M.E. (Full Time) **Prospectus No. 131736**

संत गाडगे बाबा अमरावती विद्यापीठ

SANT GADGE BABA AMRAVATI UNIVERSITY

अभ्यासक्रमिका

(FACULTY OF ENGINEERING & TECHNOLOGY)

PROSPECTUS

Prescribed for
Post Graduate Two Year Degree Course
Master of Engineering
(Full Time)
Credit Grade System

I & IInd Year Examinations 2012 - 2013 & Onwards

BRANCHES

1) M.E. (Electronics & Telecommunication)
2) M.E. Civil (Structural Engineering)
3) M.E. Civil (Transportation Engineering & Management)
4) M.E. Mechanical (Thermal Engineering)
5) M.E. Mechanical (Adv. Man. & Mech. Syst. Design)
6) M.E. (Electrical & Electronics Engineering)
7) M.E. (Computer Science & Information Technology)

2012

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Published by
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Amravati University
Amravati - 444 602

SANT GADGE BABA AMRAVATI UNIVERSITY

SPECIAL NOTE FOR INFORMATION OF THE STUDENTS

(1) Notwithstanding anything to the contrary, it is notified for general information and guidance of all concerned that a person, who has passed the qualifying examination and is eligible for admission only to the corresponding next higher examination as an ex-student or an external candidate, shall be examined in accordance with the syllabus of such next higher examination in force at the time of such examination in such subjects papers or combination of papers in which students from University Departments or Colleges are to be examined by the University.

(2) Be it known to all the students desirous to take examination/s for which this prospectus has been prescribed should, if found necessary for any other information regarding examinations etc., refer the University Ordinance Booklet the various conditions/provisions pertaining to examination as prescribed in the following Ordinances.

Ordinance No. 1	:	Enrolment of Students.
Ordinance No. 2	:	Admission of Students
Ordinance No. 4	:	National cadet corps
Ordinance No. 6	:	Examinations in General (relevent extracts)
Ordinance No. 18/2001	:	An Ordinance to provide grace marks for passing in a Head of passing and Inprovement of Division (Higher Class) and getting Distinction in the subject and condonation of defficiency of marks in a subject in all the faculties prescribed by the Statute No.18, Ordinance 2001.
Ordinance No. 9	:	Conduct of Examinations (relevent extracts)
Ordinance No. 10	:	Providing for Exemptions and Compartments
Ordinance No. 19	:	Admission of Candidates to Degrees.

Ordinance No. 109	:	Recording of a change of name of a University student in the records of the University.
Ordinance No. 6 of 2008	:	For improvement of Division/Grade.
Ordinance No.19/2001	:	An Ordinance for Central Assessment Programme, Scheme of Evaluation and Moderation of answerbooks and preparation of results of the examinations, conducted by the University, Ordinance 2001.

Dineshkumar Joshi
Registrar
Sant Gadge Baba Amravati University

PATTERN OF QUESTION PAPER ON THE UNIT SYSTEM

The pattern of question paper as per unit system will be boradly based on the following pattern.

(1) Syllabus has been divided into units equal to the number of question to be answered in the paper. On each unit there will be a question either a long answer type or a short answer type.

(2) Number of question will be in accordance with the unit prescribed in the syllabi for each paper i.e. there will be one question on each unit.

(3) For every question long answer type or short answer type there will be an alternative choice from the same unit. However, there will be no internal choice in a question.

(4) Division of marks between long answer and short answer type question will be in the ratio of 40 and 60.

(5) Each short answer type question shall Contain 4 to 8 short sub question with no internal choice.

SANT GADGE BABA AMRAVATI UNIVERSITY
DIRECTION

No. 32 /2012 Date : 18 /09/2012

Subject :- Corrigendum to Direrction No.31 of 2010, 57 of 2010 & 30 of 2012 regarding Examinations leading to the Degree of अभियांत्रिज्ी पारंजत (Master of Engineering) (Full Time) तंत्रशास्त्र पारंजत (Master of Technology) (Semester Pattern... Credit Grade System)

Whereas, the Direction No.31/2010 in respect of the examinations leading to the degree of अभियांत्रिज्ी पारंजत(Master of Engineering) (Full Time)/ तंत्रशास्त्र पारंजत (Master of Technology) (Full Time) (Semester Pattern.. Credit Grade System) is in existence**,**

AND

Whereas, the Schemes of teaching & examinations for various branches of Two Year Post Graduate Degree Course in Master of Engineering (Full Time) in the faculty of Engineering & Technology have been provided vide appendices A, B,C,D,E,F,G,H and I appended with Direction No. 31 of 2010,

AND

Whereas, the provisions for the admissions and other detailed provisions to the Degree of Master of Engineering (Full Time) are prescribed by the Direction No. 31 of 2010,

AND

Whereas, the Direction No. 30/2012 which was issued as Corrigendum to Direction No. 31 of 2010 for revised Schemes of teaching and Examinations of M.E. Civil (Structural Engg.) (Full Time) is in existence,

AND

Whereas, the proposals were received from the Principal, I.B.S.S. College of Engg., Ghatkheda, Amravati, Principal, P.R. Pote (Patil) College of Engg., Amravati, Principal, S.S.G.M. College of Engg., Shegaon, Principal, P.R.M.College of Engg. & Mngt., Badnera and H.O.D., P.G. Deptt. of Computer Science, Sant Gadge Baba Amravati University, Amravati regarding starting of new course i.e. M.E. Civil (Transportation Engg.) (Full-Time), M.E. Mechanical (Thermal Engg.) (Full-Time), M.E. Mechanical Engg. (Advanced Manufacturing & Mechanical Systems Designs) (Full Time), M.E. (Electrical & Electronics Engg.) (Full Time), M.E. (Computer Science & Information Technology)(Full Time) respectively from the current Academic Session 2012-2013,

AND

Whereas, the Board of Studies in Computer Science & Engineering in its meeting held on 29.08.2012 resolved to recommend the scheme of teaching & examination, Eligibility Criteria and draft syllabus of Master of Engineering in Computer Science & Information Technology course for its implementation from the current sessiion 2012-2013 and onwards,

AND

Whereas, Hon'ble Vice Chancellor has accepted the Scheme of teaching & examination, Eligibility Criteria with correction and draft syllabus of Master of Engineering in Computer Science & Information Technology course under section 14(7) of the Maharashtra Universities Act, 1994 on behalf of the Faculty of Engineering & Technology and Academic Council,

AND

Whereas, the Management Council in its meeting held on 16.5.2012, vide item No. 175 has considered and approved the recommendations of Academic Council to start M.E. in Computer Science & I.T. in the P.G. T. Deptt. of Computer Science of Sant Gadge Baba Amravati University,

AND

Whereas,the Management Council in its meeting held on 14.08.2012, vide item No. 251 has resolved to refer the proposal for starting M.E.(Computer Science & Information Technology) Course to the Board of Studies in Computer Engineering in the faculty of Engineering & Technology, for consideration and recommendation in this respect,

AND

Whereas, the Academic Council in its meeting held on 28-8-2012 vide Item No.96 has considered and approved the Schemes of Examinations and Syllabi alongwith Eligibility Criteria for admission to M.E. Civil (Transportation Engg.) (Full-Time), M.E. Mechanical (Thermal Engg.) (Full-Time), M.E. Mechanical Engg. (Advanced Manufacturing & Mechanical Systems Designs) (Full Time), and M.E. (Electrical & Electronics Engg.) (Full Time) alongwith the corrections received from the Chairman, Board of Studies in Civil Engineering (including Construction Technology) in the revised scheme of teaching & examinations of first & second Semester of M.E.Civil (Structural) Engineering which was already approved by theAcademic Council inits meeting held on 05.05.2012,

AND

Whereas, the Schemes of Examinations and Syllabi alongwith Eligibility Criteria for admission to the courses as mentioned in above paragraph are to be implemented from the current academic session 2012-2013 in phase wise manner,

AND

Whereas, admissions to the First Year of Master of Engineering (Full Time) course are to be made in the Academic Session 2012-2013,

AND

Whereas, the matter for admission of the students at the examination is required to be regulated by an Ordinance,

AND

Whereas, the Schemes of Examinations for the said courses in the faculty of Engineering & Technology are required to be regulated by the Regulation,

AND

Whereas, the process of making an Ordinance and the Regulation is likely to take some time,

AND

Whereas, the Syllabi along with the Schemes of Examinations of the above mentioned courses for Semester I & II of M.E. (Full Time) Courses are to be made available for the students admitted during the session 2012-2013,

Now, therefore, I, Dr. Mohan K. Khedkar, Vice-Chancellor of Sant Gadge Baba Amravati University, Amravati in exercise of powers conferred upon me under sub-section (8) of Section 14 of the Maharashtra Universities Act, 1994, do hereby direct as under :-

1. This Direction shall be called " Corrigendum to Direrction No.31 of 2010, 57 of 2010 & 31 of 2012 regarding Examinations leading to the Degree of अभियांत्रिकी पारंजत (Master of Engineering) (Full Time) तंत्रशास्त्र पारंजत (Master of Technology) (Semester Pattern... Credit Grade System) Direction, 2012."

2. This Direction shall come into force with effect from the session:

   i) 2012-2013 for Semester -I & II and,

   ii) 2013-2014 for Semester - III & IV

3. The Eligibility Criteria for admission to the degree of Master of Engineering (Full Time)/Master of Technology (Full Time) course shall have passed the Degree examination in Bachelor of Engineering/Bachelor of Technology in the branches mentioned under Column No.2 of the following table against the respective courses :-

TABLE

	M.E./M.Tech.	B.E./B.Tech.of this University or any other statutory University/ Diploma
1.		2.
a)	M.E.Civil (Transportation Engg.)	Civil/Construction Engg. Similarly Diplma holders in Civil Engg. who have completed A.M.I.E. through the Institution of Engineerins (I),Kolkata
b)	M.E.Mechanical (Thermal Engg.)	Mechanical/Automobile Engg. Similarly Diploma holders in Mechanical Engg.who have completed A.M.I.E. through the Institution the Engineers(I),Kolkata.
c)	M.E.Mechanical (Adv.Manufac.& Mech. Systems Design)	Mechanical/Automobile/Production/ Industrial Engg. Similarly Diploma holders in Mechanical/Production Engg.who have completed A.M.I.E. through the Institution of Engineers, (I),Kolkata.
d)	M.E. (Electrical & Electronics Engg.)	Electrical Engg.,Electrical(Electronics & Power) Electrical & Electronics Engg.,Electronics Engg.,Industrial Electronics Engg., Electronics & Telecommunication Engg., Instrumentation, Electrical Power System, Biomedical Engg., Telecommunication Engg.,
e)	*M.E.(Computer Science & Information Technology)	Computer Technology, Computer Engineering, Computer Science & Engg.,Electronics & Tele. Engg., Information Tech.,Electronics Engg., Electrical & Electronics Engg.,

* The process of admission shall be as per G.R. issued from time to time by the Higher & Technical Education Department, Government of Mahrashtra, Mumbai.

4. The Schemes of Examinations for M.E. Civil (Transportation Engg.) (Full-Time), M.E. Mechanical (Thermal Engg.) (Full-Time), M.E. Mechanical Engg. (Advanced Manufacturing & Mechanical Systems Designs) (Full Time), M.E. (Electrical & Electronics Engg.) (Full Time), M.E. (Computer Science & Information Technology)(Full Time) shall be as per the appendices-A, B, C, D and E respectively, appended with this Direction.

5. Following corrections shall be carried out in Direction No. 30 of 2012:-

a) In Appendix, Under the Schemes of Examination of First Semester of Master of Engineering Civil (Structural Engg.) (Full-Time) -

(i) Under the column of "Minimum Pass Marks" the words "College assessment" shall be substituted by the word "Subject" and the figure "10" against subject Sr.No. 1 to 5 of the same column shall be substituted by the figures "50",

(ii) Under the column "Name of the subject", against Sr. No. 6 and 7, the word "Studio" be substitued by the word "Lab" respectively.

b) In Appendix, Under the Schemes of Examination of Second Semester of Master of Engineering Civil (Structural Engg.) (Full-Time) -

(i) Under the column of "Minimum Pass Marks" the words "College assessment" shall be substituted by the word "Subject" and the figures "10" against subject Sr.No. 1 to 5 of the same column shall be substituted by the figures "50",

(ii) Under the column "Name of the subject", against Sr. No. 6 and 7, the word "Studio" be substitued by the word "Lab" respectively.

6. Other related provisions of the Direction No. 31 of 2010 shall be applicable for the above mentioned courses.

Date : /09/2012

(Mohan K. Khedkar)
Vice-Chancellor

TWO YEAR POST GRADUATE DEGREE COURSE IN MASTER OF ENGINEERING (FULLTIME)

CIVIL ENGINEERING (TRANSPORTATION ENGINEERING AND MANAGEMENT)

CREDIT GRADE SYSTEM

Appendix - A

First Semester																				
			TEACHING SCHEME					EXAMINATION SCHEME												
			HOURS / WEEK					THEORY							PRACTICAL					
Sr. No.	Subject Code	Subject	Lecture	Tutorial	Practical	Total HOURS	CREDITS	DURATION OF PAPER (Hr.)	MAX. MARKS THEORY PAPER	MAX. MARKS COLLEGE ASSESMENT	TOTAL	MIN. PASSING MARKS		MAX. MARKS		TOTAL	MIN. PASSING MARKS
												THEORY PAPER	SUBJECT	EXTERNAL	INTERNAL		
01	1SFTR1	Trafic Engineering and Field Studies	4	0	0	4	4	3	80	20	100	40	50	_	_	_	_
02	1SFTR2	Transport Planning and Management	4	0	0	4	4	3	80	20	100	40	50	_	_	_	_
03	1SFTR3	Design and Construction of Pavement	4	0	0	4	4	3	80	20	100	40	50	_	_	_	_
04	1SFTR4	Docks Harbour and Airport Engineering	4	0	0	4	4	3	80	20	100	40	50	_	_	_	_
05	1SFTR5	Elective – I	4	0	0	4	4	3	80	20	100	40	50	_	_	_	_
06	1SFTR6	Trafuc Engineering and Field Studies (Lab)	0	0	2	2	1	_	_	_	_	_	_	25	25	50	25
07	1SFTR7	Design & Construction of Pavement (Lab)	0	0	2	2	1	_	_	_	_	_	_	25	25	50	25
		TOTAL	20	0	4	24	22				500					100	
															TOTAL		600

Elective – I 1) Applied soil mechanies 2) DESIGN OF BRIDGES

Second Semester																				
01	2SFTR1	Advanced Rail Road Engineering	4	0	0	4	4	3	80	20	100	40	50	_	_	_	_
02	2SFTR2	Road Safety and Management System	4	0	0	4	4	3	80	20	100	40	50	_	_	_	_
03	2SFTR3	Environmental Impact Assessment	4	0	0	4	4	3	80	20	100	40	50	_	_	_	_
04	2SFTR4	Elective – II	4	0	0	4	4	3	80	20	100	40	50	_	_	_	_
05	2SFTR5	Elective – III	4	0	0	4	4	3	80	20	100	40	50	_	_	_	_
06	2SFTR6	Road Safety and Management System (Lab)	0	0	2	2	1	_	_	_	_	_	_	25	25	50	25
07	2SFTR7	Environmental Impact Assessment (Lab)	0	0	2	2	1	_	_	_	_	_	_	25	25	50	25
		TOTAL	20	1	2	23	22				500					100	
															TOTAL		600

Elective –II – 1) Geometric Design of Transportation Facilities 2)Theory and Application of GIS
Elective –III – 1) Transprtation Economics & Evaluation 2) Transportaion Systems.

Third Semester

Sr. No.	Subject Code	Subject	Lecture	Tutorial	Practical	Total	CREDITS		INTERNAL MARKS	TOTAL	MIM. PASSING MARKS
01	**3 SFTR 1**	**SEMINAR AND DISSERTATION**	_	_	6	6	15		100	100	50
		TOTAL	_	_	**6**	**6**	**15**			**100**	
											TOTAL **100**

Fourth Semester

Sr. No.	Subject Code	Subject	Lecture	Tutorial	Practical	Total	CREDITS		EXTERNAL MARKS	INTERNAL MARKS	TOTAL	MIM. PASSING MARKS
01	**4 SFTR 1**	**SEMINAR AND DISSERTATION**	_	_	12	12	30		200	100	300	150
		TOTAL	_	_	**12**	**12**	**30**				**300**	
												TOTAL **300**
												GRAND TOTAL 1600

Semester III

Seminar : Seminar to be delivered on work completed during third semester. 50 internal marks out of 100 will be assessed by a Committee consisting of Head of Department, dissertatio guide and subject expert appointed by Principal of the College / Head of University Department. Remaining 50 internal marks will be given by guide based on performance.

Dissertation : Title of the dissertation work to be submitted to the University on or before 15th Sept. (for regular examination) and 15th of February (for supplementary exam.).

Semester IV

Seminar : to be delivered on the complete work of dissertation. 50 internal marks out of 100 will be assessed by a Committee consisting of Head of Department, dissertation guide and subject expert appointed by Principal of the College / Head of University Department. Remaining 50 internal marks will be given by guide based on performance.

Note : Thesis of dissertation work must be submitted to the University on or before 30th April (for regular exam.) and 30th November (for supplementary exam.). Thesis of Dissertation work be submitted with late fee to the University upto 31 May (for regular exam.) and 31st December (for supplementary exam.). The late fee shall be charged as in case of Examination form.

Notes : 1. Student should fill the examination form in the begining of III semester jointly for III & IV semester.

2. Single marksheet for III & IV semester together will be given to the student.

TWO YEAR POST GRADUATE DEGREE COURSE IN MASTER OF ENGINEERING (FULL TIME)

MECHANICAL ENGINEERING (THERMAL ENGINEERING)

CREDIT GRADE SYSTEM

Appendix - B

First Semester

			TEACHING SCHEME						EXAMINATION SCHEME									
			HOURS / WEEK						THEORY						PRACTICAL			
Sr. No.	Subject Code	Subject	Lecture	Tutorial	Practical	Total HOURS	CREDITS		DURATION OF PAPER (Hr.)	MAX. MARKS THEORY PAPER	MAX. MARKS COLLEGE ASSESMENT	TOTAL	MIN. PASSING MARKS THEORY PAPER	MIN. PASSING MARKS SUBJECT	MAX. MARKS EXTERNAL	MAX. MARKS INTERNAL	TOTAL	MIN. PASSING MARKS
01	1MTE1	Advanced Mathematics	4	0	0	4	4		3	80	20	100	40	50	–	–	–	–
02	1MTE2	Advanced Thermodynamics	4	0	0	4	4		3	80	20	100	40	50	–	–	–	–
03	1MTE3	Fluid Dynamics	4	0	0	4	4		3	80	20	100	40	50	–	–	–	–
04	1MTE4	Advanced Heat Transfer	4	0	0	4	4		3	80	20	100	40	50	–	–	–	–
05	1MTE5	Elective – I	4	0	0	4	4		3	80	20	100	40	50	–	–	–	–
06	1MTE6	Fluid dynamics Labs	0	0	2	2	1		–	–	–	–	–	–	25	25	50	25
07	1MTE7	Advanced Heat Transfer Lab	0	0	2	2	1		–	–	–	–	–	–	25	25	50	25
		TOTAL	20	0	4	24	22					500					100	
																TOTAL		600

Elective – I 1) Waste Management & Energy Generation Systems. 2) Energy Conservation & Power Plant Economics
3) Modern Energy Sources 4) Environmental Pollution Control

Second Semester

01	2MTE1	Advanced Internal Combustion Engines.	4	0	0	4	4		3	80	20	100	40	50	–	–	–	–
02	2MTE2	Advance Refrigeration Engineerings	4	0	0	4	4		3	80	20	100	40	50	–	–	–	–
03	2MTE3	Research Methodology	4	0	0	4	4		3	80	20	100	40	50	–	–	–	–
04	2MTE4	Elective – II	4	0	0	4	4		3	80	20	100	40	50	–	–	–	–
05	2MTE5	Elective – III	4	0	0	4	4		3	80	20	100	40	50	–	–	–	–
06	2MTE6	Advance Internal Combustion Engine Lab	0	0	2	2	1		–	–	–	–	–	–	25	25	50	25
07	2MTE7	Advanced Refrigeration Engineering Lab	0	0	2	2	1		–	–	–	–	–	–	25	25	50	25
		TOTAL	20	1	2	23	22					500					100	
																TOTAL		600

Elective –II – 1) Heat Exchanger Design 2) Advanced Air Conditioning Systems 3) Finite Element Methods 4) Gas Turbine and Jet Propulsion
Elective –III – 1) Fuels and Combustion 2) Solar Energy 3) Mechatronics 4) Computational Fluid Dynamics.

Third Semester

Sr. No.	Subject Code	Subject	Lecture	Tutorial	Practical	Total	CREDITS		INTERNAL MARKS	TOTAL	MIM. PASSING MARKS
01	**3 MTES**	**SEMINAR AND DISSERTATION**	_	_	6	6	15		100	100	50
		TOTAL	_	_	**6**	**6**	**15**			**100**	
											TOTAL 100

Fourth Semester

Sr. No.	Subject Code	Subject	Lecture	Tutorial	Practical	Total	CREDITS		EXTERNAL MARKS	INTERNAL MARKS	TOTAL	MIM. PASSING MARKS
01	**4 MTEP**	**SEMINAR AND DISSERTATION**	_	_	12	12	30		200	100	300	150
		TOTAL	_	_	**12**	**12**	**30**				**300**	
												TOTAL 300
												GRAND TOTAL 1600

Semester III

Seminar : Seminar to be delivered on work completed during third semester. 50 internal marks out of 100 will be assessed by a Committee consisting of Head of Department, dissertation guide and subject expert appointed by Principal of the College / Head of University Department. Remaining 50 internal marks will be given by guide based on performance.

Dissertation : Title of the dissertation work to be submitted to the University on or before 15th Sept. (for regular examination) and 15th of February (for supplementary exam.).

Semester IV

Seminar : to be delivered on the complete work of dissertation. 50 internal marks out of 100 will be assessed by a Committee consisting of Head of Department, dissertation guide and subject expert appointed by Principal of the College / Head of University Department. Remaining 50 internal marks will be given by guide based on performance.

Note : Thesis of dissertation work must be submitted to the University on or before 30th April (for regular exam.) and 30th November (for supplementary exam.). Thesis of Dissertation work be submitted with late fee to the University upto 31 May (for regular exam.) and 31st December (for supplementary exam.). The late fee shall be charged as in case of Examination form.

Notes : 1. Student should fill the examination form in the begining of III semester jointly for III & IV semester.

2. Single marksheet for III & IV semester together will be given to the student.

TWO YEAR POST GRADUATE DEGREE COURSE IN MASTER OF ENGINEERING (FULL TIME)

MECHANICAL ENGINEERING (Advanced Manufacturing & Mechanical System Design)

CREDIT GRADE SYSTEM

Appendix - C

First Semester																			
			TEACHING SCHEME					EXAMINATION SCHEME											
			HOURS / WEEK					THEORY						PRACTICAL					
Sr. No.	Subject Code	Subject	Lecture	Tutorial	Practical	Total HOURS	CREDITS	DURATION OF PAPER (Hr.)	MAX. MARKS THEORY PAPER	MAX. MARKS COLLEGE ASSESMENT	TOTAL	MIN. PASSING MARKS		MAX. MARKS		TOTAL	MIN. PASSING MARKS
												THEORY PAPER	SUBJECT	EXTERNAL	INTERNAL		
01	1MMD1	Advanced Manufacturing Processes	4	0	0	4	4	3	80	20	100	40	50	_	_	_	_
02	1MMD2	Advanced Machine Design	4	0	0	4	4	3	80	20	100	40	50	_	_	_	_
03	1MMD3	Computer Aided Design and Engineering	4	0	0	4	4	3	80	20	100	40	50	_	_	_	_
04	1MMD4	Design of Material Handling Equipments	4	0	0	4	4	3	80	20	100	40	50	_	_	_	_
05	1MMD5	Elective – I	4	0	0	4	4	3	80	20	100	40	50	_	_	_	_
06	1MMD6	Advanced Manufacturing Processes- Lab	0	0	2	2	1	_	_	_	_	_	_	25	25	50	25
07	1MMD7	Computer Aided Design and Engineering Lab	0	0	2	2	1	_	_	_	_	_	_	25	25	50	25
		TOTAL	20	0	4	24	22				500					100	
															TOTAL		600

Elective – I 1) Reliability, Maintenance Management & Safety, 2) New Product design 3) Lean Manufacturing
4) Design for Manufacturing and Assembly 5) Ergonomics of Manufacturing

Second Semester																	
01	2MMD1	Advanced Material Technology	4	0	0	4	4	3	80	20	100	40	50	_	_	_	_
02	2MMD2	Required Prototyping and Tooling	4	0	0	4	4	3	80	20	100	40	50	_	_	_	_
03	2MMD3	Mechatronics in System Design	4	0	0	4	4	3	80	20	100	40	50	_	_	_	_
04	2MMD4	Experimental Stress Analysis	4	0	0	4	4	3	80	20	100	40	50	_	_	_	_
05	2MMD5	Elective – II	4	0	0	4	4	3	80	20	100	40	50	_	_	_	_
06	2MMD6	Mechatronics in System Design Lab	0	0	2	2	1	_	_	_	_	_	_	25	25	50	25
07	2MMD7	Experimental Stress Analysis Lab	0	0	2	2	1	_	_	_	_	_	_	25	25	50	25
		TOTAL	20	1	2	23	22				500					100	
															TOTAL		600

Elective –II – 1) Optimization Methods in Engineering Design, 2) Advanced Machine Tool Design 3) Total Quality Management
4) Computer Assisted Production Management, 5) Concurrent Engineering & Product Lifecycle Management

Third Semester

Sr. No.	Subject Code	Subject	Lecture	Tutorial	Practical	Total	CREDITS		INTERNAL MARKS	TOTAL	MIM. PASSING MARKS
01	**3 MMDS**	**SEMINAR AND DISSERTATION**	–	–	6	6	15		100	100	50
		TOTAL	–	–	**6**	**6**	**15**			**100**	
										TOTAL	**100**

Fourth Semester

Sr. No.	Subject Code	Subject	Lecture	Tutorial	Practical	Total	CREDITS		EXTERNAL MARKS	INTERNAL MARKS	TOTAL	MIM. PASSING MARKS
01	**4 MMDP**	**SEMINAR AND DISSERTATION**	–	–	12	12	30		200	100	300	150
		TOTAL	–	–	**12**	**12**	**30**				**300**	
											TOTAL	**300**
											GRAND TOTAL	**1600**

Semester III

Seminar : Seminar to be delivered on work completed during third semester. 50 internal marks out of 100 will be assessed by a Committee consisting of Head of Department, dissertation guide and subject expert appointed by Principal of the College / Head of University Department. Remaining 50 internal marks will be given by guide based on performance.

Dissertation : Title of the dissertation work to be submitted to the University on or before 15th Sept. (for regular examination) and 15th of February (for supplementary exam.).

Semester IV

Seminar : to be delivered on the complete work of dissertation. 50 internal marks out of 100 will be assessed by a Committee consisting of Head of Department, dissertation guide and subject expert appointed by Principal of the College / Head of University Department. Remaining 50 internal marks will be given by guide based on performance.

Note : Thesis of dissertation work must be submitted to the University on or before 30th April (for regular exam.) and 30th November (for supplementary exam.). Thesis of Dissertation work be submitted with late fee to the University upto 31 May (for regular exam.) and 31st December (for supplementary exam.). The late fee shall be charged as in case of Examination form.

Notes : 1. Student should fill the examination form in the begining of III semester jointly for III & IV semester.

