering, smoothing spatial filters (linear and non-linear), sharpening spatial filters (unsharp masking and high boost filters), combined spatial enhancement method.
Frequency domain methods: basics of filtering in frequency domain, image smoothing filters (Butterworth and Gaussian low pass filters), image sharpening filters (Butterworth and Gaussian high pass filters), selective filtering.

Unit-IV
Image Restoration
Image degradation/restoration, noise models, restoration by spatial filtering, noise reduction by frequency domain filtering, linear position invariant degradations, estimation of degradation function, inverse filtering, Wiener filtering, image reconstruction from projection.

Unit-V
Image Compression
Fundamentals of data compression: basic compression methods: Huffman coding, Golomb coding, LZW coding, Run-Length coding, Symbol based coding.
Digital image watermarking, representation and description- minimum perimeter polygons algorithm (MPP).

References:

1. Gonzalez and Woods: Digital Image Processing, Pearson Education.
2. Anil Jain: Fundamentals of Digital Image Processing, PHI Learning.
3. Annadurai: Fundamentals of Digital Image Processing, Pearson Education.
4. Sonka, Hlavac and Boyle: Digital Image Processing and Computer Vision, Cengage Learning.
5. Chanda and Majumder: Digital Image Processing and Analysis, PHI Learning.
6. Jayaraman, Esakkirajan and Veerakumar: Digital Image Processing, TMH.
7. William K. Pratt, Digital Image Processing, Wiley India.

EC 701 Elective – I (EC – 7013 Neural Networks)

Unit-I
Neural Network (NN)
Introduction, benefits of neural network, models of a neuron, neural network as directed graph, network architectures, artificial intelligence and neural network.
Learning processes: error correction learning, memory based learning, Hebbian learning, competitive learning, Boltzman learning, learning tasks, adaptation, statistical nature of learning process, statistical learning theory.

Unit-II
Perceptrons
Single layer perceptrons: adaptive filtering problem, unconstrained optimization technique, linear least squares filter, least mean square algorithm (LMS), perceptron convergence theorem
Multi layer perceptron: architecture, back propagation algorithm, generalization, approximations of functions, network pruning techniques.

Unit-III
Radial Basis Function (RBF) Networks
Cover's theorem on the separability of patterns, interpolation problem, supervised learning as an Ill-posed hyper surface reconstruction problem, regularization theory, regularization network, generalized radial basis function networks (RBF), estimation of the regularization parameter, approximation properties of RBF networks, comparison of RBF networks and multilayer perceptrons, Kernel regression and its relation to RBF networks, learning strategies.

Unit-IV
Information- Theoretic Models
Entropy, maximum entropy principle, mutual information, Kullback-Leibler divergence, mutual information as an objective function to be optimized, maximum mutual information principle, infomax and redundancy reduction, spatially coherent and incoherent features, independent components analysis, maximum likelihood estimation, maximum entropy method.

Unit V
Dynamically Driven Recurrent Networks
introduction, recurrent network architectures, state space model, non-linear autogressive with exogenous inputs model, computational power of recurrent networks, learning algorithms, back propagation through time, real time recurrent learning, Kalman filter, decoupled Kalman filter, vanishing gradients in recurrent networks, system identification, model reference adaptive control.

References:

1. Haykin: Neural Networks- A Comprehensive Foundation, PHI Learning.
2. Sivanandam, Sumathi and Deepa: Introduction to Neural Networks using Matlab, TMH.
3. Freeman and Skapura: Fundamentals of Neural Networks- algorithms, applications and programming techniques, Pearson Education.
4. Hagan, Demuth and Beale: Neural Network Design, Cengage Learning.
5. Anderson: An introduction ro Neural Networks, PHI Learning.
6. Satish Kumar: Neural Networks, TMH.

EC-702 Satellite Communication

Unit-I

Overview of satellite systems: Introduction, Frequency allocations for satellite systems.

Orbits and launching methods: Kepler's three laws of planetary motion, terms used for earth orbiting satellites, orbital elements, apogee and perigee heights, orbit perturbations, inclined orbits, local mean solar point and sun-synchronous orbits, standard time.

Unit-II

The Geostationary orbit: Introduction, antenna look angles, polar mount antenna, limits of visibility, near geostationary orbits, earth eclipse of satellite, sun transit outage, launching orbits.

Polarization: antenna polarization, polarization of satellite signals, cross polarization discrimination.

Depolarization: ionospheric, rain, ice.

Unit-III

The Space segment: introduction, power supply, attitude control, station keeping, thermal control, TT&C subsystem, transponders, antenna subsystem, Morelos and Satmex 5, Anik-satellites, Advanced Tiros-N spacecraft.

The Earth segment: introduction, receive-only home TV systems, master antenna TV system, Community antenna TV system, transmit-receive earth station.

Unit-IV

The space link: Introduction, Equivalent isotropic radiated power (EIPR), transmission losses, the link power budget equation, system noise, carrier-to-noise ratio (C/N), the uplink, the downlink, effects of rain, combined uplink and downlink C/N ratio, inter modulation noise, inter-satellite links.

Interference between satellite circuits.

Unit-V

Satellite services

VSAT (very small aperture terminal) systems: overview, network architecture, access control protocols, basic techniques, VSAT earth station, calculation of link margins for a VSAT star network.

Direct broadcast satellite (DBS) Television and radio: digital DBS TV, BDS TV system design and link budget, error control in digital DBS-TV, installation of DBS-TV antennas, satellite radio broadcasting.

References:

1. Roddy: Satellite Communications, TMH.
2. Timothy Prattt: Satellite Communications, Wiley India.
3. Pritchard, Suyderhoud and Nelson: Satellite Communication Systems Engineering, Pearson Education.
4. Agarwal: Satellite Communications, Khanna Publishers.
5. Gangliardi: Satellite Communications, CBS Publishers.
6. Chartrand: Satellite Communication, Cengage Learning.
7. Raja Rao: Fundamentals of Satellite communications, PHI Learning.
8. Monojit Mitra: Satellite Communication: PHI Learning.

EC-703 Optical Communication

Unit-I

Overview of Optical Fiber Communications (OFC): Motivation, optical spectral bands, key elements of optical fiber systems.

Optical fibers: basic optical laws and definitions, optical fiber modes and configurations, mode theory for circular waveguides, single mode fibers, graded-index fiber structure, fiber materials, photonic crystal fibers, fiber fabrication, fiber optic cables.

Unit-II

Optical sources: Light emitting diodes (LED): structures, materials, quantum efficiency, LED power, modulation of an LED. Laser diodes: modes, threshold conditions, laser diode rate equations, external quantum efficiency, resonant frequencies, structure and radiation patterns, single mode lasers, modulation of laser diodes.

Power launching and coupling: source to fiber power launching, fiber to fiber joints, LED coupling to single mode fibers, fiber splicing, optical fiber connectors.

Unit-III

Photo detectors: pin photo detector, avalanche photodiodes, photo detector noise, detector response time, avalanche multiplication noise.

Signal degradation in optical fibers: Attenuation: units, absorption, scattering losses, bending losses, core and cladding losses. Signal distortion in fibers: overview of distortion origins, modal delay, factors contributing to delay, group delay, material dispersion, waveguide dispersion, polarization-mode dispersion. Characteristics of single mode fibers: refractive index profiles, cutoff wavelength, dispersion calculations, mode field diameter, bending loss calculation. Specialty fibers.

Unit-IV

Optical receivers: fundamental receiver operation, digital receiver performance, eye diagrams, coherent detection: homodyne and heterodyne, burst mode receiver, analog receivers.

Digital links: point to point links, link power budget, rise time budget, power penalties.

Analog links: overview of analog links, carrier to noise ratio, multi channel transmission techniques.

Unit-V

Optical technologies

Wavelength division multiplexing (WDM) concepts: operational principles of WDM, passive optical star coupler, isolators, circulators, active optical components: MEMS technology, variable optical attenuators, tunable optical filters, dynamic gain equalizers, polarization controller, chromatic dispersion compensators.

Optical amplifiers: basic applications and types of optical amplifiers, Erbium Doped Fiber Amplifiers (EDFA): amplification mechanism, architecture, power conversion efficiency and gain. Amplifier noise, optical SNR, system applications.

Performance Measurement and monitoring: measurement standards, basic test equipment, optical power measurements, optical fiber characterization, eye diagram tests, optical time-domain reflectometer, optical performance monitoring.

References:

1. Keiser: Optical Fiber Communications, TMH.
2. Senior: Optical Fiber Communication- Principles and Practices, Pearson Education.
3. Agarwal: Fiber Optic Communication Systems, Wiley India.
4. Palais: Fiber Optics Communications, Pearson Education.
5. Satish Kumar: Fundamentals of optical Communications, PHI Learning.
6. Khare: Fiber Optics and Optoelectronics, Oxford University Press.
7. Ghatak and Thyagrajan: Fiber Optics and Lasers, Macmillan India Ltd.
8. Gupta: Optoelectronic Devices and Systems, PHI Learning.
9. Sterling: Introduction to Fiber Optics, Cengage Learning.

List of Experiments:

1. Launching of light into the optical fiber and calculate the numerical aperture and V-number.
2. Observing Holograms and their study.
3. Measurement of attenuation loss in an optical fiber.
4. Diffraction using gratings.
5. Construction of Michelson interferometer.
6. Setting up a fiber optic analog link and study of PAM.
7. Setting up a fiber optic digital link and study of TDM and Manchester coding.
8. Measurement of various misalignment losses in an optical fiber.

EC-704 Microwave Engineering

Unit-I
Microwave Transmission System
General representation of EM field in terms of TEM, TE and TM components, Uniform guide structures, rectangular wave guides, Circular Wave guides, Solution in terms of various modes, Properties of propagating and evanescent modes, Dominant modes, Normalized model voltages and currents, Power flow and energy storage in modes frequency range of operation for single mode working, effect of higher order modes, Strip line and micro strip lines general properties, Comparison of coaxial, Micro strip and rectangular wave guides in terms of band width, power handling capacity, economical consideration etc.

Unit-II
Microwave Networks and Component
Transmission line ports of microwave network, Scattering matrix, Properties of scattering matrix of reciprocal, Non reciprocal, loss less, Passive networks, Examples of two, three and four port networks, wave guide components like attenuator, Phase shifters and couplers, Flanges, Bends, Irises, Posts, Loads, Principle of operation and properties of E-plane, H-plane Tee junctions of wave guides, Hybrid T, Multi-hole directional coupler, Directional couplers, Microwave resonators- rectangular. Excitation of wave guide and resonators by couplers. Principles of operation of non reciprocal devices, properties of ferrites, Isolators and phase shifters.

Unit-III
Microwave Solid State Devices and Application
PIN diodes, Properties and applications, Microwave detector diodes, detection characteristics, Varactor diodes, parametric amplifier fundamentals, Manley-Rowe power relation MASER, LASER , Amplifiers, Frequency converters and harmonic generators using varactor diodes, Transferred electron devices, Gunn effect, Various modes of operation of Gunn oscillator, IMPATT, TRAPATT and BARITT.

Unit-IV
Microwave Vacuum Tube Devices
Interaction of electron beam with electromagnetic field, power transfer condition. Principles of working of two cavity and Reflex Klystrons, arrival time curve and oscillation conditions in reflex klystrons, mode-frequency characteristics. Effect of repeller voltage variation on power and frequency of output. Principle of working of magnetrons. Electron dynamics in planar and cylindrical magnetrons, Cutoff magnetic field, Resonant cavities in magnetron, Π-mode operation Mode separation techniques, Rising sun cavity and strapping. Principle of working of TWT amplifier. Slow wave structures, Approximate gain relationship in forward wave TWT.

Unit-V
Microwave Measurements
Square law detection, Broadband and tuned detectors. Wave-guide probes, Probe and detector mounts, Slotted line

arrangement and VSWR meter, Measurement of wave-guide impedance at load port by slotted line, Microwave bench components and source modulation. Measurement of scattering matrix parameters, High, Medium and low-level power measurement techniques, Characteristics of bolometers, bolometer mounts, Power measurement bridges, Microwave frequency measurement techniques, calibrated resonators (transmission and absorption type). Network Analyzer and its use in measurements.

References:

1. Liao: Microwave Devices and Circuits, Pearson Education.
2. Das: Microwave Engineering, TMH.
3. Rao: Microwave Engineering, PHI Learning.
4. Collins: Foundations of Microwave Engineering, Wiley India.
5. Srivastava and Gupta: Microwave Devices and Circuits, PHI Learning.
6. Reich: Microwave Principles, East West Press.
7. Pozar: Microwave Engineering, Wiley India.
8. Roy and Mitra: Microwave Semiconductor Devices, PHI learning.

List of Experiments:
Following illustrative practical should be simulated with the help of any RF simulation software:-

1. Study the characteristics of Klystron Tube and to determine its electronic tuning range.
2. To determine the frequency and wavelength in a rectangular wave-guide working on TE10 mode.
3. To determine the Standing Wave-Ratio and reflection coefficient.
4. To measure an unknown impedance with Smith Chart.
5. To study the V-I characteristics of Gunn Diode.
6. To study the following characteristics of Gunn Diode.
   (a) Output power and frequency as a function of voltage.
   (b) Square wave modulation through PIN diode.
7. Study the function of Magic Tee by measuring the following parameters.
   (a) Measurement of VSWR at different ports and
   (b) Measurement of isolation and coupling coefficient.
8. Study the function of Isolator / Circulator by measuring the following parameters.
   (a) Input VSWR measurement of Isolator / Circulator.
   (b) Measurement of insertion loss and isolation.
9. Study the function of Attenuator (Fixed and Variable type) by measuring the following parameters.
   (a) Input VSWR measurement.
   (b) Measurement of insertion loss and attenuation.
10. Study the function of Multi Hole Directional Coupler by measuring the following parameters.
   (a) To measure main line and auxiliary line VSWR.
   (b) To measure the coupling factor and directivity.
11. Study of a network analyzer and measurements using it.

EC-705 VLSI Design

UNIT I

Practical Consideration and Technology in VLSI Design

Introduction, Size and complexity of Integrated Circuits, The Microelectronics Field, IC Production Process, Processing Steps, Packaging and Testing, MOS Processes, NMOS Process, CMOS Process, Bipolar Technology, Hybrid Technology, Design Rules and Process Parameters.

UNIT II

Device Modeling

Dc Models, Small Signal Models, MOS Models, MOSFET Models in High Frequency and small signal, Short channel devices, Sub threshold Operations, Modeling Noise Sources in MOSFET's, Diode Models, Bipolar Models, Passive component Models.

UNIT III

Circuit Simulation

Introduction, Circuit Simulation Using Spice, MOSFET Model, Level 1 Large signal model, Level 2 Large Signal Model, High Frequency Model, Noise Model of MOSFET, Large signal Diode Current, High Frequency BJT Model, BJT Noise Model, Temperature Dependence of BJT.

UNIT IV

Structured Digital Circuits and Systems

Random Logic and Structured Logic Forms, Register Storage Circuits, Quasi Static Register Cells, A Static Register Cell, Micro coded Controllers, Microprocessor Design, Systolic Arrays, Bit-Serial Processing Elements, Algotronix.

UNIT V

CMOS Processing Technology

Basic CMOS Technology, A Basic n-well CMOS Process, Twin Tub Processes, CMOS Process Enhancement, Interconnects and Circuit Elements, Layout Design Rules, Latch up, Physical Origin, Latch up Triggering, Latch up Prevention, Internal Latch up Prevention Techniques.

References:

1. Geiger, Allen and Strader: VLSI Design Techniques for Analog and Digital Circuits, TMH.
2. Sorab Gandhi: VLSI Fabrication Principles, Wiley India.
3. Weste and Eshraghian: Principles of CMOS VLSI design, Addison-Wesley
4. Weste, Harris and Banerjee: CMOS VLSI Design, Pearson-Education.
5. Pucknell and Eshraghian: Basic VLSI Design, PHI Learning.
6. Sze: VLSI Technology, TMH.

EC-706 Minor Project and Seminar

The student should select a topic (from the subjects he has studied so far or any topic related to real life problem). He should do the literature survey, analyze the problem and propose some solution for the same. He should prepare a detailed (typed) report regarding the topic and should present the same with the help of power point presentation at the end of the semester. The analysis of the problem may be done with the help of some software or any hardware (which may be made by the student).

EC-707 Industrial Training

Duration: 4 weeks after the VI semester in the summer break. Assessment in VII semester.

SCHEME OF EXAMINATION

For the assessment of industrial training undertaken by the students, following components are considered with respective weightage.

A) **Term work In Industry Marks allotted**

1.	Attendance and General Discipline	05
2.	Daily diary Maintenance	05
3.	Initiative and Participative attitude during training	05
4.	Assessment of training by Industrial Supervisor/s	15
	Total	**30**

(B) **Practical/Oral Examination (Viva-voce In Institution Marks allotted**

1.	Training Report	20
2.	Seminar and cross questioning (defense)	30
	Total	**50**

Marks of various components in industry should be awarded to the student, in consultation with the Training and Placement Officer (TPO)/ Faculty of the institute, who must establish contact with the supervisor/ authorities of the organization where, students have taken training, to award the marks for term work. During training, students will prepare a first draft of the training report in consultation with the section incharge. After training they will prepare final draft with the help of the TPO/ faculty of the institute. Then, they will present a seminar on their training and will face viva-voce on training in the institute.

COURSE: EC-8011 Advanced Data Network

Unit-I

Principles of Wireless Networks

Network Planning: Introduction, wireless network topologies, cellular topology.

Wireless network operation: introduction, mobility management, radio resources and power management, security in wireless networks.

Unit-II

Mobile Data Networks

Introduction, the data-oriented CDPD network, GPRS and higher data rates, short messaging services in GSM, mobile application protocols.

Wireless LANs (WLAN)

Introduction, historical overview of the LAN industry, evolution of the WLAN industry, new interest from military and service providers, a new explosion of market and technology, wireless home networking.

Unit-III

IEEE 802.11 WLANs

Introduction, what is IEEE 802.11? The PHY layer, MAC sublayer, MAC management sublayer.

HIPERLAN

Introduction HIPERLAN, HIPERLAN-2

Wireless Geolocation Systems

Introduction, Wireless geo location system architecture, technologies for wireless geolocation, geolocation standards for E-911 services, performance measures for geo location systems.

Unit-IV

Wireless Personal Area Network (WPAN)

Introduction- IEEE 802.15 WPAN, Home RF, Bluetooth? Interference between Bluetooth and 802.11.

Satellite Networks

Satellite navigation and global positioning system: Introduction, radio and satellite navigation, GPS position location principles, GPS time, GPS receivers and codes, the C/A code, Satellite signal acquisition, GPS signal levels, timing accuracy, GPS receiver operation, GPS C/A code accuracy, differential GPS.

Unit-V

Optical Networks

Network Concepts: terminology, categories, layers. Network topologies: performance of passive linear buses, performance of star architectures. SONET/SDH: transmission formats and speeds, optical interfaces, SONET/SDH rings, SONET/SDH networks.

High speed light-wave links: links operating at 10, 40 and 160 Gbps. Optical add/drop multiplexing (OADM): OADM configurations, reconfigurable OADM.

Optical switching: optical cross-connect, wavelength conversion, wavelength routing, optical packet switching, optical burst switching. WDM network examples: wideband long-haul WDM networks, narrowband metro WDM networks, passive optical network. Mitigation of transmission impairments: chromatic dispersion compensating fiber, bragg grating dispersion compensators, polarization mode dispersion compensation, optical amplifier gain transients.

References:

1. Pahlavan and Krishnamurthy: Principles of Wireless Networks, PHI Learning.
2. Stallings: Wireless Communications and Networks, Pearson Education.
3. Keiser: Optical Fiber Communications, TMH.
4. Pratt, Bostian and Allnut: Satellite Communications, Wiley India.
5. Upena Dalal: Wireless Communications, Oxford University Press.

COURSE: EC-8012 Microwave Circuits

Unit I

Transmission lines: Impedance matching and transformation

Plane Electromagnetic waves, Transmission Lines: Line Equations and analysis, Smith Chart, Impedance Matching and transformation single stub, double stub matching, triple –stub tuner, impedance mismatch factor, quarter wave transformer, theory of small reflections, binomial and Chebyshev transformer, tapered transmission lines, triangular, exponential and Klopfenstein taper.

Unit II

Field analysis of transmission lines:

Analysis of general transmission line and terminated transmission line circuits, Planar Transmission lines, Micro strip lines.

Strip lines: Characteristic Impedance, conductor losses, Dielectric losses, Radiation Losses, Higher order modes and dispersion, Micro strip attenuation ,high frequency properties , suspended and inverted micro strip lines, coplanar lines, slot lines, Fin-lines, Coupled Lines. Substrates for microwave printed circuits

Unit III

Microwave (solid state) Amplifiers:

BJT and FET, Power gains: definitions, Stability: stability circles, tests for unconditional stability, Constant Power Gain Circles, Constant Mismatch Circles, Single stage and multi stage transistor Amplifier design, Broadband transistor Amplifier Design, Power amplifiers. Basic Noise theory, Low noise amplifier designs, Microwave amplifier designs using S-parameters.

Unit IV

Microwave oscillators and mixers:

RF oscillators, Microwave oscillators, Oscillators Phase Noise, Frequency Multipliers, Gunn oscillators and circuits, Transistor oscillators, Oscillator circuits and design.

Mixers: Mixer characteristics, linear and non-linear mixer operation, Mixer noise figure, Balanced mixers, Single ended diode mixer, single ended FET mixer, image reject mixers, other mixers, Mixer analysis using Harmonic Balancing.

Unit V

Microwave Filters:

Periodic structures: analysis, Filter design : image parameter and insertion loss method. specification of power loss ratio,

Filter transformations, Filter Implementations, Stepped-Impedance low –pass filters, coupled line filters, Filters using coupled resonators, Impedance and Admittance inverters, micro strip half-wave filter, Quarter –wave coupled cavity filters, direct –coupled cavity filters, Low-Pass filter designs, Frequency transformations and expansions, Narrowband and wideband microwave filters.

References:

1. Collin: Foundations for Microwave Engineering, Wiley India.
2. Rizzi: Microwave Engineering- Passive Circuits, PHI Learning.
3. Pozar: Microwave Engineering, Wiley India.
4. Vendelin, Pavid and Rohde, Microwave Circuit Design, Wiley India.
5. Srivastava and Gupta: Microwave Devices and Circuit Design, PHI

COURSE: EC-8013 Principles of Management and Managerial Economics

Unit I

Management Concept: Management, Administration and Organization Difference and Relationship between Organization Management and Administration. Importance of Management, Characteristics of Management.

Unit II

Management: Scientific Management, Principles of Management, Process of Management, Functions of Management, Levels of Management, Project Management.

Unit III

Decision Making: Introduction and Definition, Types of Decisions, Techniques of Decision Making, Decision making under certainty Decision making under uncertainty, Decision Making under risk.

Unit IV

Managerial Economics: Introduction, Factors Influencing Manager, Micro and Macro-economics, Theory of the Cost, Theory of the Firm, Theory of Production Function.

Unit V

Productivity: Input-Output Analysis, Micro-economics Applied to Plants and Industrial Undertakings, Production and Production system, Productivity, Factors affecting Productivity, Increasing Productivity of Resources.

References:

1. Peter Drucker, Harper and Row: The Practice of Management.
2. Koontz: Essentials of Management, PHI Learning.
3. Staner: Management, PHI Learning.
4. Daft: Principles of Management, Cengage Learning.
5. T. N. Chhabra: Principle and Practice of Management, Dhanpat Rai, New Delhi.
6. Hirschey: Managerial Economics, Cengage Learning.
7. T. R. Banga and S.C. Sharma: Industrial Organisation and Engineering Economics, Khanna Publishers.
8. O.P. Khanna: Industrial Engineering and Management, Dhanpat Rai.
9. Joel Dean: Managerial Economics, PHI learning.
10. V. L. Mote, Samuel Paul and G.S. Gupta: Managerial Economics Concepts & Cases, TMH, New Delhi.
11. V. L. Mote: Managerial Economics, TMH, New Delhi.

EC-8014-New (Introduction to Microcontrollers for Embedded systems)

UNIT-I: Introduction to Embedded systems

Embedded system overview and applications, features and architecture considerations-ROM, RAM, timers, data and address bus, Memory and I/O interfacing concepts, memory mapped I/O. CISC Vs RISC design philosophy, Von-Neumann Vs Harvard architecture, instruction set, instruction formats, and various addressing modes of 32-bit. Fixed point and floating point arithmetic operations.

Introduction ARM architecture and Cortex – M series, Introduction to the Tiva family viz. TM4C123x & TM4C129x and its targeted applications, Tiva block diagram, address space, on-chip peripherals (analog and digital) Register sets, Addressing modes and instruction set basics.

UNIT-II: Microcontroller Fundamentals for Basic Programming

I/O pin multiplexing, pull up/down registers, GPIO control, Memory Mapped Peripherals, programming System registers, Watchdog Timer, need of low power for embedded systems, System Clocks and control, Hibernation Module on Tiva, Active vs Standby current consumption. Introduction to Interrupts, Interrupt vector table, interrupt programming.

Case Study: Tiva based embedded system application bringing up the salient features of GPIO, Watchdog timer, etc.

UNIT- IIITimers, PWM and Mixed Signals Processing
Timer, Basic Timer, Real Time Clock (RTC), Timing generation and measurements, Analog interfacing and data acquisition: ADC, Analog Comparators, DMA, Motion Control Peripherals: PWM Module & Quadrature Encoder Interface (QEI).

Case Study: Tiva based embedded system application using ADC & PWM.

UNIT-IV Communication protocols and Interfacing with external devices Synchronous/Asynchronous interfaces (like UART, SPI, I2C, USB), serial communication basics, baud rate concepts, Interfacing digital and analog external device, I2C protocol, SPI protocol & UART protocol. Implementing and programming I2C, SPI & UART interface using Tiva. CAN & USB interfaces on Tiva platform. Case Study: Tiva based embedded system application using the interface protocols for communication with external devices “Sensor Hub BoosterPack”

UNIT V Embedded networking and Internet of Things

Embedded Networking fundamentals, Ethernet, TCP/IP introduction IoT overview and architecture, Overview of wireless sensor networks and design examples. Various wireless protocols and its applications: NFC, ZigBee , Bluetooth, Bluetooth Low Energy, Wi-Fi. Adding Wi-Fi capability to the Microcontroller, Embedded Wi-Fi, User APIs for Wireless and Networking applications Building IoT applications using CC3100 user API: connecting sensor devices using Tivaware sensor library.

Case Study: Tiva based Embedded Networking Application: “Smart Plug with Remote Disconnect and Wi- Fi Connectivity”

Lab

1.Interfacing and programming GPIO ports in C using Tiva (blinking LEDs , push buttons)
2.Interrupt programming examples through GPIOs
3.Use Hibernation mode and wake on RTC interrupt
4.PWM generation using PWM Module on Tiva
5.Interfacing potentiometer with Tiva GPIO
6.PWM based Speed Control of Motor controlled by potentiometer connected to Tiva GPIO
7.Connect the Tiva to terminal on PC and echo back the data using UART
8.Interfacing an accelerometer with Tiva using I2C
9.Experiment on USB (Sending data back and forth across a bulk transfer-mode USB connection.)
10.Using IQmath Library for implementing Low pass FIR filter
11.Review of User APIs for TI CC3100 & Initialization and Setting of IP addresses
12.A basic Wi-Fi application – Communication between two Tiva based sensor nodes using TIVA sensor library in TivaWare
13.Setting up the CC3100 as a HTTP server

TEXT Books:

1. John Davies, "MSP430 Microcontroller Basics", Newnes, 1st Edition
2. Ajit Pal, "Microcontrollers Principles and applications", PHI
3. B. Kanta Rao, "Embedded Systems", PHI
4. Rajkamal, "Embedded Systems Architecture Programming and design", McGraw Hill,

COURSE: EC-802 Advanced Communication Systems

Unit-I
Spread Spectrum Modulation
Introduction, frequency hopping multiple access, CDMA, cellular CDMA systems, multi user detection, time hopping impulse radio

Unit-II
Orthogonal Frequency Division Multiplexing (OFDM)
Introduction, principle of OFDM, implementation of transceivers, frequency-selective channels, channel estimation, peak to average power ratio, inter carrier interference, adaptive modulation and capacity, multiple access, multi carrier code division multiple access, single carrier modulation with frequency-domain equalization.

Unit-III
Multi antenna system: smart antennas, multiple input multiple output systems, multi user MIMO.

Unit-IV
Cognitive Radio
Problem description, cognitive transceiver architecture, principle of interweaving, spectrum sensing, spectrum management, spectrum sharing, overlay, underlay.

Unit V
Cooperative Communication
Introduction and motivation, fundamentals of relaying, relaying with multiple parallel relays, routing and resource allocation in multi hop networks, routing and resource allocation in collaborative networks, applications, network coding.

References:

1. Molisch: Wireless Communications, Wiley India.
2. Upena Dalal: Wireless Communications, Oxford University Press.
3. Kamilo Feher: Wireless Digital Communications, PHI Learning.
4. Zeimer, Peterson and Borth: Introduction to Spread Spectrum Communication, Pearson Education.
5. Mullet: Introduction to Wireless Telecommunication Systems and Networks, Cengage Learning.
6. Dixon: Spread Spectrum Systems, Wiley India.

COURSE: EC-803 Computer Networks

Unit I

Computer Networks

Introduction, applications, types of networks, network software, reference models- OSI model, TCP/IP model, comparison of OSI and TCP/IP models, example networks.

The Physical layer

Design Issues, review of data communication concepts (configuration, topology, transmission mode, media-guided and unguided, types of switching etc).

Unit II

The Data Link layer

Design issues, error detection and correction, data link protocols- stop and wait and sliding window ARQ, utilization of ARQ techniques, example of data link protocol- HDLC.

The Medium Access Control Layer

Static and dynamic channel allocation, multiple access protocols- Pure and slotted ALOHA, CSMA, Collision free protocols, limited contention protocols, CSMA/CD (ETHERNET), fast Ethernet, Gigabit Ethernet.

