Scheme and Syllabus

For

M.Tech. Programme

In

(Information Technology, Computer Science & Engineering, Information Security)
And
(Electronics & Communication Engineering, Digital Communication, Signal Processing, RF & Microwave Engineering, VLSI Design)

Of

Regular & Weekend Programme

GURU GOBIND SINGH
INDRAPRASTHA
UNIVERSITY

Guru Gobind Singh Indraprastha University
Sector – 16 C, Dwarka
New Delhi – 110 078, India
www.ipu.ac.in

Master of Technology
(Computer Science & Engineering)
(Regular Programme)

First Semester

Code No.	Paper	L	T/P	Credits	Page no. of Syllabus
Theory Papers					
MECS-601	Advanced Data Structures	4	-	4	53
MECS -603	Advanced Software Engineering	4	-	4	54
MECS -605	Advances in Data & Computer Communications	4	-	4	55
Electives (Choose any TWO)					
MECS -607	Advanced Computer Architecture	4	-	4	56
MECS -609	Enterprise Computing using JAVA	4	-	4	57
MECS-611	Computational Techniques using MATLAB	4	-	4	58
MEEC-613	Mathematical Statistics & Data Analysis	4	-	4	123
MECS- 613	Advanced Operating Systems	4	-	4	59
MECS- 615	Theory of Computation	4	-	4	60
Practicals					
MECS-651	Lab-I (ADS Lab)	0	2	1	61
MECS-653	Lab-II (ASE Lab)	0	2	1	61
MECS-655	Lab-III (ADCC Lab)	0	2	1	61
MECS-657*	Term paper I	-	-	2	61
Total		**20**	**6**	**25**	

Master of Technology
(Computer Science & Engineering)
Regular Programme

Second Semester

Paper Code	Subject	L	T/P	Credits	Page No. Of Syllabus
MECS-602	Object Oriented Analysis and Design	4	-	4	62
MECS-604	Advanced Data Base Management System	4	-	4	63
MECS-606	Advanced Algorithm Analysis & Design	4	-	4	64
Electives (Choose any Two)					
MEEC-618	ESD Using ARM microcontroller	4	-	4	126
MEEC-604	Advanced Signal Processing	4	-	4	117
MECS-608	Software Requirement & Estimation	4	-	4	65
MECS-610	Network Programming	4	-	4	66
MECS-612	Soft Computing	4	-	4	67
MEEC-612	Cellular & Mobile Communication	4	-	4	122
MECS-614	Modelling & Simulation	4	-	4	68
MECS-616	Software Metrics	4	-	4	69
MEIT-604	Advanced Software Project Management	4	-	4	88
MECS- 620	Distributed Computing	4	-	4	70
MECS-624	Advanced Computer Graphics	4	-	4	71
MESP-612	Digital Image Processing	4	-	4	170
MEIT-608	Web Semantics	4	-	4	239
Practicals					
MECS -652	Lab-IV (OOAD Lab)	-	2	1	72
MECS-654	Lab-V (ADBMS Lab)	-	2	1	72
MECS -656	Lab-VI (AAAD Lab)	-	2	1	72
MECS-658*	Term paper II	-	-	2	72
	Total	**20**	**6**	**25**	

Master of Technology
(Computer Science & Engineering)
Regular Programme

Third Semester

Paper Code	Paper	L	T/P	Credits	Page no. of syllabus
MECS-701	Advanced Data Warehousing & Data Mining	4	-	4	73
MECS-703	Advanced Software Testing	4	-	4	74
Electives (Choose any Three)					
MEEC-707	Artificial Neural Networks	4	-	4	133
MECS- 705	Cloud Computing	4	-	4	75
MECS-707	E-Commerce & Applications	4	-	4	76
MECS-709	Information Storage & Management	4	-	4	77
MECS-711	Software Quality Management	4	-	4	78
MECS-713	Advanced Digital Signal Processing	4	-	4	79
MECS-715	Advanced Multimedia	4	-	4	80
MECS-717	Cyber Crime Investigations and Cyber Forensics	4	-	4	81
MECS-719	Distributed Databases	4	-	4	82
MECS-721	Network Management	4	-	4	83
MEEC-705	Embedded Systems & RTOS	4	-	4	132
MEIT-703	Information Theory & Coding	4	-	4	91
Practicals					
MECS-751	Lab-VII (ADWDM Lab)	-	2	1	84
MECS-753	Lab-VIII (AST Lab)	-	2	1	84
MECS-755*	Term Paper III	-	-	2	84
MECS-757	Minor Project	-	-	4	84
	Total	**20**	**4**	**28**	