2. Single marksheet for III & IV semester together will be given to the student.

TWO YEAR POST GRADUATE DEGREE COURSE IN MASTER OF ENGINEERING (FULLTIME)

ELECTRICAL & ELECTRONICS ENGINEERING

CREDIT GRADE SYSTEM

Appendix - D

First Semester

			TEACHING SCHEME						EXAMINATION SCHEME									
			HOURS / WEEK					THEORY						PRACTICAL			
Sr. No.	Subject Code	Subject	Lecture	Tutorial	Practical	Total HOURS	CREDITS	DURATION OF PAPER (Hr.)	MAX. MARKS THEORY PAPER	MAX. MARKS COLLEGE ASSESMENT	TOTAL	MIN. PASSING MARKS THEORY PAPER	MIN. PASSING MARKS SUBJECT	MAX. MARKS EXTERNAL	MAX. MARKS INTERNAL	TOTAL	MIN. PASSING MARKS
01	1EEEME1	Advanced Control Systems	4	0	0	4	4	3	80	20	100	40	50	_	_	_	_
02	1EEEME2	Advanced Power Electronics	4	0	0	4	4	3	80	20	100	40	50	_	_	_	_
03	1EEEME3	Advanced Digital Signal Processing	4	0	0	4	4	3	80	20	100	40	50	_	_	_	_
04	1EEEME4	VLSI Design	4	0	0	4	4	3	80	20	100	40	50	_	_	_	_
05	1EEEME5	Modelling & Analysis of Electrical Machines	4	0	0	4	4	3	80	20	100	40	50	_	_	_	_
06	1EEEME6	Seminar	0	1	0	1	1	_	_	_	_	_	_	_	50	50	25
07	1EEEME7	VLSI Design-Lab	0	0	2	2	1	_	_	_	_	_	_	25	25	50	25
		TOTAL	20	1	2	23	22				500					100	
															TOTAL		600

Second Semester

01	2EEEME1	Digital Instrumentation	4	0	0	4	4	3	80	20	100	40	50	_	_	_	_
02	2EEEME2	Embedded Systems Design	4	0	0	4	4	3	80	20	100	40	50	_	_	_	_
03	2EEEME3	Neuro Fuzzy Control	4	0	0	4	4	3	80	20	100	40	50	_	_	_	_
04	2EEEME4	Elective- I	4	0	0	4	4	3	80	20	100	40	50	_	_	_	_
05	2EEEME5	Elective- II	4	0	0	4	4	3	80	20	100	40	50	_	_	_	_
06	2EEEME6	Seminar	0	1	0	1	1	_	_	_	_	_	_	_	50	50	25
07	2EEEME7	Embedded Systems Design-Lab	0	0	2	2	1	_	_	_	_	_	_	25	25	50	25
		TOTAL	20	1	2	23	22				500					100	
															TOTAL		600

Elective- I : 1) Power Electronic Controlled Drives 2) Digital Communication
Elective- II : 1) Flexible AC Transmission Systems 2) Digital Image Processing

Third Semester

Sr. No.	Subject Code	Subject	Lecture	Tutorial	Practical	Total	CREDITS		INTERNAL MARKS	TOTAL	MIM. PASSING MARKS
01	3EEEME1	SEMINAR AND DISSERTATION	_	_	6	6	15		100	100	50
		TOTAL	_	_	**6**	**6**	**15**			**100**	
											TOTAL 100

Fourth Semester

Sr. No.	Subject Code	Subject	Lecture	Tutorial	Practical	Total	CREDITS		EXTERNAL MARKS	INTERNAL MARKS	TOTAL	MIM. PASSING MARKS
01	4EEEME1	SEMINAR AND DISSERTATION	_	_	12	12	30		200	100	300	150
		TOTAL	_	_	**12**	**12**	**30**				**300**	
												TOTAL 300
												GRAND TOTAL 1600

Semester III

Seminar : Seminar to be delivered on work completed during third semester. 50 internal marks out of 100 will be assessed by a Committee consisting of Head of Department, dissertation guide and subject expert appointed by Principal of the College / Head of University Department. Remaining 50 internal marks will be given by guide based on performance.

Dissertation : Title of the dissertation work to be submitted to the University on or before 15th Sept. (for regular examination) and 15th of February (for supplementary exam.).

Semester IV

Seminar : to be delivered on the complete work of dissertation. 50 internal marks out of 100 will be assessed by a Committee consisting of Head of Department, dissertation guide and subject expert appointed by Principal of the College / Head of University Department. Remaining 50 internal marks will be given by guide based on performance.

Note : Thesis of dissertation work must be submitted to the University on or before 30th April (for regular exam.) and 30th November (for supplementary exam.). Thesis of Dissertation work be submitted with late fee to the University upto 31 May (for regular exam.) and 31st December (for supplementary exam.). The late fee shall be charged as in case of Examination form.

Notes : 1. Student should fill the examination form in the begining of III semester jointly for III & IV semester.

2. Single marksheet for III & IV semester together will be given to the student.

TWO YEAR POST GRADUATE DEGREE COURSE IN MASTER OF ENGINEERING (FULLTIME)

COMPUTER SCIENCE & INFORMATION TECHNOLOGY

CREDIT GRADE SYSTEM

Appendix - E

First Semester

S.No.	Subject Code	Subject	TEACHING SCHEME HOURS/WEEK Lecture	Tutorial	Practical	TOTAL HOURS	CREDITS	EXAMINATION SCHEME THEORY DURATION OF PAPERS (Hr.)	MAX. MARKS THEORY PAPER	MAX. MARKS COLLEGE ASSESSMENT	TOTAL	MIN. PASSING MARKS THEORY PAPER	MIN. PASSING MARKS SUBJECT	PRACTICAL MAX. MARKS EXTERNAL	MAX. MARKS INTERNAL	TOTAL	MIN. PASSING MARKS
01	1RNME1	Advance Computer Architecture	3	0	0	3	3	3	80	20	100	40	50	--	--	--	--
02	1RNME2	Distributed Operating System Design	4	0	0	4	4	3	80	20	100	40	50	--	--	--	--
03	1RNME3	Distributed Database System	4	0	0	4	4	3	80	20	100	40	50	--	--	--	--
04	1RNME4	Wireless Communication & Network Computing	4	0	0	4	4	3	80	20	100	40	50	--	--	--	--
05	1RNME5	Elective-I	4	0	0	4	4	3	80	20	100	40	50	--	--	--	--
06	1RNME6	CSIT Lab-I	0	0	2	2	1	--	--	--	--	--	--	25	25	50	25
07	1RNME7	CSIT Lab-II	0	0	2	2	1	--	--	--	--	--	--	25	25	50	25
08	1RNME8	Seminar & Technical Paper Writing	0	1	0	1	1	--	--	--	--	--	--	--	50	50	25
		TOTAL	**19**	**1**	**4**	**24**	**22**				**500**					**150**	
															TOTAL		**650**

Elective-I: 1) Expert System Design & Intelligent System 2) Algorithmics 3) Information Technology & Management

Second Semester

01	2RNME1	Real Time Embedded Systems	3	0	0	3	3	3	80	20	100	40	50	--	--	--	--
02	2RNME2	Performance Analysis For Imaging Systems	4	0	0	4	4	3	80	20	100	40	50	--	--	--	--
03	2RNME3	Information Technology & Security	4	0	0	4	4	3	80	20	100	40	50	--	--	--	--
04	2RNME4	Software Engineering, Testing & Reliability	4	0	0	4	4	3	80	20	100	40	50	--	--	--	--
05	2RNME5	Elective-II	4	0	0	4	4	3	80	20	100	40	50	--	--	--	--
06	2RNME6	CSIT Lab-III	0	0	2	2	1	--	--	--	--	--	--	25	25	50	25
07	2RNME7	CSIT Lab-IV	0	0	2	2	1	--	--	--	--	--	--	25	25	50	25
08	2RNME8	Seminar	0	1	0	1	1	--	--	--	--	--	--	--	50	50	25
		TOTAL	**19**	**1**	**4**	**24**	**22**				**500**					**150**	
															TOTAL		**650**

Elective-II : 1) Advanced Computing Techniques 2) Mobile Computing 3) Digital Media Development

Two Year Post Graduate Degree Course in Master of Engineering (Full-Time) (CGS)
Computer Science & Information Technology

Third Semester

S.No.	Subject Code	Subject	Lecture	Tutorial	Practical	TOTAL	CREDITS		INTERNAL MARKS	TOTAL	MM. PASSING MARKS
01	3RNME1	SEMINAR AND DISSERTATION	--	--	6	6	15		100	100	50
		TOTAL	**--**	**--**	**6**	**6**	**15**			**100**	
											TOTAL **100**

Fourth Semester

S.No.	Subject Code	Subject	Lecture	Tutorial	Practical	TOTAL	CREDITS		EXTERNAL MARKS	INTERNAL MARKS	TOTAL	MM. PASSING MARKS
01	4RNME1	SEMINAR AND DISSERTATION	--	--	12	12	30			100	300	150
		TOTAL	--	--	**12**	**12**	**30**			**100**	**300**	
												TOTAL **300**
												GRAND TOTAL 1700

Semester III

Seminar: Seminar to be delivered on work completed during third semester. 50 internal marks out of 100 will be assessed by a Committee consisting of Head of Department, dissertation guide and subject expert appointed by Principal of the College / Head of University Department. Remaining 50 internal marks will be given by guide based on performance.

Semester IV

Seminar: To be delivered on the complete work of dissertation. 50 internal marks out of 100 will be assessed by a Committee consisting of Head of Department, dissertation guide and subject expert appointed by Principal of the College / Head of University Department. Remaining 50 internal marks will be given by guide based on performance.

Note: Thesis of dissertation work must be submitted to the University on or before 30th April (for regular exam.) and 30th November (for supplementary exam). Thesis of Dissertation work be submitted with late fee to the University up to 31 May (for regular exam.) and 31st December (for supplementary exam.). The late fee shall be charged as in case of Examination form.

Notes: 1. Student should fill the examination form in the beginning of III semester jointly for III & IV semester.

2. Single mark sheet for III & IV semester together will be given to the student.

SYLLABUS PRESCRIBED FOR
TWO YEAR P. G. DEGREE COURSE IN M.E. (F.T.)
ELECTRONICS & TELECOMMUNICATION (C.G.S.)

SEMESTER I

1ENTC1 ADVANCED OPTICAL COMMUNICATION

SECTION - A

Unit I : Optical Fibre basics and Transmission Characteristics:-
Prorogation of light in planer and circular optical waveguides, Numerical Aperture, Modes in optical fibres, Attenuation in single and multimode fibres, Inter-modal and chromatic dispersion of single mode and multi-mode fibres, Waveguide dispersion, Bandwidth of single mode and multimode fibres, Polarization mode dispersion, Dispersion Compensation fibres, Techniques for reducing fiber losses.

Unit II : Optical Sources, Detectors and Optical fibre measurements

Optical Sources: Absorption & emission of radiation, Einstein Relations, Population inversion, Optical feedback and LASER oscillations, Threshold Conditions, Principles of LASER diode, characteristic and efficiency, Semiconductor injection LASER, Injection LASER characteristics.

Optical Detectors: Optical Detection principles, PIN photodiode, Avalanche photodiodes, Metal semiconductor photo detectors, Noise in P-N photo diode.

Measurements: Fibre attenuation measurement, Fibre dispersion measurement, Fibre reflective index profile measurement, Fibre cut-off wavelength measurement, Fibre NA and diameter measurement, Reflectance and optical return losses , field measurement.

SECTION- B

Unit III : Optical fibre links and components of fibre optic network:-
Link power budget, rise time budget, transmission distance for single mode links, Power penalties in design, Semiconductor optical amplifiers, Erbium Doped Fibre amplifier (EDFA), Stimulated Raman's Scattering, Raman Amplifiers, Optical parametric amplifiers.

Passive Components, switches and functional modules:-
Directional couplers, fixed and tuneable optical filters, isolators, circulators and attenuators, Concept of optical switching,

optical switches, wavelength converters, Optical add/drop multiplexers, optical cross connectors.

Unit IV : WDM Devices and it's Application
Hybrid & planer wave guide devices, Active WDM devices, Wavelength non selective devices, System application. Long Haul Broad Bandwidth Transmission System : Designing systems for long haul broad bandwidth consideration-Outage, Bit error rate, Cross connect, Low & high speed inter-phases, Multiplex / De-multiplex consideration, Regenerator spacing, Degeneration & Allowances

REFERENCE BOOKS:

1) Fiber Optic Communication Technology by Djafar Mynbaev, Lowell Scheiner, Pearson Education 2011.
2) Optical Fiber communication Principles and Practice by John M Senior, 3rd Ed, Pearson Education.
3) Optical Fiber Communication by Gerd Keiser, 4th Ed, McGraw Hill
4) Optical Network by Raju Ramswami (2nd Edition)

1ENTC2 RANDOM PROCESSES

SECTION-A

Unit - I : Scalar Random Variables: -
Concept of random variable, Discrete random variable, Continuous random variable, Expectations & Moments, Characteristics functions, Functions of random variables, Moment generation function, Central Limit theorem (CLT), Generation of random numbers.

Unit - II: Multi-dimensional Random Variables: -
Joint distribution function, Joint density function, Marginal distribution function, Conditional distribution, Covariance & Covariance matrix, Expectations & Moments, Mean and Variance of weighted sum of Random Variables, Joint Gaussian Random Variables

SECTION -B

Unit - III: Random Processes and Statistical Models for Random Signals:-
Concept of random process, Characterization and Classification, Correlation function, Properties of Auto Correlation function, Relationship between two Random Processes, Properties of

Cross Correlation function, Gaussian Random Processes. Introduction to White noise, Random Walks, Brownian motion

UNIT- IV: Power Spectral Density (PSD): -

Concept of Power Spectral Density, Properties of PSD, Power Spectral Estimation, Cross Spectral Density, Power Spectrum in Laplace Domain

REFERENCE BOOKS:

1) Probabilistic Random Signals and Statistics by X Rong Li, CRC Press
2) Random Signals and Systems by Bernard Picnicbono, PHI.
3) A First Course in Probability by Shelabo Ross, Pearson Education

1ENTC3 DIGITAL COMMUNICATION TECHNIQUES

SECTION -A

Unit -I : Characterization of Communication Signal and Optimum Receiver for AWGN Channel:-

Signal Space representation, Memory less Modulation methods, Linear Modulation with memory, Non- linear Modulation methods with memory, CPFSK & CPM, Power Spectra of Linear Modulated signal, Power Spectra of CPFSK & CPM Signals, Correlation Demodulator, Match Filter Demodulator, Optimum Detector, Probability of Error for Binary & M-array signals

Unit - II : Source and Channel Coding:-

Average mutual information & Entropy, Coding of discrete memory-less sources, Discrete Stationary Sources, Lempel-Ziv algorithm; Coding of analog sources, Rate distortion function, Scalar Quantization & Vector Quantization, Temporal and Spectral Waveform Coding, BCH codes, Reed Soloman codes, Reed Muller Codes, Convolution Codes, Transfer function of convolution codes, Viterbi decoding algorithm, stack algorithm(No problems expected)., trellis coded modulation.

SECTION: B

Unit -III : Signal Design for Band Limited Channel & Equalization:-

Design of band limited signal for zero ISI, Nyquist Criterion, Design of band limited signal for controlled ISI, partial response signaling, Data detection for controlled ISI

Linear Equalization: Peak Distortion Criterion, Mean Square Error (MSE) criterion, Decision Feedback Equalization, Coefficient Optimization, Adaptive Linear Equalizer, Zero Forcing Algorithm, LMS Algorithm.

Unit -IV : Spread Spectrum Techniques:-

Generation of PN sequence, direct sequence spread spectrum system, processing gain, jamming margin, application of direct sequence spread spectrum signal, frequency hopped spread spectrum signal, time hopping spread spectrum signal, synchronization of spread spectrum signal – acquisition & tracking.

REFERENCE BOOKS :

1) Digital Communication by J.G. Proakis, Fourth Ed, Mc Graw Hill
2) Digital Communication Techniques by Simon Haykin, John Wiley & Sons
3) Digital Communication Fundamentals and applications by Bernard Sklar, 2nd Ed, Pearson Education Asia
4) Advanced Digital Communication System and Signal Processing techniques by Dr. Kemilo Feher Prentice Hall International

1ENTC 4 DIGITAL SIGNAL PROCESSING AND APPLICATIONS

SECTION –A

Unit -I: Design of Digital FIR filters:-

Filter specifications, Magnitude & Phase response of digital filter.

Linear Phase filters: Type I, Type II, Type III, & Type IV.

FIR filter design using Impulse Response Truncation: Low pass, High pass filter & Band pass filter, FIR design using Hamming, Hanning, Blackman & Kaiser window, Differentiators, Hilbert transforms, Equi-ripple FIR filter design.

Unit -II: Design of Digital IIR filter:-

Analog filter basics: Butterworth, Chebyshev, Inverse Chebyshev filters, Elliptic filters, IIR filter design using impulse invariance, Bilinear Transform, Matched Transformation, Differentiation method (Backward difference method), Frequency transformations in Analog and Digital domain, frequency normalization, Finite word length problem, Quantization Effects on poles & zeros and frequency response

SECTION - B

Unit III: Multi-rate Digital Signal Processing:-
Decimation & Interpolation, Linear filtering with decimation and interpolation, Poly-phase filters, Filter banks, sub-band processing, Decimated filter banks, Uniform DFT filter banks, Quadrature mirror filters

Unit IV: DSP Processors and its Application:-
Architecture of TMS 320C67XX, Assembly language instructions, pipeline operations, Speech signal processing, Radar signal processing

REFERENCE BOOKS:

1) A Course in Digital Signal Processing by Boaz Porat John Wiley & Sons
2) Digital Signal Processing by J. P. Proakis, PHI
3) Real Time Digital Signal Processing- Implementation and Applications by Sen M. Kuo, Bob H.
   Lee and Wenshun Tian, 2nd Ed, John Wiley & Sons, 2006
4) Digital Signal Processing- A Computer based Approach by Sanjit K. Mitra, 4th Ed, Mc- Graw Hill
5) Digital Signal Processing: A Modern Introduction, Ashok Ambardar, Thomson, 2007
6) Digital Signal Processing, Thomas J. Cavicchi, John Wiley

ELECTIVE-I

1ENTC5 (A) REAL TIME EMBEDDED SYSTEM

SECTION – A

Unit I : Embedded System Hardware: -
Embedded systems overview, Hardware components like microcontroller, GPP,ASSP,AISP, SOC, Details of 32 bit ARM SOC architecture, Organization, Analog, Digital & High speed I/O for embedded systems, Interfacing SRAM, DRAM and flash memories with microcontroller, memory management, allocation of memory to program segments and blocks, memory maps.

Unit II : Embedded System Software: -
Techniques of writing efficient C code for microcontroller, C data types for ARM, Signed & unsigned data types, limitation of char & data types, storage class – static & extern, volatile keyword, operation on bits, functions, ARM Thumb procedural

call standard, pointers & arrays, conditional statements – if-else, switch, structure, conditional loops – for & while, preprocessing, compiling, cross compiling, compiler driver, startup code and board support packages, program segments calling assembly routines in C, interrupt handling in C, interrupt latency.

SECTION - B

Unit III: Uniprocessor Real Time Scheduling: -
Real time systems, tasks and its states, task assignment & scheduling, scheduling algorithms – rate monotonic and earliest deadline first, inter-task communication, semaphore, priority inheritance protocol, priority ceiling protocol, real time operating system features, features of micro COS – II, RTOS.

Unit IV: Embedded System Architecture & Design: -
Embedded system implementation aspects & estimation modeling, embedded system architecture, validation and debugging of embedded systems, hardware – software co-design in an embedded system, ARM Philips NXP LPC 2148 programming of on – chip components like ADC and interfacing external peripherals like keyboard, LCD, Stepper Motor.

REFERENCE BOOKS:

01) Embedded Systems by Rajkamal, 2nd Ed, Tata McGraw Hill
02) Embedded Real-time Systems Programming by Iyer & Gupta, Tata McGraw Hill
03) ARM System on Chip Architecture by Furber, 2nd Ed, Pearson India
04) Intro. To Embedded Systems by K.V. Shibu, McGraw Hill
05) Philips NXP LPC 2148 user manual
06) Scheduling in Real Time systems by Cottet, Delacroix & Mammeri, John Wiley & Sons
07) Embedded system design A Unified Hardware/software approach by Frank Valid & Tony Givangis, Publishing 1999
08) Embedded systems: World Class Designs- Jack Ganssle, Newness Publication, Australia.
09) Embedded Microprocessor Systems: Real world design – Stuart R & Ball P.E., 3rd Ed., Newness, Imprint Elsevier Science.

1ENTC5 (B) DATA COMPRESSION
SECTION- A

UNIT- I : Introduction and Mathematical background: -
Lossless compression, Lossy compression, Measure of performance, Modeling and Coding, Physical model, Probability model, Markov model, Composite Source model, Uniquely decodable codes, Prefix codes, Kraft-McMillan inequality
Huffman coding: Minimum variance, optimal, length, Extended Huffman codes, Non-binary Huffman codes, Adaptive Huffman coding, Application of Huffman codes.
Arithmetic coding: Coding a sequence, generating binary codes, Adaptive arithmetic coding, Application of arithmetic coding

Unit - II : Dictionary based compression, Context based compression and Lossless image compression: -
Static and adaptive dictionary coding techniques, Application related to file compression and Image Compression, V.42 bis Standard.
Context based Compression: Prediction with Partial Match (PPM), Burrows Wheeler Transform, Associative coder,
Lossless Image Compression: JPEG, Run-length coding, facsimile coding standards, progressive Image transmission

SECTION- B

Unit –III: Quantization Transform Coding and Sub-band Coding: -
Scalar Quantization, Quantization problem, Uniform quantization, Adaptive quantization, Non-uniform Quantization, Entropy Coded Quantization.
Vector Quantization (VQ): Advantages over Scalar Quantization, The Linde-Buzo-Gray algorithm, Tree Structured, Vector Quantization, Structured VQ.
Transform Coding: K L Transform, DCT, DST, Discrete Walsh-Hadamard transform, Applications of Transform coding to Image and audio compression
Sub band Coding: Filters, Basic Sub-band coding, algorithm, design of Filter Banks, Application to speech coding audio coding and Image compression

Unit - IV: Audio, Image and Video Compression: -
Spectral masking, Temporal masking, Psychoacoustic model, MPEG Audio coding, MPEG Advanced Audio coding, Dolby digital.

Image Compression : Predictive techniques like PCM, DPCM and DM, JPEG,JPEG-2000.
Video compression: Video signal representation, H.261 Standard by ITU-T, model based coding MPEG-1 and MPEG-2 Video Standards, ITU-T H.263 and H.264 Standards, Packet Video

REFERENCE BOOKS:

1) Introduction to Data Compression by Khalid Sayood, 2nd Ed, Academic Press.
2) Data Compression Complete Reference by David Salomon, 3rd Edition, Springer 2004.
3) Digital Image Processing by S Jayaraman, S Esakkirajan, T Veerakumar, Tata Mc-Graw Hill.
4) Digital Image Processing by R.C.Gonzalez and Woods 3rd Edition, Pearson Education.

1ENTC5 (C) ARTIFICIAL INTELLIGENCE
SECTION-A

Unit I : Fuzzy Set theory: -
Introduction to Fuzzy sets, Fuzzy relation, Membership functions, Fuzzification, De-fuzzification, Fuzzy logic, Fuzzy rule based system, Fuzzy inference system

Unit II : Fuzzy Decision Making: -
Fuzzy modeling, Adaptive Neuro-Fuzzy Inference system, Cognitive Neuro-Fuzzy modeling, Neuro-fuzzy control, Application of Neuro Fuzzy control

SECTION-B

Unit III: Artificial Neuron model: -
Single and multilayer perceptron neural network (MLP)
Learning process: Training by back-propagation, Swarm particle optimization, Genetic algorithm, simulated annealing, basic concept of bidirectional associative memory (BAM), Self organization feature map, Optical neural network.

Unit IV : Neural Networks and Applications: -
Recurrent Networks, Hamming Network, Support Vector Machine**,** Counter Propagation Networks, Cluster Discovery Network (ART), Applications of Neural Network in Character Recognition, Forecasting, Robot Kinematics and Biomedical signals .

REFERENCE BOOKS:

1) Fuzzy sets and Fuzzy Logic -Theory and Applications by George J. Klir, Bo Yuan, PHI
2) Neural Networks by Simon Haykin, Pearson Education

3) Neural networks, Fuzzy logic and genetic algorithms synthesis and applications by S. Rajasekaran, G.A. Vijayalakshmi Pai, Prentice Hall Inc (PHI)
4) Artificial Neural Networks by Zurada
5) Neuro Fuzzy and Soft Computing by Jang-Sun, Mezutani, Pearson Education
6) Introduction to Neural Networks using MATLAB 6.0 by S.N.Sivanandan, S. Sumathi, S.N. Deepa, McGraw Hill
7) Intelligent Systems & Controls by Laxmidhar Behera, Indrani Kar, Oxford University Press

1ENTC5 (D) CRYPTOGRAPHY AND NETWORK SECURITY

SECTION-A

Unit I : Overview: Services, Mechanisms and Attacks:-
The OSI Security Architecture, A model for network security.
Classical Encryption Techniques: Symmetric Cipher model, Substitution Techniques, Transposition Techniques, Rotor Machines, Steganography .
Block Ciphers and Data Encryption Standards: Simplified DES, Block cipher principles, Data encryption, The Strength of DES, Differential linear cryptanalysis, Block cipher design principles, Block cipher modes of operations, Contemporary symmetric ciphers- Triple DES, Blowfish, RC5, Characteristics of Advanced symmetric block ciphers
Confidentiality using symmetric encryption: Placement of Encryption function, Traffic Confidentiality, Key distribution

Unit II: Public Key Cryptography and RSA:-
Principles of Public key crypto-systems, The RSA Algorithm, Key management, other public key crypto-systems, Key management, Diffle-Hellaman key exchange
Message Authentication and flash function: Authentication requirements, Authentication function, Message Authentication codes, Hash function, Security of Hash function & MACs

SECTION- B

Unit - III: Hash Algorithms:- MD5 Message Digest Algorithm, Secure Hash Algorithm Authentification Applications: Kerberos X-509, Authentication Service.

Unit - IV: Electronic Mail, IP & Web Security:-
Electronic Mail Security: Pretty good privacy, S/MIME IP

Security: Overview, IP Security Architecture, Authentifications, Header, Encapsulating Security Payload, Combining security Associations, key Management
Web Security: Web security considerations, System Security: Intruders, Malicious software, Viruses, Viruses and related threats Firewalls: Firewall design principles.

REFERENCE BOOKS:

1) Cryptography and Network Security by William Stallings, Third Edition, Pearson Education.
2) Network Security, Private Communication in Public World by Charlie Kaufman, Rudia Perlman, Mike Spenciner, Second Ed., Pearson Education Asia 2002.
3) Contemporary Cryptography by Rolf Oppliger, Artech Home Publication, 2005
4) Cryptography and Network Security by Atul Kahate, Tata McGraw Hill,2003

LABORATORIES

1ENTC6 Lab-I: The laboratory work shall consist of at least 8 experiments. The experiments shall be equally distributed and based on 1ENTC1 and 1ENTC3.

1ENTC7 Lab-II: The laboratory work shall consist of at least 8 experiments. The experiments shall be equally distributed and based on 1ENTC2 and 1ENTC4.

SEMESTER-II
2ENTC1 ADAPTIVE SIGNAL PROCESSING

SECTION -A

Unit I: Introduction to Random Signals: -
Random variables, Sequences and Stochastic Process, Random Signals and Distributions, Averages, Stationary Processes, Special Random signals & its Probability Density Functions (PDF), Weiner-Khintchin relations, Filtering Random processes, Non-parametric spectral estimation, Parametric methods of power spectral estimations

Unit II: Wiener Filter and Adaptive Filtering Algorithms: -
Mean Square Error (MSE), FIR Wiener filter, Wiener solution with Wiener filtering examples.
Algorithms: Eigen values of the correlation matrix, one dimensional gradient search method, Steepest Descent algorithm, LMS algorithm, Modified LMS algorithm, Examples of LMS algorithm.

Performance analysis: stability Constraints, Conversion Speed, excess MSE

SECTION - B

UNIT III: Kalman Filters and Square Root Adaptive Filters:
Introduction to Recursive Least-Squares Adaptive filters, Recursive minimum MSE for Scalar random variables, Kalman filtering problem, Innovation process and estimation of state, Kalman filtering, Square root Kalman filters, QR-RLS algorithm

UNIT IV : Applications of Adaptive filtering:
Adaptive Equalization, Adaptive noise cancellation, Adaptive Linear prediction, Adaptive Echo Cancellation, Adaptive Lattice Filters

REFERENCE BOOKS:

1) Adaptive filter Theory by Simon Haykin, 3rd Ed, Prentice Hall Inc, 2002
2) Real Time Digital Signal Processing- Implementation and Applications by Sen M. Kuo, Bob H. Lee and Wenshun Tian, 2nd Ed, John Wiley & Sons, 2006
3) Adaptive Filtering Primer with MATLAS by Alexander D. Poulanikas & Zayed M Ramadan, Taylor & Francis Series, CRS press.
4) Adaptive Digital Filters by Maurice G Bellanger, 2nd Edition, MARCEL DEKKAR INC Adaptive Nonlinear System Identification by T Ogunfummi, Springer

2ENTC2 WIRELESS COMMUNICATION

SECTION-A

Unit -I : Fundamentals of Wireless Communication : Evolution of wireless networks and challenges
Long term fading models: two ray model, diffraction model, scattering model, Shadow fading
Short term fading: Impulse response of time varying channels, Narrow band fading model, wide band fading models, discrete time model. Capacity of wireless channel, Capacity of AWGN channel, Capacity of flat fading channel, Capacity of frequency selective fading channel, Basic diversity combining techniques.

Unit II : Analog and Digital Cellular Mobile System:- Analog Cellular System: AMPS, NMT Digital Cellular System: GSM, GSM Architecture, TDMA frame structure, Traffic and Control channels, Voice Processing in GSM. IS -95 (CDMA one): Forward Modulation channel, Reverse Modulation channel.

SECTION-B

Unit III : Low power wireless communication systems, Data Networks and protocols:-
Cordless Telephony 2 (CT2), Digital Enhanced Cordless Telephony (DECT), PHS, PDC, WAP, PCS (Functional Architecture, Radio Specifications, Frame Structure).
Protocols: IEEE 802.11, IEEE 802.15.