Unit III

Wireless Protocols

The 802.11, the 802.16, Bluetooth, RFID, Data link layer switching- uses of repeaters, hubs, bridges, switches, routers and gateways.

The Network Layer

Design Issues, Virtual Circuit and datagram networks, routing algorithms- adaptive and non-adaptive algorithms, congestion control algorithms, quality of service, internetworking, Network layer in the Internet- IPv4 protocol, IP addresses, IPv6 protocol, Internet control protocols, Mobile IP.

Unit IV

The Transport Layer

Design issues and services, Transport protocols, congestion control, UDP and TCP protocols, performance issues.

Unit V

The Application Layer

The Domain Name System, E-mail, World Wide Web, streaming audio and video, content delivery.

References:

1. Tanenbaum: Computer Networks, Pearson Education.
2. Bertsekas and Gallager: Data Networks, PHI Learning.
3. Black: Computer Networks, PHI Learning.
4. Forouzan: Computer Networks, TMH.
5. Stallings: Computer Networking and Internet Protocol, Pearson Education.
6. Keiser: Local Area Network, TMH.
7. Forouzan: Data Communication and Networking, TMH.
8. Gupta: Data Communications and Computer Networks, PHI Learning.

List of Experiments:

Practical should be performed using Scilab/ Matlab simulation software based on the above contents.

COURSE: EC-804 TV and Radar Engineering

Unit I

Basic Television System

Introduction: Scanning principles: sound and picture transmission, scanning process, camera pick-up devices, video signal, transmission and reception of video signals, brightness perception and photometric quantities, aspect ratio and rectangular scanning, persistence of vision and flicker, vertical resolution, the Kell factor, horizontal resolution and video bandwidth, interlaced scanning.

Composite Video Signal: Lines and scanning, video signal components, horizontal sync and blanking standards, vertical sync and blanking standards, video modulation and vestigial side band signal, sound modulation and inter-carrier system.

Television Standards: Standard channel characteristics, reception of the vestigial side band signals, television broadcast channel, consolidated CCIR system-B standard, various television broadcast systems.

Television Pick-up devices and Cameras: Camera lenses, auto-focus systems, television camera pick-ups, Silicon Vidicon, CCD image sensors, video processing of camera pick-up signal.

Unit II

Colour Television

Colour fundamentals: mixing of colours and colour perception, chromaticity diagram, colour television camera, colour TV signals and transmission, NTSC, SECAM and PAL system, Trinitron picture tube, automatic degaussing, plasma, LCD displays.

Television transmission and reception: requirement of TV broadcast transmission, design principle of TV transmitters, IF modulation, power output stages, block diagram of TV transmitter, co-channel interference and ghost images during propagation of television signals, antenna requirements for television system, block schematic and function requirements for television receivers, trends in circuit design, colour television receiver.

Unit III

Digital Television Technology

Merits of digital technology, fully digital television system, digital television signals, digitized video parameters, digital video hardware, transmission of digital TV signals, bit rate reduction, digital TV receivers, video processor unit, audio processor unit.

Other television systems: Closed Circuit television system (CCTV), Cable television system (CATV), multiplexed analog component encoding television system (MAC TV), High definition television system (HDTV), High definition multiplexed analog component television (HD-MAC TV), High Performance Computer Controlled TV (HPCC TV), 3-D stereoscopic television techniques..

Unit IV

RADAR

The Radar range equation, block diagram and operation, performance factors: prediction of range performance, minimum detectable signal, receiver noise, probability density functions, signal to noise ratios. Radar cross section of targets, transmitter power, pulse repetition frequency and range ambiguities, antenna parameters.

The CW radar: the Doppler effect, FM-CW radar.

The Moving Target Indicator (MTI) Radar: delay line cancellers.

Unit V

Radar Receivers

The radar receiver, noise figure, mixers, low noise front ends, displays- type A and PPI representations, duplexer and receiver protectors.

Other Radar systems: Synthetic aperture radar, HF over the horizon radar, Air Surveillance Radar (ASR), Bistatic radar.

References:

1. Dhake: Television and Video Engineering, TMH.
2. Skolnik: Introduction to Radar Systems, TMH, New Delhi.
3. Gupta: Television Engineering and Video Systems, TMH, New Delhi.
4. Gulati: Monochrome and Colour Television, New Age International.
5. Grob and Herndon: Basic Television and Video Systems, McGraw Hill International.
6. Peebles, Jr.: Radar Principles, Wiley India Pvt. LTD.
7. Edde: Radar- Principles, Technology Applications, Pearson Education.

List of Experiments:

Section A: Television Engineering

1. (a) To Study the Circuit Description of RF Tuner Section.

   (b) To Study the RF Section by Measuring Voltages at Various Test Points.

   (c) To Study the Fault Simulation and Step-by-Step Fault Finding Procedure for RF Section.

2. (a) To Study the Circuit Description of VIF Tuner Section.

   (b) To Study the VIF Section by Measuring Voltages at Various Test Points.

   (c) To Study the Fault Simulation and Step-by-Step Fault Finding Procedure for VIF Section.

3. (a) To Study the Circuit Description of Video and Chroma Section Tuner Section.

   (b) To Study the Video and Chroma Section by Measuring Voltages at Various Test Points

   (c) To Study the Fault Simulation and Step-by-Step Fault Finding Procedure for Video and Chroma Section.

4. (a) To Observe the Horizontal Oscillator and Horizontal Output Section through Various Test Point.

   (b) To Study the Fault Simulation and Step-by-Step Fault Finding Procedure for Horizontal Oscillator and Horizontal Output Section.

5. (a) To Observe the Vertical Oscillator and Vertical Output Section through Various Test Point.

   (b) To Study the Fault Simulation and Step-by-Step Fault Finding Procedure for Vertical Oscillator and Vertical Output Section.

6. To Study the Fault Simulation and Step-by-Step Fault Finding Procedure for Sound Output Section.

7. To Study the Circuit Description of Audio and Video Section Tuner Section.

8. (a) To Study the System Control Section by Measuring Voltages at Various Test Points.

   (b) To Study the Fault Simulation and Step-by-Step Fault Finding Procedure for System Control Section.

Section B: RADAR

1. Study of Doppler Effect.
2. To Measure Speed of a fan and various Other Objects (Pendulum, Tuning Fork, Plate etc.)
3. To Simulate the Variable Speed of Moving Objects using Velocity Simulator.

PROGRAMME: Electronics and Communication Engineering

COURSE: EC-805 Major Project

The student should prepare a working system or some design or understanding of a complex system that he has selected from the previous semesters using system analysis tools and submit the same in the form of a write-up i.e. detail project report. The student should maintain proper documentation of different stages of project such as need analysis, market analysis, concept evaluation, requirement specification, objectives, work plan, analysis, design, implementation and test plan wherever applicable. Each student is required to prepare a project report based on the above points and present the same at the final examination with a demonstration of the working system.

Course outcome of Electrical Engineering: BE II Year

Course Outcome for Electrical Engineering in B.E./ B.Tech II year is given as follows:-

- Analyze the concept of partial differential equations, Laplace transform & vector calculus.
- To understand the practical aspects of oscilloscope, measurements, errors & bridges.
- To understand the theoretical & practical aspects of semiconductors & MOS circuits.
- To understand basics of electrical circuits with nodal and mesh analysis, network theorems & RLC circuits.
- Analyze the concept of functions of complex variables, differential equation models & probability.
- To understand the fundamental principles of electromagnetic theory.
- To understand the theoretical & practical aspects of low& high frequency amplifiers.
- To understand the theoretical & practical aspects of modulation techniques.
- To identify the most economic generation unit. Understand the different type of stability in power system and stability limit in power system

B.E. 301 - ENGINEERING MATHEMATICS II

Unit I

Fourier Series: Introduction of Fourier series , Fourier series for Discontinuous functions, Fourier series for even and odd function, Half range series Fourier Transform: Definition and properties of Fourier transform, Sine and Cosine transform.

Unit II

Laplace Transform: Introduction of Laplace Transform, Laplace Transform of elementary functions, properties of Laplace Transform, Change of scale property, second shifting property, Laplace transform of the derivative, Inverse Laplace transform & its properties, Convolution theorem, Applications of L.T. to solve the ordinary differential equations

Unit III

Second Order linear differential equation with variable coefficients : Methods one integral is known, removal of first derivative, changing of independent variable and variation of parameter, Solution by Series Method

Unit IV

Linear and Non Linear partial differential equation of first order: Formulation of partial differential equations, solution of equation by direct integration, Lagrange's Linear equation, charpit's method. Linear partial differential equation of second and higher order: Linear homogeneous and Non homogeneous partial diff. equation of nth order with constant coefficients. Separation of variable method for the solution of wave and heat equations

Unit V

Vector Calculus: Differentiation of vectors, scalar and vector point function, geometrical meaning of Gradient, unit normal vector and directional derivative, physical interpretation of divergence and Curl. Line integral, surface integral and volume integral, Green's, Stoke's and Gauss divergence theorem

References

(i) Advanced Engineering Mathematics by Erwin Kreyszig, Wiley India
(ii) Higher Engineering Mathematics by BS Grewal, Khanna Publication
(iii) Advance Engineering Mathematics by D.G.Guffy
(iv) Mathematics for Engineers by S.Arumungam, SCITECH Publuication
(v) Engineering Mathematics by S S Sastri. P.H.I.

EE- 302 Electrical Engg. Materials

Unit I

Conducting Material: Classification and main properties, High resistivity alloy: Constant Mangann,Nichrome, Electrochemical, properties of copper, Aluminum, steel tungsten, Molybdenum, Platinum, Tantalum, Niobium, Mercurry, Nickel, Titanum, Carbon, Lead, thermal, Bitmetals, thermocouple,materials, specific resistance, conductance, variation of resistance with temperature, super conductors.

Unit II

Semi Conductor Materials: General conception, variation of electrical conductivity, Elements having semiconductor properties, general application, hall effect, energy levels, conduction in semiconductors, Intrinsic conduction, impurity conduction, P and N type impurities, electrical change, Neutrality, Drift, Mobility current flow in semi conductors P-N junction formation by alloying, Elasing (forward and reverse) of P-n junction, Reverse separation current, Zener effect, Junction, capacitance, hall defects and hall coeffiecient.

Unit III

Magnetic Materials: Details of magnetic materials, reduction between B.H. and □, soft and hard magnetic materials. Di-magnetic, Para magnetic and Ferromagnetic materials, electrical sheet steel, cast iron. Permanent magnetic materials. Dynamic and static hysteresis loop. Hysterisis loss, eddy current loss, Magnetisation, magnetic susceptibility, coercive force, core temperature, rectangular hysteresia loop, Magnet rest square loop core materials, iron silicon, Iron alloys.

Unit IV

Insulating Materials: General electrical mechanical and chemical properties of insulating material, Electrical characteristics volume and surface resistivity complex permitivity loss, and dielectric loss, equivalent circuits of an imperfect dielectric polarization and polarisability classification of dielectric.

Unit V

Mechanical Properties: Classification insulating materials on the basis of temperature rise. General properties of transformer oil, commonly used varnishes, solidifying insulating materials, resins, bituminous waxes, drying oils, Fibrous insulating materials, wood, paper and cardboard, insulating textiles, varnished adhesive tapes, inorganic fibrous material and other insulating materials, such as mica, ceramic, bakelite, ebonite, glass, PVC, rubber, other plastic molded materials.

References:

1. TTTI Madras; Electrical Engineering Materials; TMH.
2. Electrical Engineering Material s & Devices; John Allison ;TMH
3. Materials for Electrical Engineering: B.M. Tareev
4. Anderson; Di-Electrics :
5. Kortisky; Electrical Engineering Materials:
6. Indulkar and S. Thruvengadem; Electrical Engineering Materials; S. Chand
7. Dekkor AK; Electrical Engineering Materials; PHI.

EE - 303 Electrical Instrumentation

Unit I

Measurement and error, Accuracy and precision, sensitivity resolution, Error & Error analysis, Effect of temperature, Internal friction, Stray field, Hysterisis and Frequency variation & method of minimizing them, Loading effects, due to shunt connected and series connect ed instruments, calibration curve, Testing & calibration of instruments.

Galvanometers – Theory & operation of ballistic galvanometer, D'arsonal galvanometer, galvanometer motion & damping, Sensitivity, Flux meter, Vibration galvanometer, Spot deflection galvanometer. Definition of analog & digital instruments, Classification of analog instruments, their operating principle, Operating force, Types of supports, Damping, Controlling.

Unit II

Different types of Ammeter & Voltmeter – PMMC, MI, Electrodynamometer, Hotwire, Electrostatic, Induction, Rectifier, Ferro dynamic & Electro-thermic, Expression for control & deflection torque, their advantages, disadvantages & error, Extension of range of instruments using shunt & multiplier.

Unit III

Instrument transformers: Potential and current transformers, ratio and phase angle errors, testing of instrument transformers, Difference between CT and PT, errors and reduction of errors.

Measurement of power: Power in AC and DC Circuit, Electrodynamometer type of wattmeter, Construction, theory, operation & error, Low power factor & UPF wattmeter, Double element and three element dynamometer wattmeter, Measurement of power in three phase circuit, one, two & three wattmeter method, Measurement of reactive power by single wattmeter, Measurement of power using CTs & PTs.

Unit IV

Measurement of Energy: Single phase induction type energy meter – construction & operation – driving and braking torques –errors & compensations – Testing by phantom loading and using R.S.S. meter- Three phase energy meter – Tri-vector meter – Maximum demand meter, Ampere hour meter.

Potentiometer – DC potentiometer standardization – Lab type Crompton's potentiometer, application of DC potentiometer, AC polar type and coordinate type potentiometer, their construction and applications.

Unit V

Miscellaneous Instruments & Measurements: Power factor meter, Single phase and three phase Electro-dynamometer type & moving iron type.

Frequency meter – Vibrating reed, Resonance type & Weston type, Synchronoscope, Ohmmeter – series & stunt type, Multi-meter, Megger & Ratio meter.

Resistance Measurement – Classification of low, medium & high resistance – Voltmeter, Ammeter, Wheatstone Bridge, Kelvin's double bridge & loss of charge methods for resistance measurement, **Earth resistance** measurement.

Magnetic Measurement – B-H Curve, Hysterisis Loop determination, Power loss in sheet metal – Lloyd Fischer square for measurement of power loss.

References:

1. E W Golding & F C Widdis; Electrical Measurement & Measuring Instruments; Wheeler Pub.
2. A.K. Sawhney; Electrical & Electronic Measurements & Instrument; Dhanpat Rai & Sons Pub.
3. Buckingham & Price; Electrical Measurements; Prentice Hall

List of experiments (Expandable):

1. Measurement of low resistance using Kelvin's Double bridge
2. Measurement of medium resistance using Wheatstone's bridge
3. Measurement of high resistance by loss of charge method
4. Measurement of Insulation resistance using Megger
5. Measurement of earth resistance by fall of potential method and verification by using earth tester
6. Measurement of power in a single phase ac circuit by 3 voltmeter/ 3 Ammeter method
7. Calibration of a dynamometer type of wattmeter with respect to a standard/Sub Standard wattmeter
8. Calibration of a induction type single phase energy meter
9. Calibration of a dynamometer type of wattmeter by Phantom Loading method
10. Measurements using Instrument Transformers
11. Study of various types of Indicating Instruments
12. Measurement of Power in three phase circuit by one, two & three wattmeters.

EE - 304 Semiconductor Devices and circuits

Unit I
Semiconductor device, theory of P-N junction, temperature dependence and break down characteristics, junction capacitances, Zener diode, Varactor diode, PIN diode, LED, Photo diode, Transistors BJT, FET, MOSFET, types, working principal, characteristics, and region of operation, load line biasing methods,. transistor as an amplifier, gain, bandwidth, frequency response, Various applications of diode and special diodes.

UNIT II
Small signal analysis of transistor (low frequency) using h-parameters, thermal runaway and thermal stability.

Unit III
Feedback amplifier, negative feedback, voltage-series, voltage shunt ,current series and current shunt feedback , Sinusoidal oscillators, L-C (Hartley-Colpitts) oscillators, RC phase shift, Wien bridge, and Crystal oscillators. Power amplifiers, class A, class B , class A B, C amplifiers , their efficiency and power Dissipation, Pushpull and complimentary pushpull amplifier.

Unit IV
Switching characteristics of diode and transistor, turn ON, OFF time, reverse recovery time , transistor as switch , Multivibrators, Bistable, Monostable, Astable multivibrators. Cllipers and clampers, Differential amplifier, calculation of differential , common mode gain and CMRR using h-parameters, Darlington pair , Boot strapping technique. Cascade and cascade amplifier.

Unit V
Operational amplifier characteristics, slew rate , bandwidth, offset voltage ,basic current, application ,inverting , non inverting amplifier , summer , average, differentiator, integrator, differential amplifier , instrumentation amplifier , log and antilog amplifier , voltage to current and current to voltage converters , comparators Schmitt trigger , active filters, 555 timer and its application.

References:
1. Nashelsky & Boysted; Electronic Devices and Circuits; PHI
2. Millman Halkias; Electronic Devices and Circuits; McGraw- Hill
3. Achuthan MA and Bhatt KN; Fundamentals of semiconductor devices; TMH
4. Neamen Donald; Semiconductor Physics and devices
5. Millman & Grabel; Micro Electronics; McGraw-Hill
6. Bogart; Electronic Devices and Circuits; Universal Book Stall, NDelhi
7. Millman & Halkias; Integrated Electronics; McGraw- Hill.
8. Tobbey; OP- Amps their design and Application
9. R.A. Gaikward; OP- Amp and linear Integreted circuit; PHI
10. D. Raychowdhary and Shail Jain; Linear Integrated Circuits
11. Botkar; Integrated Circuits; Khanna
12. Clayton; Applications of linear Integrated circuits
13. I.J. Nagrath; Electronics -Analog and Digital; PHI

List of experiments (Expandable):
1 V-I Characteristics of different types of Diodes.
2 Applications of diodes and Design of various clipping and clamping circuits.
3 Design half & full wave rectifier
4 Design & Analysis of transistor amplifier in CE, CB & CC configuration.
5 Design & Analysis of JFET Amplifier.

6 Design & Analysis of MOSFET Amplifier.
7 To study and construct power amplifiers of various classes.
8 Study of various oscillators.
9 Char. of Op-Amp (input offset voltage, slew rate CMRR, BW, Input bias current)
10 Linear application of OP-Amp (voltage follower, inviting and non-inverting amplifier and their frequency response adder subtractor differential amplifier, integrator and differential frequency response) .
11 study of Op-Amp as a comparator
12 design of Schmitt trigger
13 Design of monoastable & astable multivibrator
NOTE- All experiments (wherever applicable) should be performed through the following steps.
Step 1:
Circuit should be designed/ drafted on paper.
Step 2: Where ever applicable the designed/drafted
circuit should be simulated using Simulation S/W (TINA-V7/ PSPICE/ Labview/ CIRCUIT MAKER etc.).
Step 3: The designed/drafted circuit should be tested on the bread board and compare the results with the simulated results.
Step 4: Where ever required the bread board circuit should be fabricated on
PCB.

EE - 305 Network Analysis

Unit I

Introduction to circuit elements R,L,C and their characteristics in terms of linearity & time dependant nature, voltage & current sources controlled & uncontrolled sources KCL and KVL analysis, Nodal & mesh analysis, analysis of magnetically coupled circuits, Transient analysis :- Transients in RL, RC&RLC Circuits, initial conditions, time constants. Steady state analysis- Concept of phasor & vector, impedance & admittance, Network topology, concept of Network graph, Tree, Tree branch & link, Incidence matrix, cut set and tie set matrices, dual networks, Dot convention, coupling co-efficient, tuned circuits, Series & parallel resonance.

Unit II

Network Theorems for AC & DC circuits- Thevenins & Norton's, Superpositions, Reciprocity, Compensation, Substitution, Maximum power transfer, and Millman's theorem, Tellegen's theorem, problems with dependent & independent sources.

Unit III

Frequency domain analysis – Laplace transform solution of Integro-differential equations, transform of waveform synthesized with step ramp, Gate and sinusoidal functions, Initial & final value theorem, Network Theorems in transform domain

Unit IV

Concept of signal spectra, Fourier series co-efficient of a periodic waveform, symmetries as related to Fourier coefficients, Trigonometric & Exponential form of Fourier series.

Unit V

Network function & Two port networks – concept of complex frequency, Network & Transfer functions for one port & two ports, poles and zeros, Necessary condition for driving point & transfer function. Two port parameters – Z,Y, ABCD, Hybrid parameters, their inverse & image parameters, relationship between parameters, Interconnection of two ports networks, Terminated two port network.

References:

1. M.E. Van Valkenburg, Network Analysis, (PHI)
2. F.F.Kuo, Network Analysis.
3. Mittal GK; Network Analysis; Khanna Publisher
4. Mesereau and Jackson; Circuit Analysis- A system Approach; Pearson.
5. Sudhakar & Pillai; Circuit & Networks- Analysis and Synthesis; TMH
6. Hayt W.H. & J.E. Kemmerly; Engineering Circuit Analysis; TMH
7. Decarlo lin; Linear circuit Analysis; Oxford
8. William D Stanley : Network Analysis with Applications, Pearson Education
9. Roy Choudhary D; Network and systems; New Age Pub
10. Charles K. Alexander & Matthew N.O. Sadiku: Electrical Circuits :TMH
11. Chakraborti :Circuit theory: Dhanpat Rai
12. B.Chattopadhyay & P.C.Rakshit; Fundamental of Electrical circuit theory; S Chand
13. Nilson & Riedel , Electric circuits ;Pearson

List of experiments (Expandable):

1. To Verify Thevenin Theorem.
2. To Verify Superposition Theorem.
3. To Verify Reciprocity Theorem.
4. To Verify Maximum Power Transfer Theorem.
5. To Verify Millman's Theorem.
6. To Determine Open Circuit parameters of a Two Port Network.

7. To Determine Short Circuit parameters of a Two Port Network.
8. To Determine A,B, C, D parameters of a Two Port Network
9. To Determine h parameters of a Two Port Network
10. To Find Frequency Response of RLC Series Circuit.
11. To Find Frequency Response of RLC parallel Circuit.

NOTE- - All experiments (wherever applicable) should be performed through the following steps. **Step 1**: Circuit should be designed/ drafted on paper. **Step 2**: Where ever applicable the designed/drafted circuit should be simulated using Simulation S/W (TINA-V7/ PSPICE/ Labview/ CIRCUIT MAKER etc.). **Step 3**: The designed/drafted circuit should be tested on the bread board and compare the results with the simulated results. **Step 4**: Where ever required the bread board circuit should be fabricated on PCB.

EE - 306 Java Technology

UNIT-I

Basic Java Features - C++ Vs JAVA, JAVA virtual machine, Constant & Variables, Data Types, Class, Methods, Objects, Strings and Arrays, Type Casting, Operators, Precedence relations, Control Statements, Exception Handling, File and Streams, Visibility, Constructors, Operator and Methods Overloading, Static Members, Inheritance: Polymorphism, Abstract methods and Classes

UNIT–II

Java Collective Frame Work - Data Structures: Introduction, Type-Wrapper Classes for Primitive Types, Dynamic Memory Allocation, Linked List, Stack, Queues, Trees, Generics: Introduction, Overloading Generic Methods, Generic Classes, Collections: Interface Collection and Class Collections, Lists, Array List and Iterator, Linked List, Vector. Collections Algorithms: Algorithm sorts, Algorithm shuffle, Algorithms reverse, fill, copy, max and min Algorithm binary Search, Algorithms add All, Stack Class of Package java. Util, Class Priority Queue and Interface Queue, Maps, Properties Class, Un-modifiable Collections.

UNIT–III

Advance Java Features - Multithreading: Thread States, Priorities and Thread Scheduling, Life Cycle of a Thread, Thread Synchronization, Creating and Executing Threads, Multithreading with GUI, Monitors and Monitor Locks. Networking: Manipulating URLs, Reading a file on a Web Server, Socket programming, Security and the Network, RMI, Networking, Accessing Databases with JDBC: Relational Database, SQL, MySQL, Oracle

UNIT–IV

Advance Java Technologies - Servlets: Overview and Architecture, Setting Up the Apache Tomcat Server, Handling HTTP get Requests, Deploying a web Application, Multitier Applications, Using JDBC from a Servlet, Java Server Pages (JSP): Overview, First JSP Example, Implicit Objects, Scripting, Standard Actions, Directives, Multimedia: Applets and Application: Loading, Displaying and Scaling Images, Animating a Series of Images, Loading and playing Audio clips

UNIT–V

Advance Web/Internet Programming (Overview): J2ME, J2EE, EJB, XML.

References:

1. Deitel & Deitel, ”JAVA, How to Program”; PHI, Pearson.
2. E. Balaguruswamy, “Programming In Java”; TMH Publications
3. The Complete Reference: Herbert Schildt, TMH
4. Peter Norton, “Peter Norton Guide To Java Programming”, Techmedia.
5. Merlin Hughes, et al; Java Network Programming , Manning Publications/Prentice Hall

List of Program to be perform (Expandable)

1. Installation of J2SDK
2. Write a program to show Concept of CLASS in JAVA
3. Write a program to show Type Casting in JAVA
4. Write a program to show How Exception Handling is in JAVA
5. Write a Program to show Inheritance and Polymorphism
6. Write a program to show Interfacing between two classes
7. Write a program to Add a Class to a Package
8. Write a program to demonstrate AWT.
9. Write a program to Hide a Class

10. Write a Program to show Data Base Connectivity Using JAVA
11. Write a Program to show “HELLO JAVA ” in Explorer using Applet
12. Write a Program to show Connectivity using JDBC
13. Write a program to demonstrate multithreading using Java.
14. Write a program to demonstrate applet life cycle.

EE -307 Self Study (Internal Assessment)

Objective of Self Study: is to induce the student to explore and read technical aspects of his area of interest / hobby or new topics suggested by faculty.

Evaluation will be done by assigned faculty based on report/seminar presentation and viva.

EE -308 Seminar / Group Discussion(Internal Assessment)

Objective of GD and seminar is to improve the MASS COMMUNICATION and CONVINCING/ understanding skills of students and it is to give student an opportunity to exercise their rights to express themselves.

Evaluation will be done by assigned faculty based on group discussion and power point presentation.

B.E. 401 - ENGINEERING MATHEMATICS III

Unit I

Functions of complex variables : Analytic functions, Harmonic Conjugate, Cauchy-Riemann Equations, Line Integral, Cauchy's Theorem, Cauchy's Integral Formula, Singular Points, Poles & Residues, Residue Theorem , Application of Residues theorem for evaluation of real integrals

Unit II

Errors & Approximations, Solution of Algebraic & Trancedental Equations (Regula Falsi , Newton-Raphson, Iterative, Secant Method), Solution of simultaneous linear equatins by Gauss Elimination, Gauss Jordan, Crout's methods , Jacobi's and Gauss-Siedel Iterative methods

Unit III

Difference Operators, Interpolation (Newton Forward & Backward Formulae, Central Interpolation Formulae, Lagrange's and divided difference formulae), Numerical Differentiation and Numerical Integration.

Unit IV

Solution of Ordinary Differential Equations(Taylor's Series, Picard's Method, Modified Euler's Method, Runge-Kutta Method, Milne's Predictor & Corrector method), Correlation and Regression, Curve Fitting (Method of Least Square).

Unit V

Concept of Probability : Probability Mass function, Probability density function. Discrete Distribution: Binomial, Poisson's, Continuous Distribution: Normal Distribution, Exponential Distribution ,Gamma Distribution ,Beta Distribution ,Testing of Hypothesis |:Students t-test, Fisher's z-test, Chi-Square Method

Reference:

(i) Numerical Methods using Matlab by J.H.Mathews and K.D.Fink, P.H.I.
(ii) Numerical Methods for Scientific and Engg. Computation by MKJain, Iyengar and RK Jain, New Age International Publication
(iii) Mathematical Methods by KV Suryanarayan Rao, SCITECH Publuication
(iv) Numerical Methods using Matlab by Yang,Wiley India
(v) Pobability and Statistics by Ravichandran ,Wiley India
(vi) Mathematical Statistics by George R., Springer

EE- 402 Electromagnetic Theory

Unit I Cartesian, cylindrical & spherical co-ordinate systems, scalar & vector fields, gradient, divergence & curl of a vector field, Divergence theorem & Stokes's theorem, concept of vectors. Electrostatic Fields – Coulomb's law, electric field intensity due to different charge distribution viz. line charge, sheet charge, Field due to continuous volume – electric potential, properties of potential function, potential gradient equipotential surfaces, line of force, Gauss law, applications of Gauss law, Gauss law in point form, method of images.

Unit II Laplace's & Poisson's equations, solution of Laplace's equation, Electric dipole, dipole moment, potential & electric field intensity due to dipole, Behavior of conductors in an electric field. Conductor & insulator, electric field inside a dielectric, polarization, Boundary value conditions for electric Field, Capacitance & Capacitances of various types of capacitors, Energy stored and energy density in static electric field, Current density, conduction & convection current density ohms law in point form, equation of continuity.

Unit III Static Magnetic Field, Biot-Savart's law, Magnetic Field intensity due to straight current carrying filament, circular, square and solenoidal current carrying wire, Relationship between magnetic flux, flux density & magnetic Field intensity; Ampere's circuital law and its applications, magnetic Field intensity due to infinite sheet and various other configurations, Ampere's circuital law in point form, Magnetic force, moving charge in a magnetic field, Lorentz Force on straight and long current carrying conductors in magnetic field, force between two long & parallel current carrying conductors. Magnetic dipole & dipole moment, a differential current loop as dipole, torque on a current carrying loop in magnetic field, Magnetic Boundary conditions.

Unit IV Scalar magnetic potential and its limitations, Vector magnetic potential and its properties, vector magnetic potential due to different simple configurations; Self and Mutual inductances, determination of self & mutual inductances, self inductance of solenoid, toroid coils, mutual inductance between a straight long wire & a square loop. Energy stored in magnetic Field & energy density, Faraday's Law, transformer & motional EMFs, Displacement current, Maxwell's equations as Generalization of circuit equations, Maxwell's equation in free space, Maxwell's equation for harmonically varying Field, static and steady fields, Maxwell's equations in differential & integral form.