Master of Technology
(Computer Science & Engineering)
Regular Progamme

Fourth Semester

Paper Code	Subject	L/P	Credits
MECS - 752	Dissertation	-	24
MECS– 754*	Seminar & Progress Report	-	4
MECS-756*	Term paper IV	-	2
	TOTAL	-	**30**

***Non University Exam System**

NOTE:

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2. Each student shall be required to appear for examination in all courses, But for the award of the degree a student shall be required to earn the minimum of 100 credits out of 108. However only Elective Courses and Term papers may be dropped towards counting for total credits of 100 to award M. Tech. Degree.

Master of Technology
(Information Technology)
Regular Programme

First Semester

Code No.	Paper	L	T/P	Credits	Page no. of Syllabus
Theory Papers					
MECS-601	Advanced Data Structures	4	-	4	53
MECS-603	Advanced Software Engineering	4	-	4	54
MECS-605	Advances in Data & Computer Communications	4	-	4	55
Electives (Choose any TWO)					
MEVS-601	Digital System Design using Verilog	4	-	4	209
MECS -607	Advanced Computer Architecture	4	-	4	56
MECS-609	Enterprise Computing using JAVA	4	-	4	57
MECS- 611	Computational Techniques using MATLAB	4	-	4	58
MEEC-613	Mathematical Statistics & Data Analysis	4	-	4	123
MECS- 613	Advanced Operating Systems	4	-	4	59
MEIT-601	Introduction to Computer Security	4	-	4	85
MEIT-603	Cellular & Mobile Communication	4	-	4	86
MECS- 615	Theory of Computation	4	-	4	60
Practicals / Viva Voce					
MEIT-651	Lab-I (ADS Lab)	-	2	1	90
MEIT-653	Lab-II (ASE Lab)	-	2	1	90
MEIT-655	Lab-III (ADCC lab)	-	2	1	90
MEIT-657*	Term Paper I	-	-	2	90
	Total	**20**	**6**	**25**	

Master of Technology
(Information Technology)
Regular Programme

Second Semester

Code No.	Paper	L	T/P	Credits	Page no. of Syllabus
Theory Papers					
MEIT-602	Advanced Mobile Computing	4	-	4	87
MEIT-604	Advanced Software Project Management	4	-	4	88
MEIT-606	Computer Graphics & Animation	4	-	4	89
Electives (Choose any TWO)					
MEEC-618	ESD Using ARM microcontroller	4	-	4	126
MECS- 602	Object Oriented Analysis & Design	4	-	4	62
MEEC-604	Advanced Signal Processing	4	-	4	117
MECS- 604	Advanced Database Management System	4	-	4	63
MEEC-606	Advanced VLSI Design	4	-	4	118
MECS-606	Advance Algorithm Analysis & Design				64
MECS-608	Software Requirements & Estimation	4	-	4	65
MECS-610	Network Programming	4	-	4	66
MECS-612	Soft Computing	4	-	4	67
MESP-612	Digital Image Processing	4	-	4	170
MECS-614	Modelling & Simulation	4	-	4	68
MECS-616	Software Metrics	4	-	4	69
MECS- 620	Distributed Computing	4	-	4	70
MEIT-608	Web Semantics	4	-	4	239
Practicals/Viva Voce					
MEIT-652	Lab-IV (AMC Lab)		2	1	91
MEIT-654	Lab-V (ASPM Lab)	-	2	1	91
MEIT-656	Lab-VI (CGA Lab)	-	2	1	91
MEIT-658*	Term Paper II			2	91
Total		**20**	**6**	**25**	