Unit IV: Private Mobile Radio network and Introduction to 3G Systems:-
Private Mobile Radio (PMR): Introduction, user community, requirement of PMR services, PMR configurations, PMR standards, TETRA Network Architecture. IMT 2000: Radio aspects, Network Aspects and Regional initiatives
Universal Personal Communication: UPT, Concepts and Service aspects, Functional architecture, Routing, Scenarios for partitioning and location of service information, Access security, Basic concepts of UMTS.

REFERENCE BOOKS:

1) Wireless Networks by G. S. Papadimitriou, A. S Pomportisis, P Nicopolitidis, John Wiley & Sons.
2) Wireless Communication by Andrea Goldsmith, Cambridge University Press.
3) Mobile and personal Communication: Systems & Service by Raj Pandya, Prentice Hall India.
4) Digital Mobile Communication and TETRA Systems by John Dunlop, Demessie Girma, James Irvine, John Wiley & Sons.
5) Wireless communications: Principles and Practice by Theodore S. Rappaport, P.E.
6) Principles of Mobile Communication by Gordon L Stuber, 2nd Ed, Kluwer Academic Publishers
7) Mobile Cellular Telecommunication, William C Y Lee , Mc Graw Hill

2ENTC3 ADVANCED COMPUTER NETWORKS AND PROGRAMMING

SECTION- A

Unit - I: Basics of Communication Networks:-
Communication networks and services, Approach to network design, Key factors in Communication network, Evolution, Concept of Layering, OSI Reference model, TCP/IP

architecture, Barkley API, TCP/IP utilities, Concept of Space-Division Switching and Time- Division Switching, Time Space Time (TST) Switching

Unit - II: Queuing models: -

Delay analysis, Arrival rate, Traffic load, Erlang 'B' and Erlang 'C' concepts, Arrival process, Service time classification of queuing systems, M/M/1 queue and Basic multiplexer model, M/M/1 steady state probabilities, Effect of scale on performance, Average packet delay, M/M/C/C Systems, M/G/1 model, Service time, Variability and Delay in M/M/1 systems.

SECTION- B

Unit III: TCP/IP and Routing: -

Architecture IPV6 IP addressing ICMP, IGMP, ARP, RARP, DHCP, Transmission Control (TCP), TCP Segment, TCP flow control, TCP Congestion control, UDP, Mobile IP, Unicast Routing protocols, Multicast Routing Protocols

Unit IV: ATM Network and Advanced Network Architectures:-

Need for ATM, B-ISDN Reference model, ATM layers, ATM Adaptation layers, ATM signaling, PNNI Routing, QoS in ATM, Overlay model, MPLS, Integrated services, RSVP, Differentiated Services.

REFERENCE BOOKS :

1) Communication Networks by Leon Garcia, Wadeja, Tata Mc Graw Hill
2) Data and Computer Communication by William Stallings, 8th Edition, Pearson Education.
3) Data Communication and networking by Behrouz Furozan, Fourth edition, McGraw Hill.
4) TCP /IP Protocol Suite by Behrouz Furozan, McGraw Hill.
5) Internetworking with TCP/IP- Vol I, II, & III by D.E. Comer, PHI

2ENTC4 RF AND MICROWAVE CIRCUIT DESIGN

Unit I : Two Port RF Networks-Circuit Refrigeration

Low frequency parameters-impedance, admittance, hybrid and ABCD. High frequency parameters-Formulation of S parameters, properties of S parameters-Reciprocal and lossless networks, transmission matrix, Signal Flow Graph:

Unit II : RF Transistor Amplifier Design And Matching Networks

Amplifier power relation, stability considerations, gain considerations noise figure, impedance matching networks,

frequency response, T and Ð matching networks, microstripline matching networks (unilateral/bilateral)

Unit III : Microstrips Lines, Design, Analysis

Introduction, types of MICs and their technology, Propagating models, Analysis of MIC by conformal transformation, Numerical analysis, Hybrid mode analysis. losses in Microstrip, Introduction to coupled Microstrip, Even and odd mode analysis, Directional couplers, branch line couplers, Design and Fabrication of Lumped elements for MICs,

Unit IV : Microstrip Circuit Design And MMIC Technology

Introduction, Impedance transformers, Filters, High power circuits, Low power circuits, MICs in satelite and Radar. Fabrication process of MMIC, Hybrid MICs, Configuration, Dielectric substances, thick and thin film technology, Testing methods, Encapsulation and mounting of Devices.

TEXT BOOKS :

1) Samuel Y Liao, "Microwave Devices & Circuits" , Prentice Hall of India, 2006.
2) Reinhold.Ludwig and Pavel Bretshko 'RF Circuit Design", Pearson Education, Inc., 2006
4) M.M.Radmanesh , RF & Microwave Electronics Illustrated, Pearson Education, 2007.
5) Hoffman R.K."HandBook of Microwave intergrated circuits",Artech House,Boston,1987.
6) Gupta .K.C and Amarjit Singh,"Microwave Intergrated circuits"John Wiley,New York,1975.

2 ENTC5 Elective-II
(A) MOBILE COMPUTING

Unit – I: Wireless network technology: Introduction to 3G and 4G mobile systems. Global System for Mobile Communication (GSM) , Wireless media access control protocols; Wireless LAN, TDMA, PRMA, CDMA, WCDMA.

Unit – II: Location management: Location management in internet, Location management in cellular phone network and PCN, performance issues, future research directions. Transport protocols in mobile environments: I-TCP, snooping protocols, Multicast transport services.

Unit – III: Services in wireless networks: Quality of service, Delays, error and packet loss, Error control schemes, Mobile distributed application support: Operating system support, Mobile

middleware and object architecture, Mobile transaction, Remote execution and mobile RPC, Cache strategies for wireless networks.

Unit – IV: Security issues in mobile and wireless: Traditional Security Issues, Mobile and Wireless Security Issues, Additional Issues(Liability, Fear, uncertainty and doubt, Fraud, Big bucks at stake), Additional Types of Attacks(man in the middle attacks, traffic analysis, Replay attacks, Buffer overflow attacks)

Approaches to security: Limit the signal, Encryption, Integrity codes, Ip security, Other Security related Mechanism (Authentication protocols, AAA, Special Hardware)

REFERENCE BOOKS:

1. Mobile Computing, edited by T. Imielinski and H.F. Korth, KluwerAcademic
2. Mobile computing by Asok Talukdar, Roopa Yawagal, TMH
3. Fundamentals of Mobile and Pervasive Computing by Frank Adelstein, Sandeep K.S. Gupta—TMT

2ENTC5 ELECTIVE-II
(B) COMMUNICATION SYSTEM DESIGN

Unit – I: Designers perspective of communication system: Wireless channel description, path loss, multi path fading Communication concepts, Receiver Architectures: Introduction, Overview of Modulation Schemes, Classical Channel, Wireless Channel Description, Path Losses: Detailed Discussion.

Unit – II: Multipath Fading: Channel model and Envelope Fading, Multipath Fading: Frequency Selective and Fast Fading, Summary of Standard Translation, Introduction Receiver Architectures, Receiver front End: general discussion, Filter Design, rest of Receiver Front Eng: Nonideatlites and Design Parameters, Derivation of NF, IIP3 of Receiver Front End, Partitioning of required NFrec_front and IIP3,rec_front into individual.

Unit – III: Low Noise Amplifier: Introduction, Wideband LNA, Design, Narrow band LNA:Impedance Matching, Narrowband LNA: Core Amplifier, Active Mixer: Introduction, Balancing, Qualitative Description of The Gilbert Mixer, Conversion Gain, Distortion, Low-Frequency Case: Analysis of Gilbert Mixer, Distortion, High- Frequency Case, Noise, A Complete Active Mixer, References, Problems.

Unit – IV: Analog to Digital Converters: Demodulators, A to D Converters used in receivers, Low cost Sigma delta modulators and it's implementation, Design Technology for Wireless Systems: Design entry / simulation, Validation and analysis tools

REFERENCE BOOKS:

1. VLSI for Wireless Communication- Bosco Leuing, (PE).
2. The design of CMOS Radio frequency integrated circuits – T Lee (Cambridge University press)
3. Analysis and design of analog integrated circuits – P Gray and R Meyer (John Wiley & Sons)
4. Microelectronics Transistor Amplifier, Analysis and design G Gonzalez (Prentice Hall)

2ENTC5 ELECTIVE-II
(C) OPTICAL NETWORKS

Unit I : SDH/SONET/WDM & DWDM

SONET/SDH architecture and protocols,Multiplexing structures, Functional components, virtual tributaries and containers, SONET/ SDH network elements, SONET/ SDH migration, Single wavelength limitations, WDM concepts and components, Introduction of DWDM,WDM network designs.

Unit II: Optical Networks ATM, IP

Basic of ATM, ATM virtual channels and path, ATM signalling Principal LANE, MOPA ATM in optical world. IP suit, Router and Switches. MPL's switching in IP, MPLS as an optical control channel, getting IP packets onto DWDM. Optical routers

Unit III: Photonic Packet switching and network survivability

Optical TDM, Synchronization, Header processing, Buffering, Burst switching Testbeds, Basic concept, Protection in SONET / SDM, Protection in client lager, Service class base on protection, Optical layer protection scheme, Network between layers.

Unit IV : Control Management

N/W management functions of SDH/SONET Frames, optical layers services and interfacing, layers within optical layers, Multivendor Interoperability performance and fault Management, Optical safety.

REFERENCE BOOKS:

1. Optical Network by Raju Ramswami (2nd Edition) Morban Kaufmann Elfpvier
2. Optical Networks– Third generation transport system -Uyless Black (Prentice Hall)
3. Opto Electronic computing system – Jordan
4. Optical networking and WDM- W. Goralski

2ENTC5 (D) SPEECH & AUDIO PROCESSING

SECTION - A

Unit I: Introduction – Speech production and acoustic phonetics, speech perception. Speech analysis: time and frequency domain techniques for pitch and formant estimation, cepstral and LPC analysis.

Unit II : Speech Enhancement: Microform Codes, Source coders, and Hybrid coders. Microphone Array processing, Noice Suppression, and Echo Canceller.

SECTION - B

Unit III : Speech Recognition: Basic pattern recognition, preprocessing, Parametic representation, evaluating the similarity of speech pattern (Accommodating both spectral and temporal variability), Network for speech recognition, Language model, artificial neural networks. Summary of current speech recognition design.

Unit IV: Speech synthesis & Applications: Articulatory, formant, and LPC synthesis, voice response and text-to-speech systems. Applications: data compression, vocoders, speech enhancement, speech recognition speaker recognition, aids for the speech and hearing impairments.

Reference Books :

1. D O'shaughnessy, Speech Communication: Human and Machine, Addison Wesley.
2. L R Rabiner and R W Schafer, Digital Processing of Speech Signals, Prentice Hall
3. J Flanagan, Speech Analysis, Synthesis, and Perception, Springer Verlag.
4. L.R. Rabiner and B. Juang " Fundamentals of Speech Recognition" Pearson Education (Asia)Pte. Ltd., 2004.

2ENTC6 Lab- I (Based on 2ENTC2 & 2ENTC3)

2ENTC7 lAB-I (Based on 2ENTC1 & 2ENTC4)

THIRD SEMESTER

3ENTC1 SEMINAR & DISSERTATION

(As per Given Scheme)

FOURTH SEMESTER

4ENTC1 SEMINAR & DISSERTATION

(As per Given Scheme)

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SYLLABUS PRESCRIBED FOR TWO YEAR P. G. DEGREE COURSE IN M.E. (F.T.) CIVIL ENGINEERING (TRANSPORTATION ENGINEERING & MANAGEMENT) (C.G.S.)

SEMESTER-I

1SFTR1 TRAFFIC ENGINEERING AND FIELD STUDIES

Introduction: Components of road traffic - the vehicle, driver and road. Objectives and scope of traffic engineering.

Traffic Engineering: Road user characteristics; human and vehicle characteristics, factors affecting road traffic; methods of measurement. Concepts of passenger car units for mixed traffic flow.

Traffic Engineering Studies and Analysis: Sampling in traffic studies; adequacy of sample size; application of sampling methods for traffic studies, objectives, methods of traffic study, equipment, data collection, analysis and interpretation (including case studies) of (i) Spot speed (ii) Speed and delay (iii) Volume (iv) Origin - destination (v) Parking . Traffic manoeuvres and Stream Characteristics; application in intersection design.

Probability and statistics for traffic engineering .

Traffic Regulations and Control: General regulations; Regulations on Vehicles, drivers and flow; Other regulations and control. Traffic management; noise and air pollution due to road traffic and method of control.

Traffic Control Devices: Traffic signs, markings, islands and signals. Different methods of signal design; redesign of existing signal including case studies. Signal system and co-ordination. Evaluation and design of road lighting.

ITS: Introduction to Intelligent Transport System- Application of ITS to Traffic Management System- Public Transportation Management System **Traffic Forecast:** General travel forecasting principles, different methods of traffic forecast - Mechanical and analytical methods, Demand relationships, methods for future projection.

Design Hourly Volume for Varying Demand Conditions: Concept of Design vehicle units and determination of PCU under mixed traffic conditions, Price-volume relationships, demand functions. Determination of design hourly volume; critical hour concept.

Highway Capacity: Factors affecting capacity, level of service; Capacity studies Capacity of different highway facilities including unsignalised and signalised intersections.

REFERENCE BOOKS:

1. Kadiyali, L.R. 'Traffic Engineering and Transport Planning', Khanna Publishers.
2. Drew, D.R. 'Traffic Flow Theory and Control', McGraw Hill Book Co.
3. IRC and IS Publications.
4. Institute of Transportation Engineers, 'Manual of Transportation Engineering Studies', Prentice Hall
5. Khanna and Justo,Text book of Highway Engineering , Nemchand Brothers, Roorkee,2000.
6. Papacostas, C.A.,, Fundamentals of Transportation Engineering', Prentice-Hall of India Private Limited, New Delhi.2000.
7. William R. McShane and Roger P. Roess,, Traffic Engineering', Prentice hall, New Jersey,2000.
8. Drew, D.R., **'Traffic Flow Theory and Contro**l', McGraw Hill Book Co.
9. Pignataro, Louis; **'Traffic Engineering** - Theory and Practice', John Wiley.
10. IRC Third **Highway Safety Workshop**, Lecture Notes 1978 and other IRC publications.
11. Highway Capacity Manual. Transportation Research board .
12. Fundamentals of Transportation and traffic Operations. Pergamon, Elsevier science Inc

1SFTR2 TRANSPORT PLANNING AND MANAGEMENT

Urban Transportation Planning - Goals and objectives - Hierarchical levels of transportation planning - Forecast - Implementation - Constraints. UTP survey – Inventory of land use Trip generation - Trip classification - productions and attractions - Multiple regression models - Category analysis - Trip production models - Trip distribution models – Linear programming approach.

Modal split models - Behavioural models - Probabilistic models - Utility functions – logit models - Two stage model. Traffic assignment - Assignment methods - Route-choice behavior - Network analysis. Landuse and its interaction - Lowry derivative models - Quick response techniques - Non-Transport solutions for transport problems. Characteristics of urban structure. Town planning concepts.

Preparation of alternative plans - Evaluation techniques - Plan implementation - Monitoring- Financing of Project – Case studies.

Motor Vehicles Act - statutory provision for road transport and connected organizations.

Route scheduling, Freight transport, Vehicle scheduling, Optimum fleet size, Headway control strategies, Crew scheduling.

Depots and Terminals - Principles and types of layout, Depot location, Twin depot concept, Crew facilities. Design of parking facilities – Bus terminal, bus stops and bus bays.

REFERENCE BOOKS:

1. Hutchinson, B.G., '**Principles of Urban Transport System Planning'** - McGraw Hill Book Co.
2. Kadiyali, L.R., '**Traffic Engineering and Transportation Planning'** - Khanna Publication.
3. Institute of Traffic Engineers - **An Introduction to Highway Transportation Engineering**'.
4. Khisty C.J., *Transportation Engineering - An Introduction*, Prentice Hall, India, 2002.

1SFTR3 DESIGN AND CONSTRUCTION OF PAVEMENT

Components of pavement structure, importance of Sub-Grade soil properties on pavement performance. Functions of Sub-Grade, sub-base, base course and wearing course.

Stresses in flexible pavements: Stresses in homogeneous masses and layered system, deflections, shear failures, equivalent wheel and axle loads.

Elements in design of flexible pavement: Loading characteristics-Static, impact and repeated loads, affects of dual wheels and tandem axles, area of contact and tyre pressure, modulus, CBR value of different layers, equivalent single wheel load, equivalent stress equivalent deflection criterion, equivalent wheel load factors, climatic and environmental factors.

Types of distress: Structural and functional, serviceability, fatigue cracking, pavement deformation and low temperature shrinkage cracking. Factors affecting performance. Relation between performance & distress.

Design methods for flexible pavement: Group Index method, California bearing ratio (CBR), Triaxial method, Mcleod Method, Benkelman Beam method. Boussiusq's and Burmister's analysis and design method. Design of flexible airport pavements.

Elements in design of Rigid pavements: Wheel load, stresses, Westergaard's analysis. Basic properties of concrete elasticity, shrinkage & creep, durability of concrete, rigid pavement design, concrete mix design.

Temperature stresses: Thermal properties of aggregates and concrete. Effect of temperature variations on concrete pavements, Westergaard's and Tomlinson's analysis of warping stresses. Combination of stresses due to different causes.

Pavement overlays: Flexible overlays and Rigid overlays.

Pavement Construction :

Equipment in Highway Construction: Various types of equipment for excavation, grading and compaction - their working principle, advantages and limitations. Special equipment for bituminous and cement concrete pavement and stabilized soil road construction

Subgrade: Earthwork grading and construction of embankments and cuts for roads. Preparation of subgrade, quality control tests

Flexible Pavements: Specifications of materials, construction method and field control checks for various types of flexible pavement layers

Cement Concrete Pavements: Specifications and method of cement concrete pavement construction; Quality control tests; Construction of various types of joints.

REFERENCE BOOKS:

1. Kadiyali L.R., " Principles & Practice of Highway Engineering" Khanna Publisher
2. Chakroborty P Das "Principles & Practice of Highway Engineering" (Khanna Publisher 2000)
3. "Highway Engineering", Khanna & Justo, (Nem Chand & Poros, Roorkee.1997)
4. E.J. Yoder, "Principles of Pavement Design," John Wiley & Sons lnc., New York.
5 Relevant IRC, ASTM, AASHTO and other Codes, Manuals and Specifications.
6. Teng – "Functional Designing of Pavements".
7. Huang - "Pavement Analysis & Design (Prentice Hall – 2003)
8. Yoder E,J, and Witezak – "Principles of Pavement Design". (Wiley & Sons, 1975)
9. Ralph Haos, Ronald Hudson & Zaniesuki " Modern Pavement Management (Kneiger Pubication,1994)

10. Sharma, S.C., '**Construction Equipment and its Management'**, Khanna Publishers

1SFTR4 DOCKS HARBOUR AND AIRPORT ENGINEERING

Water Transportation: Scope, Merits, Developments of Water Transportation in India, Inland waterways, River, Canal, Inland water transportation, Development of ports & Harbours, Harbour classification, Site selection, Harbour dimensioning.

Natural Phenomena: Tides, Water waves, Wave decay & port, wave diffraction, breaking, reflection, Littoral drift, sediment transport.

Harbour Infrastructures: Types of breakwaters, jetty, dock fenders, piers, wharves, dolphin, mooring accessories, Repair facilities, wet docks, lift docks, dry docks, gates for graving docks, floating docks, slipways, locks and gates.

Port facility: transit shed, warehouses, cargo handling, container handling, Inland port facility, Navigational aids, types, requirements of signals, lighthouses, beacon light, buoys. Dredging & coastal protection: Types of dredgers, choices, usage of dredged material, sea wall protection-sea wall revetment, bulkhead.

Planning of ports: Planning of ports for regional and intercontinental transportation development, forecasting cargo & passenger demand, regional connectivity, cargo handling capacity of port, economic evaluation of port project, impacts of port activities.

Air Transportation: Characteristics of Air Transportation structure and organization, challenges and the issues, Airport Master Plan, Characteristics of the aircraft, Airport Requirements, site selection, layout plan and financial plan, Forecasting air travel demand, Air freight demand.

Air traffic control, lighting and signing, Airport capacity and configuration, parking configurations and apron facilities ,visual aids.

Geometric Design: of runway, taxiway, aprons, Design of Passenger Terminal, analysis of flow through terminals, Design of air cargo facilities, Airfield pavement and drainage design.

Field Visit:

1. Visit to the Airport terminal building, structures of terminal area and management office.
2. Visit to the major Port: Port area and Harbour area infrastructures.

REFERENCES:

1. Khanna S.K., Arora M.G., Jain S.S., *Airport Planning & Design*, Nemchand Bros.,Roorkee
2. Horenjeff Robert, *The planning & Design of Airports*, McGraw Hill Book Co.

3. Bindra S.P., *Docks & Harbour Engineering*, Dhanpat Rai Publications,
4. Srinivasan R., Harbours, *Docks & Tunnel Engineering*, Charotar Publishing House, Anand,1999.

ELECTIVE-I
1SFTR5 (1) APPLIED SOIL MECHANICS

Introduction: Soil Mechanics applications to Highway Engg. Soil formations, Types, Regional Soil deposits of India, Index properties, their determination, importance, various soil classification systems, HRB classification, problems on these.

Soil Compaction: Introduction, Lab Tests, Factors affecting, Structure & Engg behavior of compacted cohesive soil, Field compaction specifications Field compaction control, Different types of Equipments used for compaction, their choice.

Stability of slopes: Introduction, Types, Different methods of analysis of slopes for Øu=0 & C-Ø soil, Location of most critical circle, Earth dam slopes stability, Taylor s stability number. Effect of Earthquake Force, problems on above.

Shear strength of soil: Introduction, Importance, Measurements, shear strength of clay, Sand, Elastic properties of soil – Tangent, Secant modulus, Stress – Strain curves, Poisson s ratio, Shear Modulus.

Permeability of soil: Darcy s Law, Validity, Soil-water system, Types, Determination of permeability, problems.

Site Investigation: Introduction, Planning exploration programmes, Methods, Samplers, SPT, Subsoil investigation Report, Geophysical methods.

Reinforced Earth structures: Introduction , Components, Advantages, Types of stability – external, Internal,Geo textiles – types, Functions, their uses in road embankments and railway works, other uses.

Highway Drainage: Introduction, Importance, Surface drainage, Sub-surface drainage, methods, Design of subsurface drainage system, Road construction in water logged areas, Land slides – definition, classifies, factors producing.

REFERENCE BOOKS :

1. "Basic and Applied soil Mechanics", Gopal Ranjan, ASR Rao, New Age International Publishers.
2. "Soil Mechanics & Foundation Engg", Dr.B.C. Punmia, Ashok Kumar Jain, Arun Kumar Jain, Laxmi Publications (P) Ltd, 16th edition.
3. "Highway Engg", S.K. Khanna, C.E.G. Justo, 5th edition.

4. "Soil Mechanics & Foundation Engg" – K.R. Arora Standard Publishers Distributors.
5. "Soil Mechanics for road Engineers" – HMSO, London.
6. IRC – Relevant Codes.

ELECTIVE-I
1SFTR5 (2) DESIGN OF BRIDGES

Introduction: Principles of Planning of Elevated Rail Transit System, grade separation structures, pedestrian crossing and sub- ways.

Loads on Bridges: Dead loads, live loads, dynamic effects of vehicles, longitudinal forces, centrifugal forces, wind loads, earth quake forces, stream flow pressure, load combinations, design examples

Design of Bridge Slabs: Longitudinally reinforced deck slabs, transversely reinforced bridge slabs

Design of Reinforced Concrete Bridges: Design procedures for T- beam, box girder bridges design examples

Design of Prestressed Concrete Bridges: Design code, design examples

Segmental Box bridges - precast sections, criteria, design examples

Sub-Structure Design: Foundation investigation, bearings, bridge pier design, and abutment design. Examples.

REFERENCE BOOKS:

1. Conrad P. Heins and Richard A. Lawrie, '**Design of Modern Concrete Highway Bridges**, John Wiley and Sons,1999.
2. Baider Bakht and Leslie, G. Jaeger,'**Bridge Analysis Simplied**, Mcgraw Hill Book Co,1998.
3. Johnson Victor, '**Bridge Engineering'**, Oxford IBH, New Delhi,2000.
4. Raina, R.K, **'Principles of Design of RCC Bridges**, Tata McGraw Hill,1999.
5. Krishnaraju „**Bridge Engineering**„, UPD Publishers, New Delhi,2000.

1SFTR6 TRAFFIC ENGINEERING AND FIELD STUDIES - LABORATORY

To achieve the objective the following practical will be conducted;

1. Traffic volume studies.
2. Spot -speed studies.
3. Speed and delay study.
4. Moving observer survey.
5. Parking studies
6. Origin -Destination studies, Desire line diagrams.
7. LOS study using VRT.
8. Problems related to traffic engineering.

1SFTR7 DESIGN & CONSTRUCTION OF PAVEMENT - LABORATORY

1. Plate Bearing Test.
2. Field CBR Test.
3. Pavement Evaluation by Benkelman Beam Method.
4. Road Unevenness Measurement by Bump-Integrator.
5. Valuation of Pavement Roughness by Roughometer / Profilometer.
6. Design of Flexible Pavements for Highway and Runway.
7. Design of Rigid Pavements For Highway and Runway.
8. Design of Overlays
9. Marshal Stability Test
10. Cement Concrete Mix Design

Field Visit:

1. Hot – mix plant visit,
2. Road construction site visit: Earth work construction procedure and bituminous mix laying, spreading and rolling procedure.

REFERENCE BOOKS:

1. Highway Material Testing – S K Khanna- C.E.G. Justo, Nemchand Bros- Rookee, 2000
2. S.K.Khanna & Justo C.E.G., Highway Material Testing Manual
3. A.K. Duggal and Vijay P.Puri, "Laboratory Manual in Highway Engineering,"

SEMESTER-II

2SFTR1 ADVANCED RAIL ROAD ENGINEERING

Introduction: Important development of Indian Railways, organization of Indian Railway, Track, Loco, Traction revolution for traffic growth on Indian Railways.

Track & Track Stresses: Permanent way, Track standards & structure, Track Modulus, Forces on the Track, loads, Hammer blow effect Bending Stresses in rail, stresses in Sleeper, Ballast, coning & Tilting of rails, Type of rails, Defect in rails, Rail failure, welding, methods, ultrasonic testing of thermit welding joints, Fastening of rails, fish plates, spikes, bearing plates, pandrol clips, new type of elastic fastening with S.T.sleeper, Rubber pads.

Formation, Sleeper & Ballast: Functions of formation, profile of Banks & cuttings, Track drainage, failure of bank & remedial measures, soil stabilization & Geotextiles methods, sleeper types, sleeper density, functions & requirement and Ballast types.

Point & Crossing & Turnouts: Turnout, type of switches, tongue rail, details of crossing, reconditioning of points & crossings calculation of elements of turnout coles method and IRS method. Symmetrical split, Diamond crossing, modern trend in design, problems.

Geometric Design of Track: Radius, degree of curve, super elevation, gradients, speed calculation, safe speed, equilibrium speed, permissible speed, cant, cant deficiency, negative cant, Transition curve & its design, Types, shift, laying of T.C., vertical curve & its design, problems.

Tractive power & Train resistance: various power requirements for steam, electric loco, diesel loco, Hauling power, resistances developed for Train & problems.

Signal & interlocking: Types of Signal, details of electrical signaling system, track circuits, Absolute block system, Automatic block system, interlocking & methods, Modern signaling techniques, Route relay interlocking, CTC systems.

Metropolitan Railways: Travel pattern, problems, Different forms of urban Transport, Trolley buses, surface railways, underground railways, elevated railways, mono rail, tube railways.

REFERENCE BOOKS:

1. Saxena & Arora. Railway Engineering Dhanpat Rai. Delhi.2000.
2. Ronald.A.Inglis, „An Introduction to Railway Engineering Chapman & Hall Ltd. London.1995.
3. W.W.Hay. Railway Engineering Chapman & Hall Ltd.London.1995.
4. Mundrey. J.S. Track Modernization.2000.
5. Manual on Signaling & Interlocking by Indian Railway board.

2SFTR2 ROAD SAFETY AND MANAGEMENT SYSTEM

Road accidents, Causes, scientific investigations and data collection. Analysis of individual accidents to arrive at real causes; statistical methods of analysis of accident data, application of computer analysis of accident data.

Safety in Road Design – Accident prevention through better planning and design of roads –planning road networks by land use planning, route planning, traffic planning for different land uses etc., designing for safety through link design, design of road geometrics etc., junction design for safety.

Operating the road network for safety, highway operation and counter-measures, road safety audit, principles- procedures and practice, code of good practice and checklists.

Road safety issues and various measures for road safety. Engineering, education and enforcement measures for improving road safety. Short term and long term measures. Road safety education and training. Traffic calming techniques and innovative ideas in road safety.

Economic evaluation of improvement measures by "before and after studies" Counter measures at hazardous locations – accident investigation,

problem diagnosis, development of counter measures, checklists for counter measures.