Unit V Electro Magnetic Waves : Uniform plane wave in time domain in free space, Sinusoidally time varying uniform plane wave in free space, Wave equation and solution for material medium, Uniform plane wave in dielectrics and conductors, Pointing Vector theorem, instantaneous, average and complex poynting vector, power loss in a plane conductor, energy storage, Polarization of waves, Reflection by conductors and dielectric – Normal & Oblique incidence, Reflection at surface of a conducting medium, surface impedance, transmission line analogy.

References:

1. Mathew N.O Sadiku; Elements of Electromagnetic; Oxford.
2. P.V. Gupta; Electromagnetic Fields; Dhanpat Rai.
3. N.N. Rao; Element of Engineering Electromagnetic; PHI.
4. William H. Hayt; Engineering Electromagnetic; TMH.
5. John D. Kraus; Electromagnetic; TMH.
6. Jordan Balmian; Electromagnetic wave & Radiating System; PHI.
7. David K. Cheng; Fields and Wave Electromagnetic; Addison Wesley.
8. S.P. Seth; Electromagnetic Field ;Dhanpat Rai & Sons

Note: Field plotting of electromagnetic systems on a PC using standard softwares. Application for low and high frequency devices. Suggested softwares, GEMINI(Infolytica), ANSYS, ANSOFT, NISA.

Grading IVth Semester

EE- 403 Power System

Unit I Transmission Systems: Various system of transmission & their comparison, HVDC transmission Converter, inverter, filters & substation layout. Voltage and Reactive Power control.

Unit II Distribution Systems: Primary and secondary distribution systems, concentrated & uniformly distributed loads on distributors fed at one and both ends, ring distribution, sub mains and tapered mains, voltage drop and power loss calculations, voltage regulators, Feeders Kelvin's law and modified Kelvin's law for feeder conductor size and its limitations.

Unit III Overhead Transmission Lines: Types of Conductors, Line Parameters: calculation of inductance and capacitance of single and double circuit transmission lines, three phase lines with stranded and bundle conductors, Generalized ABCD constants and equivalent circuits of short, medium & long lines. Line Performance: circle diagram, regulation and efficiency of short, medium and long lines, Series and shunt compensation, FACTS.

Unit IV Overhead Line Insulators: Types, string efficiency, grading ring, preventive maintenance. Mechanical Design of Transmission Lines: Different types of tower, sag-tension calculations, sagtemplate, string charts, vibration dampers, line supports, spacing of conductors and grounds. Coronacorona losses, radio & audio noise, transmission line - communication line interference

Unit V Cables: Classification, Construction and characteristic of different types. Insulation resistance and capacitance, grading (capacitance and inter sheath), laying, jointing and splicing of cables. phenomenon of dielectric losses, dielectric stress and sheath loss in cables.

References:

1. Nagrath IJ and Kothari DP; "Power System Engineering", Tata McGraw Hill
2. John S. Grainger and W. D. Stevenson Jr.," Power System Analysis", McGraw Hill.
3. Deshpande MV; "Electric Power System Design", TMH.
4. Central Electricity Generating Board; "Modem Power System Practice", Vol 1-8, Pergamon Oxfd
5. James J. Burke," Power Distribution Engineering: Fundamentals & Applications"; Marcel Dekker
6. Westinghouse Electric Corp; Electric Transmission & Distribution Reference Book; East Pittsbrg
7. Wadhwa CL; " Electric Power Systems"; Wiley Eastern Limited.
8. Ashfaq Hussain; "Electrical Power System
9. Gupta BR; "Power System Analysis and Design"
10. Ray " Electrical Power System:Concepts, Theory and practice", PHI

List of Experiments (Expandable):
1 Electrical design of transmission line.
2 Mechanical design of transmission line.
3 Drawing of Tower structure.
4 Drawing of insulators

EE- 404 Electric M/C -1

Unit-I

Transformer-I

Working principle, e.mf. equation, construction, phasor diagrams, equivalent circuit, voltage regulation, losses, separation of hysteresis and eddy current losses, efficiency, tests: open circuit and short circuit, load, Sumpner's test, Condition for maximum efficiency and regulation, Power and distribution transformer, allday efficiency, Excitation phenomenon, Autotransformer: working, advantages , its equivalent circuit and phasor diagram.

Unit II

Transformer-II

Three phase transformer: its construction, groups and connections, their working and applications; Scottconnection; Parallel operation of Transformers: application, advantages, requirement and load sharing; Tap changers, cooling, conservator and breather. Pulse and high frequency transformers.

Unit III

Three phase Induction Motor-I

Working principle, construction, comparison of slip ring and squirrel cage motors, steady state analysis, phasor diagram and equivalent circuit, power flow diagram, torque-speed and power-speed characteristics, Losses and efficiency, No load and block rotor test, circle diagram

Unit IV

Three phase Induction Motor-II

Starting of squirrel cage and slip ring motors, power factor control, Cogging & Crawling, Double cage &Deep bar Indication Motor, impact of unbalanced supply and harmonics on performance, speed control, braking, Induction Generator. Applications

Unit V

Single Phase Motors:

Single Phase Induction motor; double revolving field theory, equivalent circuit and its determination, performance calculation, starting methods and types of single phase Induction motors: their working principle and applications, comparison with three phases Induction Motor. Single phase A.C. series motor, Servo motors, Linear Induction Motor

Reference Books:

1. M. G. Say, Alternating Current Machines', (5th Ed.) ELBS, 1986.
2. V.Del Toro, "Electrical Machines & Power Systems", 1985, Prentice-Hall, Inc., Englewood Cliffs.
3. V.Del Toro, "Electromechanical Devices for Energy Conversion & Control Systems", PHI Pvt. Ltd.,1975.

Text Books:

1. Electrical Machines by Nagrath and Kothari (TMH).
2. A.C. Machines by Langs dorf (McGraw-Hill)
3. Electrical Machines by Dr.P.S.Bimbhra (Khanna).
4. Electrical Machines by Ashfaq Hussain. (Dhanpat Rai).

Grading IVth Semester

List of Experiments (expandable)

Experiments can cover any of the above topics, following is a suggestive list:

1. Perform turn ratio and polarity test on 1-phase transformer

2. Perform load test on a 1-phase transformer and plot its load characteristic

3. Perform OC and SC tests on a 1-phase transformer and determine its equivalent circuit. Also find its efficiency and regulation at different load and power factor.

4. Perform OC and SC tests on a 3-phase transformer and determine its equivalent circuit. Also find its efficiency and regulation at different load and power factor.

5. Perform Sumpner's test on two 1-phase transformer and determine its efficiency at various load.

6. Perform No-load and block rotor test on a 3- phase IM and determine its equivalent circuit.

7. Perform load test on a 3- phase IM and plot its performance characteristics.

8. Study various types of starters used for 3- IMs.

9. Perform No-load and block rotor test on a 1- phase IM and determine its equivalent circuit.

EE- 405 Analog & Digital Communication

Unit-I Time domain and frequency domain representation of signal, Fourier Transform and its properties, Transform of Gate, Periodic gate, Impulse periodic impulse sine and cosine wave, Concept of energy density and power density (Parseval's theorem), Power density of periodic gate and impulse function, impulse response of a system, convolutions, convolution with impulse function, causal and non causal system impulse response of ideal low pass filter, Correlation & Auto correlation.

Unit-II Base band signal, need of modulation, Introduction of modulations techniques,Amplitude modulation, Equation and its frequency domain representation, Bandwidth, Power distribution. AM suppressed carrier waveform equation and frequency domain representation Generation (Balance/Chopper modulator) and synchronous detection technique, errors in synchronous detection, Introduction to SSB and VSB Transmission Angle modulation, Frequency and phase modulation equation and their relative phase and frequency deviations, modulation index frequency spectrum, NBFM and WBFM, Bandwidth comparison of modulation techniques.

Unit-III Sampling of signal, sampling theorem for low pass and Band pass signal, Pulse amplitude modulation (PAM), Time division, multiplexing (TDM). Channel Bandwidth for PAM-TDM signal Type of sampling instantaneous, Natural and flat top, Aperture effect, Introduction to pulse position and pulse duration modulations, Digital signal, Quantization, Quantization error, Pulse code modulation, signal to noise ratio, Companding, Data rate and Baud rate, Bit rate, multiplexed PCM signal, Differential PCM (DPCM), Delta Modulation (DM) and Adaptive Delta Modulation (ADM), comparison of various systems.

Unit-IV Digital modulations techniques, Generation, detection, equation and Bandwidth of amplitude shift keying (ASK) Binary Phase Shift keying (BPSK), Differential phase shift keying (DPSK), offset and non offset quadrature phase shift keying (QPSK), M-Ary PSK, Binary frequency Shift Keying (BFSK), M-Ary FSK Quadrature Amplitude modulation (QAM), MODEM, Introduction to probability of error.

Unit-V Information theory and coding- Information, entropies (Marginal and conditional), Model of a communication system, Mathematical representation of source, channel and receiver characteristics, Mutual information, channel capacity efficiency of noise free channel Binary symmetric channel (BSC) Binary erasure channel (BEC), Repetition of signal, NM symmetric Binary channel, Shannon theorem, Shanon-Hartley theorem (S/N-BW trade off)Source encoding code properties; Shanon, Fano and Huffman coding methods and their efficiency error control coding, Minimum Hamming distance, Linear Block Code, Cyclic code and convolution codes. Line Encoding: Manchester coding, RZ, NRZ coding.

References:

1. Singh & Sapre, Communication System, TMH
2. Taub & shilling, Communication System, TMH
3. Hsu; Analog and digital communication(Schaum); TMH
4. B.P. Lathi, Modern Digital and analog communication system,
5. Simon Haykins, Communication System. John Willy
6. Wayne Tomasi, Electronic Communication system.
7. Martin S. Roden, Analog & Digital Communication System; Discovery Press.
8. Frank R. Dungan, Electronic Communication System, Thomson/Vikas.

List of Experiments(Expandable)
1. Study of sampling process and signal reconstruction and aliasing.
2. Study of PAM PPM and PDM

Grading IVth Semester

3. Study of PCM transmitter and receiver.
4. Time division multiplexing (TDM) and De multiplexing
5. Study of ASK PSK and FSK transmitter and receiver.
6. Study of AM modulation and Demodulation techniques (Transmitter and Receiver) Calculate of parameters
7. Study of FM modulation and demodulation (Transmitter and Receiver) & Calculation of parameters
8. To construct and verify pre emphasis and de-emphasis and plot the wave forms.
9. Study of super hetrodyne receiver and characteristics of ratio radio receiver.
10. To construct frequency multiplier circuit and to observe the waveform
11. Study of AVC and AFC.

EE- 406 Dot Net

UNIT I Introduction .NET framework, features of .Net framework, architecture and component of .Net, elements of .Net.

UNIT II Basic Features Of C# Fundamentals, Classes and Objects, Inheritance and Polymorphism, Operator Overloading, Structures. **Advanced Features Of C#** Interfaces, Arrays, Indexers and Collections; Strings and Regular Expressions, Handling Exceptions, Delegates and Events.

UNIT III Installing ASP.NET framework, overview of the ASP .net framework, overview of CLR, class library, overview of ASP.net control, understanding HTML controls, study of standard controls, validations controls, rich controls. **Windows Forms:** All about windows form, MDI form, creating windows applications, adding controls to forms, handling Events, and using various Tolls

UNIT IV Understanding and handling controls events, **ADO.NET-** Component object model, ODBC, OLEDB, and SQL connected mode, disconnected mode, dataset, data-reader **Data base controls:** Overview of data access data control, using grid view controls, using details view and frame view controls, ado .net data readers, SQL data source control, object data source control, site map data source.

UNIT V XML: Introducing XML, Structure, and syntax of XML, document type definition (DTD), XML Schema, Document object model, Presenting and Handling XML. xml data source, using navigation controls, introduction of web parts, using java script, Web Services

References:

1. C# for Programmers by Harvey Deitel, Paul Deitel, Pearson Education
2. Balagurusamy; Programming in C#; TMH
3. **Web** Commerce **Technology** Handbook by Daniel **Minoli**, Emma **Minoli** , TMH
4. Web Programming by Chris Bates, Wiley
5. XML Bible by Elliotte Rusty Harold ,
6. ASP .Net Complete Reference by McDonald, TMH.
7. ADO .Net Complete Reference by Odey, TMH

List of Experiments/ program (Expandable):

1. Working with call backs and delegates in C#
2. Code access security with C#.
3. Creating a COM+ component with C#.
4. Creating a Windows Service with C#
5. Interacting with a Windows Service with C#
6. Using Reflection in C#
7. Sending Mail and SMTP Mail and C#
8. Perform String Manipulation with the String Builder and String Classes and C#:
9. Using the System .Net Web Client to Retrieve or Upload Data with C#
10. Reading and Writing XML Documents with the XML Text-Reader/-Writer Class and C#
11. Working with Page using ASP .Net.
12. Working with Forms using ASP .Net
13. Data Sources access through ADO.Net,
14. Working with Data readers , Transactions
15. Creating Web Application.

Course outcome of Electrical Engineering: BE III Year

Course Outcome for Electrical Engineering in B.E./ B.Tech III year is given as follows:-

- To understand principles of electromechanical energy conversion Armature reaction, commutation parallel operation of generators Speed Control of DC Motor: Armature voltage and field current control methods Voltage regulation, effect of frequency, parallel operation of transformers Use various types of DC electrical machines in the industry.
- Students are able to calibrate the voltmeter, ammeter by the help of potentiometer Measurement of earth resistance Measure the value of capacitance and inductance by the help of different type of bridges.
- Identify the appropriate type of measuring instrument to be used in each case, and how to make the measurements more accurately.
- Have a thorough understanding of the fundamental concepts and techniques used in digital electronics.
- The course content gives full knowledge to learn Power Electronics Devices.
- Understand how to trigger and protect SCR. Understand the applications of converters in industries.
- To analyze the binary number system, logic gates and semiconductor memories.
- Able to design static and rotating electrical machines using MATLAB & SIMULINK software.
- To understand the theoretical & practical aspects of energy auditing, Load curve analysis & load management DSM.

BE- 501 – Electrical Machine-II

Unit I

Polyphase Synchronous Machines : Constructional features. Polyphase Distributed AC Windings: Types, Distribution, coil span and winding factors. Excitation systems, emf equation and harmonic elimination. Generator Mode, Interaction between excitation flux and armature mmf, equivalent circuit model and phasor diagram for cylindrical rotor machine. Salient pole machines: two reaction theory, equivalent circuit model and phasor diagram. Power angle equations and characteristics. Voltage regulation and affect of AVR. Synchronising methods, Parallel operation and load sharing, operation on infinite busbar.

Unit II

Motoring mode, Transition from motoring to generating mode, Phasor diagram, steady state operating characteristic, V-curves, starting, synchronous condenser, hunting -damper winding effects, speed control including solid state control.

Unit III

Analysis under sudden short circuit. Transient parameters of synchronous machines, various transient and sub-transient reactance, time constant. Expression of transient and sub transient reactance in terms of self and mutual inductances of various windings, Analysis of 3-ph short circuit oscillogram and determination of transient parameters from oscillogram.

Testing of Synchronous Machines - Stability considerations. Brush less generators, Single phase generators.

Unit IV

Generalized theory of Electrical Machines: Basics for development of generalized approach for analysis of electrical machines, Kron's Primitive machine, Concept of rotational transformer, voltage and pseudo stationary coil, Expression for self and mutual inductances of various windings w.r.t. rotor position, Park's and Inverse Parks transformation.

Unit V

Special Electric motors: Switched reluctance motor, linear machines- power energy and levitation types, PM brushless DC motors.

Reference Books:

1. Fitzgerald, C.Kingslay, S.D. Umans, Electric machinery ,5th Ed., McGraw Hills, 1992
2. GMC pherson and R.D. Laramorl, An Introduction to Electric Machine & Transformer,2nd Ed.,John Wiley & Sons, 1990

Text Books:

1. P.S. Bimbhra, Generalised Theory of Electrical Machines.
2. E. Open claw Tayler, The performance & Design of AC Computer Meters, A.H.Wheeler & Co. (P) Ltd. Alalhabad, 1971

Electrical Machine-II EXPERIMENTS

1. Determination of complete torque speed characteristics of a three phase induction machine in braking, motoring and generating regions and it's calibration
2. Study of effect of rotor resistance on the load characteristics of a wound - rotor induction motor.
3. (a) Determination of equivalent circuit parameters, prediction of performance. Verification from

actual load test. (b) Separation of losses of Induction motors and estimation of efficiency.

4. Speed control of Induction motor - Conventional, electronic. Solid state speed control using (i) V constant, (ii) V/f constant, (iii) slip - energy injection

5. Determination of equivalent circuit parameters of a single phase Induction motor. Prediction torque -speed characteristics. Verification from load test

6 Study of torque step rate characteristic of a stepper motor. Determination of operating range.

7. Load characteristic of universal motor, operating on dc and ac supply. Comparison of performance.

8. Load characteristic of shaded pole-motor.

9. Characteristic of switched reluctance motor.

10. Circle diagram of 3 phase Induction Motor.

11. Performance of 3 Ph. Induction Motor with single phasing and comparison.

BE- 502 – Electronic Instrumentation

Unit-I

Introduction to CRO, Different parts of CRO, Its Block diagram, Electrostatic focusing, Electrostatic deflection, post deflection acceleration, Screen for CRTs, Graticule, Vertical & Horizontal deflection system, Time base circuit, Oscilloscope probes and transducers, Attenuators, Application of CROs, Lissajous patterns, Special purpose CROs- Multi input, Dual trace, Dual beam, Sampling, Storage (Analog & Digital) Oscilloscopes.

Unit-II

A.C. Bridge Measurement

Sources and detectors, Use of Bridges for measurement of inductance, Capacitance & Q factor Maxwells bridge, Maxwells inductance capacitance bridge, Hays bridge, Andersons bridge, Owen's Bridge, De-sauty's Bridge, Schering Bridge, High Voltage Schering bridge, Measurement of relative permittivity, Heaviside cambell's bridge, Weins bridge, Universal bridge, Sources of errors in Bridge circuit, Wagner's Earthing device, Q meter and its applications and measurement methods.

Unit-III

Transducers

Transducers definition and classification, mechanical devices as primary detectors, Characteristic & choice of Transducers, Resistive inductive and capacitive transducers, strain gauge and gauge factor, Thermistor, Thermo couples, LVDT, RVDT, Synchros, Piezo-Electric transducers, Magnet elastic and magnetostrictive Hall effect transducers, Opto-electronic transducers such as photo voltaic, Photo conductive, photo diode and photo conductive cells, Photo transistors, Photo optic transducers. Introduction to analog & Digital data acquisition systems-Instrumentation systems used, Interfacing transducers to electronic control & measuring systems Multiplexing - D/A multiplexing A-D Multiplexing, Special encoders. Digital control description

Unit-IV

Signal Generators

Fixed & variable frequency AF oscillators, Sine wave generators, Standard signal generator, AF Sine and Square wave generator Function generator, Square and pulse generator, Random noise generator, Sweep generator, TV Sweep generator, Marker generator, Sweep- Marker generator, Wobblyscope, Video pattern generator Vectroscope, Beat frequency oscillator

Wave analyser Basic wave analyzer, Frequency selective wave analyzer, Heterodyne wave analyzer, Harmonic distortion, analyzer, spectrum analyzer digital Fourier analyzer.

Unit-V

Digital Instruments

Advantages of Digital instruments over analog instruments, resolution and sensitivity of Digital meters., Digital Voltmeter - Ramp type, Dual slope integration type, Integrating type, Successive approximation type, Continuous balance DVM or Servo balancing potentiometer type □VM. , compression of Electronic & Digital Volt meter, Digital Multimeter, Digital frequency meter, Time period measurement, High frequency measurement, Electronic counter, Digital tachometer, Digital PH meter, Digital phase meter, Digital capacitance meter. Digital display system and indicators like CRT, LED, LCD, Nixies, Electro luminescent, Incandescent, Electrophoretic image display, Liquid vapour display dot-matrix display, Analog recorders, X-Y recorders. Instruments used in computer-controlled instrumentation RS 232C and IEEE 488, GPIB electric interface.

List of Experiments:-

1. Measurement of inductance of a coil using Anderson Bridge.
2. Measurement of capacitance of a capacitor using schering bridge.
3. LVDT and capacitance transducers characteristics and calibration.
4. Resistance strain gauge- Strain Measurement and calibration.
5. Measurement of R,L,C & Q using LCR-Q meter.
6. Study & measurement of frequency using Lissajous patterns.
7. Measurement of pressure using pressure sensor.
8. Study of Piezo-electric Transducer and Measurement of impact using Piezo-electric Transducer
9. Measurement of Displacement using LVDT.
10. Measurement of speed of a Motor using photoelectric transducer.
11. Study & Measurement using ph meter.
12. Temperature measurement & Control using thermo couple & using thermistor.

References:

1. Albert. D. Helfrick, W.D. Cooper, Modern Electronic Instrumentation and measurement techniques, PHI.
2. Kalsi H.S., Electronic Instrumentation, TMH.
3. A.K. Sawhney, Electrical and Electronic measurements and Instrumentation, Dhanpat Rai and Co.
4. E.W. Golding, Electrical Measurement and Measuring Instruments Sir Isaac Pitman and Sons, Ltd. London 1940
5. C.S. Rangan, G.R. Sarma, V.S.V. Mani, Instrumentation Devices and Systems Tata McGraw-Hill Publishing
6. Company Ltd.
7. B.C. Nakra, K.K. Choudhry, Instrumentation, Measurement and Analysis Tata McGraw-Hill Publishing CompanyLtd.
8. Morris A.S., Principles of Measurement & Instrumentation, PHI
9. Murthy BVS, "Transducers and Instrumentation", PHI.
10. Doeblin D.O., Measurement Systems- Applications and Desig Albert D. Helfrick, William D.Cooper, Modern Electronic Instrumentation and Measurement Techniques Pearson Education.

BE- 503 – Signals & Systems

Unit I

Dynamic Representation of Systems: Systems Attributes, Causality linearity, Stability, timeinvariance. Special Signals, Complex exponentials, Singularity functions (impulse and step functions).. Linear Time-Invariant Systems: Differential equation representation convolution Integral. Discrete form of special functions. Discrete convolution and its properties. Realization of LTI system (differential and difference equations).

Unit II

Fourier Analysis of Continuous Time Signals and Systems : Fourier Series, Fourier Transform and properties, Parseval's theorem, Frequency response of LTI systems. Sampling Theorem.

Unit III

Fourier Analysis of Discrete Time Signals & Systems : Discrete-Time Fourier series, Discrete-Time Fourier Transform (including DFT) and properties. Frequency response of discrete time LTI systems.

Unit IV

Laplace Transform: Laplace Transform and its inverse: Definition, existence conditions, Region of Convergence and properties, Application of Laplace transform for the analysis of continuous time LTI system (stability etc.) Significance of poles & zeros.

Z-Transform : Z-Transform and its inverse: Definition, existence, Region of convergence and properties, Application of Z-Transform for the analysis of Discrete time LTI Systems, Significance of poles and zeros.

Unit V

Sampling: The sampling theorem, reconstruction of signal from its samples, sampling in the frequency domain, sampling of discrete-time signals.

References

1. Alan V. Oppenheim, Alan S. Willsky and H. Nawab, Signals and Systems, Prentice Hall, 1997
2. Simon Haykin, Communication Systems, 3rd Edition, John Wiley, 1995.

BE- 504 – Digital Electronics & Logic Design

Unit I
(A) Number System: Various number systems-decimal, Binary, Hex and Octal with mutual conversion, binary arithmetic in computers, addition, subtraction, multiplication and division.
(B) Binary Codes: Weighted, non-weighted codes, error detecting and correcting codes, alphanumeric codes, ASCII codes

Unit II
Boolean Algebra & Logic Hardware
(A) Boolean Algebra: AND, OR, NOT, NAND, NOR, EXOR, operations and gates, laws of Boolean algebra, reduction of Boolean expression, logic diagram, universal building blocks, negative logic
(B) Logic hardware " Diode as switch, Bipolar transistor as switch FET as switch, MOSFET (Deplection and Enhancement mode) IC Technology, MSI, LSI, VLSI, logic specification, logic families (DTL, TTL, ECL, MOS, CMOS)

Unit III
Combinational circuits and system
(A) Combinational logic: Minterms and maxterms, Truth table and Karnaugh mapping, reduction of Boolean expression with SOP, POS and mixed terms, incompletely specified functions multiple output minimization, variable mapping, minimization by labular/ Quine Mc cluskey method.
(B) Encoders, Decoders, Multiplexers, Demultiplexers, code convertors, Binary address Digital comparator, parity checker/ generator, programming logic Array (PLA);

Unit IV
Sequential circuits
(A) State tables and diagrams, flip flop and its various types- JK, RS, T, D, pulse and edge triggered flip flops transition and excitation tables, timing diagrams.
(B) Shift registers: Series and parallel data transfer, ripple counters, synchronous counters, Modulo N counter design, Up down counters, Ring

Unit V
Memory & A/D Conversion
(A) Semiconductor ROM, Bipolar and MOS RAM, organization of RAM memory subsystem. Timing circuit, clock circuit and IC Timer.
(B) Analog/ Digital conversion: Digital to analog conversion, dualeslope integration successive approximation, parallel and parallel/ series conversion, converter specifications.

Reference Books:
1. An Introduction to Digital Computer Design by V. rajaraman and T. Radhakrishnan, 3rd Edn. PHI.
2. Digital Principles and Applications by A.P. Malvino and B.P. Leach, 4th Edn. McGraw Hill.
3. Digital computer Fundamentals by T.C. Bratee, 6th Edn. McGraw Hill.
4. Pulse, Digital and switching circuits-Millman

Text Books:
1. Digital Electronics by WH Gothmann, 2nd Edn. PHI.

BE- 505 – Principles of Management & Economics

Unit I

Management Concept: Management, Administration and Organization Difference and Relationship between Organization Management and Administration. Importance of Management, Characteristics of Management

Unit II

Management: Scientific Management, Principles of Management, Process of Management, Functions of Management, Levels of Management, Project Management

Unit III

Decision Making: Introduction and Definition, Types of Decisions, Techniques of Decision Making, Decision
making under certainity Decision making under uncertainty, Decision Making under risk

Unit IV

Managerial Economics: Introduction, Factors Influencing Manager, Micro and Macro-economics, Theory of the Cost, Theory of the Firm, Theory of Production Function.

Unit V

Productivity: Input-Output Analysis, Micro-economics Applied to Plants and Industrial Undertakings, Production and Production system, Productivity, Factors affecting Productivity, Increasing Productivity of Resources

Reference Books

1. The Practice of Management Peter Drucker Harper and Row
2. Essentials of Management: Koontz, Prentice Hall of India
3. Management Staner, Prentice Hall of India
4. Principle and Practice of Management T.N. Chhabra, Dhanpat Rai New Delhi
5. Industrial Organisation and Engineering T.R. Banga and S.C. Sharma,Economics Khanna Publishers
6. Industrial Engineering and Management O.P. Khanna, Dhanpat Rai
7. Managerial Economics Joel Dean, Prentice Hall of India
8. Managerial Economics Concepts & Cases V.L. Mote, Samuel Paul, G.S. Gupta, Tata Mc Graw Hill New Delhi
9. Managerial Economics V.L.Mote, Tata McGraw Hill
10. Analytical Models for Managerial and Engineering Economics Schweyer Reinhold

BE- 506 – Electrical Engg. Simulation Lab

LIST OF EXPERIMENT

1. To generate the pulse with the help of comparator.
2. To generate the pulse with the help of PWM techniques
3. To generate the pulse with the help of sine pulse width modulation
4. To find the time response for series RL, RC,RLC circuit.
5. Write a program to calculate the efficiency of the transformer at various laod conditions and plot the graph between efficiency and load for given data.
6. Write a program to determine the equivalent circuit parameter for given problem.
7. Determine the output waveform for the clipper and clamper circuit
8. To observe the output waveform for the MOSFET
9. To observe the waveform of single phase full wave rectifier circuit with R load
10. To observe the waveform of single phase half wave thyristor circuit with R load
11. To observe the waveform of single phase full wave thyristor circuit with RL & RLE load
12. To observe the waveform of single phase semi convertor circuit with RL & RLE load
13. To observe the waveform of single phase semi convertor circuit, when one of the thyristor is replaced by diode
14. To observe the waveform for class-B COMMUTATION
15. To observe the waveform of single phase half wave AC VOLTAGE CONTROLLER

16. To observe the load current ,voltage and speed waveform of Asynchronous Machine

REFERNCES :-

1.Shailandra Jain, Modeling and simulation using MATLAB/SIMULINK ,willey

2. I.J.Nagrath,D.P. Kothari, Electrical machine,TMH

3.P.C. Sen ,Power Electronics, TMH

EE- 601 – Microprocessor & Microcontrollers

UNIT 1: Microprocessor 8086

Introduction to 16-bit 8086 microprocessors, architecture of 8086, Pin Configuration, interrupts, minimum mode and maximum mode, timing diagram, Memory interfacing, Comparative study of Salient features of 8086, 80286 and 80386.

UNIT 2: Microprocessor 8086 programming

Instruction set of 8086, Addressing mode, Assembler directives & operations, assembly and machine language programming, subroutine call and returns, Concept of stack, Stack structure of 8086, timings and delays,

UNIT 3:Input-Output interfacing: Memory Mapped I/O and Peripherals I/O. PPI 8255 Architecture and modes of operation, Interfacing to 16-bit microprocessor and programming, DMA controller (8257) Architecture, Programmable interval timer 8254, USART 8251, 8 bit ADC/DAC interfacing and programming.

UNIT 4:Microcontroller 8051

Intel family of 8 bit microcontrollers, Architecture of 8051, Pin description, I/O configuration, interrupts; Interrupt structure and interrupt priorities, Port structure and operation, Accessing internal & external memories and different mode of operations, Memory organization, Addressing mode, instruction set of 8051 and programming.