Master of Technology
(Information Technology)
Regular Programme

Third Semester

Code No.	Paper	L	T/P	Credits	Page No. of Syllabus
Theory Papers					
MECS-701	Advanced Data Warehousing & Data Mining	4	-	4	73
MEIT-703	Information Theory & Coding	4	-	4	92
Electives (Choose any Three)					
MECS-703	Advanced Software Testing	4	-	4	74
MEIT-705	Reliability Engineering	4	-	4	93
MECS -705	Cloud Computing	4	-	4	75
MECS-707	E- Commerce & Applications	4	-	4	76
MEEC-707	Artificial Neural Networks	4	-	4	133
MECS-709	Information Storage & Management	4	-	4	77
MECS-711	Software Quality Management	4	-	4	78
MECS-713	Advanced Signal Processing	4	-	4	79
MECS-715	Advanced Multimedia	4	-	4	80
MECS-717	Cyber Crime Investigations and Cyber Forensics	4	-	4	81
MECS-719	Distributed Databases	4	-	4	82
MECS-721	Network Management	4	-	4	83
MEEC-705	Embedded Systems & RTOS	4	-	4	132
Practicals/Viva Voce					
MEIT-751	Lab-VII (ADWDM Lab)	-	2	1	94
MEIT-753	Lab-VIII (ITC Lab)	-	2	1	94
MEIT-755*	Term Paper III	-	-	2	94
MEIT-757	Minor Project	-	-	4	94
Total		**20**	**4**	**28**	

Master of Technology
(Information Technology)
Regular Programme

Fourth Semester

Paper Code No.	Subject	L	T/P	Credits
MEIT-752	Dissertation	-	-	24
MEIT-754*	Seminar & Progress Report	-	-	4
MEIT-756*	Term Paper IV			2
Total		-	-	**30**

***Non University Exam System**

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Master of Technology
(Information Security)
Regular Programme

First Semester

Code No.	Paper	L	T/P	Credits	Page no. of Syllabus
Theory Papers					
MEIS-601	Advance Computer Network	4	-	4	95
MEIT-601	Introduction to Computer Security	4	-	4	85
MEIS-605	Cryptography Foundation and its Applications	4	-	4	96
Electives (Choose any TWO)					
MEIS-607	Advanced Operating System	4	-	4	240
MEIS-609	Decision Support Systems & Methods	4	-	4	97
MEIS-611	Internet Technologies & Applications	4	-	4	98
MEIS-613	Game Theory & Its Applications	4	-	4	99
MEIS-615	Network security and applications	4	-	4	100
MEEC-613	Mathematical Statistics & Data Analysis	4	-	4	123
Practical's / Viva Voce					
MEIS 651	Lab-I (Ad. CN Lab)	-	2	1	101
MEIS 653	Lab-II (ICS Lab)	-	2	1	101
MEIS 655	Lab-III (CF Lab)	-	2	1	101
MEIS-657*	Term Paper - I	-	-	2	101
Total		**20**	**6**	**25**	

*** NUES: Non University Examination**

Master of Technology
(Information Security)
Regular Programme

Second Semester

Code No.	Paper	L	T/P	Credits	Page no. of Syllabus
Theory Papers					
MECS-604	Advanced Database Management System	4	-	4	63
MECS-602	Object Oriented Analysis and Design	4	-	4	62
MEIS -604	Security Testing	4	-	4	102
Electives (Choose any TWO)					
MEIS-606	Information Security and Risk Management	4	-	4	103
MEIS-608	Technical Foundation for E - Commerce	4	-	4	104
MEIS-612	Intrusion Detection and Information Warfare	4	-	4	105
MEIT-604	Advanced Software Project Management	4		4	88
MEIS- 618	Real Time Systems	4		4	106
Practicals/Viva Voce					
MEIS-652	Lab-IV (ADBMS Lab)		2	1	
MEIS-654	Lab-V (OOAD Lab)	-	2	1	
MEIS-656	Lab-VI (Security Testing Lab)	-	2	1	
MEIS-658*	Term Paper II	-	-	2	
Total		**20**	**6**	**25**	

***Non University Exam System**

Master of Technology
(Information Security)
Regular Programme

Third Semester

Code No.	Paper	L	T/P	Credits	Page No. of Syllabus
Theory Papers					
MEIS -701	Mobile & Wireless Network Security	4	-	4	107
MECS-717	Cyber Crime Investigation & Cyber Forensics	4	-	4	81
Electives (Choose any Three)					
MECS-701	Data Warehouse and Data Mining	4		4	73
MEIS-705	Biometric Security	4	-	4	108
MEIS-707	Strategic Computing & Communication Technology	4	-	4	109
MEIS-709	Quantum Information processing	4	-	4	110
MEIS-711	Digital Defense: Issues in Security	4	-	4	111
MEIS-713	Cyber laws	4	-	4	112
MEIS -715	Financial Mathematics	4	-	4	113
MECS-705	Cloud Computing	4		4	75
MEIS-719	Security issues in Information Systems	4		4	114
Practicals/Viva Voce					
MEIS 751	Lab-VII (Mobile & WNS Lab)		2	1	115
MEIS 753	Lab-VIII (Cyber Crime Investigation & CF Lab)	-	2	1	115
MEIS-755*	Term Paper-III	-	-	2	115
MEIS-757	Minor Project		-	4	115
Total		**20**	**4**	**28**	