Traffic management techniques. Local area management. Transportation sy stem management. Low cost measures, area traffic control. Various types of medium and long term traffic management measures and their uses. Evaluation of the effectiveness and benefits of different traffic management measures, management and safety practices during road works. Case studies.

REFERENCE BOOKS:

1. BABKOV, V.F. 'Road conditions and Traffic Safety', MIR publications, - 1975.
2. K.W. Ogden, 'Safer Roads – A Guide to Road Safety Engg.' Averbury Technical, Ashgate Publishing Ltd., Aldershot, England, 1996.
3. Kadiyali, L.R., 'Traffic Engineering and Transport Planning', Khanna Publications.
4. Pignataro, Louis, 'Traffic Engineering - Theory and Practice', John Wiley.
5. RRL, DSIR, 'Research on Road Safety', HMSO, London.
6. IRC Third 'Highway Safety Workshop', Lecture Notes 1978 and other IRC publications.
7. Papacoastas 'Introduction to Transportation Engineering' – Prentice

2SFTR3 ENVIRONMENTAL IMPACT ASSESSMENT

Introduction: Concepts of environmental impact analysis, key features of National environmental policy act and its implementation, screening in the EIA process, utility and scope of EIA process, Environmental protection acts EIA at national level.

Conceptual approach for environmental impact studies, planning and management of impact studies, matrix and network methodologies for impact identification, description of the affected environmental – environmental indices.

Prediction and Assessment of Impact on Air Environment: Basic information on air quality, sources of air pollutants, effects of air pollutants, key legislations and regulations, conceptual approach for addressing air environment impacts, impact prediction approaches, assessment of significance of impacts, identification and incorporation of mitigation measures.

Prediction & Assessment of Impact on Noise & Social Environment: Basic information on noise, key legislation and guidelines, conceptual approach for addressing noise environment impacts, impact prediction methods, assessment of significance of impacts, identification and incorporation of mitigation measures, Conceptual approach for addressing socio-economic impacts, traffic and transportation system impacts, visual impacts, scoring methodologies for visual impact analysis

Decision Methods for Evaluation of Alternative: Development of decision matrix. Public participation in environmental decision making, Regulatory requirements, environmental impact assessment process, objectives of public participation, techniques for conflict management and dispute resolution, verbal communication in EIA studies

REFERENCE BOOKS:

1. Canter L.W., *Environmental Impact Assessment*, McGraw-Hill, 1997
2. Betty Bowers Marriott, *Environmental Impact Assessment: A Practical Guide*, McGraw-Hill Professional, 1997.
3. Peter Morris & Riki Therivel, *Methods of Environmental Impact Assessment*, Routledge, 2001.
4. Denver Tolliver, *Highway Impact Assessment*, Greenwood Publishing Group, 1993.
5. R. K. Jain, L. V. Urban, G. S. Stacey, H. E. Balbach, *Environmental Assessment*, McGraw-Hill Professional, 2001.
6. Relevant IRC & CPCB codes.

ELECTIVE-II
2SFTR4 (1) GEOMETRIC DESIGN OF TRANSPORTATION FACILITIES

Introduction: Classification of rural highways and urban roads. Objectives and requirements of highway geometric design.: Design Control and Criteria

Design Elements: Sight distances - types, analysis, factors affecting, measurements, Horizontal alignment - design considerations, stability at curves, superelevation, widening, transition curves; curvature at intersections, vertical alignment - grades, ramps, design of summit and valley curves, combination of vertical and horizontal alignment including design of hair pin bends, design of expressways, IRC standards and guidelines for design. problems.

Cross Section Elements: Right of way and width considerations, roadway, shoulders, kerbs traffic barriers, medians, frontage roads;

Facilities for pedestrians, bicycles, buses and trucks, Pavement surface characteristics - types, cross slope, skid resistance, unevenness.

Design Considerations: Design considerations for rural and urban arterials, freeways, and other rural and urban roads - design speeds, volumes, levels of service and other design considerations.

Design Of Intersections: Characteristics and design considerations of at-grade intersections; Different types of islands, channelization; median openings; Rotary intersections; Grade separations and interchanges - types, warrants, adaptability and design details; Interchanges - different types, ramps. Computer applications for intersection and interchange design.

Note : Computer Lab. using highway geometric design software for design of intersections, interchanges and parking lots to be carried out.

REFERENCE BOOKS:

1. AASHO, "A Policy on Geometric Design of Highways and Streets', American

   Association of State Highway and Transportation Officials, Washington D.C.
2. Khanna S.K. and Justo, C.E.G.'Highway Engineering', Nem Chand and Bros.,2000.
3. DSIR, 'Roads in Urban Areas', HMSO, London.
4. Jack E Leish and Associates, 'Planning and Design Guide: At-Grade Intersections'. Illinios.
5. Relevant IRC publications

ELECTIVE-II

2SFTR4 (2) THEORY AND APPLICATION OF GEOGRAPHIC INFORMATION SYSTEMS (GIS)

Geographic information concepts and spatial models – Introduction, spatial information, temporal information, conceptual models of spatial information, representation of geographic information.

GIS Functionality – Introduction, data acquisition, preliminary data processing, data storage and retrieval, spatial search and analysis, graphics and interaction.

Computer Fundamentals of GIS and Data storage Fundamentals of computers vector/ raster storage character files and binary files, file organization, linked lists, chains, trees. Coordinate systems and map projection: Rectangular, polar and spherical coordinates, types of map projections, choosing a map projection.

GIS Data models and structures – Cartographic map model, Geo-relation model, vector/ raster methods, non – spatial data base structure viz.. hierarchal network, relational structures. Digitizing Editing and Structuring map data – Entering the spatial (Digitizing), the non- spatial, associated attributes, linking spatial and non- spatial data, use of digitizers and scanners of different types.

Data quality and sources of error – Sources of errors in GIS data, obvious sources, natural variations and the processing errors and accuracy. Principles of Spatial data access and search, regular and object oriented decomposition, introduction to spatial data analysis and overlay analysis, raster analysis, network analysis in GIS.

GIS and remote sensing data integration techniques in spatial decision support system land suitability and multioriteria evaluation, rule based systems, network analysis, special interaction modeling, Virtual GIS.

Data base positioning systems, desirable characteristics of data base management systems, components of a data base management system, understanding the data conceptual modeling. Global positioning system, hyper spectral remote sensing, DIP techniques, hardware and software requirements for GIS, overview of GIS software.

REFERENCE BOOKS:

1. Peter A Burrough Rachael A Mc Donnel, "**Principles of GIS"** (Oxford), 2000.
2. Christopher Jones, "**GIS and Computer cartography"** (Longman),2000.
3. Lillesand, "**remote sensing and image interpretation** "(John Wiley and Sons),2000.
4. James L Riggs, **'Engineering Economics**' 4th Edition, Tata McGrawhill, New Delhi, 2005
5. Prasanna Chandra, **Financial Management** 5th Edition, Tata McGrawhill, ND05

ELECTIVE-III

2SFTR5 (1) TRANSPORTATION ECONOMICS AND EVALUATION

Introduction: Concepts and Principles of Engineering Economics, Identification and Measurements of Highway Benefits, Highway Transportation Costs, Road User Costs and Benefits, Road User Cost Study in India.

Cost and Benefits: Capital Cost, Inflation cost, Interest during construction, maintenance cost, Road user cost, Vehicle Operating cost, Accident Cost, Congestion Cost, and Pricing. Non user cost and consequences. Saving and Benefits, Road user benefits, and Consumer surplus. Social Costs and benefits from transportation projects.

Methods of Economic Analysis: Methods- BCR-NPV-IRR –Their Basic Characteristics, Illustrative applications on above Methods of Economic Analysis, Comparison of the Methods of Analysis when Applied to a Group of Mutually Exclusive Alternatives.

Economic Evaluation of Null Alternative, Characteristics and Limitations of the Different Methods of Economic Analysis, Ranking of Independent Projects, Sensitivity Analysis. case studies and problems .

Depreciation Concepts: Depreciation Cost, accounting Methods, Salvage Value Estimation, Depreciation, Taxes, Problems .

Supply and Demand: Concept-Definition-Factors affecting Demand and Supply- Shift in Demand and Supply- Transportation demand Model-Equilibrium-Sensitivity of Travel Demand- Elasticities-Consumer Surplus- Marginal Cost- Average Cost- Pricing .

REFERENCE BOOKS:

1. Robley Winfrey,'**Economic Analysis for Highways'**, International Textbook Company,Pennsylvania.1990.
2. Jotin Khisty and Kent Lall ' **Introduction to Transportation Engineering'** PHI, New Delhi,2001.
3. Kadiyali.L.R.' **Traffic Engineering and Transport planning'**, Khanna publications,New Delhi,2000.
4. Kenneth J. Button, Transport Economics, Elgar
5. David A. Hensher, Ann M. Brewer, Transport : An Economics and Management Perspective, Oxford University Press
6. Emile Quinet, Roger Vickerman, Principles Of Transport Economics, Edward Elgar Pub
7. Road User Cost Study, Central Road Research Institute
8. Dickey J.W, Project Appraisal for Developing Countries, JohnWiley
9. Ian G. Heggie, Transportation Engineering Economics, McGraw Hill

ELECTIVE-III
2SFTR5 (2) TRANSPORTATION SYSTEMS

Technological characteristics of different systems Principles and functions of important systems elements in Highway, Railways, Water ways, Airways, & Rope ways etc.

Historical development of transport in India - 20 year Road Plans, National Transport Policy Recommendations, IRC, CRRI, Vision 2021, NHDP, PMGSY. Characteristics of different modes of transport and their integration and interactions - impact on environment.

Planning of railway - Passenger and goods terminals - layout - passenger facilities – traffic control.

Airport Planning, requirements and components. Design of runway and taxiway - Apron - parking configuration - terminal requirements - Airport marking and lighting - Air traffic control.

Planning of Harbours and ports - cargo handling - Containerization - Navigation aids – Inland waterways - Pipeline transportation.

Urban transportation systems - Mass rapid transit system - Light rail transit - Personal rapid transit, guided way systems, cabin taxi, dual mode bus - Para transit systems – Demand responsive system - Intermediate public transport.

REFERENCE BOOKS :

1. **"An Introduction to Transportation Engineering"** Willian & Hay. John Wiley & Co.
2. **"An Introduction to Transportation Engineering & planning by Edward**. K. Modok. John Wiley & Co"
3. **"An Introduction to Transportation Engineering**" by Evere H.C.Carier. & Wolfgang. S. Homburger Reston Publishing inc.
4. Paquette, R.J., et al, Transportation Engineering Planning and Design, John Wiley & Sons, New York,1982.
5. 5Alan Black, Urban Mass Transportation Planning, McGraw-Hill, 1995.

2SFTR6 ROAD SAFETY AND MANAGEMENT SYSTEM - LABORATORY

The field studies on following topics :

1. Transportation management
2. Parking management
3. Road accident studies
4. Public transport route evaluation
5. Traffic signal - capacity evaluation
6. Rotary design

2SFTR7 ENVIRONMENTAL IMPACT ASSESSMENT - LABORATORY

1. Noise emitted by road traffic motor vehicles.
2. Detrimental effects of road traffic motor vehicles on human health.
3. Measurement using sound level meter and methods of prediction of highway traffic noise.

4. Noise pollution and Techniques of road traffic noise reduction.
5. Measurement of air pollution.
6. Perception survey with reference to Noise and Air .

THIRD SEMESTER

3 SFTR1 Seminar & Dissertation

FOURTH SEMESTER

4SFTR1 Seminar & Dissertation

As per given scheme

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SYLLABUS PRESCRIBED FOR
TWO YEAR P. G. DEGREE COURSE IN M.E. (F.T.)
THERMAL ENGINEERING (C.G.S.)

FIRST SEMESTER
1MTE1 ADVANCED MATHEMATICS

SECTION – A

Partial Differential Equations: Linear partial differential equations with constant coefficients and its solution, complimentary function and particular integral.

Applications of Partial Differential Equations: Method of separation of variables, solution of wave equation, one dimensional and two dimensional heat flow equation in steady state (Laplace Equation) and its solution.

SECTION – B

Statistics: -Method of least squares, curve fitting by graphical method. Co-relation regression, probability, axioms of probability, Baye's theorem, conditional probability, probability distribution; Binomial, Poisson's and Normal Distribution

Interpolation: -Newton's interpolation formulae, Newton's and Gauss's forward and backward interpolation formulae, Interpolation with unequal intervals, Lagrange's formula for unequal intervals. Newton's divided difference formula. Inverse interpolation

Numerical Methods: Numerical integration, Newton-Cote's formula, Trapezoidal rule, Simpson's one third and three eighth rule, Waddle's

rule. Numerical solution of ordinary differential equations; Taylor's series, Runge-Kutta's fourth order method, Euler's method, Milne's predictor-corrector method

TEXT BOOKS :

1. Advance Engineering Mathematics by Erwin Kreyszig, 7th and 8th Edition. Wiley Eastern.
2. Higher Engineering Mathematics by B. S. Grewal,

REFERENCE BOOKS :

1. Fundamentals of Statistics by S. C. Gupta.

1MTE2 ADVANCED THERMODYNAMICS

SECTION –A

Introduction And Overview: Introductory Concepts and Preliminaries; Properties of Pure Substances; Energy and the First Law of Thermodynamics, Energy Transfer by Heat, Work, and Mass; Second Law of thermodynamics, Entropy: A Measure of Disorder, Exergy – A Measure of Work Potential.

The Two Laws Combined: Review on some consequences of first Law, Limitations of first Law, Thermodynamic Tempera-ture Scale, Clausius-Clapeyron Equation, Stefan' s Law, Helmholtz and Gibbs Func-tions, Availability in Steady Flow, Irreversibility and Effectiveness, Combined First and Second Laws, Isothermal and Adiabatic Compressibility; Joule-Kelvin Coefficient, Maxwell Equation, Vander Wall's Gas Equation;

The Destruction Of Energy: Lost Available Work, Mechanisms of Entropy Generation or Energy Destruction, Entropy Generation Minimization.

SECTION -B

Multi Phase Systems: General considerations, Dalton & Amagat Model, Mixture of gases and vapors. Changes in Molal Properties upon Mixing, Gibbs Entropy Equation and Gibbs -Duhem Equation

Chemically Reactive Systems: Thermodynamics of reactive Systems and Criterion of Equilibrium, Phase rule. Combustion Process, Enthalpy of formation; First Law Analysis of Reacting Systems; Second Law analysis of Reacting Systems, Equilibrium Constant and its temperature Dependence.

Thermodynamic Optimization: Energy analysis of Vapor and Gas Power Cycles, Guideline for improving Thermodynamic Effectiveness; Energy analysis of Simple Power Plant (Steam Plant)

TEXT BOOKS:

1. Advanced Engineering Thermodynamics, Adrian Bejan, Wiley-Interscience Publication, Second Edition, ISBN 0-471-14880-6.
2. Fundamentals of Engineering Thermodynamics, Michael Moran & Howard Shapiro, Wiley & Sons, Sixth Edition, ISBN 978-0-471-787358

3. Fundamental of thermodynamics, Richard E. Sonntag, Gordon J. Van Wylen, Claus Borgnakke, John Wiley & Sons publication.

REFERENCE BOOKS:

1. Fundamentals of Classical Thermodynamics, Richard Sonntag, Claus Borgnakke, John Wiley & Sons, Seventh Edition, ISBN: 978-0-470-04192-5.
2. Thermodynamics: An Engineering Approach, Yunus A. Cengel & Michael A. Boles, Sixth Edition, ISBN-13 9780073305370.

1MTE3 FLUID DYNAMICS

SECTION - A

Fluid flow concepts: Euler's equations of motion, Navier stoke equation, equation of continuity, Rotational irrotational flows, potential and stream functions, and flow nets circulations. Vorticity.

Basic Function: Uniform stream, sink, vortex, doublet, superposition of functions, flow over half bodies, Rankine bodies, circular cylinder, Magnus effect.

Conformal Mapping: Simple transformation and inverse transformations.

SECTION - B

Boundary layer theory: Boundary layer theory for laminar and Turbulent flow, Blasius solution for flat plate, approximate methods, boundary layer separation and control, Effect of roughness.

Turbulent flow, Semi empirical theories of turbulence, eddy viscosity, Prandtl's mixing length theory, Karman's Similarity hypothesis, Taylor's Vorticity transfer theory.

Compressible Flow: Review of one dimensional compressible flow, approximation to two and three dimensional such as sonic, supersonic flows, small perturbation theory, Shock Waves, Prandtl Mayor's Equation.

TEXT BOOKS :

1. Foundations of Fluid Mechanics, Yuan, S.W., Prentice Hall,
2. Cengel, Y.A. and J.M. Cimbala, Fluid Mechanics, McGraw-Hill, Boston, MA
3. Mechanics of Fluids, Shames, McGraw-Hill.

REFERENCE BOOKS:

1. Boundary Layer Theory, Schlichting, H., McGraw-Hill,.
2. *Fluid Mechanics*, Kundu, P. K., and Ira M. Cohen, 4th ed., Academic Press
3. The Dynamics and Thermodynamics of Compressible Flow, Shappiro, Ronald Press.

1MTE4 ADVANCED HEAT TRANSFER

SECTION – A

Steady state conduction: Basic fundamentals, One dimensional steady state conduction: critical radius of insulation, Cylinder with heat sources, Fins of non-uniform cross section. Multi dimensional steady state conduction: Two dimensional heat conduction analytical, graphical analysis, Conduction shape factor, Numerical analysis, formulation in terms of resistances of elements, Accuracy considerations

Unsteady state heat conduction: Applicability of Heisler charts, Semi-infinite slab and cylinder suddenly exposed to convection, Transient numerical methods. Thermal resistance and capacity formulation .

Convection heat transfer: Energy equation of the boundary layer, thermal boundary layer, turbulent boundary layer heat transfer and thickness, Empirical relations for flow across cylinders and tube banks, Liquid metal heat transfer.

Natural convection systems, heat transfer on a vertical plate, free convection from horizontal cylinders and inclined surfaces, combined free and forced convection, criteria for free or forced convection.

SECTION - B

Radiation: Introduction to basic fundamentals, Radiation shape factor**,** Heat exchange between non-black bodies using network approach, gas radiation, radiation network for an absorbing and transmitting medium, Effect of radiation on temperature measurement, Radiation heat transfer coefficient.

Condensation, Boiling and Heat pipe: heat transfer coefficient during condensation on tube bank Simplified relations for boiling heat transfer with water, transpiration cooling, and ablation; classification,construction and applications of heat pipe.

Note: Heat transfer data book will be permitted in Exam hall

TEXT BOOKS :

1. Heat Transfer by J.P. Holman, Tata McGraw Hill Publication, 9th ed. 2002.
2. Heat Transfer by S.P. Sukhatme, Tata McGraw Hill Publication, 1994.

REFERENCE BOOKS :

1. Heat Transfer by P.K. Nag, Tata McGraw Hill Publication, 2005.
2. Heat and Mass Transfer Data Book Book by C P Kothandaraman, S Subramanyam, New Age International,1994
3. Heat Transfer data book Convective heat & mass transfer by Kays and Crawford, Tata

ELECTIVE - I

1MTE5 1. WASTE MANAGEMENT AND ENERGY GENERATION SYSTEMS

SECTION – A

SOLID WASTE :

Definitions - Sources, Types, Compositions, Properties of Solid Waste - Municipal Solid Waste - Physical, Chemical and Biological Property - Collection - Transfer Stations – Waste Minimization and Recycling of Municipal Waste

WASTE TREATMENT :

Size Reduction - Aerobic Composting - Incineration - Furnace Type & Design, Medical / Pharmaceutical Waste Incineration - Environmental Impacts - Measures of Mitigate Environmental Effects due to Incineration

WASTE DISPOSAL :

Land Fill Method of Solid Waste Disposal - Land Fill Classification, Types, Methods & Siting Consideration - Layout & Preliminary Design of Land Fills - Composition, Characteristics, generation, Movement and Control of Landfill Leachate & Gases - Environmental Monitoring System for Land Fill Gases

SECTION - B

HAZARDOUS WASTE MANAGEMENT

Definition & Identification of Hazardous Waste - Sources and Nature of Hazardous Waste - Impact on Environment - Hazardous Waste Control - Minimization and Recycling - Assessment of Hazardous Waste Sites - Disposal of Hazardous Waste, Underground Storage Tanks Construction, Installation & Closure

ENERGY GENERATION FROM WASTE

Types - Biochemical Conversion - Sources of Energy Generation - Industrial Waste, Agro Residues - Anaerobic Digestion - Biogas Production - Types of Biogas Plant Thermochemical Conversion - Sources of Energy Generation - Gasification - Types of Gasifiers - Briquetting - Industrial Applications of Gasifiers - Utilization and Advantages of Briquetting - Environment Benefits of Biochemical and Thermochemical Conversion

TEXT BOOKS :

1. Parker, Colin, & Roberts, Energy from Waste - An Evaluation of Conversion Technologies, Elsevier Applied Science, London, 1985
2. Shah, Kanti L., Basics of Solid & Hazardous Waste Management Technology, Printice Hall, 2000

REFERENCE BOOKS :

1. Manoj Datta, Waste Disposal in Engineered Landfills, Narosa Publishing House, 1997
2. Rich, Gerald et.al., Hazardous Waste Management Technology, Podvan Publishers, 1987
3. Bhide AD., Sundaresan BB, Solid Waste Management in Developing Countries, INSDOC New Delhi, 1983.

Websites:1. http://www.bical.net ,2. http://www.volund.dk,3. http://www.iswa.org,4. www.wmrc.uiuc.edu

ELECTIVE - I

1MTE5 2. ENERGY CONSERVATION AND POWER PLANT ECONOMICS

SECTION-A

Energy Conservation : Energy Sources – Review of Present Status of Conventional and Renewable Energy Sources**,** Common areas of inefficiency in energy use, principles of energy conservation , energy conservation planning, energy conservation in industries, household, commercial, transport and agricultural fields, energy conservation technologies, energy conservation legislation.

Energy Audit: Energy flow diagram, comparison with standards, energy management team, energy audit of illumination systems and electrical systems, energy audit of various compressed air systems, buildings, steam generation and distribution systems.

Demand Side Management: Scope of Demand Side Management, load management as a Demand Side Management strategy, tariff options of Demand Side Management, Demand Side Management and environment, different types as a captive power plants, energy banking and wheeling, role of private sector in energy management.

SECTION-B

Power Plant Economics: Economic analysis of power plants and targets, Load curves, load duration curve, different terms and definitions; Effect of fluctuating load on operation and design of the plant, methods of meeting fluctuating load, cost of electrical energy; operating costs, generation costs, depreciation cost. Cost benefit analysis, Selection of type of generation; Performance and operating characteristics of power plants; Selection of the generating equipments, Combined operation of power plants; load division between stations, effect of load factor on energy cost, different types of tariffs.

Environmental Aspects of Energy Generation : Well-to-Wheel Emission analysis of Energy Sources**,** Social and economical issues of the power plants, Greenhouse effect, Acid precipitation- acid rain and acid snow, dry

deposition and acid fog. Thermal pollution, air pollution, Radiation from nuclear power plant effluents, clean coal technologies, hydro power plants , environmental clearances.

TEXT BOOKS :

1. Power Station Engineering and Economics **,** B G A Skrotzki , W A Vopat : Tata McGraw Hill Publishing Company Limited, New Delhi,1972.
2. Power Plant Engineering, P K Nag, Tata McGraw Hill Publishing Company Limited, New Delhi ,2006.

REFERENCE BOOKS :

1. Electrical Power Distribution , A S Pabla **,** Tata McGraw Hill Publishing Company Limited, New Delhi ,2004.
2. Generation of Electrical Energy **,** B R Gupta, Eurasia Publishing House Private Limited, New Delhi, 2007.
3. Patterns of Energy Use in Developing Countries, Ashok V Desai, Wiley Eastern limited, Tokyo, 1991

ELECTIVE - I

1MTE5 3. MODERN ENERGY SOURCES

SECTION - A

Solar Energy: Flat plate and concentrating collectors- design, analysis and performance, applications. Thermal Power, Photovoltaic power; Economic Analysis

Tidal and Ocean Energy: Applications, Design aspects, Power generation methods, various cycles and analysis.

SECTION - B

Wind Energy: Atmospheric circulation, classification, factors influencing wind, wind shear, turbulence, wind speed monitoring, Betz limit, WECS: classification, characteristics, application, design aspects

Geothermal Energy And Magneto Hydrodynamics: Study of various components, Performance and methods of energy conversion.

Nuclear Energy: Fusion and fission, study of various components, Design aspects, performance and methods of power generation.

TEXT BOOKS :

1. Power Plant Technology by El- Wakil, McGraw Hill publication.
2. Solar Energy : Fundamentals and Applications (1st Revised Edition), Tata McGraw-Hill,

REFERENCES :

1. Solar Energy: Principles of thermal collection and Storage by Suhas P. Sukhatme ,Second Edition, Tata McGraw-Hill, 2006
2. Principles of Solar Thermal Engineering by F.Kreith & J .F.Kreider, McGraw Hill Publications 1978.
3. Solar Engineeering of thermal Processes by J .A.Duffie and W.A.Beckman, John Wiley & Sons publication 1999.
4. Applied Solar Energy by A.B.Meinal & F.P.Meinal, Addison Wesley 1976 publication.

ELECTIVE - I

1MTE5 4. ENVIRONMENT POLLUTION CONTROL

SECTION - A

Air Pollution : Sources and Effect - Acid Rain - Air Sampling and Measurement - Analysis of Air Pollutants - Air Pollution Control Methods and Equipments - Issues in Air Pollution control.

SOLID WASTE MANAGEMENT

Sources and Classification - Characteristics of solid waste-Potential methods of solid waste Disposal – Process and Equipments for Energy Recovery from Municipal Solid Waste and Industrial Solid Waste.

WATER POLLUTION

Sources and Classification of Water Pollutants - Characteristics - Waste Water Sampling Analysis - Waste Water, Treatment - Monitoring compliance with Standards - Treatment, Utilization and Disposal of Sludge.

SECTION - B

OTHER TYPES OF POLLUTION

Noise Pollution and its impact - Oil Pollution - Pesticides - Radioactivity Pollution Prevention and Control

POLLUTION FROM THERMAL POWER PLANTS AND CONTROL METHODS

Instrumentation for pollution control - Water Pollution from Tanneries and other Industries and their control

TEXT BOOKS :

1. G.Masters (1991): Introduction to Environmental Enginering and Science, Prentice -Hall International Editions.
2.. H.S.Peavy, D.R..Rowe, G.Tchobanoglous (1985):Environmental Enginering - McGraw- Hill Book Company,NewYork.

REFERENCE BOOKS :

1. **Environmental Considerations in Energy Development, Asian Development Bank (ADB), Manilla(1991)**
2. H.Ludwig, W.Evans (1991): Manual of Environmental Technology in Developing Countries, W.Y.
3. Brockelman and B.N.Lohani, International Book Company, Absecon Highlands, N.J.

SECOND SEMESTER

2MTE1 ADVANCED INTERNAL COMBUSTION ENGINES
SECTION - A

SPARK IGNITION ENGINES

Spark ignition engine mixture requirements – Fuel – Injection systems – Monopoint, Multipoint injection, Direct injection – Stages of combustion – Normal and abnormal combustion – Factors affecting knock – Combustion chambers.

COMPRESSION IGNITION ENGINES

States of combustion in C.I. Engine – Direct and indirect injection systems – Combustion chambers – Fuel spray behaviour – Spray structure, Spray penetration and evaporation – Air motion – Introduction to Turbo charging.

SECTION - B

POLLUTANT FORMATION AND CONTROL

Pollutant – Sources – Formation of carbon monoxide, Unburnt hydrocarbon, NOx, Smoke and Particulate matter – Methods of controlling Emissions – Catalytic converters and Particulate Traps – Methods of measurements and Introduction to emission norms and Driving cycles.

ALTERNATIVE FUELS

Alcohol, Hydrogen, Natural Gas and Liquefied Petroleum Gas- Properties, Suitability, Merits and Demerits as fuels, Engine Modifications.

RECENT TRENDS

Lean Burn Engines – Stratified charge Engines – homogeneous charge compression ignition engines – Plasma Ignition – Measurement techniques – Laser Doppler, Anemometry.

TEXT BOOK :

1. K.K. Ramalingam, Internal Combustion Engine Fundamentals, Scitech Publications, 2002.
2. R.B.Mathur and R.P. Sharma, Internal combustion Engines.
3. V. Ganesan, Internal Combustion Engines, II Edition, Tata McGraw-Hill, 2002.

REFERENCE BOOKS :

1. Duffy Smith, Auto fuel Systems, The Good Heart Willox Company, Inc.
2. John B. Heywood, Internal Combustion Engine Fundamentals first edition
3. Willard W. Pulkrabek, engineering fundamentals of the Internal Combustion Engine second edition

2MTE2 ADVANCED REFRIGERATION ENGINEERING
SECTION – A

Review of Basic Refrigeration Cycles: Reverse Carnot Cycle, Second Law of Thermodynamics. Vapor Compres-sion Refrigeration. Standard and Actual Compression Cycle.

Multi Pressure Systems: Refrigeration Component Matching and System Integration, Thermodynamics of Va-por Absorption Refrigeration, Non Conventional Refrigeration Systems with elementary analysis.