UNIT 5: 8051 Interfacing, Applications and serial communication

8051 interfacing to ADC and DAC, Stepper motor interfacing, Timer/ counter functions, 8051 based thyristor firing circuit, 8051 connections to RS-232, 8051 Serial communication , Serial communication modes, Serial communication programming, Serial port programming in C.

BOOKS:

1. Hall Douglas V. “Microprocessor and interfacing, Programming and Hardware”, second edition, Macmillan, McGraw Hill,.
2. Ray A.K., Bhurchandi K.M. "Advance Microprocessor and peripheral", first edition, TMH
3. Muhammad Ali Mazidi and Janice Gillespie Mazidi “The 8051 Microcontroller and Embedded Systems” Pearson education, 2005.
4. V.Udayashankara and M.S.Mallikarjunaswamy “8051 Microcontroller” McGraw Hill.
5. Mc Kinlay“The 8051 Microcontroller and Embedded Systems – using assembly and C”- PHI, 2006 / Pearson, 2006.
6. Krishna Kant “microprocessors & Microcontrollers Architecture, Programming & System Design.” PHI.

EE- 602 – Electrical Power Generation

Unit I

General consideration on various sources of energy, energy conversion employing steam, energy conversion using water gas turbine

a) MHD generation
b) Solar generation
c) Wind power station
d) Geothermal power generation.

Unit II

Thermal, nuclear and gas power station:

Block diagram of thermal power station, selection of site. Different types of auxilaries used in thermal power station. Nuclear Power Station: Different types of reactors and fuels, safety methods, waste disposal..

Unit III

Gas Power Station:

Block diagram, gas cycles, combined cycle power plants. Comparison between these power stations

Hydro Power Station:

Choice of site, block diagram including surge tank and penstock, Hydrographs, flow duration curve. Types of turbines, base load and peak load power station.

Unit IV

Economic aspects of power plant operations:

Definitions load factor, demand factor and Diversity factor. Calculation of cost of generation, fixed charges, interest and depreciations, Methods of Depreciation. Tariffs: Different types of tariffs, power factor improvement.

Unit V

Economic Scheduling of Power Stations:

Economic operation of power system, criteria of loading of power plants with and without transmission loss, load dispatching in power system, co-generation and coordination of power plants.

Reference:

1.G.R.Nagpal,"Power Plant Engineering", Khanna Publisher
2.. S.N. Singh Electric Power Generation. PHI.
3. M.V.Deshpandey,"Modern Design of Power Station"

EE- 603 – Electrical Machine Design

Unit-I

Introduction: Design problem-Mathematical programming methods, computer aided design-Mathematical formulation of the problem. Programming techniques (LP & NLP only), Methods of solution, Unconstrained optimization problems, constrained optimization problems.

Unit-II

Optimal design of DC machine:-Design of armature, Windings and field systems, Selection of variables for optimal design, Formulation of design equations, Objective function, Constraint functions, Algorithms for optimal design.

Unit-III

Optimal design of power transformer:-Design of magnetic circuit, Design of windings, Selection of variables for optimal design, Formulation of design equations, Objective function, Constraint functions, Algorithms for optimal design.

Unit-IV

Optimal design for 3-phase alternator:-Design of stator, windings, Design of Field systems for salient pole and non-salient pole machines, Selection of variables for optimal design, Formulation of design equations, Objective function, Constraint functions, Algorithms for optimal design.

Unit-V

Optimal design of 3-phase induction motor:-Design of stator, Windings Design of squirrel cage rotor, Design of slip ring rotor, Selection of variables for optimal design, Formulation of design equations, Objective functions Constraint functions, Algorithms for optimal design.

References:

1. Computer- Aided Design of Electrical Equipment- by Dr. M. Ramamoorthy-Affiliated East-West press Pvt. Ltd. New Delhi.
2. Electrical Machine Design- by A.K. Sawhney, Dhanpat Rai & Sons.
3. Principles of Electrical Machine Design with Computer Programmes by- S.K. Sen, Oxford & IBH Publishing Co.
4. Performance and Design of A.C. Machines-M.G. Say, Affiliated East West Press Pvt. Ltd., New Delhi.
5. Performance and Design of D.C. Machines- Clayton & Hancock.
6. Design & Testing of Electrical Machines-Deshpande, PHI.

EE- 604 – Power Electronics

Unit-I

Advantages and application of power electronic devices characteristics, Symbol & application of power diodes, power transistors, GTO, Triac, Diac, Power MOSFET, IGBT, LASCR, Fast recovery diode, schottey diode MCTs. Principle of operation of SCR, Two transistor analogy, brief idea of construction of SCR, Static characteristics of SCR, Condition of turn on & off of SCR Gate characteristics, Method for turning on of SCR, Turnoff methods, different commutation techniques (Class A,B,C,D,E, & F Commutation) firing of SCR, Use of pubic transformer and opto isolator in firing, Resistance firing Ckt, Resistance capacitance firing circuit, UJT firing cut, and ramp triggering, firing for 3-Φ circuit. SCR rating & protection of SCR over voltage, Over current, Suprior firing, Design of snubber circuit and protection of gate of SCR, heating, cooling & mounting of SCR series and parallel operation of SCR, String efficiency & problem associated with series and parallel operation of SCR

Unit-II

Operation and analysis of single phase (Half wave & Full Wave) and multiphase (Three Phase) uncontrolled and controlled rectifier circuit with resistive, resistive & inductive load (continuous & non continuous conduction, Fw small & very large inductive loads) and RLE loads. Estimation of average load voltage and load current for above rectifier cirucits active and reactive power input. Effect of free wheeling diode and source inductance on performance of these rectifier circuits . Comparison of mid point & Bridge rectifier circuits.

Unit-III

Series and parallel inverter, Voltage source & current source inverter, Single phase and three phase bridge inverter, Self cumulated inverters,, Mc- murray & MC murray bed ford inverters, Voltage control of single phase and three phase bridge inverter, Harmonics & their reduction techniques.

Unit-IV

Principle of chopper operation, Various control strategies in chopper, Step up & step-up/step down choppers, chopper configuration (Type A,B, C,D, & E), Steady state analysis of chopper circuits, Current & voltage commutation of chopper circuits Jones & Morgens chopper

Unit-V

Single phase (mid point & bridge configuration) and three phase cyclo convertor configuration and operating principles. AC voltage controllers (using SCRs & Traics) single phase full wave controller with R and RL load, Estimation of RMS load voltage, RMS load current and input power factor, three phase AC voltage controller (Without analysis) Dual converter Switched mode voltage regulator buck, Boost, Buch & Boost, Ck regulators.

References:

1 M.H. Rashid, Power Electronics Circuits, Devices and Applications, Pearson
2 Education, Singapore, 1993.
3 M Ramsmoorthy, An Introduction to transistor and their application, Affiliated East-West Press.
4 P.C. Sen, Power Electonics, TMH.
5 M.D. Singh, K.B. Khanchandani, Power Electronics, TMH, Delhi, 2001.
6 Chakravarti A., Fundamental of Power Electronics and Drives, Dhanpat Ray & Co.,
7 Dr. P.S. Bhimbhra, Power Electonics, Khanna Pub.
8 Vedam Subramanyam, Power Electronics New Age International Revised II ed. 2006.
9 Randall Shaffer, Fundaments of Power Electronics With MATLAB Cengage Leaening 2008.
10 Sivanagaraju, Power Electronics, PHI.

EE- 605 – Energy Conservation & Management

UNIT-I

General energy problem: Energy use patterns and scope for conservation.

Energy audit: Energy monitoring, Energy accounting and analysis, Auditing and targeting. Energy conservation policy, Energy management & audit, Energy audit, Types of energy audit, energy management (audit), qualities and function of energy managers, language of an energy manager, Questionnaire, Check list for top management, Loss of energy in material flow, energy performance, Maximizing system efficiency, Optimizing, input energy requirements, Energy auditing instruments, Material load energy balance diagram.

Unit-II

Thermodynamics of Energy Conservation. Basic principle. Irreversibility and second law efficiency analysis of systems. Primary energy sources, optimum use of prime-movers, energy efficient house keeping, energy recovery in thermal systems, waste heat recovery techniques, thermal insulation. Thermal energy audit in heating, ventilation and air conditioning. Maintenance and Energy audit – friction, lubrication and tribo-logical innovations. Predictive and preventive maintenance.

Unit-III

Load curve analysis & load management DSM, Energy storage for power systems (Mechanical, Thermal, Electrical & Magnetic) Restructuring of electric tariff from energy conservation consideration, Economic analysis depreciation method, time value of money, Evaluation method of projects, replacement analysis, special problems inflation risk analysis. Pay back period, Energy economics, Cost Benefit Risk analysis, Pay back period.

UNIT-IV

Energy efficient electric drives, Energy efficient motors V.S.D. power factor improvement in power system. Energy Conservation in transportation system especially in electric vehicle. Energy flow networks, Simulation & modeling, formulation & Objective & constraints, alternative option, Matrix chart.

Unit-V

Energy conservation task before industry, Energy conservation equipments, Co-Generation, Energy conservation process, Industry Sugar, Textiles, Cement Industry etc Electrical Energy Conservation in building, heating and lighting. domestic gadgets

References:

- Energy Management – W.R. Murphy & G. Mckey Butler worths.
- Energy Management Head Book- W.C. Turner, John Wiley
- Energy Management Principles- Craig B. Smith, Pergamon Press
- Energy Conservation- Paul O Callagan- Pergamon Press
- Design & Management of energy conservation. Callaghan,
- Elect, Energy Utilization & Conservation. Dr. Tripathi S.C.,

Course outcome of Electrical Engineering: BE IV Year

Course Outcome for Electrical Engineering in B.E./ B.Tech IV year is given as follows:-

- Identify basic open-loop and closed-loop control systems, and determine their transfer function by various techniques given. Predict the stability of a given system by using techniques like Routh-Hurwitz criterion, Nyquist plots, etc.
- The student will have a better understanding of the applications and trends of Electric Drives in the current industry.
- To be able to visualize above related field problems. Use High Voltage generation, transmission and protection devices and techniques in the industry.
- Design and work on basic Power System Protection devices, like CTs, PTs, Relays and Circuit Breakers.
- Solve the problems EHV AC transmission, Understand and solve the problems on voltage control. Evaluate the need of HVDC transmission. Prepare for further study in power system. Solve practical problems of power system.
- Understand the Electric Traction and Means of Supplying Power. Utilize Electric Power and Traction in various applications in the industry.

EE-701 – Power System Analysis & Control

Unit-I

General - Problems associated with modern interconnected power Systems, deregulation, power systems restructuring, distributed generation, congestion, available transfer capacities, pricing of energy and transmission services.

Unit-II

Power flow studies - Formulation of static power flow equations and solutions using Gauss-Seidel, Newton Raphson and FDLF methods, comparison of these methods, Economic operation of power system - Economic dispatch, Emission dispatch, line loss, ITL, economic dispatch using lagrangian multiplier method.

Unit-III

MW Frequency control- Coherency, control area, modeling of speed control mechanism, load damping, block diagrammatic representation of single and two area interconnected system, static and dynamic response, .optimum parameter adjustment.

Unit-IV

MVAR Voltage control Problem- Difference in control strategy over MW – f control, characteristics of an excitation system, DC AC and static excitation system, General block diagram representation of voltage regulators.

Unit-V

Power System Stability - Steady state, dynamic and transients stability, Swing equation , equal area criterion, solution of swing equation using step by step method modified Eulers method and Rnge-Kutta method, methods of improving transient stability.

Reference Books :

1.Modern Power Sdystem Analysis-by I.J. Nagrath & D.P. Kothari Tata Mc Graw - Hill Publication Company Ltd 2^{n} edition.

2 A Chakrawarti Power System Analysis:Operation and Control PHI Learning 3rd edition

3. Electrical Power Systems-by C.L. Wadhwa New Age International (P) Limited Publishers, 2nd edition 1998.

4.Weedy B.M."Electric Power System" John Wiley and Sons,3rd edition.

5. Reactive power Control in Electric Systems-by T.J.E. Miller, JohnWiley & Sons.

6. T.K. Nagsarkar, M.S. Sukhiza, -"Power System Analysis", Oxford University Press.

7. Elgerd O.I.,"Electric Energy Systems Theory",TMH, New Delhi,Second Edition 1983.

8. Prabha Kundur, "Power system stability and control", Mc-Graw Hill Inc, New York, 1993.

9. Taylor C.W., "Power System Voltage Stability", Mc-Graw Hill Inc, New York, 1993.

10. Nagrath IJ, Kothari D.P., "Power System Engineering", Tata Mc-Graw Hills, New Delhi 1994.

11. P.S.R. Murthy, "Power System Operation and Control", B S Publication -

List Of Experiments:

1. To develop a program in Matlab for information of Y-bus matrix for N bus system.
2. Load flow solution for 3-bus system using Gauss- Seidel, Newton Raphson and FDLF methods up to 3 iteration.
3. Load flow solution for IEEE 6-bus and 30-bus system in Matlab using Newton Raphson method.
4. Assessment of transient stability of a single machine system.
5. Effect of compensation on voltage profile of IEEE 6-bus system.
6. Study of any software tools (PSCAD, EDSA, Mi POWER, ETAP etc).

EE-702 – Utilization of Electrical Energy

UNIT I ILLUMINATION ENGINEERING

Nature of light, units, sensitivity of the eye, luminous efficiency, glare. Production of Light; Incandescent lamps, arc lamps gas discharge lamps- fluorescent lamps-polar curves, effect of voltage variation on efficiency and life of lamps, Distribution and control of light, lighting calculations, solid angle, inverse square and cosine laws, methods of calculations, factory lighting, flood lighting and street lighting, Direct diffused and mixed reflection & transmission factor, refractors, light fittings.

UNIT II
HEATING, WELDING AND ELECTROLYSIS

Electrical heating-advantages, methods and applications, resistance heating, design of heating elements, efficiency and losses control. Induction heating: core type furnaces, core less furnaces and high frequency eddy current heating, dielectric heating: principle and special applications, arc furnaces: direct arc furnaces, Indirect arc furnaces, electrodes, design of heating elements, power supply and control.
Different methods of electrical welding, resistance welding, arc welding, energy storage welding, laser welding, electrobeam welding, and electrical equipment for them.
Arc furnaces transformer and welding transformers.
Review of electrolytic principles., laws of electrolysis, electroplating, anodisisng- electro-cleaning, extraction of refinery metals, power supply for electrolytic process, current and energy efficiency.

UNIT III TRACTION

Special features of Traction motors, Different system of electric traction and their Advantages and disadvantages, diesel electric locomotives. Mechanics of train movement: simplified speed time curves for different services, average and schedule speed, tractive effort, specific energy consumption, factors affecting specific energy consumption, acceleration and braking retardation, adhesive weight and coefficient of adhesion.

UNIT IV
TRACTION MOTORS

DC motors, single phases and three phases motors, starting and control of traction
motors, braking of traction motors: plugging, rheostatic and regenerative braking, Modern 25 KV a.c.
single phase traction systems: advantages, equipment and layout of 25 KV, line and current selection,
single phase power frequency A.C. traction.

UNIT V

ELECTRIC DRIVES
Individual and collective drives- electrical braking, plugging, rheostatic and regenerative braking load equalization use of fly wheel criteria for selection of motors for various industrial drives, calculation of electrical loads for refrigeration and air-conditioning, intermittent loading and temperature rise curve.

References:

- Tailor, E.O., Utilization of Elect. Energy.
- H. Pratap, Art and Science of Utilization of Electrical Energy.
- Gupta, J.B., Utilization of Elect. Energy
- Garg, G.C., Utilization of Elect. Power and Elect. Traction.
- N V Suryanarayan, Utilization of Elect. Power including Electric Drives and Elect. Traction, New Age International.
- Hancok N N, Electric Power Utilisation, Wheeler Pub.

EE-703 – Electrical Drives

Unit I

Basic Concepts of Electric Drives

Elements of drive systems, Requirement of electric drives, Rating & Selection of drives, groups and individual drives, Constant power and Constant torque drives.

Motor Mechanism dynamics

Review of Characteristics of AC & DC motors, load characteristic, load-drive speed torque characteristics, quadrant speed torque characteristics. Mechanical Systems Stability of Electric drives, referred moment of inertia and torque of motor load combination, load equalization.

Unit II

DC Drives

Starting & Braking of conventional, Phase controlled and chopper controlled drives, Transient & Steady state analysis, Energy recovery systems.

Unit III

Induction Motor Drives

Conventional method of Starting braking and speed control, PWM, (VSI) Voltage source Inverter and Current Sources (CSI) fed IM drives, cyclo converter fed drive, Vector control drives.

Slip Controlled IM Drives

Review of Conventional methods & converter controlled-Crammers & Scherbius drives; rotor impedance control.

Unit IV

Synchronous Motors Drives

VSI and CSI fed; self-controlled-Brush less &. commutatorless dc & ac motor drives.

Unit V

Special Drives :Fundamentals of Switched reluctance motors, Stepper Motors, Permanent Magnet Motor Introduction to vector control; Digital control of drives.

Case Studies Electric traction, steel & cements plants, textile & paper mills, machine tool drive and CNC, electric cars.

List of Experiments:

1. Study the starting and running characteristics of converter fed DC traction motor.
2. To study the energy recovery systems and braking of a DC drive.
3. To study the braking Methods of a three-phase induction motor.
4. To study the performance of VSI fed three-phase induction motor using PWM technique.
5. To control the speed of a three phase slip ring Induction motor using rotor impedance control.
6. To study the performance of Vector Controlled three phase Induction motor drive.
7. To Study frequency Controlled Synchronous motor drive.

8. To study the control & performance Characteristics of switched Reluctance motor.
9. To study the performance & control of a Stepper motor.
10. To Study the Performance of a permanent magnet Brushless dc motor drive.

References:

- Pillai S. K. "A first course on Electrical Drives", Second edition, Wiley Eastern.
- Ned Mohan Electrical Machine Drive WILEY INDIA
- Dubey G. K., "Power Semiconductor Controlled Drives", PHI,
- Dubey G. K. , "Fundamentals of Electrical Drives". Narosa Publishing House.
- Bose B. K., "Power Electronics and AC Drives", PHI Learning.
- Murphy M. D., and Tumbuli F., "Power Electronic Control of AC Motors", Pergamon Press, Oxford University Press.
- P.V. Rao, "Power semiconductor Drives", BS Publications
- S.Shiva Nagaraju power semiconductor drive PHI learning

Elective-I (EE-7101 – Computer Aided Design of Electrical Machines)

Unit-I

Design of Synchronous Machine

Features of construction of low speed and medium speed Machine, design consideration of turbo and water wheel alternators, output coefficient and choice of main dimensions, design of stator winding, design of field systems, regulation, losses and efficiency, cooling systems.

Unit-II

Design of 3 Phase Induction Motor

Design consideration of ac motors, calculation of main dimensions, design of stator winding, effect of air gap on performance.

Rotor Design:

Design of slip ring and squirrel cage rotor, components of leakage reactance, calculation of leakage reactance and its effect on the performance.

Unit-III

Design of single phase Induction motor

Calculation of main dimensions of stator, complete design of stator with its punching details, design of main and auxiliary winding, design of rotor, performance calculation of designed rotor and performance by equivalent circuit approach.

Unit-IV

Design of Electrical Equipments

Design of choke, DC motor starter, Lifting magnets and other electro magnetic devices.

Unit-V

Computer Aided Design

Philosophy and economics of computer aided design, advantages limitations, analysis and synthesis methods, and selection of input data and design variables, flow charts for design of induction motor and synchronous machine. Optimization of design constrained and unconstrained optimization problem

References:

1. Deshpandey M.V., "Design of Electrical Machines" PHI Learning
2. Veinot Cyril G., "Computer Aided Design of Electrical Machinery", MIT Press, London, UK.
3. Say M.G., "Performance Design of AC Machinery"
4. Clayton, "Performance Design of DC Machine"
5 Sharanugasundararn A., Gangadharan G., & Palani R., "Electrical Machine Design Data Book", Wiley Eastern Ltd., New Delhi.
6. Veinolt Cyril.G., "Theory & Design of Small Induction Motors", McGraw-Hill Book Company, Inc..
7. Rama Moorthy, "Computer Aided Design of Electrical Equipment", Affiliated East-West Press, New Delhi.

Elective-I (EE-7102 – Soft Computing Techniques & Application)

UNIT-1
Review of probability theory: Random variable, distribution functions , function of random variable. generation of random digit, and random variants from various distribution function, Monte Carlo simulation, sampling distributions station evolution using MCS, confidence interval, coefficient of variation.

UNIT-2
Evolution of ANN, Artificial neurons activation functions general network structure g - rule, and back propagation rule of training, RBF and FLN network.

UNIT-3
Draw back of classical optimization techniques, genetic algorithm; binary and real parameter GA, constraints handling in GA.

UNIT-4
Evolution strategies(ES), two members non-recombinative ES, multi member ES, recombinative ES. Optimization based on swarm intelligence particle, swarm optimization and its variants .

UNIT-5
Application of soft computing techniques to problem of electrical engg. e.g. economic dispatch, reliable optimization, ANN training using evolutionary algorithms.

References:

1. R.Y. Rubinstein Simulation and the Monte Carlo method, John Wiley & sons 1^{st} Edition.
2. Paul. L. Mayer-Introducing probability and statical application, Addition Weslay.
3. Rajasekaran and pai- Neural Network, Fuzzy logic & Genetic Algorithms. PHI Learing
4. LiMin. Fu, Neural Networks in Computer Intelligence, 9^{th} Reprint TMH
5. Multi objective optimization using evolutionary algorithm- Kalyanmoy Deb John Wiley Sons Ltd.
6. Probability and Random processes for Electrical Engineering , Alberto Leon Garcia II^{nd} Pearson .
7. Principles of soft computing- S N Shivanandan, S N Deepa Wiley India (P) Ltd, I edition 2007.
8. Hand book of genetic algorithm- Rajaserkharans, vijaya laxmi pai.
9. PSO Tutorial- Kennedy Ebuehart.
10. Sivanandam & Deepa- An Introduction to Neural Networks using Matlab 6.0 1^{st} ed., TMH
11. M.Amirthavalli, Fuzzy logic and neural networks, Scitech publications.

Elective-I (EE-7103 – SCADA Systems and Applications)

Unit I

Introduction to SCADA and PLC:SCADA: Data acquisition system, evaluation of SCADA, communication technologies, monitoring and supervisory functions. PLC: Block diagram, programming languages, Ladder diagram, Functional Block diagram, Applications, Interfacing of PLC with SCADA.

Unit II

SCADA system components: Schemes, Remote Terminal Unit, Intelligent Electronic Devices, Communication Network, SCADA server.

Unit III

SCADA Architecture-Various SCADA Architectures, advantages and disadvantages of each system, single unified standard architecture IEC 61850 SCADA / HMI Systems.

Unit IV

SCADA Communication-Various industrial communication technologies- wired and wireless methods and fiber optics, open standard communication protocols.

Unit V

Operation and control of interconnected power system-Automatic substation control, SCADA configuration, Energy management system, system operating states, system security, state estimation, SCADA applications Utility applications, transmission and distribution sector operation, monitoring analysis and improvement. Industries oil gas and water. Case studies, implementation, simulation exercises.

Reference Books:

1. Stuart A Boyer: SCADA supervisory control and data acquisition.
2. Gordan Clark, Deem Reynders, Practical Modem SCADA Protocols.
3. Sunil S. Rao, Switchgear and Protections, Khanna Publication.

Elective-II (EE-7201 – High Voltage Engg.)

Unit - I
Breakdown in gases
Mechanisms of breakdown in gases, various related ionization processes. Townsends and streamer theories. Paschen's law, Breakdown in Non-uniform fields. Effect of wave shape of impressed voltage on the breakdown strength. Breakdown of sphere gap arid rod gap.

Unit - II
Breakdown in liquid and solids
Mechanisms of breakdown in liquids, suspended particle, suspended water, cavitation and tubble and electronic breakdown theories. Mechanisms of breakdown in solids; intrinsic electro-mechanical, erosion, surface, thermal and streamer, Relation between electric strength of solids and time, intrinsic breakdown strength.

Unit - III
Impulse Generator
Specifications of an impulse voltage Wave, standard impulse, reasons for adopting the particular shape, Analysis and control of simple circuit of impulse generator. Multistage impulse generator (Marks circuit) circuit working, earthing arid tripping. Techniques to observe wave front on C.R.O.
Generation of High Voltage
Methods of generation of power frequency high voltage cascade transformers and resonance methods, Generation of high voltage d.c., voltage stabilization. Tesla coil.

Unit - IV Measurement of High Voltage
Potential dividers-resistive, capacitive and mixed dividers for high voltage. Sphere gap; construction, mounting, effect of nearby earthed objects, humidity and atmospheric conditions, effect of irradiation and polarity, Electrostatic voltmeter; principle and classification, constructional details of an absolute electrostatic voltmeter. Oscilloscopes and their applications in high voltage measurement.

Unit - V
High Voltage Testing
Measurement of insulation resistance of cables. Wet and dry flashover test of insulators. Testing of insulators in simulated polluted conditions. Testing off transformers and rotating machines. Measurement of breakdown strength of oil. Basic techniques of non-destructive testing of insulators; measurement of loss angle, High Voltage Schering bridge, and partial discharge measurement techniques.

Over Voltage and Insulation Coordination
Lighting, Switching and temporary over voltages, BIL, SIL, methods of insulation coordination.

References:

- L. V. Bewley, "Traveling Waves on Transmission Systems", Wiley New York. M. S. Naidu and V. Kamaraju," High Voltage Engineering", Tata McGraw Hill.
- D.V. Razevig:" High Voltage Engineering", translated by Dr.M.P. Chourasia,
- Khanna Publisher
- Kuffel & Zingal, High Voltage Engg.
- Kuffel & Abdullah, High Voltage Engg.

Elective-II (EE-7202 – Calibration and Testing of Electrical Equipments)

Unit - I
Electricity Rules: Indian Electricity Rules, Indian Electricity Act, Electricity Supply Act.

Unit - II Standards: Study of Various Indian Standards codes for various important electrical equipments.

Unit - III
Installation & Commissioning : Installation & Commissioning of out door Indoor electrical equipments like transformer, Motors, Switchgears, Panels, Relays, CT, PT, Earthing etc.

Unit - IV
Testing: Testing of new & Old electrical installation as per IS of the following. Transformer, Cables, Insulating Oil, Protective relays, Circuit Breakers, CT, PT, Meters, Energy Meters, PVC insulated cables, High voltage Testing & Routing Test, Type test on above.

Unit - V
Calibration : Calibration of meters, Energy meters, Relays, Circuit breakers, & other equipments as per IS specification.

References:

- M. Subbarao, Installation Commissioning & testing of Electrical Engineering Equipments, Khanna Pub.
- Jagdishlal, Hanbook of Electricity Laws, Delhi Law House.
- I.S. Codes, Indian Standard codes, Indian Standard Institution, Nanak Bhavan, New Delhi.

IS	9283	-	Submersible Motor
IS	325	-	Induction Motor
IS	2071	-	High Voltage Testing
IS	3156	-	Potential Transformer
IS	2705	-	Current Transformer
IS	1255	-	Cables
IS	2026	-	Power Transformer
IS	1866	-	Transformer Oil
IS	694	-	PVC insulated Cables

Elective-II (EE-7203 – Generalised Theory of Electrical Machines)

Unit-I
Review : Primitive machine, voltage and torque equation.
Concept of transformation change of variables & m/c variables and transform variables.
Application to D.C. machine for steady state and transient analysis, and equation of cross field commutator machine.

Unit-II
Induction Machine : Voltage, torque equation for steady state operation, Equivalent circuit, Dynamic performance during sudden changes in load torque and three phase fault at the machine terminals. Voltage & torque equation for steady state operation of 1- ö induction motor & scharge motor.

Unit-III
Synchronous Machine : Transformation equations for rotating three phase windings, Voltage and power equation for salient and non salient alternator, their phasor diagrams, Simplified equations of a synchronous machine with two damper coils.

Unit-IV
Operational Impedances and Time Constants of Synchronous Machines: Park's equations in operational form, operational impedances and G(P) for a synchronous machine with four Rotor Windings, Standard synchronous machine Reactances, time constants, Derived synchronous machine time constants, parameters from short circuit characteristics.

Unit-V
Approximate Methods for Generator & System Analysis : The problem of power system analysis, Equivalent circuit & vector diagrams for approximate calculations, Analysis of line to line short circuit, Application of approximate method to power system analysis.

References:

- P.C.Krause, Analysis of Electric Machinery, Wiley India.
- B.Adkins, The General theory of Electrical Machines.
- B.Adkins & R.G.Harley, The General theory of AC Machines.
- P.S.Bhimbra, Generalised theory of Electrical m/c
- White & Woodson, Electro Mechanical Energy Conversion.

EE-706 – Major Project –I(Planning & Literature Survey)

The Major Project Work provides students an opportunity to do something on their own and under the supervision of a guide. Each student shall work on an approved project, which may involve fabrication, design or investigation of a technical problem that may take design, experimental or analytical character or combine element of these areas. The project work involves sufficient work so that students get acquainted with different aspects of manufacture, design or analysis. The students also have to keep in mind that in final semester they would be required to implement whatever has been planned in the Major Project in this semester. It is possible that a work, which involves greater efforts and time may be taken up at this stage and finally completed in final semester, but partial completion report should be submitted in this semester and also evaluated by an external examiner. At the end of semester, all students are required to submit a synopsis.

EE-707 – Industrial Training

SCHEME OF STUDIES

Duration: 2 weeks after the VI semester in the summer break, Assessment in VII semester.

SCHEME OF EXAMINATION

For the assessment of industrial training undertaken by the students, following components are considered with their weightage.

(a) Term work

In Industry	Marks allotted
1. Attendance and General Discipline	05
2. Daily diary Maintenance	05
3. Initiative and participative attitude during training	05
4. Assessment of training by Industrial Supervisor/s	05
TOTAL	20

(b) Practical/Oral Examination (Viva-Voce)

In Institution	Marks allotted
1. Training Report	10
2. Seminar and cross questioning (defense)	20
TOTAL	30

Marks of various components in industry should be awarded to the students, in consultations with the Training and Placement Officer/Faculty of Institute, Who must establish contact with the supervisor/Authorities of the organisation where, students have taking training to award the marks for term work and I/c of training from Industry. During training students will prepare a first draft of training report in consultation with section in-charge. After training they will prepare final draft with the help of T.P.O./Faculty of the institute. Then they will present a seminar on their training and they will face viva-voce on training in the institute.