SECTION -B

Properties of Refrigerants: Green House Effect, Numbering and Color Coding of Refrigerants, Recent Trends in Refrigerants. Air as refrigerant and air refrigeration cycles, Refrigerant Component Matching and Designing Refrigeration Components like Compressor, Condenser, Cap-illary, Condenser, Etc.

TEXT BOOKS :

1. Refrigeration and air conditioning, Ahmadul Ameen, Prentice Hall of India, New Delhi, 2006
2. Refrigeration and air conditioning, C P Arora, Tata McGraw-Hill, 2nd ed ,2003

REFERENCE BOOKS :

1. 1.Refrigeration and Air Conditioning Technology, Tomczyk, J. A., Whitman, W. C., Johnson, W. M., Pub: Delmar S.Africa, 4th edition, 2000.
2. 2.Electricity For Refrigeration, Heating, and Air Conditioning, Russell E. Smith, Delmar Cengage Learning; 7th edition, 2006
3. The ASHRAE Handbooks with CDs, 2005-2008.

2MTE3 RESEARCH METHODOLOGY

SECTION – A

Research Concept: Concept, meaning, objectives, motivation; Types of research, approaches (descriptive research, conceptual, theoretical, applied and experimental research)

Formulation of Research Task: Literature Review: importance & methods, sources, field study, laboratory experiments, critical analysis of already generated facts, hypothetical proposal for future development and testing, selection of research task, prioritization of research, introduction to hypothesis testing.

Mathematical Modeling and Simulation: Concept of modeling, classification of mathematical models, modeling with ordinary differential equations, differential equations, partial differential equations, graphs. Simulation concept, types (quantitative, experimental, computer, statistical), process of formulation of model based on simulation.

Experimental Modeling: Definition of experimental design, examples, single factor experiments, guidelines for designing experiments.

SECTION - B

General model of process: Input factors/variables, Output parameters/ variables, controllable/ uncontrollable variables, dependent/independent variables, compounding variables, extraneous variables and experimental validity.

Process optimization and designed experiments: methods for study of response surface, First order design. Determining optimum combination of factors, determination of steepest ascent, Taguchi approach to parameter design.

Analysis of Results (Parametric and Non parametric, Descriptive and Inferential Data): types of data, Methods and techniques of data collection, sampling and sample design, Non parametric test, error analysis, analysis of variance, significance of variance, analysis of co-variance, multiple regression, Introduction to Analytical hierarchical process, Factor analysis, Cluster analysis, Fuzzy logic, testing linearity/ non linearity of model, testing adequacy of model.

Report Writing: types of report, layout of research report, interpretation of results, layout and format, style of writing, typing, references, pagination, tables, figures, conclusions, appendices.

Landscape of Creativity: Convergent Vs. divergent thinking, creativity, creativity Vs intelligence, creativity abilities, determination of Creativity, increasing creativity, creative achievement, techniques of creativity, collective creativity.

TEXT BOOKS :

1. Research in Education, John W Besr & James V Kahn, Prentice HalI of India, New Delhi.
2. Theories of Engineering Experiments, Schank Fr, Tata McGraw Hill Publishing Ltd., New Delhi.
3. Experimental design by Cochran & Cocks, John Wielly & sons, New Delhi, 2005.

REFERENCE BOOKS :

1. Research Methodology, C R Kothari, Wiley Eastern publishers, New Delhi, 10th edition, 2006.
2. Design of Experiments, Douglas Montgomary, 1995.
3. Formulation of Hypothesis, Willkinson K, P L Bhandarkar, Himalaya Publishing House, Mumbai, 2005.

ELECTIVE – II

2MTE4 (1) HEAT EXCHANGER DESIGN

SECTION-A

Constructional Details And Heat Transfer

Types - Shell and Tube Heat Exchangers - Regenerators and Recuperators - Industrial Applications Temperature Distribution and its Implications - LMTD – Effectiveness.

Flow Distribution And Stress Analysis

Effect of Turbulence - Friction Factor - Pressure Loss - Channel Divergence Stresses in Tubes - Heater sheets and Pressure Vessels - Thermal Stresses - Shear Stresses - Types of Failures.

SECTION-B

Design Aspects

Heat Transfer and Pressure Loss - Flow Configuration - Effect of Baffles - Effect of Deviations from Ideality - Design of Typical Liquid - Gas-Gas-Liquid Heat Exchangers

Condensers And Evaporators Design

Design of Surface and Evaporative Condensors - Design of Shell and Tube - Plate Type Evaporators

Cooling Towers

Packings - Spray Design - Selection of Pumps - Fans and Pipes - Testing and Maintenance – Experimental Methods.

TEXT BOOKS :

1. Fundamentals of Heat Exchanger Design by Ramesh K. Shah, Dusan P Sekulic, 1st edition, Wiley, 2002.

2. Process Heat Transfer by D.Q. Kern, Tata McGraw Hill Publication, 1999.
3. Mechanical design of hear exchanger design & Pressure vessel component, by Sing K.P. A. I.; Arcturus Publishers Cherry Hill, 2006.

REFERENCE BOOKS :

1. Heat Exchanger Design by Frass & Ozisik, John Wiley and Sons, Newyork, 1997.
2. Convective Heat transfer by Kays and London, Tata McGraw Hill Publication, 1997.
3. ANSI Standards for pipe and nozzle selection, 1996.
4. ASME Section VIII Division for pressure Vessel and Boiler Design Code, 1995.
5. ASME section II, Material Specifications, 1995.

ELECTIVE – II

2MTE4 (2) ADVANCED AIR CONDITIONING SYSTEMS

SECTION - A

Properties of Air Water Mixture, Psychometric Air Conditioning Processes, Dehumidification Processes, Com-fort Air Conditioning, Parameters Affects Comfort Conditions, Cooling Load Calculations, Design Of Air Delivery Sys-tem To Hospital, Auditorium, Hotels Etc., Noise And Vibration Control In Air Conditioning Hall.

SECTION - B

Air Conditioning Component Selection (Component Matching), Designing Air Ducts, Window Air Conditioner / Split Air Conditioner Performance Testing, Energy calculations- Degree-Day procedure, Bin Method, Comprehensive Simulation methods method, Flow- Pump - and piping Design.

Electrical Circuits And Components In Air Conditioner Like Olp, Capacitor, Performance Study Of Motors Used For Fan, Blower, Compressor,

TEXT BOOKS :

1. Refrigeration and air conditioning, Ahmadul Ameen, Prentice Hall of India, New Delhi, 2006
2. Refrigeration and air conditioning, C P Arora, Tata McGraw-Hill, 2nd ed, 2003
3. Air Conditioning Principles and Systems, E G Pita, Prentice Hall of India, 4th edition, 2005.

REFERENCE BOOKS :

1. The ASHRAE Handbooks with CDs, 2005-2008
2. Refrigeration and Air Conditioning Technology, Tomczyk, J. A., Whitman, W. C., Johnson, W. M., Pub: Delmar S. Africa, 4th edition, 2000.

ELECTIVE -II

2MTE4 (3) FINITE ELEMENT METHODS

SECTION - A

Introduction

Overview of numerical methods - Discretised representation of physical systems - thermal resistance, flow resistance networks, thermal capacitance - Governing equations and Boundary conditions for thermal and flow systems.

One Dimentional Heat Conduction

Principles of variations calculus - applications of vibrational approach to one dimensional heat conduction -element matrix contribution and assembly.

Heat Functions And Analysis

Weighted residual methods - Galerkin's approach - Shape functions and interpolations - Application of Galerkin's weighted residual approach to one dimensional heat conduction - Three nodded triangular elements, 2 D steady state, state conduction using triangular elements - Radiation and natural convective boundary conditions - incorporation of variations in thermal properties.

SECTION - B

Convective Heat Transfer

Higher order elements and numerical integration solution of heat conduction and creeping flow using higher order element - Solution of convective heat transfer.

Heat Exchanger Applications

Incompressible laminar flow simulation - Stream function/Vorticity methods,Velocity Pressure formulation, mixed order interpolation for incompressible flow,modifications for turbulent flow. Application to heat exchanger.

Software Codes

Description of programs for heat conduction, fluid flow,Assignment problems using these codes.

TEXT BOOKS :

1. The Finite Element Method in Engg., 2nd ed. S.S.Rao Pergamon Press, 1990.

2. Applied Finite Element Analysis, 2nd ed, Larry Segerlind John Wiley & Sons, 1988.
3. Finite Element Analysis Theory and Programming 2nd ed, C.S.Krishnamoorthy, Tata mcgraw-Hill 1991.
4. Finite Elements Methods, J.N.Reddy, mcgraw-Hill 1988.
5. Finite Element Methods O.C.Zienkiewiez, mcgraw-Hill 1980.
6. Introduction to Finite Elements in Engg., T.R.Chandrapatla and Belegundu, Prentice Hall of India.
7. Finite Element Computational Fluid Mechanics - A.J.Baker, mcgraw-Hill.

ELECTIVE-II
2MTE4 (4) GAS TURBINES & JET PROPULSION

SECTION - A

General Concepts related to Turbo machinery: Classification; Euler's Equation for Turbo machinery; Velocity triangle; Cascade analysis & nomenclature. Shaft Power & Aircraft Propulsion Cycles.

Centrifugal Compressors: Work done and pressure rise; Slip; Compressibility effects; Compressor characteris-tics. Axial Flow Compressors: Stage pressure rise; Blockage in compressor annulus; Degree of reaction; 3- D flow; Stage performance; h-s diagram & efficiency; off design performance; Performance characteristics; Design process. Combus-tion System.

Axial Flow Turbines: Stage performance; Degree of reaction; h-s diagram & efficiency; Vortex theory; Overall turbine performance; Performance characteristics; Blade cooling; Design process. Prediction of performance of simple gas turbines; Off Design performance; Gas turbine blade materials; matching procedure.

Combined cycles: Differences between Single and combined Cycles, characteristics of combined cycles, Performance calculations for Combined Cycle.

SECTION - B

Thermodynamics Of Aircraft Jet Engines
Theory of Jet Propulsion - Thrust and efficiency - Ram Jet - Turbojet and Turbofan engines - Turboprop and Turboshaft Engines - Thrust augmentations - Typical engine performance - Engine - Aircraft matching.

Aero-Thermodynamics Of Jet Propulsion Subsystems
Subsonic inlets - Supersonic inlets - Gas turbine combustors - After burners and Ramjet Combustors -Supersonic Combustion - Exhaust Nozzles.

TEXT BOOKS :

1. Philip G. Hill and Carl R. Peterson, Mechanics and Thermodynamics of Propulsion, Second Edition,
2. Bonney E.A. Zucrow N.J. Principles of Guided Missile Design, Van Nostranc Co., 1985.
3. S.M. Yahya, Gas Dynamics and Jet Propulsion.

REFERENCE BOOKS :

1. Addition - Wesley Publishing Company, New York, 1992.
2. Zucrow N.J. Principles of Jet Propulsion and Gas Turbines, John Wiley and Sons Inc, New York, 1970.
3. Zucrow N.J. Aircraft and Missile Propulsion, Vol.I and Vol.II, John Wiley and Sons Inc, New York, 1975.

ELECTIVE -III
2MTE5 (1) FUEL & COMBUSTION

SECTION - A

Introduction
General, Conventional Energy Sources, Solar Energy, Nuclear Power, Energy from Biomass, Wind Power, Tidal Power, Geothermal Energy, Energy Survey of India, Rocket Fuels

Solid, Liquid & Gaseous Fuels
General, Family of Coal, Origin of Coal, Gasification of Coal, Analysis and Properties of Coal, Action of Heat on Coal, Classification of Coal, Oxidation of Coal, Hydrogenation of Coal, Efficient use of Solid Fuels. Manufactured Fuels, Agro Fuels, Solid Fuel Handling, Properties Related to Combustion, Handling Storage

Theory Of Combustion Process
Origin and Classification of Petroleum, Refining and Other Conversion Processes, Composition of Petroleum with respect to Combustion, Property & Testing of Petroleum Products, Various Petroleum Products, Nature of Indian Crudes & Petroleum Refining in India, Liquid Fuels from Other Sources, Storage and Handling of Liquid Fuels, Liquid Fuels Combustion Equipment. Types of Gaseous Fuels, Natural Gases, Methane from Coal Mines, Manufactured Gases, Producer Gas, Water
Gas, Carburetted Water Gas, Blast Furnace Gas Fuels, Through Non-Thermal Route - Biogas, Refinery Gas, LPG, Cleaning and Purification of Gaseous Fuels.

SECTION - B

Stoichiometry

Stoichiometry and Thermodynamics, Combustion Stoichiometry General, Rapid Methods of Combustion

Stoichiometry, Combustion Thermodynamics, Problem, Combustion Problems with Chemical Reactions Burners Stoichiometry Relations, Theoretical Air Required for Complete Combustion, Calculation of Minimum Amount of Air Required for a Fuel of known Composition, Calculation of Dry Flue Gases if Fuel Composition is Known, Calculation of the Composition of Fuel & Excess Air Supplied,from Exhaust Gas Analysis, Dew Point of Products, Flue Gas Analysis (O 2, CO 2, CO, NO x, SO x).

Burner Design

Ignition, Concept of Ignition, Auto Ignition, Ignition Temperature. Flame Propagation, Various Methods of Flame Stabilization, Incorporation in Burner Design, Basic Features and Types of Solid, Liquid and Gaseous Fuel Burner, Design Consideration of Different Types of Coal - Oil and Gas Burners, Recuperative & Regenerative Burners

TEXT BOOKS :

1. Samir Sarkar, Fuels & Combustion, 2nd Edition, Orient Longman, 1990
2. Bhatt ,vora Stoichiometry, 2nd Edition, Tata Mcgraw Hill, 1984
3.. Sharma SP, Mohan Chander, Fuels & Combustion, Tata Mcgraw Hill, 1984

REFERENCE BOOKS :

1. Blokh AG, Heat Transfer in Steam Boiler Furnace, Hemisphere Publishing Corpn, 1988
2. Civil Davies, Calculations in Furnace Technology, Pergamon Press, Oxford, 1966

Websites:
http ://shop.ieee.org.
http ://opus.utah.edu
http ://www.creada..org

ELECTIVE-lll
2MTE5 (2) SOLAR ENERGY
SECTION -A

Radiative Properties and Characteristics of Materials

Reflection from ideal specular, ideal diffuse and real surfaces, Selective Surfaces: Ideal coating characteristics; Types and applications; Anti-

reflective coating; Preparation and characterization. Reflecting Surfaces and transparent materials.

Solar Thermal Energy Storage

Types: Sensible storage; Latent heat storage; Thermo-chemical storage. Design of storage System. Solar Thermal Energy system: Solar still; Solar cooker: Solar pond; Solar passive heating and cooling systems: Trombe wall; Greenhouse technology: Fundamentals, design, modeling and applications.

PHOTOVOLTAIC SOLAR CELL

P:N Junction - Metal - Schottky Junction, Electrolyte - Semiconductor Junction, Types of Solar Cells - their Applications - Experimental Techniques to determine the Characteristics of Solar Cells - Photovoltaic Hybrid Systems Photovoltaic Thermal Systems – Storage Battery - Solar Array and their Characteristics Evaluation - Solar Chargeable Battery.

Solar Energy for Industrial Process Heat

Industrial process heat: Temperature requirements, consumption pattern; Applications of solar flat plate water heater & air heater for industrial process heat; Designing thermal storage; Transport of energy.

SECTION-B

Solar Heating & Cooling System

Solar water heating systems, Liquid based systems for buildings, Solar air heating systems, Methods of modeling and design of Solar heating system, Cooling requirements of buildings, Vapour absorption refrigeration cycle; Water, ammonia & lithium bromide-water absorption refrigeration systems; Solar desiccant cooling.

Performances of solar collectors

ASHRAE code; Modeling of solar thermal system components and simulation; Design and sizing of solar heating systems: f – chart method and utilizability methods of solar thermal system evaluation; Development of computer package for solar heating and cooling applications;

Flat-plate Collectors

Energy balance for Flat Plate Collectors; Thermal analysis; Heat capacity effect; Testing methods; Types of Flat Plate Collectors: Liquid Flat Plate Collectors, Air flat-plate Collectors- Thermal analysis; Evacuated tubular collectors.

Concentrating Collector Designs

Classification, design and performance parameters; Tracking systems; Compound parabolic concentrators; Parabolic trough concentrators; Concentrators with point focus; Heliostats; Comparison of various designs: Central receiver systems, parabolic trough systems; Solar power plant; Solar furnaces

TEXT BOOKS :

1. S.P.Sukhatme-Solar Energy: principles of Thermal Collection and Storage, Tata McGraw-Hill
2. J.A.Duffie and W.A.Beckman-Solar Engineering of Thermal Processes-John Wiley, (1991).

REFERENCE BOOKS :

J.F.Kreider and F.Kreith-Solar Energy Handbook McGraw-Hill (1981).

ELECTIVE-III

2MTE5 (3) MECHATRONICS

SECTION - A

Introduction: Scope, sensors, transducers, selection, contact & non contact optical types, performance, examples.

Actuators : Principal, types-hydraulic, pneumatic, electrical, contact speed,multispeed, step and continuous variable, actuators with stepping motors.

Computer process controls : Computer process interface, interface hardware, direct digital control, supervisory computer control.

Design of mechatronics elements: Measuring system, control software and user interface, gauging, tool monitoring system, spindle drives, feed drives, servo principles, configuration CNC systems, interfacing, monitoring, diagnostics.

Automatic loading and unloading devices, magazines, bunkers, orientors, feeders, separators, etc.

SECTION - B

Pneumatic systems: Different control components of pneumatic systems and there conversion valves, auxiliary devices, synchronizing, clamping, declamping, application to robotics.

Hydraulic systems: Different control components of hydraulic systems, valves and auxiliary devices, design and analysis of hydraulic circuits sequencing, synchronizing, pneumo-hydraulic, CNC lubrication, machine tool applications.

TEXT BOOKS :

1. Industrial Automation by Turgam, Mir Publication.
2. Pneumatics and Hydraulics by Stewar

REFERENCE BOOKS :

1. Mechatronics by HMT
2. Introduction to Mechatronics and Measurment Systems by Michal B. Histand & David G. Aiciatore.

ELECTIVE -III

2MTE5 (4) COMPUTATIONAL FLUID DYNAMICS

SECTION – A

Review of Governing Equations: Governing Equations of Fluid flow and heat transfer, review of numerical methods.

Discretization: Introduction to finite differences, difference equations, explicit and implicit approaches: definition and contrasts, errors and analysis of stability.

Classification of Partial Differential Equations: Explicit and Implicit methods, solution of select model equations; Laplace heat and wave equation, laminar boundary layer solution

SECTION - B

CFD Techniques: The lax -wendroff technique, Mac Cormack's technique, Relaxation technique and its use with low speed inviscid flows, aspects of numerical dissipation and dispersion; artificial viscosity, Alternating Direction Implicit (ADI) technique, pressure correction technique with application to incompressible viscous flow.

Initial And Boundary Value Problems: Free falling of a spherical body, two dimensional motions of a body through a fluid radial flow.

TEXT BOOKS :

1. Computational Fluid Flow and Heat Transfer, Muralidhar, K. and Sundararajan, T., Narosa Pub., 2004.
2. Computational Fluid Dynamics: The Basics with Applications, Anderson, J. D., Jr. McGraw Hill, 2002.
3. Computational Fluid Dynamics: An Introduction for Engineers, Abbot, M. B. and Basco, D. R., John Wiley & Sons, 2006.
4. Computational Fluid Dynamics: Principles and Applications, Blazek, J., Elsevier Science, 2001.

THIRD SEMESTER

3 MTES Seminar & Dissertation

FOURTH SEMESTER

4MTEP Seminar & Dissertation

As per given scheme

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SYLLABUS PRESCRIBED FOR
TWO YEAR P.G. COURSE IN
MASTER OF ENGINEERING (FULL TIME)
MECHANICAL ENGINEERING (ADVANCED MANUFACTURING
& MECHANICAL SYSTEMS DESIGN)

SEMESTER-I

1MMD1 ADVANCED MANUFACTURING PROCESSES

SECTION - A

Advance machining theory: mechanics of chip formation, shear angle relations, and theoretical determination of cutting force in orthogonal cutting, analysis of turning, drilling, and milling operations. Mechanics of grinding, dynamometry, thermal aspects of machining, tool life and tool wear, economics of machining.

NC/CNC: basic concept, NC control, special features of CNC machine: turret head, tool magazine, servomotors, ball lead screw, automatic tool changer (ATC), and classification of CNC machines, cutting tool and tool holders, point to point, straight cut and continues path, control codes, machine control units, closed system, NC, machine components, CNC, DNC, Manual part programming, formats, coding, programming languages. APT, ADAPR, EXAPT etc. sensors and adaptive control, Manual part programming for drilling, milling and lathe, examples in APT. applications and economics of CNC.

Metal casting: Metal casting processes, pattern and mould, moulding materials, elements of gating system design, riser design, solidification structure, solidification shrinkage structure, defects and properties of finished casting, heat treatment.

SECTION - B

Welding process, heat flow in welding, metallurgy of fusion weld, welding stresses and distortions, preheat and post weld heat treatment weld ability tests, weld defects, weld inspection and quality control. Electron beam welding, ultrasonic welding, laser beam welding.

Metal forming: Nature of plastic deformation, fundamentals of plasticity, mechanics of metal forming processes like rolling, forging, drawing, extrusion etc. various forming operations, defects in metal forming, local instability and tearing, bending of sheets, hydro forming. Electro magnetic forming, explosive forming, electro hydraulic forming, stretch forming, contour roll forming.

Unconventional machining process: parametric study, applications and fundamentals of Ultrasonic Machining USM, Abrasive Jet Machining AJM, Water Jet Machining WJM, Abrasive Water Jet Machining AWJM, Electro- chemical Machining ECM, Electro Discharge Machining EDM, Electron Beam Machining EBM, Laser Beam Machining LBM.

Books Recommended:
TEXT BOOKS:

1. Juneja, Fundamentals of metal cutting
2. A. Ghosh, and A. K. Mallik, Affiliated East-West Press Pvt. Ltd. New Delhi “Manufacturing Science”

REFERENCE BOOKS:

1. Arshinov, Metal cutting theory & cutting tool design
2. Mikhal Groover, CAD/CAM
3. N. K. Mehta, Machine tool design
4. E. P. DeGarmo, J. T Black, R. A. Kohser, Prentice Hall of India, New Delhi (ISBN 0-02-
5. 978760) “Materials and Processes in Manufacturing” (8th Edition), ,
6. G.F. Benedict, Marcel Dekker, Inc. New York (ISBN 0-8247-7352-7) “Nontraditional Manufacturing Processes”.

1MMD2 ADVANCED MACHINE DESIGN
SECTION-A

Introduction: Role of failure prevention analysis in mechanical design, Modes of mechanical failure, Review of failure theories for ductile and brittle materials including Mohr’s theory and modified Mohr’s theory, Numerical examples.

Fatigue of Materials: Introductory concepts, High cycle and low cycle fatigue, Fatigue design models, Fatigue design methods, Fatigue design criteria, Fatigue testing, Test methods and standard test specimens, Fatigue fracture surfaces and macroscopic features, Fatigue mechanisms and microscopic features.

Stess-Life (S-N) Approach: S- N curves, Statistical nature of fatigue test data, General S-N behavior, Mean stress effects, Different factors influencing S-N behaviour, S-N curve representation and approximations, Constant life diagrams, Fatigue life estimation using S-N approach.
Strain-Life(-N)approach: Monotonic stress-strain behavior ,Strain controlled test methods ,Cyclic stress-strain behavior, Strain based approach to life estimation, Determination of strain life fatigue properties, Mean stress effects, Effect of surface finish, Life estimation by N approach.

SECTION-B

LEFM Approach: LEFM concepts, Crack tip plastic zone, Fracture toughness, Fatigue crack growth, Mean stress effects, Crack growth life estimation.

Statistical Aspects of Fatigue: Definitions and quantification of data scatter, Probability distributions, Tolerance limits, Regression analysis of fatigue data, Reliability analysis, Problems using the Weibull distribution.

Fatigue from Variable Amplitude Loading: Spectrum loads and cumulative damage, Damage quantification and concepts of damage fraction and accumulation, Cumulative damage theories, Load interaction and sequence effects, Cycle counting methods, Life estimation using stress life approach.

Surface Failure: Introduction, Surface geometry, Mating surface, Friction, Adhesive wear, Abrasive wear, Corrosion wear, Surface fatigue spherical contact, Cylindrical contact, General contact, Dynamic contact stresses, Surface fatigue strength.

Books Recommended:

TEXT BOOKS:

1. Robert L. Norton, Pearson: "Machine Design"
2. S. Suresh: "Fatigue of Materials" - Press, Cambridge, U.K.

REFERENCE BOOKS:

1. Jack. A. Collins, John Wiley, Newyork: "Failure of Materials in Mechanical Design"- 1992.
2. Julie. A. Benantine: "Fundamentals of Metal Fatigue Analysis"- Prentice Hall,1990
3. ASM Hand Book: "Fatigue and Fracture"- Vol. 19, 2002.
4. Ralph I. Stephens, Ali Fatemi, Robert .R. Stephens, Henry Fuchs, John: "Metal Fatigue in Engineering"- Wiley Newyork, Second edition. 2001.

1MMD3 COMPUTER AIDED DESIGN AND ENGINEERING

SECTION - A

CAD – Introduction, typical Product Cycle, Implementation of a typical CAD process, Application of CAD and their Advantages

3D modeling and viewing: Introduction, Modeling Approaches, Types of Geometric Models, Coordinate System, sketching and Sketch Planes,

Parameters and Dimensions, Basic Features, Datum Features, Geometric Constraints, Modeling Operations and Strategies

Modeling Aids and Tools: Introduction, Geometric Modifiers, Layers, Colors, Grids, Groups, Dragging and Rubbering, Clipping, Entity Selection methods, Geometric Arrays, Transformations, Editing.

Geometric Modeling: Types of Curves and Curve Manipulations, Types of Surfaces and Surface Manipulations, Solids: Introduction, Geometry and Topology, Solid Entities, Fundamentals of Solid Modeling, Boundary Representation (B-rep), Constructive Solid Geometry (CSG) examples, Sweeps and Solid Manipulations, Feature based Modeling: Introduction, Feature Entities, Parametrics, Feature Manipulations

CAD/CAM Data exchange and data storage: Introduction, graphics and computing standards, data exchange standards like IGES, STEP

Assembly Modeling: Introduction, Assembly Modeling, Assembly Tree, Assembly Planning, Mating Conditions, Bottom – Up and Top – Down Assembly Approaches with examples, Tolerance Analysis and Mass Property calculations

SECTION - B

Review of One Dimensional FEM: FEM Methodology – Modeling and discretization Interpolation, elements, nodes and degrees-of-freedom-applications of FEA. One-Dimensional Elements: Bar element – truss element – assembly of elements – properties of stiffness matrices-boundary conditions-solution of equations-mechanical loads and stresses-thermal loads and stresses-example problems.

Review of Two and Three Dimensional FEM: Interpolation and shape functions - element matrices-linear triangular elements (CST)-quadratic triangular elements – bilinear rectangular elements solid elements-higher order elements – stress calculations.

Applications to Field Problems: Solution to problems in linear elasticity- plane problems in elasticity- plates and shells- solution of problems in heat-transfer and fluid mechanics- numerical examples-discussion on error estimates

Books Recommended:

TEXT BOOKS:

1. Ibrahim Zeid, Matering CAD/CAM, Tata McGraw Hill Publishing Co. Ltd., New Delhi.

2. Chandrupatla & Belagundu, Finite Elements in Engineering, Prentice Hall of India Private Ltd., 1997.

REFERENCE BOOKS:

1. P. N. Rao, CAD/CAM, Prentice Hill, International
2. Daryl L. Logan, A first course in the Finite Element Method, Fourth edition, Thomson
3. Ibrahim Zeid, CAD/CAM – Theory and Practice, MGH International
4. Mikell P Groover and Emory W Zimmers Jr., CAD/CAM – Computer Aided Design and Manufacturing, Prentice Hill, International
5. P. Radhakrishnan, S. Subramanayan and V.Raju, CAD/CAM/CIM, New Age International (P) Ltd., New Delhi.
6. Rogers, D.F. and Adams, A., Mathematical Elements for Computer Graphics, McGraw Hill Inc, NY, 1989
7. Cook, Robert Davis et al "Concepts and Applications of Finite Element Analysis ", Wiley, John & Sons, 1999.
8. Bathe, K.J., Finite Element Procedures in Engineering Analysis, 1990.
9. S. S. Rao, Finite Element Analysis, 2002 Edition.
10. David V Hutton, Fundamentals of Finite Element Analysis, McGraw-Hill International Edition, 2004.

1MMD4 DESIGN OF MATERIAL HANDLING EQUIPMENTS

SECTION-A

Introduction: Transmission and its requirements. Matching of load and prime mover. Types of material equipment's – Characteristics applications selection of the system.

Design Of Hoists: Design of hosting elements – ropes, chains, pulleys, sheaves, hoists of different types. **Design Of Elevators**: Types – Design of chair and bucket elevators – belt and bucket elevators - discharges.

SECTION-B

Design Of Conveyors: Types of conveyors – design of belt, pneumatic, hydraulic, screw and vibratory conveyors – selection of the conveyors.

Selection Of Drives: Types of drives – rails traveling mechanism – slewing with rotary pillar, fixed pillar and turn tablets – traveling gear. Selection of

Grabbing Attachments: Cranes grabs – grabbing attachments for loose pieces – lifting magnets grab buckets and liquid handling buckets. Design of Arresting Mechanism: Brakes – Shoes, Band, cone disc and Centrifugal types.

Books Recommended:

TEXT BOOKS:

1. Spivakovsky, A. & Dychnov, V.K., "Conveying Machines Volumes I & II", MIR Publishers Moscow.
2. Rudenko, N., "Material Handling Equipments", MIR Publishers, Moscow

REFERENCE BOOKS:

1. Boltz, Hord, A., "Material Handling Handbook ", The Ronald Press CO.
2. V. Dobrovolsky et. al, "Design of Machine Elements", MIR Publishers
3. Spivakovsky, F. and Dyachkov, V.,"Conveyours and Related Equipments". MIR Pulishers, Moscow.
4. Duglas, R WOODLEY, "Encyclopaedia of Materials Handling – Vol 1 Pregmen.
5. Hudson Wilbur, G., "Conveyors and Related Equipments ", Join Wiley and Sons.
6. M. F. Spotts and T. E. Shoup, " Design of Machine Elements", PHI
7. J.E.Shiegley, "Mechanical Engg Design", Mc-Graw Hill Book Co
8. D.N. Reshetov, "Machine Design", MIR Publishers.

1MMD5 ELECTIVE-I

(1) RELIABILITY, MAINTENANCE MANAGEMENT & SAFETY

SECTION-A

Reliability Engineering: System reliability - series, parallel and mixed configuration, Block diagram, r-out-of-n structure,Solving problems using mathematical models. Reliability improvement and allocation-Difficulty in achieving reliability,Method of improving reliability during design, different techniques available to improve reliability, Optimization, Reliability – Cost trade off, Prediction and analysis, Problems.

Maintainability, Availability & Failure Analysis: Maintainability & Availability – Introduction, formulae, Techniques available to improve

maintainability & availability, trade off among reliability, maintainability & availability, simple problems, Defect generation – Types of failures, defects reporting and recording, Defect analysis, Failure analysis, Equipment down time analysis, Breakdown analysis, TA, FMEA, FMECA.

Maintenance Planning and Replacement: Maintenance planning – Overhaul and repair; Meaning and difference,Optimal overhaul/Repair/ Replace maintenance policy for equipment subject to breakdown, Replacement decisions –Optimal interval between preventive replacements of equipment subject to breakdown, group replacement.

SECTION-B

Maintenance Systems: Fixed time maintenance, Condition based maintenance, Operate to failure, Opportunity maintenance, design out maintenance, Total productive maintenance, Inspection decision – Optimal inspection frequency, non-destructive inspection, PERT & CPM in maintenance, Concept of terrotechnology.

Condition Monitoring: Techniques-visual monitoring, temperature monitoring, vibration monitoring, lubricant monitoring, Crack monitoring, Thickness monitoring, Noise and sound monitoring, Condition monitoring of hydraulic system, Machine diagnostics - Objectives, Monitoring strategies, Examples of monitoring and diagnosis, Control structure for machine diagnosis.

Safety Aspects: Importance of safety, Factors affecting safety, Safety aspects of site and plant, Hazards of commercial chemical reaction and operation, Instruments for safe operation, Safety education and training, Personnel safety, Disaster planning and measuring safety effectiveness, Future trends in industrial safety.

Books Recommended:

TEXT BOOKS :

1. Concepts in Reliability Engineering L.S. Srinath Affiliated East West Press
2. Maintainability and Reliability Handbook Editors: Ireson W.A. and C.F. Coombs McGraw Hill Inc.

REFERENCE BOOKS:

1. Failure Diagnosis and Performance Monitoring L.F. Pau Marcel Dekker
2. Industrial Maintenance Management S.K. Srivastava S. Chand & Co Ltd.
3. Management of Industrial Maintenance Kelly and M.J. Harris Butterworth and Co.

4. Maintenance, Replacement and Reliability A.K.S. Jardine Pitman Publishing
5. Engineering Maintainability: How to Design for Reliability and Easy Maintenance B.S. Dhillon Prentice Hall of India

1MMD5 ELECTIVE-I

(2) NEW PRODUCT DESIGN

SECTION - A

Introduction: Types of design, importance of design, design considerations, product life cycle, technology life cycle, benchmarking and mass customisation, stages, objectives, success factors, concurrent approach in NPD

Product Development Process & Methodologies: Integrated Product development process - *Identifying Customer Needs***:** Gather raw data from customers, interpret raw data in terms of customer needs, organize the needs into a hierarchy, establish the relative importance of the needs and reflect on the results and the process, *Conceive* – Specification, Concept design: the activities of concept generation, Concept Selection**:** Overview of methodology, concept screening, and concept scoring, *Design* - Detailed design, Validation and analysis (simulation), Tool design, *Realize* - Plan manufacturing: Factors influencing material and process selection, approaches, tools and software used in selection, Manufacture, Build/ Assemble, Test (quality check), *Service* - Sell and Deliver, Use, *Maintain and Support*, *Dispose*

Product Development Approaches: Bottom-up design, Top-down design, Front-loading design workflow, Design in context, Modular design. Concurrent engineering, partnership with supplier, collaborative and Internet based design, work structuring and team deployment, Product and process systemization, problem, identification and solving methodologies, improving product development solutions

SECTION - B

Prototyping: Prototyping basics, principles of prototyping, technologies, planning for prototypes, practical examples

Design Analysis Tools: Product Reliability, Mortality Curve. Design for Manufacturing: machining, casting, forging and metal forming, optimum design, Design for Assembly and Disassembly, Design for Six Sigma, Design for reliability, Design for product life cycle Deign for maintainability and serviceability, Design for environment, Design for aesthetic, Design for packaging, Design for handling, Design for safety, etc., Estimation of Manufacturing costs, Reducing the component costs and assembly costs, Minimize system complexity.

Probabilistic Design Concepts: FMEA, QFD, Taguchi Method for design of experiments, Estimation of Manufacturing costs, Reducing the component costs and assembly costs, Minimize system complexity.

Books Recommended:

TEXT BOOKS:

1. Dieter George E., Engineering Design, McGraw Hill Pub. Company, 2000.
2. Chitale A. K. and Gupta R. C., Product Design and Manufacture, Prentice-Hall of India, New Delhi.

REFERENCE BOOKS:

1. Ulrich Karl T and Eppinger Steven D., Product design and development, McGraw Hill Pub. Company, 1995.
2. Bralla, James G., Handbook of Product Design for Manufacturing, McGraw Hill Pub. 1986

1MMD5 ELECTIVE-I

(3) LEAN MANUFACTURING

SECTION -A

Introduction: Introduction, background, and lean thinking. Importances of philosophy, strategy, culture, alignment, focus and systems view.

Toyota Production System: Discussion of Toyota Production System. Lean production preparation – System assessment, process and value-stream mapping – Sources of waste.

Lean production processes: Lean production processes, approaches and techniques.—Importance of focusing upon flow. Tools include: Workplace organization, Stability. Just-In-Time – One piece flow – Pull.

SECTION -B

Cellular systems: Cellular systems, Quick change and set-up reduction methods.

Total productive maintenance: Total productive maintenance, Poka-Yoke – mistake proofing, quality improvement. Visual management. Startup of lean processes, examples and applications.

Sustaining improvement: Sustaining improvement and change, auditing, follow-up actions

Books Recommended:

TEXT BOOKS:

1. N. Gopalkrishnan, Simplified Lean Manufacture, PHI Learning Private Limited. New Delhi

2. B.S Nagendra Parashar, Cellular Manufacturing system: An integrated approach, PHI Learning Private Limited. New Delhi

REFERENCES BOOKS:

1. William M. Feld , Lean Manufacturing: Tools, Techniques, and How to Use Them ,The st Lucie Press.
2. Lonnie Wilson, How To Implement Lean Manufacturing: by McGraw Hill, August 2009.
3. Walter W Mc Intyre, Lean and Mean Process Improvement:
4. Dale H. Besterfield, Total Quality Management, Pearson Educations.

1MMD5 ELECTIVE-I

(4) DESIGN FOR MANUFACTURING AND ASSEMBLY

SECTION – A

Introduction: Design philosophy steps in Design process , General Design rules for manufacturability , basic principles of design Ling for economical production , creativity in design. Materials: Selection of Materials for design Developments in Material technology , criteria for material selection , Material selection interrelationship with process selection process selection charts.

Machining process: Overview of various machining processes , general design rules for machining - Dimensional tolerance and surface roughness , Design for machining , Ease ,Redesigning of components for machining ease with suitable examples. General design recommendations for machined parts.

Metal casting: Appraisal of various casting processes, selection of casting process, - general design considerations for casting , casting tolerances , use of solidification simulation in casting design , product design rules for sand casting.

SECTION – B

Metal joining: Appraisal of various welding processes, Factors in design of elements, general design guidelines , pre and post treatment of welds , effects of thermal stresses in weld joints , design of brazed joints. Forging, Design factors for Forging , Closed die forging design , parting lines of die5 drop forging die design , general design recommendations. Extrusion & Sheet Metal Work: Design guidelines for extruded sections - design principles for Punching, Blanking, Bending, Deep Drawing, Keeler Goodman Forming Line Diagram, and Component Design for Blanking.

Assemble advantages: Development of the assemble process, choice of assemble method assemble advantages social effects of automation.

Automatic assembly transfer systems: Continuous transfer, intermittent transfer, indexing mechanisms, and operator - paced free – transfer machine.

Design of manual assembly: Design for assembly fits in the design process, general design guidelines for manual assembly, development of the systematic DFA methodology, assembly efficiency, classification system for manual handling, classification system for manual insertion and fastening, effect of part symmetry on handling time, effect of part thickness and size on handling time, effect of weight on handling time, parts requiring two hands for manipulation, effects of combinations of factors, effect of symmetry effect of chamfer design on insertion operations, estimation of insertion time.

Books Recommended:

TEXT BOOKS:

1. Geoffrey Boothroyd, "Assembly Automation and Product Design", Marcel Dekker Inc., NY, 1992.
2. Geoffrey Boothroyd, "Hand Book of Product Design" Marcel and Dekken, N.Y. 1990.

REFERENCE BOOKS:

1. Engineering Design – Material & Processing Approach – George E. Deiter, McGraw Hill Intl. 2nd Ed.2000.
2. A Delbainbre "Computer Aided Assembly London, 1992.

1MMD5 ELECTIVE-I
(5) ERGONOMICS OF MANUFACTURING
SECTION -A

Introduction: Introduction and Human performance - Interdisciplinary nature of ergonomics, modern ergonomics. Information input and processing, factors affecting human performance, physical work load and energy expenditure, heat stress, manual lifting.

Work Space Design: Work Space Design, Anthropometry, Workspace designs for standing and seated workers, arrangement of components within a physical space, interpersonal aspect of workplace design.

SECTION -B

Design of Equipments: Design of Equipments, Ergonomic factors to be considered, design of displays and controls, design for maintainability.
Design of Environment: Design of Environment, Illumination – climate – Noise – motion

TEXT BOOKS:

1. Martin Helander,A guide to Ergonomics of Manufacturing, TMH, 1996.
2. Bridger, R.S., "Introduction to Ergonomics", McGraw Hill, 1995.

REFERENCES BOOKS:

3. McCormick, J., Human Factors in Engineering and Design, McGraw Hill, 1992.
4. W Karwowski, Ergonomics in Manufacturing: Raising Productivity through Workplace Improvement, Engineering and management press.

1MMD6 ADVANCED MANUFACTURING PROCESSES -LAB

At least five practicals (study/trials) based on above syllabus, as given below shall be performed and a report there of submitted by the students

List of Practicals:-

1. Demonstration of job setting on CNC turning center and vertical machining center.
2. Preparation of program for plain turning of shaft.
3. Preparation of program for taper turning.
4. Preparation of program for grooving.
5. Preparation of program for threading.
6. Preparation of program for pocket milling.
7. Preparation of program for drilling.
8. Preparation of program for 2D profile cutting.
9. Preparation of program for boring and tapping.

Practical Examination:
Practical examination shall consist of viva voce/performance based on the above syllabus and practical work.

1MMD7 COMPUTER AIDED DESIGN AND ENGINEERING -LAB

At least five practicals (study/trials) based on above syllabus, as given below shall be performed and a report there of submitted by the students

List of Practicals:-

1. Study of at least one CAD software in each of the following category,
    a. High-End CAD like UG/NX, CATIA, Pro/E
    b. Middle-range CAD like Solid Edge, AIP, Solid Edge
    c. Low-end CAD like AutoCAD, Turbo CAD, AutoCAD LT
2. Assembly modeling (for any 2 assemblies or sub-assemblies) using top down and bottom-up approaches inclusive of sketching, parts modeling (using solid and surface modeling/styling toolboxes), drafting (parts and assemblies)
3. Part families and design table creation using spreadsheet interface
4. CAD File/data exchange amongst the various CAD software and software for CMM, CAE, CNC, CAM
5. Customization/Program development for parts modeling and drafting using API and other development tools
6. **FEA:** Using any FEA software packages solve 2 problems each on structural mechanics and heat transfer, Introduction to nonlinear analysis

Practical Examination:

Practical examination shall consist of viva voce/performance based on the above syllabus and practical work.

SEMESTER-II

2MMD1 ADVANCED MATERIALS TECHNOLOGY

SECTION - A

Materials and Classification: Solid materials- Classification, Ceramics, composites and metal glasses, selection and application of tool steel, Magnetic alloys, Copper, aluminum and magnesium alloys, Bearing alloys, Super hard materials, Plastics, Alloying techniques-Thermal, mechanical and chemical methods, Power metallurgy techniques.

Mechanical Properties: Strengthening mechanism of materials, elements of dislocation theories, Strain hardening, Grain size control, Single crystal growth, Reinforcing fibres for polymers, Composite structure, determination of mechanical properties of materials, Dynamic tests, Fracture and toughness tests, Low temperature and high temperature tests, Creepm characteristics, Hot hardness tests.

SECTION - B

Processing of Materials for Casting and Joining: Plastic working of materials, Strain hardening, Recovery and recrystallisation, Formability, Forgibility and drawability of materials, Powder processing of materials, Ceramic processing, Composite processing, Features controlling machinability of materials, thermal treatment for better mach inability of metals, Universal mach inability index.

Modern Materials and Alloys: Super alloys-refractory materials, Ceramic and their applications, Low melting alloys, Shape memory alloys, Advanced Composites-Particulate and dispersioned composites, Metal matrix and ceramic matrix composites, Carbon-Carbon composites, Ti and Ni based alloys for gas turbine applications, Managing and cryogenic steels, smart and nano materials.

Non metallic materials: Polymeric materials - Formation of polymer structure - Production techniques of fibres, foams, adhesives andcoatings - Structure, properties and applications of engineering polymers - Advanced structural ceramics, WC, TiC, TaC, AI2O3, SiC, Si3N4, CBN and diamond – properties and applications.

Books Recommended:

TEXT BOOKS:

1. Engineering Materials and Applications P. Flinn and P.K. Trojan MIR Publications
2. Engineering Materials: Polymers, Ceramics and Composites A.K Bhargava Prentice Hall of India

REFERENCE BOOKS:

1. Manufacturing processes for Engineering Materials Serope Kalpakjian Wesley Publishing Co.
2. An introduction to Physical Metallurgy S.H. Avner McGraw Hill
3. Advances in Materials and Their Applications P. Rama Rao Wiley Eastern
4. Mechanical Metallurgy Dieter McGraw Hill:
5. P.C.Shrma, Production technology
6. Thomas H.Courtney, " Mechanical Behaviour of Materials ", (2nd Edition), McGraw-Hill,
7. Charles J.A., Crane, F.A.A and Furness, J.A.G., " Selection and use of Engineering Materials ", (3rd Edition), Butterworth-Heiremann, 1977.

8. Flinn, R.A. and Trojan, P.K., " Engineering Materials and their Applications ", (4th Edition),
Jaico, 1999.
9. George E.Dieter, " Mechanical Metallurgy ", McGraw Hill, 1988.
10. Metals Hand Book, Vol.10, " Failure Analysis and Prevention ", (10th Edition), 1994.

2MMD2 RAPID PROTOTYPING AND TOOLING

SECTION-A

Introduction: Need for time compression in product development, Product development conceptual design, Development, Detail design, Prototype, Tooling, Applications of RP.

Stereolithography systems: Principle, Process parameters, Process details, Machine details, Applications.

Laser sintering systems: Principle, Process parameters, Process details, Machine details, Applications. Fusion deposition modeling: Principle, Process parameters, Process details, Machine details, Applications.

SECTION-B

Laminated object manufacturing: Principle, Process parameters, process details, Machine details, Applications. Laser engineering net shaping (lens): Ballistic Particle Manufacturing (BPM), 3D printing. Principle, introduction to rapid tooling, Direct and indirect method. Commercial softwares for RP, STL file generation. Rapid tooling techniques- vacuum casting, DMLS, etc. Introduction to reverse engineering.

Books Recommended:

TEXT BOOKS:

1. Ghosh A., "Rapid Prototyping: A Brief Introduction", Affiliated East West,
2. Kenneth G. Cooper, "Rapid Prototyping Technology: Selection and Application", CRC Press, 2001.

REFERENCE BOOKS:

1. Pham, D.T. & Dimov.S.S., "Rapid manufacturing", Springer - Verlag, London, 2001.
2. Terry wohlers, "Wohlers Report 2007", Wohlers Associates, USA, 2007.

3. Chua Chee Kai, Leong Kah Fai, Lim Chu -Sing, "Rapid Prototyping:
4. Principles and Applications", World Scientific, 2003.

2MMD3 MECHATRONICS IN SYSTEM DESIGN

SECTION - A

Fundamentals of Mechantronics: Evolution, Definition and concepts of Mechatronics, Conventional system vs. mechatronic system, Need and Role of Mechantronics in Design, Manufacturing and Factory Automation. Hardware components for Mechatronics. Transducer signal conditioning and Devices for Data conversion programmable controllers.

Sensors and Actuators: Transducers and Sensors – Tactile sensor – Proximity and range sensors – Sensing joint forces –Position and velocity sensing devices – Design of drive systems – Hydraulic and Pneumatic drives – Linear and rotary actuators and control valves – Electro hydraulic servo valves, electric drives – Motors – Robot End effectors– Vacuum, magnetic and air operated grippers, Micro sensors in Mechatronics.

Pneumatic Systems: Physical concepts of pneumatics, electro pneumatic components, operation and application, valves, auxiliary devices, actuation, synchronizing, clamping, declamping etc. Design of pneumatic logic circuit.

SECTION - B

Hydraulic Systems: Study of different control components of Hydraulic Systems, Valves and auxiliary devices, design and analysis of Hydraulic circuits sequencing Synchronizing, hydropneumatics, Design of electrohydraulic circuits.

Programmable Logic Controller: Comparison between microprocessor and microcontroller organization of microcontroller system Review of logic gates, basic structure, features, input/output processing, programming, functional block diagram (FBD), ladder diagram, logic functions, latching, sequencing, jumps, internal relays, counters, shift registers, master and jump control, data handling, data movement, data comparison, arithmetic operations, code conversion, analog input and output, applications of PLC

Books Recommended:

TEXT BOOKS:

1. C.W. De Silva, "Mechatronics: An Integrated Approach, Publisher: CRC.
2. Harry Stewart, "Pneumatics & Hydraulics", D. B. Taraporewala Sons and Co.,

3. M.P. Groover, "Automation, Production Systems and CIM by, PHI

REFERENCE BOOKS :

1. M. B. Histand & D. G. Aiciatore, "Introduction to Mechatronics & Measurement Systems by McGraw Hill.
2. Moh Mazidi and J. Mazidi, "The 8051 Microcontrollers and Embedded Systems", Prentice Hall
3. A. Malov, Y. Ivanov, " Principles of Automation" Automation by, MIR Publication
4. B.W. Anderson, "The Analysis and Design of Pneumatic Systems Wiley Eastern
5. D.V. Hall, "Microprocessor and It's Applications", Tata McGraw Hill
6. Anthony Esposito, "Fluid Power with Applications Prentice Hall of India
7. Phillipe Collet, "Robotic Technology", Prentice Hall
8. Y. Koren, "Robotics for Engineers", McGraw Hill

2MMD4 EXPERIMENTAL STRESS ANALYSIS

SECTION-A

Introduction to Photoelasticity: Photo elasticity, Light and Optics as Related to Photoelasticity Behavior of Light, Plane and circularly polarized light, Bright and dark field setups, Polariscope-Plane Polarizers, Wave Plates, Arrangement of Optical Elements in a Polariscopic, Constructional Details of Diffused Light and Lens, Photo elastic materials

Theory of Photoelasticity: Stress Optic Law in Two Dimensions at Normal Incidence, Effects of a Stressed Model in a Plane Polariscope, Effects of a Plane Model in a Circular Polariscope with Dark and Light Field Arrangements.

Analysis Techniques: Isochromatic Fringe Patterns, Isoclinic Fringe Patterns, Compensation Techniques, separation Techniques, Sealing Model to Prototype Stresses.

Three Dimensional Photoelasticity: Introduction, locking in model deformation, materials for three-dimensional photo elasticity, machining cementing and slicing three-dimensional models, slicing the model and interpretation of the resulting fringe patterns, effective stresses, the shear difference method in three dimensions, applications of the Frozen-stress method, the scattered light method.

SECTION-B

Strain Measurement Methods: Basic Characteristics of a Strain Gauge, Various types of strain gauges , Types of Shell Gauge, Moire Method of Strain Analysis, Grid Method of Strain Analysis.

Electrical Resistance Strain Gauge: Factors Influencing Strain sensitivity in Metallic Alloys, Gauge Construction Temperature Compensation, Factors-Influencing Gauge Section Gauge Sensitivity and Gauge Factor, Correction for transverse Strain Effects, Semiconductor Strain Gauges. Strain gauge circuits-Rosette Analysis - three element rectangular Rosette, the four Element Delta Rosettee, Stress Gauge, Strain Circuits, Potentiometer Circuits, Wheatstone Bridge.

Moire Methods: Introduction, mechanism of formation of Moire fringes, the geometrical approach to Moire-Fringe analysis, the displacement field approach to Moire-Fringe analysis, out of plane displacement measurements, out of plane slope measurements, sharpening and multiplication of Moire-Fringes, experimental procedure and techniques.

Brittle Coating Method: Introduction, Coating Stresses, Failure Theories, Brittle Coating Crack Patterns Produced by Direct Loading, Brittle Coating Crack Patterns Produced by refrigeration Techniques, Brittle Coating Crack, Pattern Produced by Releasing the Load, Double Crack Pattern, Crack Detection, Ceramic based brittle coatings, Resin based brittle coatings, Test procedures for brittle coatings analysis, Calibration procedures, analysis of brittle coating data. Load-Time Relation and Its influence on the threshold Strain Effects of a Biaxial stress Field.

Birefringent Coatings

Introduction, Coating stresses and strains, coating sensitivity, coating materials, application of coatings, effects of coating thickness, Fringe-order determinations in coatings, stress separation methods.

Books Recommended:

TEXT BOOKS:

1. J.W. Dally and W.F. Riley, Experimental Stress Analysis, 2nd Ed. MGH.
2. K. Ramesh, Published by IIT Madras, India, Experimental Stress Analysis, 2009.

REFERENCE BOOKS:

1. A Mubin, Khanna Publications, Experimental Stress Analysis, 2003.
2. Sadhu Singh, Khanna Publishers, Experimental Stress Analysis, 1982

3. Mark B. Moore, Prentice-Hall , Principles of experimental stress analysis, 1954
4. Dureli, An Introduction to Experimental Stress and Strain Analysis.
5. Srinath , An Introduction to Experimental Stress Analysis - MGH.
6. Experimental Stress Analysis - Dally and Riley, McGraw Hill.
7. Photoelasticity Vol I and Vol II - M.M.Frocht,. John Wiley and sons.
8. Strain Gauge Primer - Perry and Lissner.
9. Photo elastic Stress analysis - Kuske, Albrecht and Robertson John Wiley & Sons.
10. Motion Measurement and Stress Analysis - Dave and Adams,
11. Hand Book of Experimental Stress Analysis AS. Kobayassin (Ed), SEMNCH, II edition.

2MMD5 ELECTIVE - II

(1) OPTIMIZATION METHODS IN ENGINEERING DESIGN

SECTION - A

Introduction: Historical Developments, Engineering applications of Optimization

Classical Optimization Techniques: Introduction, Review of single and multivariable optimization methods with and without constraints, Non-linear one-dimensional minimization problems, Examples.

Constrained Optimization Techniques: Introduction, Direct methods - Cutting plane method and Method of Feasible directions, Indirect methods - Convex programming problems, Exterior penalty function method, Examples and problems

Unconstrained Optimization Techniques: Introduction, Direct search method - Random, Univariate and Pattern search methods, Rosenbrock's method of rotating co-ordinates, Descent methods - Steepest Decent methods-Quasi-Newton's and Variable metric method, Examples.

SECTION – B

Geometric Programming: Introduction, Unconstrained minimization problems, solution of unconstrained problem from arithmetic-geometric inequality point of view, constrained minimization problems, generalized polynomial optimization, Applications of geometric problems, Introduction to stochastic optimization.

Novel methods for Optimization: Introduction to simulated annealing, selection of simulated annealing parameters, simulated annealing

algorithm; Genetic Algorithm (GA), Design of GA, Key concepts of GA, Neural Networks, A frame work for Neural Network models, Construction of Neural Network algorithm, Examples of simulated algorithm, genetic annealing and Neural Network method.

Books Recommended:

TEXT BOOKS:

1. Engineering Optimization, S. S. Rao New Age International
2. Optimization for Engineering Design, Kalyanmoy Deb Prentice Hall of India

REFERENCE BOOKS:

1. Applied Optimal Design, E. J. Haug and J.S. Arora Wiley, New York
2. Optimization, G.V. Reklaites, A. Ravindran and K.M. Rogsdeth Wiley, New York

2MMD5 ELECTIVE - II

(2) ADVANCED MACHINE TOOL DESIGN

SECTION - A

Machine Tool Drive: working and auxiliary motion in machine, Machine tool drives, Hydraulic transmission, Mechanical transmission, General requirements of machine tool design, Layout of machine tools.

Regulation of Speed and Feed Rates: Aim of speed feed regulation, stepped regulation of speed, design of speed box, Design of feed box, Special cases of gear box design, Set stopped regulation of speed and feed rates.

Design of Machine Tool Structure: Fundamentals of machine tool structures and their requirements, Design criteria of machine tool structure, Static and dynamic stiffness, Design of beds and columns, Design of housing models, Techniques in design of machine tool structure.

SECTION - B

Design of Guide-ways and power Screws: Function and type of guide-ways, design of slide-ways, Protecting devices for slide-ways, Design of power screws.

Design of Spindles and Spindle Supports: Materials for spindles, Design of spindles, Antifriction bearings, Sliding bearings.

Dynamics of Machines Tools: General procedure of assessing dynamic stability of EES, Cutting processing, Closed loop system, Dynamic characteristics of cutting process, Stability analysis.

Books Recommended:

TEXT BOOKS:

1. N.K. Mehta Tata McGraw Hill "Machine Tool Design"
2. Acherkan, N., "Machine Tool Design", Vol. 3 & 4, MIR Publishers, Moscow, 1968

REFERENCE BOOKS:

1. CMTI Banglore "Machine Tool design Handbook"
2. Koenisberger, F., "Design Principles of Metal cutting Machine Tools", Pergamon Press, 1964.
3. Sen. G. and Bhattacharya, A., "Principles of Machine Tools", Vol.2, NCB.Calcutta, 1973

2MMD5 ELECTIVE - II
(3) TOTAL QUALITY MANAGEMENT
SECTION – A

Introduction: Quality – Basic concepts, dimensions, economics of quality, quality Gurus.

TQM: Definition, evolution, journey from inspection to TQM, comparison at different stages, dimensions of TQM, TQM viewpoints, reasons for adopting TQM.

Introspection to TQM environment: Sphere of TQM, components of TQM, TQM – Managing Total Quality, Factors affecting TQM environment, Classification and interaction among factors, Researchers' viewpoint, TQM as a system, steps in TQM implementation, Roadblocks in TQM implementation, Reasons for TQM failure.

Role of soft options in TQM: Hard vs. Soft factors, Role and expectation of employer, employee, customer and supplier from organization and vice versa. Human factors in TQM, Role of top management commitment, work culture,motivation,coordination,attitude,innovation.

Section – B

Quality initiatives in organizations: Role of tools and techniques in TQM, Classification of tools and techniques – Problem identification, Data analysis, Graphical, Creativity, Companywide. Brief description of Quality awards: – MBNQA, Deming award, European quality award, Australian quality award.

TQM Effectiveness: Impact of TQM, Need and difficulty in measuring TQM effect, Parameters governing effect of TQM.