1.1 OBJECTIVE OF INDUSTRIAL TRAINING

The objective of undertaking industrial training is to provide work experience so that student's engineering knowledge is enhanced and employment prospects are improved. The student should take this course as a window to the real World of Work and should try to learn as much as possible from real life experiences by involving and interacting with industry staff. Industrial training also provides an opportunity to students to select an engineering problem and possibly an industry guide for their Major Project in final semester.

Industrial training of the students is essential to bridge the wide gap between the classroom and industrial environment. This will enrich their practical learning and they will be better equipped to integrate the practical experiences with the classroom learning process.

1.2 LEARNING THROUGH INDUSTRIAL TRAINING

During industrial training students must observe following to enrich their learning:

- Industrial environment and work culture.
- Organisational structure and inter personal communication.
- Machines/ equipment/ instruments - their working and specifications.
- Product development procedures and phases.
- Project planning, monitoring and control.
- Quality control and assurance.
- Maintenance system.
- Costing system.
- Stores and purchase systems.
- Layout of Computer/ EDP/MIS centres.
- Roles and responsibilities of different categories of personnel.
- Customer services.
- Problems related to various areas of Work etc.

Faculty and TPO are supposed to plan industrial training in such a manner that students get exposure on most of the above arena in the field (world of work). Students are supposed to acquire the knowledge on above by -

1. Observation,
2. Interaction with officials at the workplace
3. Study of Literature at the workplace (e.g. User Manual, standards, maintenance schedules, etc.)
4. "Hand's on" experience
5. Undertaking / assisting project work.
6. Solving problems at the work place.
7. Presenting a seminar.
8. Participating in-group meeting/ discussion.
9. Gathering primary and secondary data/ information through various sources, Storage, retrieval and analysis of the gathered data.
10. Assisting officials and managers in their working.
11. Undertaking a short action research work.
12. Consulting current technical journals and periodicals in the library.
13. Discussions with peers.

1.3 GUIDANCE TO THE FACULTY/TPO FOR PLANNING AND IMPLEMENTING THE INDUSTRIAL TRAINING

The industrial training programme, which is spread to 2 weeks' duration, has to be designed inconsultation with the authorities of the work place, keeping in view the need of the contents. Following are some of the salient points:

- Spelling out the objectives of the industrial training in behavioral terms and same is informed in advance to the 1) students, 2) authorities of the work place and 3) supervising faculty members.
- Discussing and preparing students for the training for which meetings with the students has to be planned.
- Meeting with industrial personnel and orienting them regarding the objective of the training and the expectations of the programme.

- Correspondence with the authorities of the work place.
- Orientation classes for students on how to make the training most beneficial - monitoring daily diary, writing weekly reports, how to interact with various categories of industrial personnel, how to behave and undertake responsibilities, how to gather information from the workplace,ethics etc.
- Guiding students to make individual plans (week wise/ day wise) to undertake industrial training
- Developing a system of maintaining training records, by teachers for every batch of students for convenient retrieval.
- Inviting industrial personnel to deliver lectures on some aspects of training.

1.4 ACTION PLAN FOR PLANNING STAGES AT THE INSTITUTION LEVEL

S.No.	Activity	Commencing Week	Finishing week	Remarks

1. Meeting with Principal
2. Meeting with Colleagues
3. Correspondence with work place (Industries concerned)
4. Meeting with authorities of work place
5. Orientation of students for industrial training
6. Scrutinizing individual training plan of students
7. Commencement of industrial training
8. First monitoring of industrial training
9. Second monitoring of industrial training
10. Finalization of Training report
11. Evaluation of performance at Industry level
12. Evaluation of industrial programme in the institution.

1.5 INDUSTRIAL TRAINING

DAILY DIARY

Name of the Trainee:……………………………………….College:……………………………….

Industry/Work place:…………………………………………………………..Week No.:………………

Department/Section:………………………………………………………….Date:……………………

Dates	Brief of observations made, work done, problem/project undertaken, discussion held,literature-consulted etc.

Course: EE801 Power System Analysis & Control

Unit-I

General - Problems associated with modern interconnected power Systems, deregulation, power systems restructuring, distributed generation, congestion, available transfer capacities, pricing of energy and transmission services.

Unit-II

Power flow studies - Formulation of static power flow equations and solutions using Gauss- Seidel, Newton Raphson and FDLF methods, comparison of these methods, Economic operation of power system - Economic dispatch, Emission dispatch, line loss, ITL, economic dispatch using lagrangian multiplier method.

Unit-III

MW Frequency control- Coherency, control area, modeling of speed control mechanism, load damping, block diagrammatic representation of single and two area interconnected system, static and dynamic response, .optimum parameter adjustment.

Unit-IV

MVAR Voltage control Problem- Difference in control strategy over MW – f control, characteristics of an excitation system, DC AC and static excitation system, General block diagram representation of voltage regulators.

Unit-V

Power System Stability - Steady state, dynamic and transients stability, Swing equation , equal area criterion, solution of swing equation using step by step method modified Eulers method and Rnge-Kutta method, methods of improving transient stability.

Reference Books :

1. Modern Power System Analysis-by I.J. Nagrath & D.P. Kothari Tata Mc Graw – Hill Publication Company Ltd 2nd edition.
2. Electrical Power Systems-by C.L. Wadhwa New Age International (P) Limited Publishers, 2nd edition 1998.
3. Reactive power Control in Electric Systems-by T.J.E. Miller, John Wiley & Sons.
4. T.K. Nagsarkar, M.S. Sukhiza, -"Power System Analysis", Oxford University Press.
5. Elgerd O.I., "Electric Energy Systems Theory", TMH, New Delhi, Second Edition 1983.
6. Prabha Kundur, "Power system stability and control", Mc-Graw Hill Inc, New York, 1993.
7. Taylor C.W., "Power System Voltage Stability", Mc-Graw Hill Inc, New York, 1993.
8. Nagrath IJ, Kothari D.P., "Power System Engineering", Tata Mc-Graw Hills, New Delhi 1994.
9. Weedy B.M. "Electric Power System" John Wiley and Sons, 3rd edition.
10. P.S.R. Murthy, "Power System Operation and Control", B S Publ-ication

11. Power Generation, Operation and Control by A.J. wood and B.F. Wollenberg John Wiley & Sons Inc. 1984.
12. Power Systems Analysis- by A.R. Bergen Prentice Hali Inc.
13. Economic Operation of Power Systems- by L.K. Kirchmayer Wiley Eastern Ltd.

List Of Experiments:

1. To develop a program in Matlab for information of Y-bus matrix for N bus system.
2. Load flow solution for 3-bus system using Gauss- Seidel, Newton Raphson and FDLF methods up to 3 iteration.
3. Load flow solution for IEEE 6-bus and 30-bus system in Matlab using Newton Raphson method.
4. Assessment of transient stability of a single machine system.
5. Effect of compensation on voltage profile of IEEE 6-bus system.
6. Study of any software tools (PSAT, EDSA, MY POWER, ETAP etc).

Course: EE802 Power System Protection

Unit-I

Fault Analysis

Faults in power systems, single line diagram, equivalent impedance diagram, per unitreactances. Analysis (using matrices) of power systems by symmetrical components under:

(a) Three phase short circuit.

(b) Line to line fault.

(c) Line to ground fault.

(d) Double line to ground fault.

Sequence networks and their inter connections for different types of faults, effects offault impedance. Current Limiting Reactors: Applications, types, construction and location of current limiting reactors, short circuit calculation using reactors.

Unit-II

Relays

General considerations, sensing of faults, construction of electro-magnetic attraction and induction types relays, Buchholz and negative sequence relay, concept of reset, pick up, inverse time and definite time characteristics, over current , over voltage, directional, differential and distance relays on R-X diagram. Static Relays: Introduction, advantage and limitation of static relays, static over current, directional, distance and differential relays.

Unit-III

Protection

Types & detection of faults and their effects, alternator protection scheme (stator, rotor, reverse power protection etc.). Power transformer protection (external and internal faults protection), generator-transformer unit protection scheme, bus bar protection. Transmission line protection (current/time grading, distance), Pilot relaying schemes, power line carrier protection.

Unit-IV

Switchgear

Theory of current interruption- energy balance and recovery rate theory, arc quenching, recovery and restriking voltages. Types of circuit breakers. bulk oil and minimum oil, air break and air blast, sulphur hexa fluride (SF6) and vacuum circuit breakers. Rating selection and testing of circuit breakers/operating mechanisms. LT switchgear, HRC fuses, types construction and applications.

Unit-V

Modern Trends In Protection

Electronic relays, static relays functional circuits: comparators, level detectors, logic and training circuits, microprocessor and computer based protection schemes, software development for protection, security & reliability.

List of Experiments:

Operating Characteristics of

1) Over Voltage Relays
2) IDMT Relays
3) Percentage based differential relays
4) Determination of instantaneous relays
5) Buchholz relays
6) Solid state over current relays

Course: EE 8301 Advanced Electrical Drives

COURSE CONTENTS

Unit-I

Review of electric motors & Solid state converters: Speed control techniques of DC, Induction & synchronous motor, Converters, inverters, chopper and cyclo converter operation, Effects of power electronic equipments on load side & supply side.

Unit-II

Review of closed loop controllers, sensors & transducers : PI, PID, Variable structure. AC, DC & Pulse tacho-generators.

Unit-III

DC Drives : Converter & chopper fed DC drive, Reversing, Starting, Regenerative breaking , Four quadrant operation, High power application.

Unit-IV

AC Drive: Inverter & cyclo converter fed drive, Vector control, Sensor less operation, Linear electrical motor concept, Synchronous motor drive

Unit-V

Special Drives: Switched reluctance & permanent magnet brushless DC Operation, Converters, Characteristics & Control, PLC based drives.

Unit-VI

Servo drives & stepper motor- AC & DC Servomotor, Stepper motor, Control techniques, Controllers, Microstepping, Sensorless operation.

Unit-VII

Power Quality & energy Conservation- Line Side pollution, standards, Harmonic elimination techniques in converter, Filters, Energy efficient electric motors, Pay back periods, Energy conservation through sold state control.

Reference:

- Ned Mohan, T.M. Undeland, W.P. Robbins, Power Electronics-Converters, Applications and design", John Wiley & Sons.
- J.M.D. Murphy, F.O. Turnbull, "Power Electronic Control of AC motors", Pergamon Press.
- P.C. Sen, D.C. drive, Pergamon Press
- B.K. Bose, Power Electronics & AC drive prentice Hall.
- Dubey G.K. "Power semi Conductor controller drives, Prentice Hall.
- Vedam Subramanyam, "Electrical Drives".
- T.J.E. Miller, Switched Reluctance & P.M. B.L. DC motor, Pergamon Press
- P.V. Rao, "Power semiconductor Drives", BS Publications.

Course: EE8302 Process Control

COURSE CONTENTS

Unit I

Special characteristics of process systems large time constants, interaction, multistaging, pure lag; control loops for simple systems and their Dynamics & stability.

Unit II

Generation of control action in electronic and pneumatic controllers. Control valves, valve positioners, relief and safety valves, relays, volume boosters, pneumatic transmitters for process variable. Tuning of controllers - Zeigler Nichols and other techniques.

Unit III

Different control techniques and interaction of process parameters e.g. feed forward, cascade, ratio, over-ride controls Batch continuous process controls. Feed forward Control schemes.

Unit IV

Various process schemes / unit operations and their control schemes e.g. distillation columns, absorbers, heat exchangers, furnaces, reactors, mineral processing industries, etc. Use of control schemes for process optimization.

Unit V

Advanced control strategies with case studies. Use of DDC and PLC. Introduction to supervisory control. Conversion of existing control schemes in operating plants, data loggers.

References:

- Dale Patrick, Stephen Fardo, "Industrial Process Control System".
- Shinskey F.G., "Process Control System", III Ed., McGraw Hill.
- Smith C.A. & A.B. Corripio, "Principle & Practiced Automatic Process Control", J. Willey.
- Rao M & S.Qiv, "Process Control Engg.", Gorden & Breach.

Course: EE8303 Computer Application to Power Systems

Course Contents

Unit I

Models of power system components, network model using graph theory, formation of Z bus, transmission line models, regulating transformer, line loadability, capability curves of alternator.

Unit II

Control of load bus voltage using reactive power control variable, SVC & SVS, Regulated shunt compensation, series and shunt compensation, Uniform series and shunt compensation and effect on loadability of transmission lines.

Unit III

Sensitivity analysis- General sensitivity relations, generation shift distribution factors, line outage distribution factors, compensated shift factors, sensitivity associated with voltage-VAR, sensitivities relating load bus voltage changes in terms of PV bus voltage changes, sensitivity relating changes in reactive power generation for changes in PV Bus Voltage.

Unit IV

Power system security – Security functions, Security level, contingency analysis, security control, economic dispatch using LP formulation, pre-contingency and post- contingency, corrective rescheduling.

Unit V

Voltage stability - Difference between voltage and angle stability, PV Curve for voltage stability assessment, proximity and mechanism, modal analysis using reduced Jacobian, participation factor, effect of series and shunt compensation on voltage stability , effect of load models.

References:

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- Power Generation, Operation and Control by A.J. wood and B.F. Wollenberg John Wiley & Sons Inc. 1984.
- Computer methods in power systems analysis – by stage G.W. and E.L. Abiad A.H. Mc Graw Hill.
- Computer Techniques in Power Systems Analysis- Pai M.A. Tata Mc Graw Hill.
- Computer Modeling of Electrical Power Systems, Arrillaga J. Arnord C.P Harker B.J. John Wiley & Son
- Computer Aided Power Systems Analysis Kusic G.L.- 2nd Edition, CRC Press
- Modern Power Systems Analysis Nagrath I.J. and Kothari D.P. Tata Mc Graw Hill.
- Power System Analysis Grainger J.J. & Stevnson W.D. Mc Graw Hill.
- Power System Stability and control –P Kundur ,IEEE Press 1994.
- Advance Power Systems Analysis and Dynamics Singh L.P. John Wiley.

Course: EE 8401 Renewable & Non Conventional Energy Systems

COURSE CONTENTS

Unit - I

Renewable Energy Systems

Energy Sources, Comparison of Conventional and non-conventional, renewable and non-renewable sources. Statistics of world resources and data on different sources globally and in Indian context. Significance of renewable sources and their exploitation. Energy planning, Energy efficiency and management.

Unit – II

Wind Energy System

Wind Energy, Wind Mills, Grid connected systems. System configuration, working principles, limitations. Effects of wind speed and grid conditions. Grid independent systems - wind-battery, wind-diesel, wind-hydro biomass etc. wind operated pumps, controller for energy balance.Small Hydro System Grid connected system, system configuration, working principles, limitations. Effect of hydro potential and grid condition. Synchronous versus Induction Generator for stand alone systems. Use of electronic load controllers and self excited induction generators.Wave Energy System: System configuration: grid connected and hybrid systems.

Unit - III

Solar Radiation

Extraterrestrial solar radiation, terrestrial solar radiation, Solar thermal conversion, **Solar Photo tonic System**

Solar cell, Solar cell materials, efficiency, Characteristics of PV panels under varying insulation. PV operated lighting and water pumps, characteristics of motors and pumps connected to PV panels.

Biomass Energy System: System configuration, Biomass engine driven generators, feeding loads in stand-alone or hybrid modes, Biomass energy and their characteristics.

Unit – IV

Energy from oceans

Ocean temperature difference, Principles of OTEC, plant operations,

Geothermal Energy

Electric Energy from gaseous cells, Magneto-hydro generated energy, Non hazardous energy from nuclear wastes, Possibilities of other modern non-conventional energy sources.

Unit - V

Electric Energy Conservation

Energy efficient motors and other equipment. Energy saving in Power Electronic controlled drives. Electricity saving in pumps, air-conditioning, power plants, process industries, illumination etc. Methods of Energy Audit.

Measurements systems; efficiency measurements. energy regulation, typical case studies, various measuring devices analog and digital, use of thyristers.

References:

- John Twidell & Toney Weir, Renewable Energy Resources, E & F N Spon.
- El-Wakil, Power Plant Technology, McGraw Hill.
- Rai G D, Non-conventional Energy Resources, Khanna.
- F Howard E. Jordan, "Energy-Efficient Electric Motor & their Application-II", Plenum Press, New York, USA.
- Anna Mani, "Wind Energy Resource Survey **in** India-Ill", Allied Publishers Ltd., New Delhi,
- S.P. Sukhatme: Solar Energy, TMH-4e,
- Dr. A. Ramachandran, Prof B.V Sreekantan & M F.C. Kohli etc, "TERI Energy Data Directory & Year book 1994-95", Teri Tata Energy Research Institute, New Delhi,

Course: EE8402 Power System Planning & Reliability

Course Contents

Unit-I

Review of Probability Theory Element of probability theory Probability Distribution, Random variable, Density and distribution functions. Mathematical expectation. Binominal distribution, Poisson distributions, Normal distribution, Exponential distribution, Weibull distribution.

Unit-II

Reliability of Engineering Systems
Component reliability, Hazard models, Reliability of systems wit non-repairable components, series, Parallel, Series-Parallel, Parallel-series configurations. Non-series-parallel configurations, minimal tie-set, minimal cut-set and decomposition methods. Repairable systems, MARKOV process, Long term reliability, Power System reliability.

Unit-III

Reliability of Engineering Systems
Reliability model of a generating unit, State space methods, Combing states, sequential addition method, Load modeling, Cumulative load model, merging of generation and load models, Loss of load probability, Percentage energy loss, Probability and frequency of failure, Operating reserve calculations.

Unit-IV

Power Network Reliability
Weather effect on transmission lines, Common mode failures, Switching after fauls, three, state components, Normally open paths, Distribution system reliability.

Unit-V

Composite System Reliability
Bulk Power supply systems, Effect of varying load, Inter connected systems, correlated and uncorrelated load models, Cost and worth of reliability.

Unit-VI

Reliability Improvement & Testing
Proper Design simplicity, Component improvement
Testing Plans, time censored & sequential reliability tests, accelerated life test, Environ mental test, Reliability estimations

References:

- J. Endreny, Reliability Modeling in Electric Power Systems, John Wiley & Sons.
- Roy Billinton & Ronald, N allan, Reliability Evaluation of Power Systems, Plenum Press, New York.

Course: EE8403 EHV A.C. and D.C. Transmission

COURSE CONTENTS

Unit-I

Constitution of EHV a.c. and d.c. links, Kind of d.c. links, Limitations and Advantages of a.c. and d.c. transmission, Principal application of a.c. and d.c. transmission, Trends in EHV a.c. and d.c. transmission, Power handling capacity. Converter analysis garetz circuit, Firing angle control, Overlapping.

Unit-II

FACTS devices, basic types of controller, series controller, static synchronous series compensator(SSSC), thyristor-controlled series capacitor(TCSC), thyristor controlled series reactor(TCSR), shunt controller (STATCOM), static VAR compensator(SVC), series-series controller, combined series-shunt controller, unified power flow controller(UPFC), thyristor controlled phase shifting transformer(TCPST).

Unit-III

Components of EHV d.c. system, converter circuits, rectifier and inverter valves, Reactive power requirements, harmonics generation, Adverse effects, Classification, Remedial measures to suppress, filters, Ground return. Converter faults & protection harmonics misoperation, Commutation failure, Multiterminal D.C. lines.

Unit-IV

Control of EHV d.c. system desired features of control, control characteristics, Constant current control, Constant extinction angle control. Ignition Angle control. Parallel operation of HVAC & DC system. Problems & advantages.

Unit-V

Travelling waves on transmission systems, Their shape, Attenuation and distortion, effect of junction and termination on propagation of traveling waves. Over voltages in transmission system. Lightning, switching and temporary over voltages: Control of lighting and switching over voltages

Reference:

1. S. Rao,- "EHV AC & DC Transmission" Khanna pub.
2. Kimbark,-" HVDC Transmission" john willy & sons pub.
3. Arrillaga,- "HVDC Transmission"2nd Edition ,IEE londan pub.
4. Padiyar, -"HVDC Transmission" 1st Edition ,New age international pub.
5. T.K. Nagsarkar,M.S. Sukhiza, -"Power System Analysis", Oxford University
6. Narain.G. Hingorani, l. Gyugyi-"Undustanding of FACTS concept and technology", John Wiley & sons pub.
7. P.Kundur- "H.V.D.C. Transmission" McGraw Hill Pub.

Course: EE803 Major Project

COURSE GUIDELINES

The objectives of the course ‘Major Project’ are

- To provide students with a comprehensive experience for applying the knowledge gained so far by studying various courses.
- To develop an inquiring aptitude and build confidence among students by working on solutions of small industrial problems.
- To give students an opportunity to do some thing creative and to assimilate real life work situation in institution.
- To adapt students for latest developments and to handle independently new situations.
- To develop good expressions power and presentation abilities in students.

The focus of the Major Project is on preparing a working system or some design or understanding of a complex system using system analysis tools and submit it the same in the form of a write-up i.e. detail project report. The student should select some real life problems for their project and maintain proper documentation of different stages of project such as need analysis, market analysis, concept evaluation, requirement specification, objectives, work plan, analysis, design, implementation and test plan. Each student is required to prepare a project report and present the same at the final examination with a demonstration.

The faculty and student should work according to following schedule:

i) Each student undertakes substantial project in an approved area of the subject and supervised by a member of staff.

ii) The student must submit outline and action plan for the project execution (time schedule) and the same be approved by the concerned faculty.

iii) At all the steps of the project, students must submit a written report of the same.

Course outcome of Electronics & Communication Engineering: BE II Year

- Analyze the concept of partial differential equations ,Laplace transform & vector calculus.
- Students learn the internal computer concepts & microprocessor.
- To understand the practical aspects of oscilloscope, measurements, errors & bridges.
- To understand the theoretical & practical aspects of semiconductors & MOS circuits.
- To understand basics of electrical circuits with nodal and mesh analysis, network theorems & RLC circuits.
- Analyze the concept of functions of complex variables, differential equation models & probability.
- To understand the fundamental principles of electromagnetic theory.
- To analyze the binary number system, logic gates and semiconductor memories.
- To understand the theoretical & practical aspects of low & high frequency amplifiers.
- To understand the theoretical & practical aspects of modulation techniques.

B.E. 301 - ENGINEERING MATHEMATICS II

Unit I

Fourier Series: Introduction of Fourier series , Fourier series for Discontinuous functions, Fourier series for even and odd function, Half range series Fourier Transform: Definition and properties of Fourier transform, Sine and Cosine transform.

Unit II

Laplace Transform: Introduction of Laplace Transform, Laplace Transform of elementary functions, properties of Laplace Transform, Change of scale property, second shifting property, Laplace transform of the derivative, Inverse Laplace transform & its properties, Convolution theorem, Applications of L.T. to solve the ordinary differential equations

Unit III

Second Order linear differential equation with variable coefficients : Methods one integral is known, removal of first derivative, changing of independent variable and variation of parameter, Solution by Series Method

Unit IV

Linear and Non Linear partial differential equation of first order: Formulation of partial differential equations, solution of equation by direct integration, Lagrange's Linear equation, charpit's method. Linear partial differential equation of second and higher order: Linear homogeneous and Non homogeneous partial diff. equation of nth order with constant coefficients. Separation of variable method for the solution of wave and heat equations

Unit V

Vector Calculus: Differentiation of vectors, scalar and vector point function, geometrical meaning of Gradient, unit normal vector and directional derivative, physical interpretation of divergence and Curl. Line integral, surface integral and volume integral, Green's, Stoke's and Gauss divergence theorem

References

(i) Advanced Engineering Mathematics by Erwin Kreyszig, Wiley India
(ii) Higher Engineering Mathematics by BS Grewal, Khanna Publication
(iii) Advance Engineering Mathematics by D.G.Guffy
(iv) Mathematics for Engineers by S.Arumungam, SCITECH Publuication
(v) Engineering Mathematics by S SSastri. P.H.I.

EC- 302 Computer Organization& Architecture

Unit I:

Computer Organization Computer types, Structure with basic computer components, Function in brief with instruction fetch and execute, Interrupts and I/O communication, Interconnection structure, bus interconnection, Multiple Bus hierarchies, Elements of bus design Performance metrics and measurement

Unit II: Computer Memory System Characteristics of memory system, Memory hierarchy, Cache Memory- Cache memory principles, Elements of cache design- cache address, size, mapping functions, replacement algorithms, write policy, Internal Memory- semiconductor memory, External Memory- Hard Disk organization, RAID

Unit III:

Input and Output System I/O modules- Module function and I/O module structure, Programmed I/O , Polling I/O, Interrupt driven I/O , DMA function, Synchronous and Asynchronous serial data communication, Computer peripherals like keyboard, mouse, printer, scanner and display devices

Unit IV:

Processor Organization Evolution of Intel processor architecture- 4 bit to 64 bit, Control unit Hardwired and microprogrammed, concept of pipelining , Study of microprocessor 8085,Functional pins and Register organization, Memory mapped I/O and I/O mapped I/O schemes,

Unit V:

Instruction Set and Assembly Language Programming Addressing modes and Formats- immediate, direct, indirect, register, register indirect, displacement and stack, Instruction Cycle machine cycle and Data flow, 8085 instruction set and assembly programming, Time delay concept , stack and subroutines, Interrupt handling, Instruction set architecture RISC and CISC

References:

[1] William Stallings, “Computer Organization and Architecture”, Prentice Hall of India, Sixth Edition.

[2] A. Tannenbaum, “Structured Computer Organization”, Pearson Education, 2002.

[3] Patterson & Hennessy, “Computer Organization and Design”, Morgan Kaufmann, 2007

[4] Ramesh S. Gaonkar, “Microprocessor, Architecture, Programming, and Applications with the 8085”, Penram International Publication, 5/e

EC - 303 Electronic Instrumentation

Unit-I

Measurement and Error: Accuracy and Precision, Sensitivity, Linearity, Resolution, Hysterisis, Loading Effect. Measurements of Current, Voltage, Power and Impedance: DC and AC Ammeter, DC Voltmeter-Chopper type and solid-state, AC voltmeter using Rectifier, Average, RMS, Peak Responding voltmeters, Multi-meter, Power meter, Bolometer and Calorimeter.

Unit-II

Cathode Ray Oscilloscope (CRO): Different parts of CRO, Block diagram, Electrostatic focusing, Electrostatic deflection, Post deflection acceleration, Screen for CRTs, Graticules, Vertical and Horizontal deflection system, Time base circuit, Oscilloscope Probes, Applications of CRO, Special purpose CROs-Multi input, Dual trace, Dual beam, Sampling, Storage (Analog and Digital), Oscilloscope.

Unit-III

AC Bridges: Maxwell's bridge (Inductance and Inductance-Capacitance), Hay's bridge, Schering bridge (High voltage and Relative permittivity), Wein bridge, Wagner earth detector, Impedance measurement by Q-meter. **Non-Electrical Quantities (Transducer):** Classification of Transducers, Strain gauge, Displacement Transducer- Linear Variable Differential Transformer (LVDT) and Rotary Variable Differential Transformer (RVDT), Temperature Transducer- Resistance Temperature Detector (RTD), Thermistor, Thermocouple, Piezo-electric transducer, Optical Transducer- Photo emissive, Photo conductive, Photo voltaic, Photo-diode, Photo Transistor, Nuclear Radiation Detector.

Unit-IV

Signal generator & Display: Signal and Function Generators, Sweep Frequency Generator, Pulse and Square Wave Generator, Beat Frequency Oscillator, Digital display system and indicators, Classification of Displays, Display devices, Light Emitting diodes(LED), Liquid Crystal Display(LCD).

Unit-V

Digital Measurement and Instruments: Advantages of Digital Instrument over Analog Instrument, Digital-to-analog conversion (DAC) - Variable resistive type, R-2R ladder Type, Binary ladder, Weighted converter using Op-amp and transistor, Practical DAC. Analog-to-digital Conversion(ADC) -Ramp Technique, Dual Slope Integrating Type, Integrating Type (voltage to frequency), Successive Approximations, digital voltmeters and multi-meters, Resolution and sensitivity of digital meter, PLC structure, principle of operation, response time and application.

References:

1. H. S. Kalsi: Electronics Instrumentation, TMH.

2. K. Sawhney: Instrumentation and Measurements, Dhanpat Rai and Co.

3. Helfric and Cooper: Modern Electronic Instrumentation and Measurement Techniques; Pearson.

List of Experiments:

All experiments (wherever applicable) should be performed through the following steps.

Step 1: Circuit should be designed/drafted on paper.

Step 2: The designed/drafted circuit should be simulated using Simulation Software

Step 3: The designed/drafted circuit should be tested on the bread board and compare the results with the simulated results.

Step 4: The bread board circuit should be fabricated on PCB by one batch using PCB machine.

1. Study of CRO and Function Generator.
2. Displacement measurement by LVDT.
3. Force measurement by strain gauge.
4. Measurement of Capacitor, Self-induction using Q-meter.
5. Temperature measurement by thermistor, RTD and thermocouple.
6. Optical Transducer- Photo conductive, Photo voltaic, Photo-diode, Photo-Transistor
7. Design of digital to analog converter.
8. PLC operation and applications (for example: relay, timer, level, traffic light etc.)

EC - 304 Electronic Devices& Circuits

Unit-I

Semiconductor intrinsic and extrinsic, p-type and n-type, energy band diagrams, majority and minority carrier, charge density in semiconductor, generation and recombination of charges, process of diffusion, diffusion and drift currents, Hall effects and its applications. p-n junction, depletion layer, potential barrier, electric field, forward and reverse biased junction, current components in p-n diode, current equation, V-I characteristics, cut in voltages of Si and Ge diode, transition and diffusion capacitance, power dissipation,.