Books Recommended:

TEXT BOOKS:

1. Oakland "Total Quality Management" Butterworth – Heinamann Ltd.
2. Waller Jenny, Allen Derek and Burna Andrew "The TQM toolkit – a guide to practical techniques for TQM"

REFERENCE BOOKS:

1. Logothetis N. "Managing for total quality from Deming to Taguchi and SPC" by (PHI)
2. Feigenbaum A.V. "Total Quality Control" (MGH)
3. Besterfield Dale H "Total Quality Management" (Pearson Education)
4. John Gilbert "A slice by slice guide to TQM" (Affiliated East West Press)

2MMD5 ELECTIVE-II
(4) COMPUTER ASSISTED PRODUCTION MANAGEMENT
SECTION-A

Computer aided process planning: Approaches to CAPP, basic part representation methods, shape producing capabilities, Process economics

Computer assisted QC: co-ordinate measuring machines construction and types, automated dimensional gauging and in process gauging

Capacity planning: Roll of capacity planning in manufacturing, planning and control systems, hierarchy of capacity planning decisions links to other system modules, capacity planning and control techniques.

SECTION-B

Just in time: JIT in manufacturing planning and control, leveling the production, pull system introduction, product and process design, JIT applications

Computer aided inventory control: Computer aided purchasing procedure, simulation of inventory problems Computer aided materials management: Material requirement planning, computer integrated materials management.

Books Recommended:
TEXT BOOKS:

1. Groover M.P.- Automation, Production Systems and CIM.

2. CAD/CAM theory and concepts, by Kuldeep Sareen and Chandandeep Grewal, S. Chand & company Ltd.

REFERENCE BOOKS:

1. David Bedworth, M.R. Handerson & Philip Wilze- Computer Integrated Design and manufacturing

2MMD5 ELECTIVE - II

(5) CONCURRENT ENGINEERING & PRODUCT LIFE CYCLE MANAGEMENT

SECTION -A

Introduction: Extensive definition of Concurrent Engineering (CE), CE design methodologies, Review of CE techniques like DFM (Design for manufacture), DFA (Design for assembly), QFD (Quality function deployment), RP (Rapid prototyping), TD (Total design), for integrating these technologies, Organizing for CE, CE tool box, Collaborative product development.

Use of Information Technology: IT support, Solid modeling, Product data management, Collaborative product commerce, Artificial Intelligence, expert systems, Software hardware component design.

Design Stage: Lifecycle design of products, Opportunities for manufacturing enterprises, Modality of concurrent engineering design, Automated analysis Idealization control, CE in optimal structural design, Real time constraints.

SECTION -B

Need for PLM: Importance of PLM, Implementing PLM, Responsibility for PLM, Benefits to different managers, Components of PLM, Emergence of PLM, Lifecycle problems to resolve, Opportunities to seize.

Components of PLM: Components of PLM, Product lifecycle activities, Product organizational structure, Human resources in product lifecycle, Methods, techniques, Practices, Methodologies, Processes, System components in lifecycle, slicing and dicing the systems, Interfaces, Information, Standards.

Books Recommended:

TEXT BOOKS:

1. Anderson and LHein , Integrated Product Development M.M. IFS Publications

2. Prasad , Concurrent Engineering Fundamentals: Integrated Product Development Prentice hall India

REFERENCE BOOKS:

3. I Moustapha , Concurrent Engineering in Product Design and Development New Age International. Michael Grieves, Product Lifecycle Management McGraw Hill
4. Andrew Kusiak , Concurrent Engineering: Automation tools and Technology Wiley Eastern Publications

2MMD6 MECHATRONICS IN SYSTEM DESIGN - LAB

At least four practicals (study/trials) based on above syllabus, as given below shall be performed and a report there of submitted by the students

List of Practicals:-

1. Sensors applications in Mechanical System
2. Design and testing of sequencing circuits.
3. Design and testing of Different types of Speed control Circuits.
4. Design and testing of Continuous reciprocation of Double acting Cylinder.
5. Study of different components of a CNC Machine-tool
6. Application of Microcontroller in a Mechatronic system

Practical Examination:

Practical examination shall consist of viva voce/performance based on the above syllabus and practical work.

2MMD7 EXPERIMENTAL STRESS ANALYSIS - LAB

At least five practicals (study/trials) based on above syllabus, as given below shall be performed and a report there of submitted by the students

List of Practicals:-

1. Determination of Fringe constant of photoelastic material using.
2. Circular disc subjected to diametric compression.
3. Pure bending specimen (four point bending)
4. Determination of 3- dimensional experimental stress analysis using polariscope.
5. Determine slopes of plates by experimental technique.
6. Determination of Principal stresses 1 and 2 in magnitude and direction
7. Study of effect of pressure on principal stresses.

8. Determination of stress concentration using photo elasticity for simple component like plate with a hole under tension. 2D crane hook.
9. Determination of stress frozen and a slice of cross section are taken to analyze stress & no separate loading frame required.
10. Experiments using strain gauges.
11. Measurement of strain, temperature effects
12. Fixing of gauges on surfaces.
13. Experiments using photoelastic bench.
14. Setting of polariscope and calibration of disc, beam and tension model.

Practical Examination:

Practical examination shall consist of viva voce/performance based on the above syllabus and practical work.

SEMESTER - III

3MMDS SEMINAR & DISSERTETION
(As per given Scheme)

Project

SEMESTER-IV

4MMDP PROJECT SEMINAR & DISSERTETION
(As per given Scheme)

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SYLLABUS PRESCRIBED FOR
TWO YEAR P.G. COURSE IN
MASTER OF ENGINEERING (FULL TIME)
M.E. (ELECTRICAL & ELECTRONICS ENGINEERING)

SEMESTER-I
1EEEME1 ADVANCED CONTROL SYSTEMS

Unit I : Signal Processing in Digital Control: Configuration of the Basic Digital Control Scheme, Principles of Signal Conversion, Basic Discrete-Time Signals, Time-Domain Models for Discrete-Time Systems, z-transform, Transfer Function Models, Frequency Response, Stability on the z-plane and the Jury stability criterion, Sample-and-Hold Systems, Sampled Spectra and Aliasing, Reconstruction of Analog Signals, Principles of Discretization.

Unit II: Models of Digital Control Devices and Systems: z-domain description of Sampled Continuous-Time Plants, z-domain description of Systems with Dead-Time, Implementation of Digital Controllers, Tunable PID Controllers, Digital Temperature Control System, Digital Position Control System, Stepping Motors and their Control.

Unit III: Design of Digital Control Algorithms: Introduction, z-plane specifications of Control System Design, Digital Compensator design using Frequency Response Plots, Digital Compensator design using Root Locus Plots, z-plane synthesis.

Unit IV: Control System Analysis Using State Variable Methods: Vectors and Matrices, State Variable Representation, Conversion of state variable models to transfer functions, Conversion of transfer functions to Canonical State Variable Models, Eigen values and Eigen vectors, Solution of state equations, Concepts of Controllability and Observability.

Unit V: State Variable Analysis of Digital Control Systems: State descriptions of Digital Processors, State Description of Sampled Continuous-Time Plants, State Description of Systems with Dead-Time, Solution of State Difference Equations, Controllability and Observability, Multivariable Systems.

Unit VI: Pole-Placement Design and State Observers: Stability Improvement by State Feedback, Necessary and Sufficient Conditions for arbitrary Pole-Placement, State Regulator

Design, Design of State Observers, State Feedback with Integral Control, Digital Control Systems with State Feedback.

TEXT BOOK:

M. Gopal, Digital Control and State Variable Techniques, TMH.

REFERENCE BOOKS:

1. Katsuhiko Ogata Digital Control Engineering, PHI.
2. Kuo B. C. Digital Control Systems, Wiley & Sons
3. Ioan Dor Landau and Gianluca Zito, Digital Control Systems, Springer.
4. M. Sami Fadali, Antonio Visioli, Digital Control Engineering: Analysis and Design , AP.

1EEEME2 ADVANCED POWER ELECTRONICS

Unit I: Semiconductor Devices: Review of Semiconductor devices like Power BJT, SCR, MOSFET, IGBT, GTO, MCT; Static and dynamic characteristics of these devices; Single quadrant, Two quadrant and bid-directional switches.

Unit II: Switching Voltage Regulators: Linear voltage regulators; Switching voltage regulators; Review of basic dc-dc voltage regulator configurations -Buck, Boost, Buck-Boost converters and their analysis for continuous and discontinuous mode; Fly back converter, Forward converter, Push-pull converter, Cuk converter, Sepic Converter; Design criteria for SMPS; Multi-output switch mode regulator.

Unit III: Design of Magnetic Components: Design of power transformer; high frequency transformers for fly back, forward, half-bridge–full Bridge and push pull converters; Design of inductors for various converter topologies; Design of current transformers; Different types of core materials.

Unit IV: DC-AC converters/Inverters: Classification; Review of line commutated inverters; Bridge inverters with 120°,180°,and 150° modes of operation; Harmonic reduction techniques; Sine-triangular PWM; Space Vector Pulse Width Modulation; Current Source Inverters.

Unit V: Gate and Base drive circuits: Preliminary design considerations; DC coupled drive circuits with uni polar and bipolar outputs; Importance of isolation in driver circuits; electrically isolated drive circuits; Some commonly available driver chips (based

on boot-strap capacitor); Cascade connected drive circuits; Thyristor drive circuits; Protection in driver circuits; Blanking circuits for bridge inverters.

Unit VI : Three phase AC voltage controllers and Cyclo-converters: Review of On-off and phase control; Three phase half-wave and full wave controllers and their analysis with resistive loads; three phase bi-directional delta connected controllers; 3-phase cyclo-converter circuits; circulating current operation; non-circulating current operation; mean output voltage and harmonics in supply current waveform

TEXT BOOK:

1. Ned Mohan, Undeland and Robbins, Power Electronics: Converters, Applications and Design (Wiley)

REFERENCE BOOKS:

1. Rashid M.H., Power Electronics, Pearson Education
2. G.K. Dubey, Doradla, Joshi, Sinha, Thyristorised Power Controllers Wiley
3. Sen P.C., Power Electronics, Tata McGraw Hill.
4. Philip T.Krein, Elements of Power Electronics, Oxford University Press.

1EEEME3 ADVANCED DIGITAL SIGNAL PROCESSING

Unit-I : Review of Discrete time systems, LTI systems, Impulse response and frequency response. Discrete convolution. Discrete Fourier Transform and Fast Fourier Transforms, Inverse DFT, Algorithms for efficient computation of DFT and FFT. Fast convolution. Correlation.

Unit-II : Implementation of DSP algorithms, Block diagram and signal flow graph representations, Basic IIR and FIR filter structures, Cascaded, parallel and lattice realizations, computational complexity. Finite word length effects and quantization errors.

Unit-III : Digital filter design. FIR and IIR filters, linear phase filters, design techniques for IIR filters using analog filter transformation methods, design techniques for FIR filters using windowing method. Analysis of finite word length effects.

Unit-IV : Estimation of Auto-correlation and Power Spectra of random signals. Nonparametric methods – averaging periodograms,

Welch method, Blackman and Tukey method, Parametric methods, AR, MA and ARMA models, Yule Walker method, Levinson-Durbin algorithm.

Unit-V: Multi-rate digital signal processing. Poly-phase decomposition, multistage decimators and interpolators, Digital filter banks. Adaptive filtering, minimum mean square error criterion, Wiener filter, LMS adaptive algorithm.

Unit-VI: General purpose DSP processors, Implementation of DSP algorithms on General purpose processors: issues, advantages & disadvantages . Special purpose DSP processors –Hardware digital filters and FFT processors.

TEXT BOOK:

Proakis and Manolakis Digital Signal Processing: Principles, Algorithms and Applications: 3rd Ed.-Prentice-Hall (India)

REFERENCE BOOKS:

1. S.Mitra, Digital Signal Processing: A Computer Based Approach: Tata McGraw Hill
2. Oppenheim & Schafer, Discrete Time Signal Processing, PHI.
3. Defatta, Digital Signal Processing, Wiley Inter-Science.
4. Ifeachor & Jervis, Digital Signal Processing , Pearson Education

1EEEME4 VLSI DESIGN

Unit-I : VLSI and Moore's Law. CMOS technology. Hierarchical design. The VLSI design process.IP-based design. Fabrication methods. Transistor structures. Characteristics of transistors and wires. Design rules. Layout design. Reliability.

Unit-II : Combinational logic.Static logic gates.Basic Gate Layout. Delay and power consumption .Alternate gate structures: switch, domino. Wire delay models. Design-for-yield. Gates as IP.

Unit III : Combinational Logic Networks: Layouts for logic networks. Delay through networks. Logic and interconnect design. Power consumption and power optimization. Switch logic networks. Combinational logic testing.

Unit-IV: Sequential Machines: Latches and flip-flops. structures and Clocking disciplines.Performance analysis. Sequential system design. Power optimization. Verification and testing of FSMs.

Unit-V : Subsystems Design: Pipelines and data paths. Adders. Multipliers. Memory. PLAs. FPGAs. Image sensors. Buses and networks-on-chips. Data paths.

Unit-VI: Floor planning: Floorplanning styles and methodology.Global routing.
Clock distribution.Power distribution.Packaging and pads. Register-transfer design.Pipelining. High-level synthesis.

TEXT BOOK:

Wayne Wolf: "Modern VLSI Design", Prentice-Hall.

REFERENCE BOOKS:

1. Vai M.M. "VLSI Design", CRC Press.
2. Weste N, Eshraghian, "Principles of CMOS VLSI Design" , Pearson Education.
3. Chandrasetty V A "VLSI Design", Springer.
4. Esteban Tlelo-Cuautle and Sheldon X.-D. Tan, "VLSI Design", InTech, Croatia.

1EEEME5 MODELING & ANALYSIS OF ELECTRICAL MACHINES

Unit-I: Introduction to the theory of basic two pole machine applicable to DC Machines, Three-phase induction machines and synchronous machine. Kron's primitive machine, Need of modeling, Introduction to modeling of electrical machines, Voltage and Torque equations.

Unit-II: Concept of transformation: change of variable & machine variable and transform variable for arbitrary reference frames. Application to DC machine for steady state and transient analysis, Equation of cross field commutator machine.

Unit-III : Polyphase Induction Machines: Voltage and torque equations, Equivalent circuit, Steady state analysis, Dynamic performance during sudden change in load torque and three phase fault at the machine terminals.

Unit-IV: Polyphase synchronous Machine: Voltage and Torque equations in stator, rotor and air gap field reference frame. Transformation and transformed equations. Park transformation, Voltage and power equation for salient and non-salient alternator, their phase diagrams.

Unit-V: Dynamic analysis of interconnected Machines: Machine interconnection Matrices. Transformation of voltage and torque equation using interconnection matrix. Large signal transient analysis using transformed equations. The DC generator/DC Motor system. The alternator/synchronous system.

Unit- VI : Linearized machine equations: Linearization of machine equation, small displacement stability: Eigen values of typical induction machine and synchronous machine, transfer function formulation.

TEXT BOOK :

Paul C. Krause, O Wasynczuk, S D. Sudhoff, "Analysis of Electric Machinery", IEEE Press.

REFERENCE BOOKS:

1) B. Adkins, "The Generalized theory of Electrical Machine", McGraw-Hill.

2) P.S. Bhimbra , "Generalised theory of Electrical Machines", Khanna Publishers.

3) C. V. Jones, Butterworth "The Unified theory of Electrical Machines" , Wiley.

4) Boldia and S.A. Nasar , "Electrical Machine Dynamics" , Macmillan Press.

1EEEME6 SEMINAR

The Seminar shall be based on the recent trends in the field of electrical and electronics engineering preferably related to the subjects 1EEEME1 to 1EEEME5. It should be surveyed from the technical literature published in international /national journals. A report should be prepared following the guidelines of IEEE paper format, submitted and followed by the presentation.

1EEEME7 VLSI DESIGN - LAB

Minimum Eight experiments based on the syllabus of 1EEEME4 VLSI Design using appropriate hardware and software.

2EEEME1 DIGITAL INSTRUMENTATION

Unit -I : Introduction: The basis of measurement, International unit system, Measurement &Electrical standards, Measurement errors, Factors influencing measurement errors, Enabling technologies: Processor based components and system components, Semicustom and custom ICs, Display devices.

Unit-II : Data converters: Sampled data systems, A-to-D converter errors, Basic SHA operation, ADC architectures, D to A converters, DAC architectures, Data acquisition system interfaces.

Unit-III : Waveform parameters and amplitude related measurements, Digital multimeters. DMM specifications. Pulse parameters and measurements, Fundamentals of oscilloscopes: basic operation, Digital storage oscilloscopes.

Unit-IV : Electronic counters: Basic counter circuitry, Modes of operation, Accuracy of counters, High frequency measurements and down conversion techniques, Modulation domain analysers. Signal generators. Arbitrary waveform generators (AWG).

Unit-V : Spectrum analysis: Dynamic signal analysis, Types of spectrum analyser, Superheterodyne spectrum analyser, Logic analysers: Basic operation, Types of analysis, Probing, Clocking, Triggering. Advanced features and measurement techniques.

Unit-VI : Instrument buses and VLSI testing: IEEE-488 bus, major specifications, GPIB operation, GPIB devices and interface functions, GPIB applications. VXIbus. The RS 232 interface. VLSI testing and automatic test equipment. Digital telecommunication transmission systems and associated Measurements: ADSL standard – ANSI T1.413, ADSL measurements.

TEXT BOOK:

Nihal Kuluratna "Digital and Analog Instrumentation" The Institution of Engineering and Technology, London.

REFERENCE BOOKS:

1. Bouwens ,A.J."Digital instrumentation." McGraw Hill, 1984.

2. John Lenk,D."Handbook of Microcomputer based instrumentation and control",PHI1984

3. Doebelin "Measurement System ,Application and Design",(4/e),McGraw Hill,1990.

4. Evans D. S. " Fundamentals of Digital Instrumentation", Hilger & Watts.

2EEEME2 EMBEDDED SYSTEMS DESIGN

Unit-I : Embedded systems introduction: Processor technologies, implementation technologies, and design technologies. General-purpose processors and the 8051: Architecture, instruction set and programming environment.

Unit-II: Single-purpose processors: Standard peripheral processors :timers/counters, UARTs, A/D, D/A, PWM, etc. and designing custom processors ,combinational logic design, sequential logic design, custom processor design.

Unit-III : System Integration: Memories (ROM, RAM, compositions), Interfacing (serial/parallel, interrupt-driven, parallel), Arbiters. Common interfacing protocols: PCI, ISA, I2C, CAN.

Unit-IV: Computational models and describing behavior: sequential program, state machines, dataflow. Finite state machines. Concurrent process model. Implementation technologies: Custom VLSI, standard cell and gate array, programmable logic devices (including FPGAs).

Unit-V : Real time Operating System Concept: Architecture of kernel, task scheduler, Process and Threads. ISR, Inter Process Communication through Semaphores, mailbox, message queues, pipes. Events, timers and memory management, RTOS services in contrast with traditional OS.

Unit-VI : Embedded Linux; Introduction to the Linux kernel, Configuring and booting the kernel, the root file system, Root file directories, Linux file systems, Types of file system: Disk, RAM, Flash, Network. TCP/IP Networking- Network configuration, Device control from user space- Accessing hardware directly, Inter Process Communication- Linux process model and IPCs.

TEXT BOOKS:

Frank Vahid, Tony Givargis “Embedded System Design “, PHI.

REFERENCE BOOKS:

1. Rajkamal, “ Embedded Sytems “ TMH
2. David Simon “Embedded Systems Software Primer” Pearson.
3. Steve Heath, “Embedded System Design”, Elsevier.
4. Marwedel, Peter. “Embedded Systems Design” , Springer.

2EEEME3 NEURO FUZZY CONTROL

Unit-I : Fuzzy Logic for Control :Fuzziness and linguistic rules , Fuzzy sets in control ,Combining fuzzy sets , Sensitivity of functions Combining fuzzy rules ,Truth tables for fuzzy logic , Fuzzy partitions , Fuzzy relations ,Defuzzification Level curves and alpha-cuts ,Universal approximation.

Unit-II : Fuzzy Control: A fuzzy controller for an inverted pendulum, Main approaches to fuzzy control, Stability of fuzzy control systems. Fuzzy controller design.

Unit-III : Neural Networks for Control: Introduction to neural network, Implementing neural networks , Learning capability ,The delta rule ,The back propagation algorithm ,Practical issues in training.

Unit-IV : Neural Control : Neural networks in control ,Inverse dynamics ,Neural networks in direct neural control A neural network for temperature control , Simulating PI control with a neural network Neural networks in indirect neural control ,System identification, Instantaneous linearization.

Unit-V : Fuzzy-Neural and Neural-Fuzzy Control : Fuzzy concepts in neural networks, Basic principles of fuzzy-neural systems ,Basic principles of neural-fuzzy systems ,Adaptive network fuzzy inference systems ,ANFIS learning algorithm ,Generating fuzzy rules

Unit-VI : Applications of neural control to current control and speed control of induction motors, Fuzzy logic control of a synchronous generator set. Applications of neuro fuzzy control: Cooling scheme for laser materials, Color quality processing, Identification of trash in cotton and Integrated pest management systems.

TEXT BOOKS:

1. Hung T. Nguyen, A first course in Fuzzy and Neural Control, CRC Press.
2. M.N. Cirstea, A. Dinu, J.G. Khor,M. McCormick, Neural and Fuzzy Logic Control of Drives and Power Systems, Newnes Press.

REFERENCE BOOKS:

1. Fuller Robert; Introduction to Neuro Fuzzy Systems, Springer.
2. Lamba V. K. Neuro Fuzzy Systems, Laxmi Publications.
3. Jang, sun & Mizutani , Neuro-fuzzy And Soft Computing, PHI.
4. D. Nauck, F. Klawonn, R. Kruse: Foundations of Neuro-Fuzzy Systems, John Wiley.

2 EEEME4 ELECTIVE-I
(1) POWER ELECTRONIC CONTROLLED DRIVES

Unit I : Phase-Controlled DC Motor Drives: Principles of DC Motor Speed Control, Armature and Field Controls, Four Quadrant operation, Phase controlled converters, Control modeling of the Three-Phase converter, Converter configuration for a Four-Quadrant DC Motor Drive, Three-Phase Converter-Controlled DC Motor Drive, Design of Controllers.

Unit II : Chopper-Controlled DC Motor Drive**:** Principle of operation of the Chopper, Four quadrant Chopper circuit, Model of the Chopper, Steady-State analysis of Chopper-Controlled DC Motor Drive, Pulsating Torques, Closed-Loop operation, Speed-Controlled DC Motor Drive.

Unit III : Phase-Controlled Induction Motor Drives: Stator-Voltage Control, Steady-state analysis, Approximate analysis, Torque-Speed Characteristics with Phase Control, Slip-Energy Recovery Scheme, Steady-state analysis, Starting, Rating , Closed-Loop Control.

Unit IV : Frequency-Controlled Induction Motor Drives: Voltage-Source Inverter, Voltage-Source Inverter-Driven Induction Motor, Speed control, Constant Volts/Hz Control, Constant Slip-Speed Control, and Constant-Air Gap-Flux Control.

Unit V : Vector-Controlled Induction Motor Drives: Principle of Vector control, Direct Vector control, Derivation of Indirect Vector-Control Scheme, Indirect Vector-Control Scheme, and Implementation of Indirect Vector-Control Scheme.

Unit VI: PM Brushless DC Motor (PMBDCM): Modeling of PM Brushless DC Motor, PMBDCM Drive Scheme, Phase Advancing, Half-Wave PMBDCM Drives, Sensorless Control of PMBDCM Drive, Design of Current and Speed Controllers.

TEXT BOOK :

R. Krishnan, "Electric Motor Drives: Modeling, Analysis and Control", Pearson Education.

REFERENCE BOOKS:

1. Ned Mohan, Undeland, Robbins, "Power Electronics" ,Wiley.
2. G.K. Dubey, Doradla, Joshi, Sinha, "Thyristorised Power Controllers", Wiley.
3. Rashid M.H., "Power Electronics", Pearson Education.
4. B.K.Bose, "Power Electronics and Motor Drives", Elsevier.

2 EEEME4 ELECTIVE-I
(2) DIGITAL COMMUNICATIONS

Unit I : Digital Modulation Schemes- Representation of Digitally Modulated Signals, Memory-less Modulation Methods, Signaling Schemes with Memory, Power Spectrum of Digitally Modulated Signals.

Unit II : Waveform and Vector Channel Models, Waveform and Vector AWGN channels, Optimal Detection and Error Probability for Band-Limited Signaling, Optimal Detection and Error Probability for Power-Limited Signaling, Optimal Detection in Presence of Uncertainty, Comparison of Digital Signaling Methods.

Unit III : Carrier and Symbol Synchronization- Signal Parameter Estimation, Carrier Phase Estimation, Symbol Timing Estimation, Joint Estimation of Carrier Phase and Symbol Timing, Performance Characteristics of ML Estimators.

Unit IV : Linear Block Codes- Basic Definitions, General Properties of Linear Block Codes, Some Specific Linear Block Codes, Optimum Soft Decision Decoding of Linear Block Codes, Hard Decision Decoding of Linear Block Codes, Comparison of Performance between Hard Decision and Soft Decision Decoding.

Unit V : Trellis Codes- The Structure of Convolutional Codes, Decoding of Convolutional Codes, Distance Properties of Binary Convolutional Codes, Punctured Convolutional Codes, Other Decoding Algorithms for Convolutional Codes, Practical Considerations in the Application of Convolutional Codes.

Unit VI: Digital Communication Through Band-Limited Channels – Characterization of Band Limited Channels, Signal Design for Band Limited Channels, Optimum Receiver for Channels with ISI and AWGN, Linear Equalization.

TEXT BOOK:

John Proakis, Masoud Salehi, "Digital Communications", (5/e), McGraw Hill International.

REFERENCE BOOKS:

1. Bernard Sklar, " Digital Communication" (2/e). Pearson Education.
2. Simon Haykins, "Digital Communication" John Wiley & Sons.
3. K Sam Shanmugam, "Digital Communications", John Wiley & Sons.

2EEEME5 ELECTIVE-II

1) FLEXIBLE AC TRANSMISSION SYSTEMS

UNIT –I : Introduction to Facts Controllers**:** Reactive power control: Reactive power, uncompensated transmission line, reactive power compensation – Principles of conventional reactive power compensators: Synchronous condensers, saturated reactor, phase angle regulator, and other controllers.

UNIT–II: Thyristor Controlled Shunt Compensator**:** SVC Objective of shunt compensation – Principle and operating characteristics of Thyristor Controlled Reactor – Thyristor Switched Capacitor – TSC-TCR static Var Compensators –

UNIT-III: SVC control system – SVC voltage regulator model – Transfer function and dynamic performance of SVC – Transient stability enhancement and power oscillation damping, mitigation of sub synchronous resonance.

UNIT–IV: Thyristor Controlled Series Compensator**:** TCSC Series compensation – Principles of operation of TCSC – Capability characteristics of TCSC – Modeling of TCSC – TCSC control system – enhancement of system damping – mitigation of sub synchronous resonance.

UNIT–V: Voltage Source Converter Based Shunt and Series Compensator**:** STATCOM: (Static Synchronous Compensator) Principle of operation, VI Characteristics, Harmonic performance – Steady state model. SSSC: (Static Synchronous Series Compensator) Principle of operation and characteristics of SSSC– control scheme for SSSC.

UNIT–VI: Unified Power Flow Controller**:** Basic operating principles – conventional transmission control capability of UPFC – Independent real and reactive power flow control – control scheme for UPFC – Basic control system for P and Q control – dynamic performance.

TEXT BOOK:

Narani.G.Hingorani and Laszlo Gyugyi, “Understanding FACTS”, First Indian Edition, 2001, IEEE Power Engineering Society Sponsor, IEEE Press.

REFERENCE BOOKS :

1. T J E Miller, “Reactive Power Control in Electric Systems”, John Wiley.

2. Hingorani N G, “High Power Electronics and Flexible AC Transmission Systems”, IEEE High Power Engineering Review, 1998.
3. Padiyar K R “FACTS Controllers in Power Transmission & Distribution”, New Age.
4. R. Mohan and R.K.Varma, “Thyristor-Based FACTS Controllers for Electrical Transmission Systems”, IEEE Press.

2EEEME5 ELECTIVE-II

(2) DIGITAL IMAGE PROCESSING

UNIT -I : Introduction & Image Transforms: Introduction to Image processing System, Human Visual System, and Elements of an Image Processing System. Image Transforms: Fourier Transform, 2-D discrete Fourier Transform, Hadamard Transform, Discrete Cosine Transform, KL Transform, SVD.

UNIT- II : Image Enhancement: Introduction, Image Enhancement in spatial domain, Enhancement through point operation, Types of point operation, Histogram manipulation, Linear Gray –Level Transform, Non Linear Gray Level Transform, Local or neighborhood operation, Median Filter.

UNIT-III: Image Restoration and Denoising: Introduction, Types of Image Blur, Linear Image-restoration Techniques, Non-linear Image-restoration Techniques, Blind Deconvolution, Classification of Blind-Deconvolution Techniques. Classification of Noise in Image, Median Filtering, Trimmed Average Filter, Performance Metrics in Image Restoration, and Applications of Digital Image Restoration.