Unit-II

Diodes Family: Characteristics and application of Zenerdiode, avalanche diode, Varactor diode, Schottky diode, Tunnel Diode, PIN diode, LED, photodiodes, phototransistors,

Diode Applications: p-n junction diode as rectifier, clipper and clamper, The diode as a circuit element, The Load line concept, The Pieceswise linear diode modal, Clipping circuits, Clipping at two independent levels, Comparators, Sampling Gate, Rectifiers, Other full wave circuits, Capacitor filter additional diodes circuits.

Unit-III

Bipolar junction transistor - Construction, basic operation, current components and equations,. CB, CE and CC-configuration, input and output characteristics, Early effect, region of operation, active, cutoff and saturation region Ebers-Moll model, , power dissipation in transistor (Pdmax rating), Photo transistor, Uni-junction Transistor (UJT) : Principle of operation, characteristics,

Unit-IV

Small Signal analysis: Small signal Amplifier,Amplifier Bandwidth, Hybrid model, analysis of transistor amplifier using H parameter, Transistor at high frequencyHybrid πmodel.

Power Amplifiers: ClassA,ClassB,ClassAB,ClassC,Class D, Transformer coupled and Push-Pull amplifier.

Unit-V

FET construction- JFET: Construction, n-channel and p-channel, transfer and drain characteristics, parameters,Equivalent model and voltage gain, analysis of FET in CG, CS and CD configuration. Enhancement and Depletion MOSFET drainand transfer Characteristics.

Uni-junction Transistor (UJT) and Thyristors:UJT: Principle of operation, characteristics, UJT relaxation oscillator, PNPN Diode and its characteristics, Silicon controlled rectifier: V-I characteristics, DIAC and TRIAC,Thyristors parameters and applications

.**References**:

1. Boylestad and Nashelsky: Electronic Devices and Circuit Theory, Pearson Education

2. Millman and Halkias: Integrated electronics, TMH

3. Graham Bell: Electronic Devices and Circuits, PHI

4. Sendra and Smith: Microelectronics, Oxford Press.

5. Donald A Neamen: Electronic Circuits Analysis and Design, TMH

List of Experiments (Expandable):

All experiments (wherever applicable) should be performed through the following steps.

Step 1: Circuit should be designed/drafted on paper.

Step 2: The designed/drafted circuit should be simulated using Simulation Software

Step 3: The designed/drafted circuit should be tested on the bread board and compare the results with the simulated results.

Step 4: The bread board circuit should be fabricated on PCB by one batch using PCB machine.

1. V-I characteristics of various Diodes (p-n, Zener, Varactor, Schottky, Tunnel, Photodiode etc)

2. Characteristics of Transistors (BJT and FET)

3. Study of Power electronic devices (Diac, Triac, SCR, Power MOSFET, IGBT etc).

EC - 305 Network Analysis

Unit-I

Introduction to circuit elements R, L, C and their characteristics in terms of linearity and time dependence, KCL and KVL analysis, dual networks, analysis of magnetically coupled circuits, Dot convention, coupling co-efficient, Tuned circuits, Series and parallel resonance, voltage and current sources, controlled sources.

Unit-II

Network topology, Concept of Network graph, Tree, tree branches and links, cut set and tie set schedules. Network Theorems - Thevenin, Norton, Superposition, Reciprocity, Compensation, Maximum power transfer and Millmans theorems, problems with controlled sources.

Unit-III

Transient analysis: Transients in RL, RC and RLC circuits, initial conditions, time constants, networks driven by constant driving sources and their solutions.

Steady state analysis: - Concepts of phasors and vectors, impedance and admittance. Node and mesh analysis of RL, RC and RLC networks with sinusoidal and other driving sources. Resonance Circuits.

Unit-IV

Frequency domain analysis - Laplace transform solution of Integral-differential equations. Transform of waveform - step, ramp, Gate and sinusoidal functions. Initial and final value theorem. Network Theorems in frequency domain. Fourier Series, Trigonometric & exponential form of fourier series, Fourier series of basic functions.

Unit-V

Network function & Two port networks concept of complex frequency.Network functions of one and two ports, poles and zeros network of different kinds. Necessary conditions for driving point & transfer function.

Two port parameters- Z, Y, ABCD, hybrid parameters, their inverse and image parameters, relationship between parameters. Interconnection of two port networks, Terminated two port networks.

References:

1. M.E. Van Valkenburg: Network Analysis, PHI

2. Mesereau and Jackson: Circuit Analysis- A system Approach, Pearson.

3. Hayt W.H. & J.E. Kemmerly: Engineering Circuit Analysis, TMH

4. Decarlolin: Linear circuit Analysis, Oxford

5. William D Stanley : Network Analysis with Applications, Pearson Education

6. Roy Choudhary D: Network and systems, New Age Pub

7. Chakraborti: Circuit Theory, Dhanpat Rai.

List of experiments (Expandable)

All experiments (wherever applicable) should be performed through the following steps.

Step 1: Circuit should be designed/drafted on paper.

Step 2: The designed/drafted circuit should be simulated using Simulation Software.

Step 3: The designed/drafted circuit should be tested on the bread board and compare the results with the simulated results.

Step 4: The bread board circuit should be fabricated on PCB by one batch using PCB machine.

1. To Verify Thevenin Theorem.

2. To Verify Superposition Theorem.

3. To Verify Reciprocity Theorem.

4. To Verify Maximum Power Transfer Theorem.

5. To Verify Millman's Theorem.

6. To Perform Open Circuit Test on Two Port Network.

7. To Perform Short Circuit Test on Two Port Network.

8. To Find Frequency Response of LRC Series Circuit.

9. To Find Frequency Response of LRC parallel Circuit

EC -306Self Study (Internal Assessment)

Objective of Self Study: is to induce the student to explore and read technical aspects of his area of interest / hobby or new topics suggested by faculty.

Evaluation will be done by assigned faculty based on report/seminar presentation and viva.

EC -307Seminar / Group Discussion(Internal Assessment)

Objective of GD and seminar is to improve the MASS COMMUNICATION and CONVINCING/ understanding skills of students and it is to give student an opportunity to exercise their rights to express themselves.

Evaluation will be done by assigned faculty based on group discussion and power point presentation.

B.E. 401 - ENGINEERING MATHEMATICS III

Unit I

Functions of complex variables : Analytic functions, Harmonic Conjugate, Cauchy-Riemann Equations, Line Integral, Cauchy's Theorem, Cauchy's Integral Formula, Singular Points, Poles & Residues, Residue Theorem , Application of Residues theorem for evaluation of real integrals

Unit II

Errors & Approximations, Solution of Algebraic &Trancedental Equations (Regula Falsi , Newton-Raphson, Iterative, Secant Method), Solution of simultaneous linear equatins by Gauss Elimination, Gauss Jordan, Crout's methods , Jacobi's and Gauss-Siedel Iterative methods

Unit III

Difference Operators, Interpolation (Newton Forward & Backward Formulae, Central Interpolation Formulae, Lagrange's and divided difference formulae), Numerical Differentiation and Numerical Integration.

Unit IV

Solution of Ordinary Differential Equations(Taylor's Series, Picard's Method, Modified Euler's Method, Runge-Kutta Method, Milne's Predictor & Corrector method), Correlation and Regression, Curve Fitting (Method of Least Square).

Unit V

Concept of Probability : Probability Mass function, Probability density function. Discrete Distribution: Binomial, Poisson's, Continuous Distribution: Normal Distribution, Exponential Distribution ,Gamma Distribution ,Beta Distribution ,Testing of Hypothesis |:Students t-test, Fisher's z-test, Chi-Square Method

Reference:

(i) Numerical Methods using Matlab by J.H.Mathews and K.D.Fink, P.H.I.

(ii) Numerical Methods for Scientific and Engg. Computation by MKJain, Iyengar and RK Jain, New Age International Publication

(iii) Mathematical Methods by KV Suryanarayan Rao, SCITECH Publuication

(iv) Numerical Methods using Matlab by Yang,Wiley India

(v) Pobability and Statistics by Ravichandran ,Wiley India

(vi) Mathematical Statistics by George R., Springer

PROGRAMME: Electronics and Communication Engineering
COURSE: EC-402 Electromagnetic Theory

Course Contents

Unit I

Review of vector calculus: orthogonal coordinate systems, gradient, divergence and curl. Laplacian operator forscalar and vectors. Vector integral and differential identities and theorems. Phasor representation of harmonic variation of scalar and vectors

Static electric fields, Columb's law, electric flux density and electric field intensity, permittivity, dielectric constant,field of distributed charges in free space, potential function, Laplace's and Poisson's equations, electric dipole, stored electric energy density. Boundary conditions at abrupt discontinuities between two media including conducting boundaries, surface charge distribution capacitance between two isolated conductors

Unit II

Solution of Laplace's equations in systems of dielectric and conducting boundaries, uniqueness theorem, twodimensional boundary condition problems, solution by symmetry, conformal transformation of functions, image theory etc. fields in parallel wire, parallel plane and coaxial systems.

Static currents and magnetic fields- flow of charge in conductive media, lossy conductive medium, current density,specific conductivity, mobility, explanation of Ohm's law employing mobility.

Magnetic effects of current flow, Biot-Savart's law in vector form magnetic field intensity, magnetic flux, and permeability, closed loop currents, Ampere's circuital law in integral and differential vector form, magnetic vector potential and related equations. Problems related to straight wire toroidal and cylindrical solenoids, inductance. Boundary conditions on magnetic field, equivalent surface currents for abrupt discontinuity of magnetic field.

Unit III

Time varying fields – Faraday's law in integral and differential forms, displacement current concept, Maxwell'sequations in differential and integral forms, wave equations in source free region electric and magnetic stored energy density, continuity equation, Poynting vector theorem.

Time harmonic fields, r.m.s. phasor representation of field vectors, Maxwell's equations for TH field, average energy density, complex Poynting vector, duality concept.

Helmholtz wave equation, general solution in free space in various coordinates, plane polarized wave in free space, properties of plane waves, wave front, power flow, stored energy density.

Unit IV

Circular and elliptic polarization, resolution in terms of linear polarized waves and vice- versa.

Plane waves in lossy medium, low loss dielectric, good conducting and ionized media, complex permittivity, loss tangent, skin depth, transmission line analogy, boundary conditions at perfect conductor surface, surface current density Interference of two plane waves traveling at oblique directions.

Unit V

Reflection and refraction of plane waves at dielectric media and conducting Surfaces, Brewster's angle, totalinternal reflection, resultant fields and power flow in both media. Frequency dispersive propagation, phase velocity and group velocity. Magnetic vector potential for sources in free space, retarded potential, radiation principles, boundary condition at infinity

References:

1. Mathew N.O Sadiku: Elements of Electromagnetic, Oxford University Press
2. William H. Hayt: Engineering Electromagnetic, TMH.
3. John D. Kraus: Electromagnetics, Mc. Graw Hill.
4. Jordan Balmian: Electromagnetic wave and Radiating System, PHI.
5. David K. Cheng: Electromagnetic Fields and Wave, Addison Wesley.
6. Ramo, Whinnerry and VanDuzzer " Fields and waves in communication electronics ", Wiley 1984
7. Harrington RF, "Electromagnetic fields" Mc Graw Hill

PROGRAMME: Electronics and Communication Engineering
COURSE: EC-403 Digital Electronics

Course Contents

Unit-I
Review of Number systems and Binary codes, Binary arithmetic – addition, subtraction, multiplication and divisionalgorithms. **Boolean algebra**: theorems and functions, Simplification of Boolean functions, minimization techniques, Karnaugh's map method, Quine and McCluskey's method, realization of various binary functions using AND ,OR , NOT,XOR logic gates.

Unit-II
Universal gates: NAND, NOR, realization of boolean function using universal gates. Half and full adder, half and fullsubtractor, Series and parallel adder, BCD adders, lookahead carry generator. Decoders, Encoders, multiplexers and de-multiplexers. Analysis and design of combination circuits, realization of various Boolean functions using NAND, NOR gates and multiplexers.

Unit-III
Multivibrators: Astable, Monostable and bistablemultivibrators, 555 timer chip and its application in multivibrators. **Flip-Flops**: R-S, Clocked R-S, T, D, J-K, race around problem, Master-slave J-K., State and Excitation Tables.
Shift registers and counters :synchronous and asynchronous counters, Binary ripple counter, up-down counter,Johnson and ring counter. Analysis and Design of Sequential Circuits.

Unit-IV
Semiconductor memories: Organization and construction of RAM, SRAM, DRAM, RAMBUS ROM, PROM,EPROM, EEPROM, PAL and PLAs etc

Unit-V
Logic families: RTL, DTL, TTL, ECL, IIL, PMOS, NMOS and CMOS logic etc. Interfacing between TTL and MOS,vice-versa.

References:

1. M. Mano : Digital Logic and Computer Design, Pearson Education
2. W.H. Gothman : Digital Electronics, PHI.
3. Millman and Taub : Pulse, Digital and Switching Waveforms, MGH
4. Salivahanan and Ari Vahagan : Digital Circuits and Design, Vikas Publishing House
5. Leach and Malvino : Digital Principles and Applications, TMH

List of Experiments (Expandable):
All experiments (wherever applicable) should be performed through the following steps. **Step 1:** Circuit should be designed/drafted on paper.
Step 2: The designed/drafted circuit should be tested on the bread board.
Step 3: The bread board circuit should be fabricated on PCB by one batch using PCB machine.

1. To test and study of operation of all logic Gates for various IC's.
2. Implementation of AND, OR, NOT, NOR, X-OR and X-NOR Gates by NAND and NOR Universal gates.
3. Binary Addition by Half Adder and Full Adder circuit.
4. Binary Subtraction by Half Subtractor and Full Subtractor circuit.
5. Design a BCD to excess-3 code converter.
6. Verification of the Demorgan's Theorem.
7. Study of RS, JK, T & D flip-flops.
8. Multiplexer/Demultiplexer based boolean function realization.
9. Study and Application of 555 timer (Astable, Monostable, Schmitt trigger, VCO

PROGRAMME: Electronics and Communication Engineering
COURSE: EC-404 Linear Integrated Circuits

Course Contents

Unit-I

Amplifier Basics, Transistor as an amplifier, load line, Q-point and its selection criteria, designing of fixed bias andself-bias, stability of biasing circuits, calculation of stability factor.

Feedback amplifier: positive and negative feedback loop gain, effect of negative feedback on gain stability,distortion, bandwidth, input and output impedance of amplifier, types of feedback (voltage, current, series and shunt) and their analysis

Unit-II

Oscillators: condition of sustained oscillation, RC phase shift, LC (Hartley and Collpit) Oscillators, Wein Bridge,Negative resistance (Tunnel diode and UJT) oscillators, crystal oscillators.

Introduction to integrated circuits: Advantages and characteristic parameters of IC's, basic building components, data sheets.

Unit III

Tuned amplifier and its applications, Q factor, selectivity and bandwidth, effect of loading, double tuning(synchronous and stagger)

Cascade amplifiers, Calculation of gain, Input and output impedance, Effect of Cascading on bandwidth,Transformer, RC and direct-coupled amplifier and their performance.

Darlington connection, equivalent circuit and Calculation of gain and impedances, Cascade amplifier: advantage,circuit diagram and analysis, feedback pair and applications of BIFET, Bootstrapping technique.

Unit IV

.**Differential amplifier** - configuration, transfer characteristics, DC analysis, h-parameter analysis, differential andcommon mode gain, CMRR, constant current source and current mirror, level shift.

Operational amplifier (IC741), specifications, ideal and practical characteristics, frequency response, unity gainbandwidth, limitations, slew rate and its effect on full power bandwidth, input offset voltage, bias and offset currents, compensation.

Unit-V

Op-Amp applications: Inverting and non-inverting amplifier Analog computation, summer (inverting and non-inverting), averager, integrator, differentiator, scalar, sign changer, phase changer, multiplier, buffer, Differential amplifier, instrumentation amplifier, comparator, Schmitt trigger, precision rectifier, log and antilog amplifier, voltage-to-current and current-to-voltage converter.

References:

1. Millman and Halkias : Integrated electronics, TMH
2. Gayakwad ; OPAMP and Linear Integrated Circuits, Pearson Education
3. Boylestad and Nashelsky : Electronic Devices and Circuit Theory, PHI
4. Sendra and Smith : Microelectronics, Oxford Press
5. Graham Bell : Electronic Devices and Circuits , PHI
6. Donald A Neamen : Electronic Circuits Analysis and Design, TMH
7. B. VisvesvaraRao Linear Integrated Circuits Pearson

List of Experiments (Expandable):
All experiments (wherever applicable) should be performed through the following steps. **Step 1:** Circuit should be designed/drafted on paper.
Step 2: The designed/drafted circuit should be tested on the bread board
Step 3: The bread board circuit should be fabricated on PCB by one batch using PCB machine.

1. Characteristics of Op-Amp (input offset voltage, slew rate, CMRR, BW, input bias current.
2. Linear application of Op-Amp (voltage follower, inverting and non-inverting amplifier and their frequency response, adder, substractor, differential amplifier, integrator and differential frequency response)
3. To design and construct a shunt and series regulator and find line and load regulation.
4. Design and performance evaluation of transistor amplifiers in CE, CB and CC configuration
5. Design and performance evaluation of FET amplifiers.

PROGRAMME: Electronics and Communication Engineering
COURSE: EC-405 Analog Communication

Course Contents

Unit-I

Signal Analysis: Vectors and signals, orthogonal functions, Fourier series, Complex Fourier spectrum, FourierTransform, Time domain and frequency domain representation of a signal, Existence of the FT, FT of some useful functions like exponential signal single sided & double sided, Gate function, singularity functions, FT of various functions, Properties of FT, Convolution, Convolution with Impulse Function.
Signal Energy and Power: Spectral Density of various types of signals, Spectra (Parseval's Theorem), DensitySpectra of Periodic Gate and Impulse train.
Linear Time Invariant (LTI) Systems Casual and Non Causal System, Distortion less System, Impulse Response ofDistortion less System, Ideal Filter and Practical Filter.

Unit-II

Modulation Techniques: Need and types of modulation techniques, Amplitude Modulation, Frequency Spectrum,Power Distribution, Modulation by Complex Signal, Low Level and High Level AM Modulators, Linear Integrated Circuit AM Modulators, Suppressed Carrier Generation (Balance/Chopper and Square Law Modulation), SSB Generator (Phase and Frequency Discrimination Method), VSB Transmission and Application. Detection of AM signals: Envelope Detector Circuit, RC Time Constant, Synchronous Detection Technique, Error in Synchronous Detection, SSB signal detection, PLL and its use in demodulation.

Unit-III

Angle Modulation: Frequency and Phase Modulation Frequency spectrum, bandwidth requirement, Frequency andPhase Deviation, Modulation Index, NBFM and WBFM, Multiple frequencies FM. FM Modulators: Direct (Parameter Variation Method) and Indirect (Armstrong) Method of frequency modulation. FM Detector: Slope Detector,
Foster Seely Discriminator, Ratio Detector and PLL detectors.

Unit-IV

Radio Transmitters: AM transmitter, block diagram and working of Low Level and High Level Transmitters,Trapezoidal Pattern and Carrier Shift, SSB Transmitters, FM transmitters - Frequency Multiplication Applied to FM Signals, FM transmitters.
Radio Receivers: Block Diagram of Radio Receiver, Receiver Characteristics (Selectivity, Fidelity and Sensitivity),AM Receiver, RF Receiver, Super-heterodyne Receiver, RF Amplifier, Frequency Mixer, AVC and AFC, Image Signal, Intermediate Frequency Selection, Diversity Reception, FM Receiver.

Unit-V

Noise : Sources and types of noise and their power density, White Noise, Noise from Single and Multiple noisesource for Linear Systems, Super Position of Power Spectrum, Equivalent Noise Bandwidth, Noise Figure, and Equivalent Noise Temperature, their Relationship, Calculation of Noise Figure and Noise Temperature for Cascade Systems,

References:

1. B.P. Lathi : Communication Systems, BS Publication
2. Taub and Schilling : Principles of communication Systems, TMH
3. Singh and Sapre : Communication Systems, TMH
4. S Haykin : Communication Systems, John Wiley and Sons Inc
5. B.P. Lathi : Signal, Systems and Communication Systems, BS Publication

List of Experiments (Expandable):
All experiments (wherever applicable) should be performed through the following
steps. **Step 1:** Circuit should be designed/drafted on paper.
Step 2: The designed/drafted circuit should be tested on the bread board.
Step 4: The bread board circuit should be fabricated on PCB by one batch using PCB machine.

1. Analysis of AM Modulation and Demodulation Techniques (Transmitter and Receiver), Calculation of Parameters
2. Analysis of FM Modulation and Demodulation (Transmitter and Receiver) and Calculation of Parameters
3. To Construct and Verify Pre-emphasis and De-emphasis and Plot the Waveforms.
4. Study of Super-heterodyne Receiver and Characteristics of Radio Receiver.
5. To Construct Frequency Multiplier Circuit and to Observe the Waveform
6. Study of AVC and AFC.
7. Study of PLL chip (566) and its use in various systems

PROGRAMME: Electronics and Communication Engineering
COURSE: EC-406 Software Lab-II

Course Contents

ADVANCED SIMULATION/ VERIFICATION SOFTWARE

Study of simulation/ verification software (any one- LAB-VIEW/KTECHLAB/ GNU CIRCUIT ANALYSIS PACKAGE/ LOGISIM/ MULTISIM/ SCILAB etc).

Overview and Study of the key features and applications of the software.
Application of the software in the field of Electronic Circuits, Digital Electronics and Analog Communication. Design, Optimization, simulation and verification of

1. Electronic circuits (example amplifiers, oscillators etc).
2. Realization and verification of various digital electronic circuits (example logic gates, adders, subtractorsetc)
3. Realization of various signals and communication link etc.

Students should simulate and verify atleast six circuits they are learning in the current semester.

Course outcome of Electronics & Communication Engineering: BE III Year

- To analyze the concepts of telephone systems and data communications
- To analyze various time domain and frequency domain techniques to assess the system performance, controllability and observability using state space representation.
- To understand the theoretical & practical aspects of random variables, analog systems & digital modulation techniques.
- Students learn about the architecture & assembly language programming of 8086 microprocessor & 8051 microcontroller.
- To understand the theoretical & practical aspects of communication networks & transmission lines.
- Students learn about the power supplies, thyristors and SCR families and PLC
- Students analyze the concept of services, interferences, cell splitting, GSM & CDMA technologies of cellular phones.
- To perform time, frequency domain analysis of signal & systems and the digital signal processing using z- transform, DFT and FFT algorithm.
- To understand the theoretical & practical aspects of radiation pattern, different types of antenna their synthesis and propagation of radio waves.
- To understand the theoretical & practical aspects of VLSI circuits & systems.

EC-501 Voice and Data Communication

Unit I

Telephone instruments and signals

Introduction, the subscriber loop, standard telephone set, basic call procedure, call progress tones and signals, cordless telephones, caller identification, electronic telephones.

Telephone circuit

Introduction, the local subscriber loop, channel noise and units of power measurements, transmission parameters, voice frequency circuit arrangements, crosstalk.

Unit II

Public telephone network

Introduction, transmission system environment, public telephone network, instruments, local loops, trunk circuits, - local central and operator-assisted exchanges, automated central office switches and exchanges, telephone numbering plan, telephone services, telephone switching hierarchy, common channel signaling system.

Multiplexing of telephone channels

Introduction, time division multiplexing, T1 digital carrier, digital hierarchy, digital carrier line encoding, T carrier systems, digital carrier frame synchronization, bit versus word interleaving, statistical TDM, codecs and combo chips, frequency division multiplexing, FDM hierarchy, composite baseband signal, formation of master group, wavelength division multiplexing.

Unit III

Multiplexing of telephone channels

Introduction, time division multiplexing, T1 digital carrier, digital hierarchy, digital carrier line encoding, T carrier systems, digital carrier frame synchronization, bit versus word interleaving, statistical TDM, codecs and combo chips, frequency division multiplexing, FDM hierarchy, composite baseband signal, formation of mastergroup, wavelength division multiplexing.

Unit IV

Data Communications

Components, protocols and standards, standards organizations, line configuration, topology, transmission mode, digital signals, digital to digital encoding, digital data transmission, DTE-DCE interface, interface standards, modems, cable modem, transmission media- guided and unguided, transmission impairment, performance, wavelength and Shannon capacity.

Unit V

Error detection and correction

Types of error, error detection- redundancy check (longitudinal, vertical and cyclic), checksum, error correction-hamming code.

Switching

Circuit switching (space-division, time division and space-time division), packet switching (virtual circuit and datagram approach), message switching.

References:

1. Tomasi: Advanced Electronic Communication Systems, PHI Learning.
2. Forouzan: Data Communications and Networking, TMH.
3. Tomasi: Introduction to Data Communication Systems, Pearson Education.
4. William Stallings: Data and Computer Communications, Pearson Education
5. Brijendra Singh: Data Communications and Networks, PHI Learning.

<u>**EC- 502 Control Systems**</u>

Unit-I

Control system

Terminology and classification of control system, examples of control system, mathematical modeling of mechanical and electrical systems, differential equations, block diagram representation and reduction, signal flow graph techniques.

Feedback characteristics of control systems

Feedback and non-feedback systems, reduction of parameter variations by use of feedback, control over system dynamics and effects of disturbances by the use of feedback, linearization effect of feedback, regenerative feedback.

Unit-II

Time response analysis

Standard test signals, time response of 1st order system, time response of 2nd order system, steady-state errors and error constants, effects of additions of poles and zeros to open loop and closed loop system.

Time domain stability analysis

Concept of stability of linear systems, effects of location of poles on stability, necessary conditions for stability, Routh-Hurwitz stability criteria, relative stability analysis, Root Locus concept, guidelines for sketching Root-Locus.

Unit-III

Frequency response analysis

Correlation between time and frequency response, Polar plots, Bode Plots, all-pass and minimum-phase systems, log-magnitude versus Phase-Plots..

Frequency domain stability analysis

Nyquist stability criterion, assessment of relative stability using Nyquist Criterion (phase margin, gain margin and stability), closed-loop frequency response.

Unit-IV

Approaches to system design

Design problem, types of compensation, design of phase-lag, phase lead and phase lead-lag compensators in time and frequency domain, proportional, derivative, integral and PID compensation.

Digital control systems

System with digital controller, difference equations, the z-transform, pulse transfer function, inverse z-transform, the s and z domain relationship.

Unit-V

Concept of state, state variables and state model,

State space representation of systems, block diagram for state equation, transfer function decomposition, solution of state equation, transfer matrix, relationship between state equation and transfer function, controllability and observability.

References:

1. Nagrath and Gopal: Control System Engineering, New Age International Publishers.
2. Kuo: Automatic Control Systems, PHI Learning.
3. Varmah: Control Systems, TMH.
4. Distefano (Schaum series): Control Systems, TMH
5. Manke: Linear Control System, Khanna Publishers.
6. Stefani, Shahian: Design of feedback control systems, Oxford University Press.
7. Ogata: Modern Control Engineering, PHI Learning.

EC- 503 Digital Communications

Unit-I

Random variables

Cumulative distribution function, Probability density function, Mean, Variance and standard deviations of random variable, Gaussian distribution, Error function, Correlation and autocorrelation, Central-limit theorem, Error probability, Power Spectral density of digital data.

Unit-II

Digital conversion of Analog Signals

Sampling theorem, sampling of band pass signals, Pulse Amplitude Modulation (PAM), types of sampling (natural, flat-top), equalization, signal reconstruction and reconstruction filters, aliasing and anti-aliasing filter, Pulse Width Modulation (PWM), Pulse Position Modulation (PPM).

Digital transmission of Analog Signals

Quantization, quantization error, Pulse Code Modulation (PCM), companding, scrambling, TDM-PCM, Differential PCM, Delta modulation, Adaptive Delta modulation, vocoders.

Unit-III

Digital Transmission Techniques

Phase shift Keying (PSK)- Binary PSK, differential PSK, differentially encoded PSK, Quadrature PSK, M-ary PSK.Frquency Shift Keying (FSK)- Binary FSK (orthogonal and non-orthogonal), M-ary FSK.
Comparison of BPSK and BFSK, Quadrature Amplitude Shift Keying (QASK), Minimum Shift Keying (MSK).

Unit-IV

Other Digital Techniques

Pulse shaping to reduce inter channel and inter symbol interference- Duobinary encoding, Nyquist criterion and partial response signaling, Quadrature Partial Response (QPR) encoder decoder.
Regenerative Repeater- eye pattern, equalizers.

Optimum Reception of Digital Signals

Baseband signal receiver, probability of error, maximum likelihood detector, Bayes theorem, optimum receiver for both baseband and passband receiver- matched filter and correlator, probability of error calculation for BPSK and BFSK.

Unit-V

Information Theory

Source Coding: Introduction to information theory, uncertainty and information, average mutual information and entropy, source coding theorem, Huffman coding, Shannon-Fano-Elias coding,
Channel Coding: Introduction, channel models, channel capacity, channel coding, information capacity theorem, Shannon limit.

References:

1. Taub and Schilling: Principles of Communication Systems, TMH.
2. Lathi: Modern Digital and Analog Communication Systems, Oxford University Press.
3. Simon Haykins: Communication Systems, John Wiley.
4. Ranjan Bose: Information Theory, Coding and Cryptography, TMH.
5. Das, Mallik, Chatterjee: Principles of Digital Communication, New Age International
6. Skylar and Ray: Digital Communications, Pearson Education.
7. Rao: Digital Communications, TMH.

List of Experiments:

1. Study of Sampling Process and Signal Reconstruction and Aliasing.
2. Study of PAM, PPM and PDM.
3. Study of PCM Transmitter and Receiver.
4. Time Division Multiplexing (TDM) and Demultiplexing.
5. Study of ASK, PSK and FSK Transmitter and Receiver.

EC- 504 Microprocessors and Microcontrollers

Unit I

Architecture of 8086 Microprocessor

BIU and EU, register organization, pin diagram, memory organization, clock generator 8284, buffers and latches, 8288 bus controller, maximum and minimum modes.

Unit II

Assembly Language Programming of 8086

Instruction formats, addressing modes, instruction set, assembly language programming, ALP tools- editor, assembler, linker, locator, debugger, emulator.

8086 based multiprocessor systems

Interconnection topologies, coprocessors 8087 NDP, I/O processors 8089 IOP, bus arbitration and control, lightly and tightly coupled systems.

Unit III

Peripheral devices and their interfacing

Memory interfacing, Programmable input/output ports 8255, Programmable interval timer 8253, keyboard/ display controller 8279, CRT controller 8275, Programmable communication interface 8251 USART.

Unit IV

Interrupts of 8086

Interrupts and interrupt service routine, interrupt cycle, maskable and non-maskable interrupts, interrupt programming. Programmable interrupt controller 8259.

DMA in 8086

Basic DMA operation, modes of DMA transfer, DMA controller 8257.

Unit V

8051 Microcontroller

Features, architecture, Pin Diagram, memory organization, external memory interfacing, instruction syntax, data types, subroutines, addressing Modes, instruction set, ALP of 8051. Applications of 8051.

References:

1. Ray and Bhurchandi: Advanced microprocessors and peripherals, TMH.
2. Brey: The Intel Microprocessors, Architecture, Programming and Interfacing, Pearson Education.
3. Senthil Kumar: Microprocessors and interfacing, Oxford University press.
4. Bahadure: Microprocessors 8086 and Pentium family, PHI Learning.
5. Udayashankara and Mallikarjunaswamy: 8051 Microcontroller, TMH.
6. Mazidi and Mazidi: The 8051 Microcontroller and Embedded Systems, Pearson Education
7. D. V. Hall: Microprocessors and Interfacing, TMH.

List of Experiments:

1. Assembly Language Programs of Microprocessor 8086.
2. Assembly Language Programs of Microcontroller 8051.
3. Assembly Language Programs for Interfacing Chips.

EC– 505 Communication Networks and Transmission Lines

Unit I

Characteristic Parameters of symmetrical and asymmetrical two port networks and their design

Image impedance, iterative impedance, characteristic impedance, propagation coefficient, image transfer coefficient , iterative transfer coefficient, Lattice and Bridged T networks, reactive matching networks, matching techniques, insertion loss, symmetrical and asymmetrical attenuators and their design.

Unit II

Passive LC Filters

Analysis and design of Low pass, high pass, band pass and band elimination filters, m-derived filters, composite filters, Filter specifications, Butterworth approximation, Chebyshev approximation, elliptic function approximation, frequency transformation.

Unit III

Positive real function

LC, RL, RC, and RLC network synthesis, Foster and Cauer network, minimum positive real function, Brune's method, Bott-Duffin method, Synthesis-Coefficient.

Unit IV

Transmission line fundamentals

Lumped parameter equivalent, voltage and current on a transmission line, infinite line, characteristic impedance and propagation constant, waveform distortion, attenuation and phase equalizers, distortion-less line, loading, liner reflection on a line, reflection coefficient, input and transfer impedances, open circuit and short circuit line, reflection factors, reflection loss, insertion loss, T and π equivalents of a line, location of line fault, construction and design of two wire line and coaxial cable.

Unit V

Line at radio frequencies

Parameters of line and coaxial cable at radio frequencies, dissipation-less line, voltage and current on a dissipation-less line, standing waves, standing wave ratio, input impedance of open circuit and short circuit, power and impedance measurement on lines, eighth-wave, quarter-wave and half wave line, circle diagram, Smith chart, solution of problems using Smith chart, single and double stub matching .introduction to micro-strip lines and its analysis.

References:

1. Ryder: Networks and Transmission Lines, PHI Learning.
2. Valkenberg: Introduction to Modern Network synthesis, Wiley India.
3. Suresh: Electric Circuits and Networks, Pearson Education.
4. Raju: Electromagnetic field theory and Transmission Lines, Pearson Education.
5. Ganesan: Transmission Lines and Waveguides, TMH.
6. Rao: Electromagnetic Waves and Transmission Lines, PHI learning.

List of Experiments:

1. To set up the standing waves formation on a transmission line and observe their maxima and minima using frequency domain method.
2. To measure the characteristic impedance of transmission lines using frequency domain method and to differentiate between the matched and unmatched lines.
3. To measure the VSWR, reflection coefficient and return loss in a transmission line.
4. To measure the dielectric constant of insulator in the transmission line.
5. To measure the velocity of propagation and wavelength in the given transmission line.
6. To study the attenuation characteristics of signal along a transmission line and observe its variation with frequency. Also calculate the phase constant and propagation constant.
7. To study the effect of reactive loads on transmission lines.
8. To study the difference between lossy and loss less line.
9. To study the physical dimensions of transmission line and estimation of characteristic impedance.
10. To study behavior of infinite and short lines.
11. To study the operation of Balun transformer.
12. To study the loading of transmission lines and estimate the cut off frequency of a loaded line.
13. To study the use of coaxial lines as tuned circuits and delay lines.
14. To study the input and output impedance of any RF circuits and match it to 50/75 ohms.
15. Simulation of various filters

EC– 506 Software Lab-III

Study of simulation software (any one Scilab/ MatLab etc.)
Introduction to Scilab / Matab, Study of Scilab / Matlab programming environment, Modeling, Design and development of Programs.
Overview and Study of the key features and applications of the software.
Application of the software in the field of Control Systems, Data Communications and Communication Systems.

1. Programs Related to Control System- open-loop and closed loop control system, frequency response plots, determining transient response, specifications of second order system, effect of PID controller on control system, Bode plot, Nyquist plot and Root Locus plot, state space analysis.
2. Programs Related to Communication Systems--Simulation of a Communication System (Generation, addition of noise and Detection), AM, FM, PM, PAM, PCM, PSK, FSK etc.
3. Programs related to Data Communications- simulations of CRC, LRC, VRC, hamming codes, line encoding techniques.

References:

1. Rudra Pratap: Getting Started with MATLAB, Oxford University Press.
2. http://www.scilab.in
3. http://ekalavya.it.iitb.ac.in/contents.do?topic=Scilab
4. Vinu V. Das: Programming in Scilab, New Age Publisher.
5. Chapman Stephen J.: MATLAB Programming for Engineers, Thomson Cengage
6. Proakis: Contemporary Communication System Using MATLAB; Thomson Cengage.
7. Kuo: Automatic Control Systems, PHI Learning.
8. Singh and Chaudhari: Matlab Programming, PHI Learning

EC – 601 Industrial Electronics

Unit-I
Power Supplies
Power supply, rectifiers (half wave, full wave), performance parameters of power supplies, filters (capacitor, inductor, inductor-capacitor, pi filter), bleeder resistor, voltage multipliers .
Regulated power supplies (series and shunt voltage regulators, fixed and adjustable voltage regulators, current regulator), switched regulator (SMPS), comparison of linear and switched power supply, switch mode converter (flyback, buck, boost, buk-boost, cuk converters).

Unit-II
Thyristors
Silicon controlled rectifies (SCR), constructional features, principle of operation, SCR terminology, turn-on methods, turn-off methods, triggereing methods of SCR circuits, types of commutation, comparison of thyristors and transistors, thermal characteristics of SCR, causes of damage to SCR, SCR overvoltage protection circuit, seies and parrel operation of sCRs, Line commutated converters (half wave rectifier with inductive and resistive load, single phase and three phase full wave rectifiers).

Unit-III
Other members of SCR family
Triacs, Diacs, Quadracs, recovery characteristics, fast recovery diodes, power diodes, power transistor, power MOSFET, Insulated gate bipolar transistor (IGBT), loss of power in semiconductor devices, comparison between power MOSFET, power transistor and power IGBT.

Unit-IV
Applications of OP-AMP
Basics of OP-AMP, relaxation oscillator, window comparator, Op-comp as rectangular to triangular pulse converter and vice- versa, Wien bridge oscillator, function generator, frequency response of OP-AMP, simplified circuit diagram of OP-AMP, power supplies using OP-AMP, filters (low-pass, high pass) using OP-AMP.

Unit-V
Programmable Logic Controller (PLC)
Functions, applications, advantages and disadvantages of PLC over conventional relay controllers, comparison of PLC with process control computer system, factors to be considered in selecting PLC, functional block diagram of PLC, microprocessor in PLC, memory, input and output modules (interface cards), sequence of operations in a PLC, status of PLC, event driven device, ladder logic language, simple process control applications of PLC, Programming examples.

References:

1. Bishwanath Paul: Industrial Electronics and control, PHI Learning.
2. Rashid: Power Electronics- Circuits, devices and applications, Pearson Education.
3. Singh and Khanchandani: Power Electronics, TMH
4. Bhimbra: Power Electronics, Khanna Publishers.
5. Moorthi: Power Electronics, Oxford University Press.
6. Webb: Programmable Logic Controllers- Principles and Applications, PHI Learning.
7. Petruzulla: Programmable Logic Controllers, TMH.

EC-602 Cellular Mobile Communications

Unit-I

Introduction to cellular mobile system

A basic cellular system, performance criteria, uniqueness of mobile radio environment, operation of cellular systems, planning of cellular system.

Elements of cellular radio system design

General description of problem, concept of frequency reuse channels, co-channel interference reduction factor, desired C/I in an omni-directional antenna system, hand off mechanism, cell splitting, components of cellular systems.

Unit-II

Cell coverage for signal and traffic

General introduction, mobile point-to-point model, propagation over water or flat open area, foliage loss, propagation in near- in distance, long distance propagation, path loss from point-to-point prediction model, cell site antenna heights and signal coverage cells, mobile-to-mobile propagation.

Cell site antennas and mobile antennas

Equivalent circuits of antennas, gain and pattern relationship, sum and difference patterns, antennas at cell site, unique situations of cell site antennas, mobile antennas.

Unit-III

Cochannel interference reduction

Cochannel interference, real time cochannel interference measurement at mobile radio transceivers, design of antenna systems - omni directional and directional, lowering the antenna height, reduction of cochannel interference, umbrella- pattern effect, diversity receiver, designing a system to serve a predefined area that experiences cochannel interference.

Types of Noncochannel interference

Adjacent channel interference, near-end-far-end interference, effect on near-end mobile units, cross-talk, effects of coverage and interference by applying power decrease, antenna height decrease, beam tilting, effects of cell site components, interference between systems, UHF TV interference, long distance interference.

Unit-IV

Frequency management and Channel Assignment

Frequency management, frequency spectrum utilization, setup channels, channel assignment, fixed channel assignment, non-fixed channel assignment algorithms, additional spectrum, traffic and channel assignment, perception of call blocking from the subscribers

Handoffs and dropped calls

Value of implementing handoffs, initiation of handoff, delaying a handoff, forced handoff, queuing of handoff, power- difference handoff, mobile assisted handoff and soft handoff, cell-site handoff and intersystem handoff, dropped call rate formula.

Unit-V

Digital Cellular Systems

GSM- architecture, layer modeling, transmission, GSM channels and channel modes, multiple access scheme.

CDMA- terms of CDMA systems, output power limits and control, modulation characteristics, call processing, hand off procedures.

Miscellaneous mobile systems- TDD systems, cordless phone, PDC, PCN, PCS, non cellular systems.

References:

1. Lee: Cellular and Mobile Telecommunication- Analog & digital systems, TMH.
2. Rappaport: Wireless Communications- principles and practice, Pearson Education.
3. Lee: Mobile communications design fundamentals, Wiley India.
4. Faher Kamilo: Wireless Digital Communication, PHI Learning.
5. Raj Kamal: Mobile Computing, Oxford University Press.

EC – 603 Digital Signal Processing

Unit – I
Discrete-Time Signals and Systems
Discrete-time signals, discrete-time systems, analysis of discrete-time linear time-invariant systems, discrete time systems described by difference equation, solution of difference equation, implementation of discrete-time systems, stability and causality, frequency domain representation of discrete time signals and systems.

Unit - II
The z-Transform
The direct z-transform, properties of the z-transform, rational z-transforms, inversion of the z transform, analysis of linear time-invariant systems in the z- domain, block diagrams and signal flow graph representation of digital network, matrix representation.

Unit - III
Frequency Analysis of Discrete Time Signals
Discrete fourier series (DFS), properties of the DFS, discrete Fourier transform (DFT), properties of DFT, two dimensional DFT, circular convolution.

Unit - IV
Efficient Computation of the DFT
FFT algorithms, decimation in time algorithm, decimation in frequency algorithm, decomposition for ‘N’ composite number.

Unit - V
Digital filters Design Techniques
Design of IIR and FIR digital filters, Impulse invariant and bilinear transformation, windowing techniques-rectangular and other windows, examples of FIR filters, design using windowing.

References:

1. Oppenheim and Schafer: Digital Signal Processing, PHI Learning.
2. Johnny R. Johnson: Introduction to Digital Signal Processing, PHI Learning.
3. Proakis: Digital Signal Processing, Pearson Education.
4. Rabiner and Gold: Theory and Application of Digital Signal Processing, PHI Learning.
5. Ingle and Proakis: Digital Signal Processing- A MATLAB based Approach, Thompson, Cengage Learning.

List of Experiments:
1. Generation, analysis and plots of discrete-time signals.
2. Implementation of operations on sequences (addition, multiplication, scaling, shifting, folding etc).
3. Implementation of Linear time-invariant (LTI) systems and testing them for stability and causality.
4. Computation and plot of DTFT of sequences, verification of properties of DTFT.
5. Computation and plots of z-transforms, verification of properties of z-transforms.
6. Computation and plot of DFT of sequences, verification of properties of DFT.
7. Computation and plots of linear/circular convolution of two sequences.
8. Computation of radix-2 FFT- Decimation in time and Decimation in frequency.
9. Implementation of IIR and FIR filter structures (direct, cascade, parallel etc).
10. Implementation of various window design techniques (Rectangular, Bartlett, Hann, Hamming etc).

EC – 604 Antennas and Wave Propagation

Unit I
Radiation
Potential function and the Electro magnetic field, potential functions for Sinusoidal Oscillations, retarded potential, the Alternating current element (or oscillating Electric Dipole), Power radiated by a current element, Application to short antennas, Assumed current distribution, Radiation from a Quarter wave-monopole or Half wave dipole, sine and cosine integral, Electromagnetic field close to an antenna, Solution of the potential equations, Far-field Approximation.

Unit II
Antenna Fundamentals
Introduction, network theorems, directional properties of dipole antennas, travelling –wave antennas and effect of feed on standing-wave antennas, two –element array, horizontal patterns in broad-cast arrays, linear arrays, multiplication of patterns ,effect of earth on vertical patterns, Binomial array, antenna gain, effective area.

Unit III
Types of antennas
Babinet's principles and complementary antenna, horn antenna, parabolic reflector antenna, slot antenna, log periodic antenna, loop antenna, helical antenna, biconical antenna, folded dipole antenna, Yagi-Uda antenna, lens antenna, turnstile antenna. Long wire antenna: resonant and travelling wave antennas for different wave lengths, V-antenna, rhombic antenna, beverage antenna, microstrip antenna.

Unit IV
Antenna array synthesis
Introduction, retarded potentials, array structures, weighting functions, linear array analysis, different forms of linear arrays, Schelknoff unit circle, linear array synthesis, sum and difference patterns, Dolph-Chebychev synthesis of sum pattern, Taylor synthesis of sum patterns, Bayliss synthesis of difference patterns, planar arrays, arrays with rectangular boundary.

Unit V
Propagation of radio waves
Fundamentals of electromagnetic waves, effects of the environment, modes of propagation.
Ground wave propagation- Introduction, plane earth reflection, space wave and surface wave, transition between surface and space wave, tilt of wave front due to ground losses.
Space wave propagation- Introduction, field strength relation, effects of imperfect earth, curvature of earth and interference zone, shadowing effect of hills and buildings, absorption by atmospheric phenomena, variation of field strength with height, super refraction, scattering, tropospheric propagation, fading, path loss calculations.
Sky wave propagation- Introduction, structural details of the ionosphere, wave propagation mechanism, refraction and reflection of sky waves by ionosphere, ray path, critical frequency, MUF, LUF, OF, virtual height, skip distance, relation between MUF and skip distance.

References:

1. Jordan and Balmain: Electromagnetic Waves and Radiating System, PHI Learning.
2. Krauss: Antennas and wave propagation, TMH.
3. Balanis: Antenna Theory Analysis and Design, Wiley India Pvt. Ltd.
4. Harish and Sachidananda: Antennas and wave propagation, Oxford University Press.
5. Raju: Antennas and Wave Propagation, Pearson Education.
6. Kennedy: Electronic Communication Systems, TMH.

List of Experiments:
1. To Plot the Radiation Pattern of an Omni Directional Antenna.
2. To Plot the Radiation Pattern of a Directional Antenna.
3. To Plot the Radiation Pattern of a Parabolic Reflector Antenna.
4. To Plot the Radiation Pattern of a Log Periodic Antenna.
5. To Plot the Radiation Pattern of a Patch Antenna.
6. To Plot the Radiation Pattern of a Dipole/ Folded Dipole Antenna.

7. To Plot the Radiation Pattern of a Yagi (3-EL/4EL) Antenna.
8. To Plot the Radiation Pattern of a Monopole/ WHIP/ Collinear Antenna.
9. To Plot the Radiation Pattern of a Broad site Antenna.
10. To Plot the Radiation Pattern of a Square Loop Antenna.

EC – 605 VLSI Circuits and Systems

Unit I
Introduction

Introduction to CMOS VLSI circuit, VLSI design flow, Design strategies ,Hierarachy, regularity, modularity, locality, MOS Transistor as a Switches, CMOS Logic, Combinational circuit, latches and register, Introduction of CAD Tool , Design entry, synthesis, functional simulation.

Unit II
Specification of sequential systems

Characterizing equation & definition of synchronous sequential machines. Realization of state diagram and state table from verbal description, Mealy and Moore model machines state table and transition diagram. Minimization of the state table of completely and incompletely specified sequential machines.

Unit III
Asynchronous Sequential Machine

Introduction to asynchronous sequential machine, Fundamental mode and Pulse mode asynchronous sequential machine, Secondary state assignments in asynchronous sequential machine, races and hazards.

Unit IV
State Machine

Algorithmic state machine and fundamental concept of hardware/ firmware algorithms. Controllers and data system designing.

Unit V
Fault Detection in combinational circuit

Types of faults, Fault detection using Boolean Difference and path sensitization method.
Concept of PROM, PLA, PAL, CPLD and FPGA, PALASM software applications.

Refrences:

1. Neil Weste: Principle of CMOS VLSI Design, TMH.
2. Kohavi: Switching & Finite Automata Theory, TMH.
3. Lee: Digital Circuits and Logic Design, PHI Learning..
4. Roth Jr.: Fundamentals of Logic Design, Jaico Publishing House.
5. Parag K. Lala: Fault Tolerant and Fault Testable Hardware Design, BS Publication.

EC – 606 Software Lab- IV

VHDL
Hardware abstraction, Basic language elements: identifiers, data objects, data types, operators, behavioral modeling, data flow modeling, structural modeling, simulation and analysis.

VERILOG
Overview of digital design with Verilog, Hierarchical Modeling: basic concepts, models and ports, gate level modeling, data flow modeling, behavioral modeling, logic synthesis with Verilog HDL, simulation.

Experiments:
Design and simulation of following using Verilog/ VHDL .
Logic gates: NAND, NOR, XOR, XNOR.
Half adder, full adder, subtractor, latches, multiplexers- 2:1, 4:1, 8:1, comparators, decoders- 2:4, 3:8, 4:16.
4-bit ripple carry full adder,4-bit Ripple carry counter, parity generator, up/down counters.

References:

1. Samir palnitkar: Verilog HDL- A Guide to Digital Design and Synthesis, Pearson Education.
2. Bhasker: A Verilog HDL Primer –synthesis, Pearson Education
3. Pedroni: Circuit Design with VHDL, PHI Learning.
4. Perry: VHDL- Programming by example, TMH.

Course outcome of Electronics & Communication Engineering: BE IV Year

- To learn the applications of wireless services, channel models, diversity & transceivers.
- Student learn the theoretical aspects of satellite systems, geostationary orbit, polarization, space links & satellite services.
- To understand the theoretical & practical aspects of optical communication and learn about optical sources, receivers, optical fibers and its technologies.
- Analyze different types of waveguides and microwave components, tubes and vacuum tubes.
- To analyze device modeling, circuit simulation & CMOS processing technologies in VLSI systems.
- To learn the management and managerial economics to be ready for future endeavour of life.
- To understand the spread spectrum modulation, OFDM & advance communication systems.
- To recognize the technological trends of computer networking & evaluate the challenges in building networks and solutions to those.
- To understand the theoretical & practical aspects of basic television systems, colour television & basic radar engineering.

EC 701 Elective – I (EC – 7011 Wireless Communication)

Unit-I
Introduction
Applications and requirements of wireless services: history, types of services, requirements for the services, economic and social aspects.
Technical challenges in wireless communications: multipath propagation, spectrum limitations, limited energy, user mobility, noise and interference-limited systems.
Propagation mechanism: free space loss, reflection and transmission, diffraction, scattering by rough surfaces, wave guiding.

Unit-II
Wireless Propagation channels
Statistical description of the wireless channel: time invariant and variant two path models, small-scale fading with and without a dominant component, Doppler spectra, temporal dependence of fading, large scale fading.
Wideband and directional channel characteristics: causes of delay dispersion, system theoretic description of wireless channels, WSSUS model, condensed parameters, ultra wideband channels, directional description.

Unit-III
Channel models: Narrowband, wideband and directional models, deterministic channel-modeling methods.
Channel sounding: Introduction, time domain measurements, frequency domain analysis, modified measurement methods, directionally resolved measurements.
Antennas: Introduction, antennas for mobile stations, antennas for base stations.

Unit-IV
Transceivers and signal processing: Structure of a wireless communication link: transceiver block structure, simplified models. Modulation formats, demodulator structure, error probability in AWGN channels, error probability in flat-fading channels, error probability in delay and frequency-dispersive fading channels.

Unit V
Diversity: Introduction, microdiversity, macrodiversity and simulcast, combination of signals, error probability in fading channels with diversity reception, transmit diversity.
Equalizers: Introduction, linear equalizers, decision feedback equalizers, maximum likelihood sequence estimation (Viterbi detector), comparison of equalizer structures, fractional spaced equalizers, blind equalizers.

References:

1. Molisch: Wireless Communications, Wiley India.
2. Taub and Schilling: Principles of Communication Systems, TMH.
3. Haykin: Mordern Wireless Communication, Pearson Education.
4. Upena Dalal: Wireless Communication, Oxford University Press.
5. Rappaport: Wireless Communication, Pearson Education.
6. Price: Wireless Communication and Networks, TMH.
7. Palanivelu and Nakkereeran : Wireless and Mobile Communication, PHI Learning.
8. Chidambara Nathan: Wireless Communication, PHI Learning.

EC 701 Elective – I (EC – 7012 Digital Image Processing)

Unit-I

Digital Image Processing (DIP)

Introduction, examples of fields that use DIP, fundamental steps in DIP, components of an image processing system.

Digital Image Fundamentals: elements of visual perception, image sensing and acquisition, image sampling and quantization, basic relationships between pixels.

Unit-II

Image Transforms

Two-dimensional (2D) impulse and its shifting properties, 2D continuous Fourier Transform pair, 2D sampling and sampling theorem, 2D Discrete Fourier Transform (DFT), properties of 2D DFT.

Other transforms and their properties: Cosine transform, Sine transform, Walsh transform, Hadamard transform, Haar transform, Slant transform, KL transform.

Unit-III

Image Enhancement

Spatial domain methods: basic intensity transformation functions, fundamentals of spatial filtering, smoothing spatial filters (linear and non-linear), sharpening spatial filters (unsharp masking and high boost filters), combined spatial enhancement method.

Frequency domain methods: basics of filtering in frequency domain, image smoothing filters (Butterworth and Gaussian low pass filters), image sharpening filters (Butterworth and Gaussian high pass filters), selective filtering.

Unit-IV

Image Restoration

Image degradation/restoration, noise models, restoration by spatial filtering, noise reduction by frequency domain filtering, linear position invariant degradations, estimation of degradation function, inverse filtering, Wiener filtering, image reconstruction from projection.

Unit-V

Image Compression

Fundamentals of data compression: basic compression methods: Huffman coding, Golomb coding, LZW coding, Run-Length coding, Symbol based coding.

Digital image watermarking, representation and description- minimum perimeter polygons algorithm (MPP).

References:

1. Gonzalez and Woods: Digital Image Processing, Pearson Education.
2. Anil Jain: Fundamentals of Digital Image Processing, PHI Learning.
3. Annadurai: Fundamentals of Digital Image Processing, Pearson Education.
4. Sonka, Hlavac and Boyle: Digital Image Processing and Computer Vision, Cengage Learning.
5. Chanda and Majumder: Digital Image Processing and Analysis, PHI Learning.
6. Jayaraman, Esakkirajan and Veerakumar: Digital Image Processing, TMH.
7. William K. Pratt, Digital Image Processing, Wiley India.

EC 701 Elective – I (EC – 7013 Neural Networks)

Unit-I
Neural Network (NN)
Introduction, benefits of neural network, models of a neuron, neural network as directed graph, network architectures, artificial intelligence and neural network.
Learning processes: error correction learning, memory based learning, Hebbian learning, competitive learning, Boltzman learning, learning tasks, adaptation, statistical nature of learning process, statistical learning theory.

Unit-II
Perceptrons
Single layer perceptrons: adaptive filtering problem, unconstrained optimization technique, linear least squares filter, least mean square algorithm (LMS), perceptron convergence theorem
Multi layer perceptron: architecture, back propagation algorithm, generalization, approximations of functions, network pruning techniques.

Unit-III
Radial Basis Function (RBF) Networks
Cover's theorem on the separability of patterns, interpolation problem, supervised learning as an Ill-posed hyper surface reconstruction problem, regularization theory, regularization network, generalized radial basis function networks (RBF), estimation of the regularization parameter, approximation properties of RBF networks, comparison of RBF networks and multilayer perceptrons, Kernel regression and its relation to RBF networks, learning strategies.

Unit-IV
Information- Theoretic Models
Entropy, maximum entropy principle, mutual information, Kullback-Leibler divergence, mutual information as an objective function to be optimized, maximum mutual information principle, infomax and redundancy reduction, spatially coherent and incoherent features, independent components analysis, maximum likelihood estimation, maximum entropy method.

Unit V
Dynamically Driven Recurrent Networks
introduction, recurrent network architectures, state space model, non-linear autogressive with exogenous inputs model, computational power of recurrent networks, learning algorithms, back propagation through time, real time recurrent learning, Kalman filter, decoupled Kalman filter, vanishing gradients in recurrent networks, system identification, model reference adaptive control.

References:

1. Haykin: Neural Networks- A Comprehensive Foundation, PHI Learning.
2. Sivanandam, Sumathi and Deepa: Introduction to Neural Networks using Matlab, TMH.
3. Freeman and Skapura: Fundamentals of Neural Networks- algorithms, applications and programming techniques, Pearson Education.
4. Hagan, Demuth and Beale: Neural Network Design, Cengage Learning.
5. Anderson: An introduction ro Neural Networks, PHI Learning.
6. Satish Kumar: Neural Networks, TMH.

EC-702 Satellite Communication

Unit-I

Overview of satellite systems: Introduction, Frequency allocations for satellite systems.

Orbits and launching methods: Kepler's three laws of planetary motion, terms used for earth orbiting satellites, orbital elements, apogee and perigee heights, orbit perturbations, inclined orbits, local mean solar point and sun-synchronous orbits, standard time.

Unit-II

The Geostationary orbit: Introduction, antenna look angles, polar mount antenna, limits of visibility, near geostationary orbits, earth eclipse of satellite, sun transit outage, launching orbits.

Polarization: antenna polarization, polarization of satellite signals, cross polarization discrimination.

Depolarization: ionospheric, rain, ice.

Unit-III

The Space segment: introduction, power supply, attitude control, station keeping, thermal control, TT&C subsystem, transponders, antenna subsystem, Morelos and Satmex 5, Anik-satellites, Advanced Tiros-N spacecraft.

The Earth segment: introduction, receive-only home TV systems, master antenna TV system, Community antenna TV system, transmit-receive earth station.

Unit-IV

The space link: Introduction, Equivalent isotropic radiated power (EIPR), transmission losses, the link power budget equation, system noise, carrier-to-noise ratio (C/N), the uplink, the downlink, effects of rain, combined uplink and downlink C/N ratio, inter modulation noise, inter-satellite links.

Interference between satellite circuits.

Unit-V

Satellite services

VSAT (very small aperture terminal) systems: overview, network architecture, access control protocols, basic techniques, VSAT earth station, calculation of link margins for a VSAT star network.

Direct broadcast satellite (DBS) Television and radio: digital DBS TV, BDS TV system design and link budget, error control in digital DBS-TV, installation of DBS-TV antennas, satellite radio broadcasting.

References:

1. Roddy: Satellite Communications, TMH.
2. Timothy Prattt: Satellite Communications, Wiley India.
3. Pritchard, Suyderhoud and Nelson: Satellite Communication Systems Engineering, Pearson Education.
4. Agarwal: Satellite Communications, Khanna Publishers.
5. Gangliardi: Satellite Communications, CBS Publishers.
6. Chartrand: Satellite Communication, Cengage Learning.
7. Raja Rao: Fundamentals of Satellite communications, PHI Learning.
8. Monojit Mitra: Satellite Communication: PHI Learning.

EC-703 Optical Communication

Unit-I

Overview of Optical Fiber Communications (OFC): Motivation, optical spectral bands, key elements of optical fiber systems.

Optical fibers: basic optical laws and definitions, optical fiber modes and configurations, mode theory for circular waveguides, single mode fibers, graded-index fiber structure, fiber materials, photonic crystal fibers, fiber fabrication, fiber optic cables.

Unit-II

Optical sources: Light emitting diodes (LED): structures, materials, quantum efficiency, LED power, modulation of an LED. Laser diodes: modes, threshold conditions, laser diode rate equations, external quantum efficiency, resonant frequencies, structure and radiation patterns, single mode lasers, modulation of laser diodes.

Power launching and coupling: source to fiber power launching, fiber to fiber joints, LED coupling to single mode fibers, fiber splicing, optical fiber connectors.