UNIT-IV: Image Segmentation: Introduction, Classification of Image segmentation techniques, Region Approach to Image segmentation, Clustering Techniques, Image segmentation based on Thresholding, Edge-based Segmentation, Classification of Edges, Edge detection, Edge Linking, Hough Transform, Active Contour, Watershed Transform, Shape Representation Techniques.

UNIT-V: Image Compression: Need for Image Compression, Redundancy and Classification of redundancy in images, Classification of Image Compression Schemes, Fundamentals of Information Theory, Run-length Coding, Shannon-Fano coding, Huffman Coding, Arithmetic Coding, Dictionary-Based Compression,

Predictive Coding, Transform Based Compression, Image Compression Standard, Scalar Quantization, Vector Quantization.

UNIT VI: Wavelet Based Image Processing: Introduction to Wavelet Transform, Continuous Wavelet Transform, 2D Continuous Wavelet Transform, Multi-resolution analysis, Wavelet based Image Compression, JPEG2000 Compression Standard. Digital Image Watermarking: Classification of watermarking methods, watermarking in spatial domain, watermarking in frequency domain, applications of digital water marking.

TEXT BOOK:

Jayaraman, Esakkairajan, Veerkumar, "Digital Image Processing", TMH Publication.

REFERENCE BOOKS:

1. R.C Gonzales & Woods, "Digital Image Processing" –Addison Wesley.
2. A.K.Jain "Fundamental Digital Image Processing "–Prentice Hall Inc.
3. W.K Pratt, "Digital Image Processing" John Wiley.
4. B Chanda and D.Mujumdar, "Digital Image Processing and Analysis" PHI.

2EEEME6 SEMINAR

The Seminar shall be based on the recent trends in the field of electrical and electronics engineering preferably related to the subjects 2EEEME1 to 2EEEME5. It should be surveyed from the technical literature published in international /national journals. A report should be prepared following the guidelines of IEEE paper format, submitted and followed by the presentation.

2EEEME7 EMBEDDED SYSTEMS DESIGN LAB

Minimum Eight experiments based on the syllabus of 2EEEME2 Embedded Systems Design using appropriate hardware and software.

SEMESTER - III

3EEEME 1 SEMINAR & DISSERTETION

(As per given Scheme)

SEMESTER-IV

4EEEME 1 SEMINAR & DISSERTETION

(As per given Scheme)

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SYLLABUS PRESCRIBED FOR TWO YEAR P.G. COURSE IN MASTER OF ENGINEERING (FULL TIME) M.E. (COMPUTER SCIENCE & INFORMATION TECHNOLOGY)

1RNME1 ADVANCED COMPUTER ARCHITECTURE

Unit I: Fundamentals: Technology & Computer usage trends, costs, Performance measurements. Quantitative principles of Computer design. Concepts of memory hierarchy. Instruction set architectures. Memory addressing. Operations in the instruction set. Encoding. Role of compilers. DLX architecture.

Unit II: Pipelining: Basic principles & DLX. Various hazards: Pipelines, data, control hazards. Implementation issues. Multicycle operations. Crosscutting issues. Instruction set design and pipelining. MIPS R4000 pipeline architecture.

Unit III: Advanced pipeline and instruction - level parallelism: concepts & challenges. Data hazards & dynamic scheduling. Dynamic Hardware prediction. Compiler support for ILP. Hardware support for parallelism. Studies of ILP. Power PC620.

Unit IV: Memory- hierarchy design : Basics of caches, Reducing cache miss & hit time. Main memory. Virtual memory. Protections Examples of virtual memory. Issues in the design of memory hierarchies. Alpha APX 21064 Memory hierarchy.

Unit V: Storage Systems: Types of storage devices, Buses & their types, performance I/O performance measures. Reliability, Availability and RAID. Interfacing to an Operating system. Designing an I/O system. Unix file system performance.

Unit VI: Interconnection networks: Introduction & basic concepts, Computer connection to interconnection network. Interconnection network media. Practical issues. Examples of interconnection networks. Issues for interconnection networks. Internet working. An ATM network of workstation.

TEXT BOOK:

Hennessy J.L. & Patterson D.A."Computer Architecture : A Quantitative Approach" 2/e (Harcourt Asia).

REFERENCE BOOKS:

1. Hayes J.P., "Introduction to Computer Architecture", (McGraw Hill)).
2. Tenanbaum A. S., "Computer Organisation and Architecture", (PHI).
3. Hwang K., "Advanced Computer Architecture", (McGraw Hill).
4. Hamacher V.C, "Computer Organization", (McGraw Hill).

1RNME2 DISTRIBUTED OPERATING SYSTEM DESIGN

Unit I: Introduction : Distributed Computing Models, Software Concepts, Issues in Designing Distributed systems, Client Server Model, Case studies, review of n/w communication, protocols for distributed system.

Unit II: Interprocess communication : Message passing, case study, group communication, case study
Remote Communication : Introduction, RPC – Implementation, Communication, Issues, RMIs, Java RMs.

Unit III: Synchronization : Introduction, Clock synchronization, logical clocks, Mutual Exclusion, Election Algorithm, Deadlocks in distributed systems.

Unit IV: Distributed System Management : Introduction, Tash assignment, Load Balancing, Load sharing, Process Management, Process Migration, Threads, Fault tolerance.

Unit V: Distributed Shared Memory : Introduction, Basic Concepts, Design Issues in DSM, Issues in Implementation.

Unit VI: Distributed file management : Introduction, Distributed file system design.
Naming : Introduction, Designing, Human Oriented Names
Security in Distributed Systems : Introduction, Case Studies
Realtime distributed OS : Introduction, Design of RTDOS

TEXT BOOKS :

1) Distributed Systems : "Concepts & Design Coreterous, Dollimore, Kindberge – Addison-Wesley.

REFERENCE BOOKS :

1) Jose Garrido, Schlesiger, Hongson : "Principle of Mdern Operating Systems",
Pub : Jones & Bartlet Learning ((VIVA Books)
2) Tang : "Security Scrategies in Linux Platforms and applications" ,
Pub : Jones & Bartlet Learning ((VIVA)
3) Soloman : "Security Strategies in Windows Platforms and Applications",
Pub : Jones & Bartlet Learning ((VIVA)
4) Lunch : "Distributed Algorithms", Pub : CBS

1RNME3 DISTRIBUTED DATABASE SYSTEMS

Unit I: **Review of DBMS :** Introduction to Database Processing, ER models, Database Models, Symentic Object Models, Relational Model, Normalization, Database Designs Using ER models, Managing multiusers databases, ODBC, OLE, DB, ADO, Webserver Data Environment, ODBC, JDBC, JSP with reference databases, Relational Data Manipulation with SQL, MySQL & Oracle.

Unit II: **Distributed Databases Management Systems :**
Introduction to DDBMS, Parallel DBMS, DDBMS Architecture, Data storage, Distributed Catalogue Management, Distributed Query Processing, Distributed transactions, Distributed concurrency control, Distributed Databases Recovery, Mobile Databases, Case Study.

Unit III: **Emerging Trends in Distributed Computing :**
Introduction to Grid Computing, SOA, Cloud Computing
Dataware Housing : Need, Benefits, Subject oriented Data, Data granularity, Information flow mechanism.

Unit IV: **Meta Data** : Rele, Classification, Management, DWH architecture, DWH and data marts, DWH Scheme, Keys in DWH schema, OLAP in DWH, OLAP Design considerations, OLAP models, Security Issues.

Unit V: **Data Mining :** Introduction, Fundamentals, Classifications, Major Issues, Mining frequent patterns, association & correlation, clustor analysis, evolution analysis

Unit VI: Market Basket Analysis, Apriori Algorithm, Association Regeneration, constraint based association rules
Classification and Prediction, Bay's Theorem, Rule Based classification.

BOOKS RECOMMENDED :

1) C.J. Date : "Database Processing", Addison Wesley
2) Mahajan : " Distributed Computing"
3) M.H. Danham : "Data mining Introductory & Advance topics", PE
4) Han, Kamber : "Data Mining", Morgan Kaufmah
5) Dataware Housing : OUP
6) Dataware Housing : John Wiley

1RNME4 WIRELESS COMMUNICATION & NETWORK COMPUTING

Unit I: Wireless Communication present scenario, fundamentals, Introduction to source coding and channel coding

Unit II: Radio propagation over wireless channels, Brief overview of channel models.

Unit III: Wireless Communication Systems Standards, MAN, WLAN, WMAN, Introduction to mimo, Brief Overview of simulation.

Unit IV: Spread spectrum technology, multiple access wireless communication, GSM.

Unit V: GPRS, imode, UmTS, Wireless data networks, RFID.

Unit VI: Connecting the last mile, wireless Information Security, convergence-3G, Future Trends, 4G.

TEXT BOOKS :

1) Upen Dalal : Wireless Communication, Offord.
2) Vern A D : Wireless Data Technologies, Wiley

REFERENCE BOOKS:

1. Vern A.D."Wireless Data Technologies" : Wiley
2. Ray ES : "Space/Tererestrial Mobile Network Internet access & QOS, : Wiley
3. Rai Zing : "Multihop Wireless Networks, Wiley
4. Yu Kwang, Ricky Klark, Vincnt K.N.Lau : wireless Internet & Mobile Computing Interoperability & Performance" : Wiley

1RNME5 ELECTIVE I
(1) EXPERT SYSTEM DESIGN & INTELLIGENT SYSTEMS

Unit I: Introduction to ES : Overview of AI, Intelligent systems, knowledge representation, principles & techniques evaluating & comparising ES, TMS, Nonmonotonic justification, maintaining multiple contacts.

Unit II: Rule based systems : Canonical systems, production systems, production systems, associate nets & frame systems, OOAD for ES.
University Issues, knowledge acquisition, ES shells, knowledge acquisition methods, tools for building ES.

Unit III: Fuzzy Systems : introduction, foundation of fuzzy systems, fuzzy relations, arithmetic operations of fuzzy numbers, linguistic

descriptions and their analytical forms, defuzzification methods, fuzzy logic in control and decisionmaking applications, hardware realization of the analog fuzzy controller.

Unit IV: Artificial Neural Networks : introduction, Neuron physiology, artificial neurons, artificial neural networks, features of artificial neural networks, backpropagation training algorithms, functional link neural networks, cascasde correlation neural networks.

Unit V: Genetic Algorithms and Evolutionary Programming : introduction, genetic algorithms, procedures of genetic algorithms, the working of genetic algorithms, the logic behind genetic algorithms, evolutionary programming, the working of evolutionary programming, genetic-algorithmbased machine learning classifier system.

Unit VI: Swarm Intelligent Systems : introduction, background of Ant intelligent systems, importance of the ant colony paradigm, ant colony systems, development of the ant colony systems, application of ant colony intelligence, the working of ant colony systems, particle Swarm intelligent systems, engineering applications of PSIS and future research.

TEXT BOOKS :

1) Peter Jackson "Introduction to Expert System" PE 3rd Ed., 2003
2) N.P.Padhy, "Artificial Intelligence and Intelligent Systems", Oxford.

REFERENCE BOOKS :

1) Hakin, Simon 2003, "Neural Networks : A Comprehensive Foundation", PHI, New Delhi.
2) Kosko B. 1997, "Neural Networks and Fuzzy Systems", PHI, New Delhi.
3) Rajasekaran S. and G.A.Vijayalakshmi Pai, 2003, "Neural Networks, Fuzzy Logic and Genetic Algorithms", PHI, New Delhi.
4) Sriram, Ram D. 1977, "Intelligent Systems for Engineering - AKnowledge-Based Approach", Springer, London.

1RNME5 ELECTIVE I
(2) ALGORITHMICS

Unit I: Introduction: Mathematical Notations, Proof techniques, Elementary algorithmics, Efficiency of algorithms : Examples. Asymptomatic notations: conditional asymptomatic

notations. Notation with several parameters. Operations on asymptomatic notations.

Unit II: Algorithm analysis: Analysing control structures. Examples. Average-case analysis. Amortized analysis. Solving recurrences. Review of data structures: Arrays, Stacks, Queries, Records & Pointers, Lists, Graphs, Trees, Associative tables, Heaps.

Unit III: Greedy Algorithms: Some characteristics, Graphs: Minimum spanning trees, Shortest paths. The knapsack problem, Scheduling, Divide & Conques : Introduction - general template, Binary search, sorting, median finding & matrix multiplication. Exponentiation. Cryptograph.

Unit IV: Dynamic programming: Examples, Principle of optimality, Knapsack problem & shortest paths. Chained matrix multiplication, Recursion, Memory function. Graphs: Traversing trees. Depth-first-search : Directed & undirected graphs : Breadth-first-search. Back tracking. Branch-and-Bound. Minimax principle.

Unit V: Probability algorithms: Introduction, pseudorandom generation. Numerical probabilistic algorithms. Monte Carlo algorithms. Las Vegas algorithms. Parallel algorithms: Basic techniques. Work & efficiency. Examples. Parallel evaluations of expressions. Parallel sorting networks & parallel sorting.

Unit VI: Computational complexity. Introduction. Information-theoretic arguments. Adversary arguments. Linear reduction, Introduction to NP-completeness. Heuristic algorithms. Approximate algorithms. NP-hard approximation problems. Approximation schemes.

TEXT BOOK:

G. Brassard, P.Bratley, "Fundamentals of Algorithmics", (PHI).

REFERENCE BOOKS:

1. Horowitz & Sahni, "Fundamentals of Algorithms", (Galgotia).
2. Aho, Ullman, "Analysis & Design of Computer Algorithms", (Addison-Wesley).
3. Donald E.Knuth, "The Art of Computer Programming", Vol.I, Vol.II, Vol.III, (Addison-Wesley).

1RNME 5 ELECTIVE I

(3) INFORMATION TECHNLOGY MANAGEMENT

Unit-I : IT and Strategy : Information revolution, Business and strategy. IT Strategy, Strategy and Success, Design Parameters, Strategic

positioning, Evolution of strategy sequences and getting the right, development of a strategy ,types of strategy ,context and strategy.

Unit-II : Managing IT :IT management and its roles, It governance, It governance and strategy, Technology management process, Technology selection, Strategic aspects of technology. IT and business alignment, Risk Management ,Exploiting IT Capabilities, Deploying IT in strategic manner ,Strategic planning for information technology and frameworks , Measuring IT, Performance Measures : Balanced Score Card.

Unit-III : E- strategy : What is e- strategy. E-business and E-strategy, E- business objectives ,E-Commerce and E-Business, Making e- strategy work, E-strategy and the E-economy.
IT strategies for IT companies: Project Vs Product Companies , Strategies aspects for an IT product company, IT Strategic perspective for product company ,IT Strategies for Product company information Technology Strategy development, Product life cycle and project life cycles.

Unit-IV : IT strategies for Knowledge Management
Knowledge Management, Knowledge Management and IT strategies, role of Knowledge Management in IT strategies for IT companies, knowledge industry and knowledge strategy knowledge workers, IT strategic services ,product and consulting .
IT strategies for non –IT companies : Role of IT in non –IT companies , IT Investment decision, measurement of IT,IT strategies for Non-IT companies, IT supply chain management and constraint management, IT enabled supply chain management.

Unit-V : IT Strategies in specific scenario, Enterprise resource planning implementation, mapping IT strategies initiatives to ERP ,supply chain contribution and business strategy, IT strategies for business process outsourcing,
IT strategy implementation : IT strategy implementation, Development and need of it strategic plan ,IT strategy implementation to gain competitive advantage, IT strategy and leadership, IT strategy and differentiation , Execution and IT strategy .

Unit-VI : Global dimension of It Strategy : IT strategies in global environment, Global product cycle, Making It global scenario, globalization and competitive strategy, global project management, Mergers and acquisitions ,IT compatibility in M&A.

TEXT BOOK:

Parag Kulkarni,Pradip K Chande "IT Strategy for Business", OXFORD University Press.

REFERENCE BOOKS:

1. Earl. M, "Management Strategies for Information Technology ",Prentice Hall.
2. Gottschalk , P " Strategic Knowledge Managements Technology " IGP USA
3. Hill , C and G Jones " Strategic management " Houghton Miffen USA
4. Honeycutt J " Knowledge management Strategies" , Microsoft Press USA.

2RNME1 REAL TIME EMBEDDED SYSTEMS

Unit I: Introduction to ES : Application, categories, architecture overview, specialties, Recent Trends.
Architecture : Hardware Architecture, Software Architecture

Unit II: Programming of ES : Memory Management, Timing, Device Drivers, Productivity Tools, Code Optimization, Coding guidelines, C++ & Java for ES.
ES development process & design, Implementation, Integration, testing, Packaging, Configuration management, projects.

Unit III: Hardware Platforms and Communications : Types of hardware platforms, microcontrollers, communication interfaces, RS232, RS422, US, Infrared, IEEE, Ethernet, Bluetooth.

Unit IV: RTOS & ES : Kernel architecture, Tash scheduler, ISRs, Semaphones, Mutex, Mailboxes, Message Censes, Event Registers, Pipes, Signals, Timers, Memory Management, Priority Inversion, Embedded OS, RTOS, Handheld OS, OS S/W, Embedded winXP, Perting RTOS on ES Board.

Unit V: Sample ES : Representative OS, Es programming in Linux, Shell programming, system programming, project overview for navigation system, protocol convertor, Database applications, Mobile Java applications.

Unit VI: Embedded S/W development for Microcontroller : Development Environment, Tools, Application development, RFID System, DSP based system, Future Trends.

TEXT BOOK :

1) Embedded / Real Time Systems : "Concept, Design & Programming", Black Book – Prasad Dreamtech Pub.

REFERENCE BOOKS:

1. Null & Labour : Essentials of Computer Architecture & Organization",
Pub : Jones & Bartlet (VIVA Pub.)
2. Heath :"Embedded System Design", Pub : CBS
3. Shaw : Real Time Systems & Softwares" : Pub : CBS
4. Zurawaski : "Embedded Systems Handbook", Pub : CBS

2RNME2 PERFORMANCE ANALYSIS FOR IMAGING SYSTEMS

Unit I Basic Principles of Imaging, Imerging System, Performance, Imaging System Isues

Unit II Acquisition of Images, Image quality, Signal Processing, Performance evolution

Unit III Signal & Image processing, Image resampling performance issues

Unit IV Super resolution, Image debluzzing, performance analysis

Unit V Image contrast Enhancement, Non uniformity correction, performance issues

Unit VI Time Scale, Image Function, Performance measurement

TEXT BOOK :

"Signal Processing and Performance Analysis of Image Systems" : S. Susan Young, Renald GD, Edlie L.J., Artech House Inc.

REFERENCE BOOKS:

1. Gomes : "Image Processing for Computer Graphics" Pub : CBS
2. Abut : "DSP for in-vehicle and mobile systems" Pub: CBS
3. Adali : "Adaptive Signal Processing : Next Generation Solution" Pub : CBS

2RNME3 INFORMATION TECHNOLOGY & SECURITY

Unit I Introduction, Security, Public key cryptography, Hash function, quantum, cryptography, cryptography protocols.

Unit II PKD, wireless network access, mobile security, Secure software Engineering, ICT Security.

Unit III ICT & forensic, Risk Asessment, IS management, Hacking & cracking, Reconnaissance

Unit IV Scanning tools, sniffers, TCP/IP vulnerability, Password cracking, spooling

Unit V Session Hacking, Hacking N/W devices, Trojan Horses, Dos Attacks, Buffer Overflows.

Unit VI Programming experts, mail vulnerability, Web Application Vulnerability, Windows Vulnerability, Linux Vulnerability, Incident Handling.

TEXT BOOKS :

1) Multidisciplinary Introduction to Information Security Stig FM – CRC Press
2) Computer Seciruty, Concepts, Issues & implementation – Cenage Learning.

REFERENCE BOOKS:

1. Workman, Phelps, Gathegi :"Information Security for Managers" Pub : Jones & Bartlet (VIVA Pub.)
2. Newman: "Computer Security" Pub: Jones & Bartlet (VIVA Pub.)
3. Johnson & Merkov : "Security Policies and Implementation Issues" , Pub: Jones & Bartlet (VIVA Pub.)
4. Gibson : "Managing Risks in Information Systems", Pub: Jones & Bartlet (VIVA Pub.)
5. Basworth : "Computer Security Handbook", Pub : Jones & Bartlet (VIVA Pub.)

2RNME4 SOFTWARE ENGINEERING, TESTING & RELIABILITY

Unit I: Software Engineering Reviews : Software Process models, requirements Engineering, Introduction to UML, Meta Model, Extensibility Mechanism, Introduction to OCL, Behivirol Model, Design Engineering, OOD.

Unit II: Software Testing : Introduction to Testing Methodology, Terminology, Methodology, Verification, Validation.

Unit III: Testing Techniques : Dynamic Testing – Black Box & White Box, Static Testing, Validation Activity, Regression Testing.

Unit IV: Test Management & Quality Management :
1st organization, Test Planning, Software Metrics, Software Quality, Quality Management, Quality factors, Test process maturity models. Testing Tools, OOT Basics, Testing of Web Based systems, Debugging.

Unit V: Reliability Engineering : Introduction, Reliability maths, Life data analysis and Problem plotting,, Monte Carlo in simulation.

Unit VI: Software Reliability : Introduction, Load strength Inferences, Reliability Prediction and modeling, software reliability model, patterns.

BOOKS RECOMENDED:

1) Sommerville : "Software Engineering", 7th Ed., Addison-Wesley 2004
2) Grandy Booch, Ram Bough, Jacobson, "Onified modeling language users guide", 2nd Ed., Addison-Wesley
3) Marsh Chauhan : Software Testing, Principle & Practice", Publishing.
4) Pratric DT " Practical Reliability Engineering" Wiley

REFERENCE BOOK :

1. Richardson & Thies :"Secure Software Design, Pub : Jones & Bartlet (VIVA Pub.)

2RNME5 ELECTIVE II
(1) ADVANCED COMPILING TECHNIQUES

Unit I: Symbol-Table Structure: Storage Classes, Visibility, and Lifetimes, Symbol Attributes and Symbol-Table Entries, Local Symbol-Table Management, Global Symbol-Table Structure, Storage Binding and Symbolic Registers, Approaches to Generating Loads and Stores.

Unit II: Intermediate Representations: Issues in Designing an Intermediate Language, High-Level, Medium-Level and Low-Level Intermediate Languages, Multi-Level Intermediate Languages, Sample Intermediate Languages: MIR, HIR, and LIR, Representing MIR, HIR and LIR. ICAN Naming of Data Structures, Routines to Manipulate Intermediate Code.

UnitIII: Run-Time Support: Data Representations and Instructions, Register Usage, The Local Stack Frame, The Run-Time Stack, Parameter-Passing Disciplines, Procedure Prologues, Epilogues, Calls, and Returns, Code Sharing and Position-Independent Code, Symbolic and Polymorphic Language Support.

Unit IV: Producing Code Generators Automatically: Introduction, need and applications to Automatic production of Code Generators, a Syntax- Directed Technique. Introduction to Semantics-Directed Parsing, Tree Pattern Matching and Dynamic Programming.

Unit V: Control-Flow Analysis: Various Approaches, Depth-First Search, Preorder Traversal, Post order Traversal, Breadth-Firs Search, Dominators and Post dominators, Loops, Strongly Connected Components, Reducibility, Interval Analysis, Control Trees, Structural Analysis.

Unit VI: Data-Flow Analysis: Basic Concepts, Taxonomy of Data-Flow Problems, Solution Methods: Iterative, Lattices of Flow Functions and Control-Tree-Eased. Structural Analysis, Interval Analysis,

Du- Chains, Ud-Chains, Webs, SSA Form. Dealing with Arrays, Structures, and Pointers. Automating Construction of Data-Flow Analyzers.

TEXT BOOK:

Steven S. Muchnick, "Advanced Compiler Design Implementation" (Hartcourt Asia- Morgan Kaufman).

REFERENCE BOOKS:

1. Aho, Sethi, Ullman, "Compilers: Principles Techniques and Tools" (Pearson).
2. D. M. Dhamdhere, "Compiler Construction" (2/e), Macmillan.
3. Cooper & Torczon, "Engineering a Compiler" Elsevier.
4. K C. Louden, "Compiler Construction: Principles and Practice" Cengage.

2RNME5 ELECTIVE II

(2) MOBILE COMPUTING

Unit I: Characteristics, Fundamentals and Infrastructure of cellular system, Satellite system, Network protocol, Ad Hoc and sensor network, Wireless MAN's, LAN's and PAN's.
Mobile Ratio Propagation: Types of Radio waves, Propagation mechanism, Free space propagation, Land propagation, Path loss, Slow fading, Fast fading, Doppler effect, Delay spread, Coherence Bandwidth ,Inter symbol and Co-channel Interferences.

Unit II: Cellular Concept: Cell area, Signal strength and cell parameter, Capacity of a cell, Frequency reuse, Cluster, Co-channel Interference, Cell Splitting, Cell sectoring. Channel allocation: Static allocation verses Dynamic allocation, fixed channel allocation (FCA), Dynamic channel allocation, Hybrid channel allocation (HCA), Allocation in specialized system structure, System Modeling.

Unit III: Mobile communication systems: Cellular system infrastructure, Registration, Handoff parameter and underlying support Roaming support, Multicasting, Security and privacy, Firewall and system security. Exiting wireless system: AMPS, IS-41, GSM, IMT-2000.

Unit IV: Ad hoc And sensor network: Characteristic of MANET, Applications, Routing, Table – driven routing protocol, Source initiated On- demand Routing, Hybrid protocol, Wireless sensor network, Fixed wireless sensor networks.

Unit V: Wireless MANs, LANs and PAN's**:** Wireless metropolitan area networks (WMANs), Wireless Local Area networks (WLANs),

and Wireless Personal Area networks (WPANs), Recent Advances, Introduction, and Ultra –wideband technology.

Unit VI: Multimedia services requirement, Push –to-talk (PTT) technology, Mobility and resources management for Integrated system, Multicast in Wireless networks, Directional and smart antennas, Design issue in sensor networks, Bluetooth network, Low - power design, XML, Threat and security issue..

TEXT BOOK:

Agrawal D P and Zeng Q A, "Introduction to Wireless and Mobile Systems", (CENGAGE) (2/e).

REFERENCE BOOKS:

1. Jochen Schiller, "Mobile Communication", (Pearson Education) Second Edition.
2. C.K. Toh, "Ad Hoc Mobile Wireless Networks: Protocols & Systems", (Pearson Edu.)
3. Rajkamal, "Mobile Computing" (Oxford University Press).
4. George A, "Mobile Ad Hoc Networks: From Wireless LANs to 4G Networks" (TMH).

2RNME5 ELECTIVE - II

(3) DIGITAL MEDIA DEVELOPMENT

Unit I : Introduction to Multimedia Systems design, Elements,Systems architechture & technologies , Objects for multimedia systems , Multimedia data interface standards, Multimedia Databases, Data Compression need, lossy and lossless compression, binary image compression Schemes, color, grey and still video image compression , Full motion video compression , audio compression.

Unit II : Data and file format standards RTF, TIFF,RIFF, MIDI , JPEG ,AVI, MPEG Standards, video and image display systems, image scanners , Digital voice and audio, Digital camera, video images and animation, Full motion video

Unit III : Telecommunications considerations for Multimedia, Specialised processors , ISDN, LAN and WAN for Enterprise Multimedia Applications, Distibuted Object Model, Multimedia communication protocols (UDP , RTP , RTCP , TELNET) Multimedia Applications and Design issues,,Virtual Reality Design,Componects of Multimedia Systems,, Application Workflow & Distributed Application Design Issues

Unit IV : Multimedia Authoring and User Interface, Design Considerations, Hypermedia Applications, Information Access,

Object display, Hypermedia Messaging, Integrated document management

Unit V : Distributed Multimedia Systems, Components, Client-server Operation, Object Server, Network Performance Issues, Distributed Multimedia databases, Managing distributed Objects

Unit VI : System Design: Design issues,requirements, feasibility, Performance Analysis, Design for performance , Multimedia Systems Design , Extensibility and example.

BOOKS RECOMMENDED:

1. Prabhat K Andleigh and Kiran Thakrar "Multimedia Systems Design" (PHI Publications).
2. Fred Halsall," Multimedia Communications by (Pearson Publications).
3. Ze-Nian Li, Mark S.Drew,"Fundamentals of Multimedia" (Pearson Publications).
4. John K.Koegel Buford, "Multimedia Systems" (Pearson Education)

REFERENCE BOOKS:

1. Game Engineering Design & Implementation - Alan Thorn, Pub : Jones & Bartlet (VIVA Pub.)
2. Fundamentals of Game Development : Chandler & Chandler, Pub : Jones & Bartlet (VIVA Pub.)

2RNME 6 CSIT LAB - III: This lab shall be based on 2RNME1 - Real Time Embedded System
AND **2RNME2** - Performance Analysis for Imaging Systems

2 RNME 7 CSIT LAB - IV : This lab shall be based on 2RNME 3- Informn.Tech.& Security
AND **2RNME4** - Software Engineering, Testing & Reliability
AND/OR **2 RNME5 (E-2**) Mobile Computing (if offered)