Unit-III

Photo detectors: pin photo detector, avalanche photodiodes, photo detector noise, detector response time, avalanche multiplication noise.

Signal degradation in optical fibers: Attenuation: units, absorption, scattering losses, bending losses, core and cladding losses. Signal distortion in fibers: overview of distortion origins, modal delay, factors contributing to delay, group delay, material dispersion, waveguide dispersion, polarization-mode dispersion. Characteristics of single mode fibers: refractive index profiles, cutoff wavelength, dispersion calculations, mode field diameter, bending loss calculation. Specialty fibers.

Unit-IV

Optical receivers: fundamental receiver operation, digital receiver performance, eye diagrams, coherent detection: homodyne and heterodyne, burst mode receiver, analog receivers.

Digital links: point to point links, link power budget, rise time budget, power penalties.

Analog links: overview of analog links, carrier to noise ratio, multi channel transmission techniques.

Unit-V

Optical technologies

Wavelength division multiplexing (WDM) concepts: operational principles of WDM, passive optical star coupler, isolators, circulators, active optical components: MEMS technology, variable optical attenuators, tunable optical filters, dynamic gain equalizers, polarization controller, chromatic dispersion compensators.

Optical amplifiers: basic applications and types of optical amplifiers, Erbium Doped Fiber Amplifiers (EDFA): amplification mechanism, architecture, power conversion efficiency and gain. Amplifier noise, optical SNR, system applications.

Performance Measurement and monitoring: measurement standards, basic test equipment, optical power measurements, optical fiber characterization, eye diagram tests, optical time-domain reflectometer, optical performance monitoring.

References:

1. Keiser: Optical Fiber Communications, TMH.
2. Senior: Optical Fiber Communication- Principles and Practices, Pearson Education.
3. Agarwal: Fiber Optic Communication Systems, Wiley India.
4. Palais: Fiber Optics Communications, Pearson Education.
5. Satish Kumar: Fundamentals of optical Communications, PHI Learning.
6. Khare: Fiber Optics and Optoelectronics, Oxford University Press.
7. Ghatak and Thyagrajan: Fiber Optics and Lasers, Macmillan India Ltd.
8. Gupta: Optoelectronic Devices and Systems, PHI Learning.
9. **Sterling**: Introduction to Fiber Optics, Cengage Learning.

List of Experiments:

1. Launching of light into the optical fiber and calculate the numerical aperture and V-number.
2. Observing Holograms and their study.
3. Measurement of attenuation loss in an optical fiber.
4. Diffraction using gratings.
5. Construction of Michelson interferometer.
6. Setting up a fiber optic analog link and study of PAM.
7. Setting up a fiber optic digital link and study of TDM and Manchester coding.
8. Measurement of various misalignment losses in an optical fiber.

EC-704 Microwave Engineering

Unit-I

Microwave Transmission System

General representation of EM field in terms of TEM, TE and TM components, Uniform guide structures, rectangular wave guides, Circular Wave guides, Solution in terms of various modes, Properties of propagating and evanescent modes, Dominant modes, Normalized model voltages and currents, Power flow and energy storage in modes frequency range of operation for single mode working, effect of higher order modes, Strip line and micro strip lines general properties, Comparison of coaxial, Micro strip and rectangular wave guides in terms of band width, power handling capacity, economical consideration etc.

Unit-II

Microwave Networks and Component

Transmission line ports of microwave network, Scattering matrix, Properties of scattering matrix of reciprocal, Non reciprocal, loss less, Passive networks, Examples of two, three and four port networks, wave guide components like attenuator, Phase shifters and couplers, Flanges, Bends, Irises, Posts, Loads, Principle of operation and properties of E-plane, H-plane Tee junctions of wave guides, Hybrid T, Multi-hole directional coupler, Directional couplers, Microwave resonators- rectangular. Excitation of wave guide and resonators by couplers. Principles of operation of non reciprocal devices, properties of ferrites, Isolators and phase shifters.

Unit-III

Microwave Solid State Devices and Application

PIN diodes, Properties and applications, Microwave detector diodes, detection characteristics, Varactor diodes, parametric amplifier fundamentals, Manley-Rowe power relation MASER, LASER , Amplifiers, Frequency converters and harmonic generators using varactor diodes, Transferred electron devices, Gunn effect, Various modes of operation of Gunn oscillator, IMPATT, TRAPATT and BARITT.

Unit-IV

Microwave Vacuum Tube Devices

Interaction of electron beam with electromagnetic field, power transfer condition. Principles of working of two cavity and Reflex Klystrons, arrival time curve and oscillation conditions in reflex klystrons, mode-frequency characteristics. Effect of repeller voltage variation on power and frequency of output. Principle of working of magnetrons. Electron dynamics in planar and cylindrical magnetrons, Cutoff magnetic field, Resonant cavities in magnetron, Π-mode operation Mode separation techniques, Rising sun cavity and strapping. Principle of working of TWT amplifier. Slow wave structures, Approximate gain relationship in forward wave TWT.

Unit-V

Microwave Measurements

Square law detection, Broadband and tuned detectors. Wave-guide probes, Probe and detector mounts, Slotted line

arrangement and VSWR meter, Measurement of wave-guide impedance at load port by slotted line, Microwave bench components and source modulation. Measurement of scattering matrix parameters, High, Medium and low-level power measurement techniques, Characteristics of bolometers, bolometer mounts, Power measurement bridges, Microwave frequency measurement techniques, calibrated resonators (transmission and absorption type). Network Analyzer and its use in measurements.

References:

1. Liao: Microwave Devices and Circuits, Pearson Education.
2. Das: Microwave Engineering, TMH.
3. Rao: Microwave Engineering, PHI Learning.
4. Collins: Foundations of Microwave Engineering, Wiley India.
5. Srivastava and Gupta: Microwave Devices and Circuits, PHI Learning.
6. Reich: Microwave Principles, East West Press.
7. Pozar: Microwave Engineering, Wiley India.
8. Roy and Mitra: Microwave Semiconductor Devices, PHI learning.

List of Experiments:

Following illustrative practical should be simulated with the help of any RF simulation software:-

1. Study the characteristics of Klystron Tube and to determine its electronic tuning range.
2. To determine the frequency and wavelength in a rectangular wave-guide working on TE10 mode.
3. To determine the Standing Wave-Ratio and reflection coefficient.
4. To measure an unknown impedance with Smith Chart.
5. To study the V-I characteristics of Gunn Diode.
6. To study the following characteristics of Gunn Diode.
   (a) Output power and frequency as a function of voltage.
   (b) Square wave modulation through PIN diode.
7. Study the function of Magic Tee by measuring the following parameters.
   (a) Measurement of VSWR at different ports and
   (b) Measurement of isolation and coupling coefficient.
8. Study the function of Isolator / Circulator by measuring the following parameters.
   (a) Input VSWR measurement of Isolator / Circulator.
   (b) Measurement of insertion loss and isolation.
9. Study the function of Attenuator (Fixed and Variable type) by measuring the following parameters.
   (a) Input VSWR measurement.
   (b) Measurement of insertion loss and attenuation.
10. Study the function of Multi Hole Directional Coupler by measuring the following parameters.
    (a) To measure main line and auxiliary line VSWR.
    (b) To measure the coupling factor and directivity.
11. Study of a network analyzer and measurements using it.

EC-705 VLSI Design

UNIT I

Practical Consideration and Technology in VLSI Design

Introduction, Size and complexity of Integrated Circuits, The Microelectronics Field, IC Production Process, Processing Steps, Packaging and Testing, MOS Processes, NMOS Process, CMOS Process, Bipolar Technology, Hybrid Technology, Design Rules and Process Parameters.

UNIT II

Device Modeling

Dc Models, Small Signal Models, MOS Models, MOSFET Models in High Frequency and small signal, Short channel devices, Sub threshold Operations, Modeling Noise Sources in MOSFET's, Diode Models, Bipolar Models, Passive component Models.

UNIT III

Circuit Simulation

Introduction, Circuit Simulation Using Spice, MOSFET Model, Level 1 Large signal model, Level 2 Large Signal Model, High Frequency Model, Noise Model of MOSFET, Large signal Diode Current, High Frequency BJT Model, BJT Noise Model, Temperature Dependence of BJT.

UNIT IV

Structured Digital Circuits and Systems

Random Logic and Structured Logic Forms, Register Storage Circuits, Quasi Static Register Cells, A Static Register Cell, Micro coded Controllers, Microprocessor Design, Systolic Arrays, Bit-Serial Processing Elements, Algotronix.

UNIT V

CMOS Processing Technology

Basic CMOS Technology, A Basic n-well CMOS Process, Twin Tub Processes, CMOS Process Enhancement, Interconnects and Circuit Elements, Layout Design Rules, Latch up, Physical Origin, Latch up Triggering, Latch up Prevention, Internal Latch up Prevention Techniques.

References:

1. Geiger, Allen and Strader: VLSI Design Techniques for Analog and Digital Circuits, TMH.
2. Sorab Gandhi: VLSI Fabrication Principles, Wiley India.
3. Weste and Eshraghian: Principles of CMOS VLSI design, Addison-Wesley
4. Weste, Harris and Banerjee: CMOS VLSI Design, Pearson-Education.
5. Pucknell and Eshraghian: Basic VLSI Design, PHI Learning.
6. Sze: VLSI Technology, TMH.

EC-706 Minor Project and Seminar

The student should select a topic (from the subjects he has studied so far or any topic related to real life problem). He should do the literature survey, analyze the problem and propose some solution for the same. He should prepare a detailed (typed) report regarding the topic and should present the same with the help of power point presentation at the end of the semester. The analysis of the problem may be done with the help of some software or any hardware (which may be made by the student).

EC-707 Industrial Training

Duration: 4 weeks after the VI semester in the summer break. Assessment in VII semester.

SCHEME OF EXAMINATION

For the assessment of industrial training undertaken by the students, following components are considered with respective weightage.

A) **Term work In Industry Marks allotted**

1.	Attendance and General Discipline	05
2.	Daily diary Maintenance	05
3.	Initiative and Participative attitude during training	05
4.	Assessment of training by Industrial Supervisor/s	15
	Total	**30**

(B) **Practical/Oral Examination (Viva-voce In Institution Marks allotted**

1.	Training Report	20
2.	Seminar and cross questioning (defense)	30
	Total	**50**

Marks of various components in industry should be awarded to the student, in consultation with the Training and Placement Officer (TPO)/ Faculty of the institute, who must establish contact with the supervisor/ authorities of the organization where, students have taken training, to award the marks for term work. During training, students will prepare a first draft of the training report in consultation with the section incharge. After training they will prepare final draft with the help of the TPO/ faculty of the institute. Then, they will present a seminar on their training and will face viva-voce on training in the institute.

COURSE: EC-8011 Advanced Data Network

Unit-I

Principles of Wireless Networks

Network Planning: Introduction, wireless network topologies, cellular topology.

Wireless network operation: introduction, mobility management, radio resources and power management, security in wireless networks.

Unit-II

Mobile Data Networks

Introduction, the data-oriented CDPD network, GPRS and higher data rates, short messaging services in GSM, mobile application protocols.

Wireless LANs (WLAN)

Introduction, historical overview of the LAN industry, evolution of the WLAN industry, new interest from military and service providers, a new explosion of market and technology, wireless home networking.

Unit-III

IEEE 802.11 WLANs

Introduction, what is IEEE 802.11? The PHY layer, MAC sublayer, MAC management sublayer.

HIPERLAN

Introduction HIPERLAN, HIPERLAN-2

Wireless Geolocation Systems

Introduction, Wireless geo location system architecture, technologies for wireless geolocation, geolocation standards for E-911 services, performance measures for geo location systems.

Unit-IV

Wireless Personal Area Network (WPAN)

Introduction- IEEE 802.15 WPAN, Home RF, Bluetooth? Interference between Bluetooth and 802.11.

Satellite Networks

Satellite navigation and global positioning system: Introduction, radio and satellite navigation, GPS position location principles, GPS time, GPS receivers and codes, the C/A code, Satellite signal acquisition, GPS signal levels, timing accuracy, GPS receiver operation, GPS C/A code accuracy, differential GPS.

Unit-V

Optical Networks

Network Concepts: terminology, categories, layers. Network topologies: performance of passive linear buses, performance of star architectures. SONET/SDH: transmission formats and speeds, optical interfaces, SONET/SDH rings, SONET/SDH networks.

High speed light-wave links: links operating at 10, 40 and 160 Gbps. Optical add/drop multiplexing (OADM): OADM configurations, reconfigurable OADM.

Optical switching: optical cross-connect, wavelength conversion, wavelength routing, optical packet switching, optical burst switching. WDM network examples: wideband long-haul WDM networks, narrowband metro WDM networks, passive optical network. Mitigation of transmission impairments: chromatic dispersion compensating fiber, bragg grating dispersion compensators, polarization mode dispersion compensation, optical amplifier gain transients.

References:

1. Pahlavan and Krishnamurthy: Principles of Wireless Networks, PHI Learning.
2. Stallings: Wireless Communications and Networks, Pearson Education.
3. Keiser: Optical Fiber Communications, TMH.
4. Pratt, Bostian and Allnut: Satellite Communications, Wiley India.
5. Upena Dalal: Wireless Communications, Oxford University Press.

COURSE: EC-8012 Microwave Circuits

Unit I

Transmission lines: Impedance matching and transformation

Plane Electromagnetic waves, Transmission Lines: Line Equations and analysis, Smith Chart, Impedance Matching and transformation single stub, double stub matching, triple –stub tuner, impedance mismatch factor, quarter wave transformer, theory of small reflections, binomial and Chebyshev transformer, tapered transmission lines, triangular, exponential and Klopfenstein taper.

Unit II

Field analysis of transmission lines:

Analysis of general transmission line and terminated transmission line circuits, Planar Transmission lines, Micro strip lines.

Strip lines: Characteristic Impedance, conductor losses, Dielectric losses, Radiation Losses, Higher order modes and dispersion, Micro strip attenuation ,high frequency properties , suspended and inverted micro strip lines, coplanar lines, slot lines, Fin-lines, Coupled Lines. Substrates for microwave printed circuits

Unit III

Microwave (solid state) Amplifiers:

BJT and FET, Power gains: definitions, Stability: stability circles, tests for unconditional stability, Constant Power Gain Circles, Constant Mismatch Circles, Single stage and multi stage transistor Amplifier design, Broadband transistor Amplifier Design, Power amplifiers. Basic Noise theory, Low noise amplifier designs, Microwave amplifier designs using S-parameters.

Unit IV

Microwave oscillators and mixers:

RF oscillators, Microwave oscillators, Oscillators Phase Noise, Frequency Multipliers, Gunn oscillators and circuits, Transistor oscillators, Oscillator circuits and design.

Mixers: Mixer characteristics, linear and non-linear mixer operation, Mixer noise figure, Balanced mixers, Single ended diode mixer, single ended FET mixer, image reject mixers, other mixers, Mixer analysis using Harmonic Balancing.

Unit V

Microwave Filters:

Periodic structures: analysis, Filter design : image parameter and insertion loss method. specification of power loss ratio,

Filter transformations, Filter Implementations, Stepped-Impedance low –pass filters, coupled line filters, Filters using coupled resonators, Impedance and Admittance inverters, micro strip half-wave filter, Quarter –wave coupled cavity filters, direct –coupled cavity filters, Low-Pass filter designs, Frequency transformations and expansions, Narrowband and wideband microwave filters.

References:

1. Collin: Foundations for Microwave Engineering, Wiley India.
2. Rizzi: Microwave Engineering- Passive Circuits, PHI Learning.
3. Pozar: Microwave Engineering, Wiley India.
4. Vendelin, Pavid and Rohde, Microwave Circuit Design, Wiley India.
5. Srivastava and Gupta: Microwave Devices and Circuit Design, PHI

COURSE: EC-8013 Principles of Management and Managerial Economics

Unit I

Management Concept: Management, Administration and Organization Difference and Relationship between Organization Management and Administration. Importance of Management, Characteristics of Management.

Unit II

Management: Scientific Management, Principles of Management, Process of Management, Functions of Management, Levels of Management, Project Management.

Unit III

Decision Making: Introduction and Definition, Types of Decisions, Techniques of Decision Making, Decision making under certainty Decision making under uncertainty, Decision Making under risk.

Unit IV

Managerial Economics: Introduction, Factors Influencing Manager, Micro and Macro-economics, Theory of the Cost, Theory of the Firm, Theory of Production Function.

Unit V

Productivity: Input-Output Analysis, Micro-economics Applied to Plants and Industrial Undertakings, Production and Production system, Productivity, Factors affecting Productivity, Increasing Productivity of Resources.

References:

1. Peter Drucker, Harper and Row: The Practice of Management.
2. Koontz: Essentials of Management, PHI Learning.
3. Staner: Management, PHI Learning.
4. Daft: Principles of Management, Cengage Learning.
5. T. N. Chhabra: Principle and Practice of Management, Dhanpat Rai, New Delhi.
6. Hirschey: Managerial Economics, Cengage Learning.
7. T. R. Banga and S.C. Sharma: Industrial Organisation and Engineering Economics, Khanna Publishers.
8. O.P. Khanna: Industrial Engineering and Management, Dhanpat Rai.
9. Joel Dean: Managerial Economics, PHI learning.
10. V. L. Mote, Samuel Paul and G.S. Gupta: Managerial Economics Concepts & Cases, TMH, New Delhi.
11. V. L. Mote: Managerial Economics, TMH, New Delhi.

EC-8014-New (Introduction to Microcontrollers for Embedded systems)

UNIT-I: Introduction to Embedded systems

Embedded system overview and applications, features and architecture considerations-ROM, RAM, timers, data and address bus, Memory and I/O interfacing concepts, memory mapped I/O. CISC Vs RISC design philosophy, Von-Neumann Vs Harvard architecture, instruction set, instruction formats, and various addressing modes of 32-bit. Fixed point and floating point arithmetic operations.

Introduction ARM architecture and Cortex – M series, Introduction to the Tiva family viz. TM4C123x & TM4C129x and its targeted applications, Tiva block diagram, address space, on-chip peripherals (analog and digital) Register sets, Addressing modes and instruction set basics.

UNIT-II: Microcontroller Fundamentals for Basic Programming

I/O pin multiplexing, pull up/down registers, GPIO control, Memory Mapped Peripherals, programming System registers, Watchdog Timer, need of low power for embedded systems, System Clocks and control, Hibernation Module on Tiva, Active vs Standby current consumption. Introduction to Interrupts, Interrupt vector table, interrupt programming.

Case Study: Tiva based embedded system application bringing up the salient features of GPIO, Watchdog timer, etc.

UNIT- IIITimers, PWM and Mixed Signals Processing
Timer, Basic Timer, Real Time Clock (RTC), Timing generation and measurements, Analog interfacing and data acquisition: ADC, Analog Comparators, DMA, Motion Control Peripherals: PWM Module & Quadrature Encoder Interface (QEI).

Case Study: Tiva based embedded system application using ADC & PWM.

UNIT-IV Communication protocols and Interfacing with external devices Synchronous/Asynchronous interfaces (like UART, SPI, I2C, USB), serial communication basics, baud rate concepts, Interfacing digital and analog external device, I2C protocol, SPI protocol & UART protocol. Implementing and programming I2C, SPI & UART interface using Tiva. CAN & USB interfaces on Tiva platform. Case Study: Tiva based embedded system application using the interface protocols for communication with external devices “Sensor Hub BoosterPack”

UNIT V Embedded networking and Internet of Things

Embedded Networking fundamentals, Ethernet, TCP/IP introduction IoT overview and architecture, Overview of wireless sensor networks and design examples. Various wireless protocols and its applications: NFC, ZigBee , Bluetooth, Bluetooth Low Energy, Wi-Fi. Adding Wi-Fi capability to the Microcontroller, Embedded Wi-Fi, User APIs for Wireless and Networking applications Building IoT applications using CC3100 user API: connecting sensor devices using Tivaware sensor library.

Case Study: Tiva based Embedded Networking Application: “Smart Plug with Remote Disconnect and Wi- Fi Connectivity”

Lab

1.Interfacing and programming GPIO ports in C using Tiva (blinking LEDs , push buttons)
2.Interrupt programming examples through GPIOs
3.Use Hibernation mode and wake on RTC interrupt
4.PWM generation using PWM Module on Tiva
5.Interfacing potentiometer with Tiva GPIO
6.PWM based Speed Control of Motor controlled by potentiometer connected to Tiva GPIO
7.Connect the Tiva to terminal on PC and echo back the data using UART
8.Interfacing an accelerometer with Tiva using I2C
9.Experiment on USB (Sending data back and forth across a bulk transfer-mode USB connection.)
10.Using IQmath Library for implementing Low pass FIR filter
11.Review of User APIs for TI CC3100 & Initialization and Setting of IP addresses
12.A basic Wi-Fi application – Communication between two Tiva based sensor nodes using TIVA sensor library in TivaWare
13.Setting up the CC3100 as a HTTP server

TEXT Books:

1. John Davies, “MSP430 Microcontroller Basics”, Newnes, 1st Edition
2. Ajit Pal, “Microcontrollers Principles and applications”, PHI
3. B. Kanta Rao, “Embedded Systems”, PHI
4. Rajkamal, “Embedded Systems Architecture Programming and design”, McGraw Hill,

COURSE: EC-802 Advanced Communication Systems

Unit-I

Spread Spectrum Modulation

Introduction, frequency hopping multiple access, CDMA, cellular CDMA systems, multi user detection, time hopping impulse radio

Unit-II

Orthogonal Frequency Division Multiplexing (OFDM)

Introduction, principle of OFDM, implementation of transceivers, frequency-selective channels, channel estimation, peak to average power ratio, inter carrier interference, adaptive modulation and capacity, multiple access, multi carrier code division multiple access, single carrier modulation with frequency-domain equalization.

Unit-III

Multi antenna system: smart antennas, multiple input multiple output systems, multi user MIMO.

Unit-IV

Cognitive Radio

Problem description, cognitive transceiver architecture, principle of interweaving, spectrum sensing, spectrum management, spectrum sharing, overlay, underlay.

Unit V

Cooperative Communication

Introduction and motivation, fundamentals of relaying, relaying with multiple parallel relays, routing and resource allocation in multi hop networks, routing and resource allocation in collaborative networks, applications, network coding.

References:

1. Molisch: Wireless Communications, Wiley India.
2. Upena Dalal: Wireless Communications, Oxford University Press.
3. Kamilo Feher: Wireless Digital Communications, PHI Learning.
4. Zeimer, Peterson and Borth: Introduction to Spread Spectrum Communication, Pearson Education.
5. Mullet: Introduction to Wireless Telecommunication Systems and Networks, Cengage Learning.
6. Dixon: Spread Spectrum Systems, Wiley India.

COURSE: EC-803 Computer Networks

Unit I

Computer Networks

Introduction, applications, types of networks, network software, reference models- OSI model, TCP/IP model, comparison of OSI and TCP/IP models, example networks.

The Physical layer

Design Issues, review of data communication concepts (configuration, topology, transmission mode, media-guided and unguided, types of switching etc).

Unit II

The Data Link layer

Design issues, error detection and correction, data link protocols- stop and wait and sliding window ARQ, utilization of ARQ techniques, example of data link protocol- HDLC.

The Medium Access Control Layer

Static and dynamic channel allocation, multiple access protocols- Pure and slotted ALOHA, CSMA, Collision free protocols, limited contention protocols, CSMA/CD (ETHERNET), fast Ethernet, Gigabit Ethernet.

Unit III

Wireless Protocols

The 802.11, the 802.16, Bluetooth, RFID, Data link layer switching- uses of repeaters, hubs, bridges, switches, routers and gateways.

The Network Layer

Design Issues, Virtual Circuit and datagram networks, routing algorithms- adaptive and non-adaptive algorithms, congestion control algorithms, quality of service, internetworking, Network layer in the Internet- IPv4 protocol, IP addresses, IPv6 protocol, Internet control protocols, Mobile IP.

Unit IV

The Transport Layer

Design issues and services, Transport protocols, congestion control, UDP and TCP protocols, performance issues.

Unit V

The Application Layer

The Domain Name System, E-mail, World Wide Web, streaming audio and video, content delivery.

References:

1. Tanenbaum: Computer Networks, Pearson Education.
2. Bertsekas and Gallager: Data Networks, PHI Learning.
3. Black: Computer Networks, PHI Learning.
4. Forouzan: Computer Networks, TMH.
5. Stallings: Computer Networking and Internet Protocol, Pearson Education.
6. Keiser: Local Area Network, TMH.
7. Forouzan: Data Communication and Networking, TMH.
8. Gupta: Data Communications and Computer Networks, PHI Learning.

List of Experiments:

Practical should be performed using Scilab/ Matlab simulation software based on the above contents.

COURSE: EC-804 TV and Radar Engineering

Unit I

Basic Television System

Introduction: Scanning principles: sound and picture transmission, scanning process, camera pick-up devices, video signal, transmission and reception of video signals, brightness perception and photometric quantities, aspect ratio and rectangular scanning, persistence of vision and flicker, vertical resolution, the Kell factor, horizontal resolution and video bandwidth, interlaced scanning.

Composite Video Signal: Lines and scanning, video signal components, horizontal sync and blanking standards, vertical sync and blanking standards, video modulation and vestigial side band signal, sound modulation and inter-carrier system.

Television Standards: Standard channel characteristics, reception of the vestigial side band signals, television broadcast channel, consolidated CCIR system-B standard, various television broadcast systems.

Television Pick-up devices and Cameras: Camera lenses, auto-focus systems, television camera pick-ups, Silicon Vidicon, CCD image sensors, video processing of camera pick-up signal.

Unit II

Colour Television

Colour fundamentals: mixing of colours and colour perception, chromaticity diagram, colour television camera, colour TV signals and transmission, NTSC, SECAM and PAL system, Trinitron picture tube, automatic degaussing, plasma, LCD displays.

Television transmission and reception: requirement of TV broadcast transmission, design principle of TV transmitters, IF modulation, power output stages, block diagram of TV transmitter, co-channel interference and ghost images during propagation of television signals, antenna requirements for television system, block schematic and function requirements for television receivers, trends in circuit design, colour television receiver.

Unit III

Digital Television Technology

Merits of digital technology, fully digital television system, digital television signals, digitized video parameters, digital video hardware, transmission of digital TV signals, bit rate reduction, digital TV receivers, video processor unit, audio processor unit.

Other television systems: Closed Circuit television system (CCTV), Cable television system (CATV), multiplexed analog component encoding television system (MAC TV), High definition television system (HDTV), High definition multiplexed analog component television (HD-MAC TV), High Performance Computer Controlled TV (HPCC TV), 3-D stereoscopic television techniques..

Unit IV

RADAR

The Radar range equation, block diagram and operation, performance factors: prediction of range performance, minimum detectable signal, receiver noise, probability density functions, signal to noise ratios. Radar cross section of targets, transmitter power, pulse repetition frequency and range ambiguities, antenna parameters.

The CW radar: the Doppler effect, FM-CW radar.

The Moving Target Indicator (MTI) Radar: delay line cancellers.

Unit V

Radar Receivers

The radar receiver, noise figure, mixers, low noise front ends, displays- type A and PPI representations, duplexer and receiver protectors.

Other Radar systems: Synthetic aperture radar, HF over the horizon radar, Air Surveillance Radar (ASR), Bistatic radar.

References:

1. Dhake: Television and Video Engineering, TMH.
2. Skolnik: Introduction to Radar Systems, TMH, New Delhi.
3. Gupta: Television Engineering and Video Systems, TMH, New Delhi.
4. Gulati: Monochrome and Colour Television, New Age International.
5. Grob and Herndon: Basic Television and Video Systems, McGraw Hill International.
6. Peebles, Jr.: Radar Principles, Wiley India Pvt. LTD.
7. Edde: Radar- Principles, Technology Applications, Pearson Education.

List of Experiments:

Section A: Television Engineering

1. (a) To Study the Circuit Description of RF Tuner Section.

   (b) To Study the RF Section by Measuring Voltages at Various Test Points.

   (c) To Study the Fault Simulation and Step-by-Step Fault Finding Procedure for RF Section.

2. (a) To Study the Circuit Description of VIF Tuner Section.

   (b) To Study the VIF Section by Measuring Voltages at Various Test Points.

   (c) To Study the Fault Simulation and Step-by-Step Fault Finding Procedure for VIF Section.

3. (a) To Study the Circuit Description of Video and Chroma Section Tuner Section.

   (b) To Study the Video and Chroma Section by Measuring Voltages at Various Test Points

   (c) To Study the Fault Simulation and Step-by-Step Fault Finding Procedure for Video and Chroma Section.

4. (a) To Observe the Horizontal Oscillator and Horizontal Output Section through Various Test Point.

   (b) To Study the Fault Simulation and Step-by-Step Fault Finding Procedure for Horizontal Oscillator and Horizontal Output Section.

5. (a) To Observe the Vertical Oscillator and Vertical Output Section through Various Test Point.

   (b) To Study the Fault Simulation and Step-by-Step Fault Finding Procedure for Vertical Oscillator and Vertical Output Section.

6. To Study the Fault Simulation and Step-by-Step Fault Finding Procedure for Sound Output Section.

7. To Study the Circuit Description of Audio and Video Section Tuner Section.

8. (a) To Study the System Control Section by Measuring Voltages at Various Test Points.

   (b) To Study the Fault Simulation and Step-by-Step Fault Finding Procedure for System Control Section.

Section B: RADAR

1. Study of Doppler Effect.
2. To Measure Speed of a fan and various Other Objects (Pendulum, Tuning Fork, Plate etc.)
3. To Simulate the Variable Speed of Moving Objects using Velocity Simulator.

PROGRAMME: Electronics and Communication Engineering

COURSE: EC-805 Major Project

The student should prepare a working system or some design or understanding of a complex system that he has selected from the previous semesters using system analysis tools and submit the same in the form of a write-up i.e. detail project report. The student should maintain proper documentation of different stages of project such as need analysis, market analysis, concept evaluation, requirement specification, objectives, work plan, analysis, design, implementation and test plan wherever applicable. Each student is required to prepare a project report based on the above points and present the same at the final examination with a demonstration of the working system.