***Non University Exam System**

Master of Technology
(Information Security)
Regular Programme

Fourth Semester

Paper Code No.	Subject	L	T/P	Credits
MEIS-752	Dissertation	-	-	24
MEIS-754*	Seminar	-	-	4
MEIS-756*	Term Paper -IV	-	-	2
Total				**30**

***Non University Exam System**

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SCHEME OF EXAMINATION

M.Tech. (Electronics & Communication Engineering)

Regular Programme

FIRST SEMESTER EXAMINATION

Code No.	Paper	L	T/P	Credits	Page no. of Syllabus
Theory Papers					
MEEC-601	Optoelectronics and Optical fibre communication	4	-	4	116
MEDC-601	Advanced Digital Communication systems	4	-	4	143
MEVS -603	VLSI Technology	4	-	4	210
Elective (Choose any two)					
MECS -607	Advanced Computer Architecture	4	-	4	56
MEEC-607	Advanced Computer Networks	4	-	4	119
MEVS-601	Digital System Design using Verilog	4	-	4	209
MEVS-613	Wireless Networks	4		4	219
MECS- 611	Computational Techniques using MATLAB	4	-	4	58
MEEC -611	Telecommunications system Modelling &Simulation.	4	-	4	121
MEEC-613	Mathematical Statistics & Data Analysis	4	-	4	123
MEIT-705	Reliability Engineering	4	-	4	93
MESP-609	Optimization Techniques	4	0	4	168
Practicals / Viva Voce					
MEEC-651	Lab – 1 (OOFC Lab)	-	2	1	129
MEEC-653	Lab – 2 (ADCS Lab)	-	2	1	129
MEEC-655	Lab -3 (VLSI Lab)	-	2	1	129
MEEC-657*	Term Paper - I	-	-	2	129
Total		20	6	25	

*** NUES : Non University Examination**

SCHEME OF EXAMINATION

M.Tech. - *(Electronics & Communication Engineering)*
Regular Programme

SECOND SEMESTER EXAMINATION

Code No.	Paper	L	T/P	Credits	Page no. of Syllabus
Theory Papers					
MEIT-602	Advanced Mobile Computing	4	-	4	87
MEEC-604	Advanced Signal Processing	4	-	4	117
MEEC-606	Advanced VLSI Design	4	-	4	118
Electives (Choose any TWO)					
MEEC-610	Microwave Integrated circuits	4	-	4	120
MEEC-612	Cellular & Mobile Communication	4	-	4	122
MEEC-614	Advanced Radiation Systems	4	-	4	124
MEEC-616	Telecommunication Switching and Tele-traffic Engineering	4	-	4	125
MEEC-618	ESD Using ARM microcontroller	4	-	4	126
MEEC-620	Instrumentation and Control Engineering	4	-	4	127
MEEC-626	Fuzzy Logic & Design	4	-	4	128
MEDC-608	Satellite Communication	4	-	4	150
MEDC-602	Advanced Information Theory & Coding	4	-	4	144
MESP-612	Digital Image Processing	4	-	4	170
MESP-602	Detection and Estimation Theory	4	-	4	161
Practicals/Viva voce					
MEEC-652	Lab- 4 (AMC Lab)		2	1	130
MEEC-654	Lab – 5 (ASP Lab)	-	2	1	130
MEEC-656	Lab – 6 (Ad. VLSI Lab)	-	2	1	130
MEEC-658*	Term Paper II			2	130
Total		**20**	**6**	**25**	

SCHEME OF EXAMINATION

M.Tech. - (Electronics & Communication Engineering)
Regular Programme

THIRD SEMESTER EXAMINATION

Code No.	Paper	L	T/P	Credits	Page no. of Syllabus
Theory Papers					
MEEC-701	Adhoc Sensor Networks	4	-	4	131
MERF-601	Advance Electromagnetic Engineering	4	-	4	184
Electives (Choose any Three)					
MEEC-705	Embedded Systems & RTOS	4	-	4	132
MEEC-707	Artificial Neural Networks	4	-	4	133
MEEC-709	Multimedia Communication	4	-	4	134
MEEC-711	Cryptography & Coding	4	-	4	135
MEEC-713	MEMS and Sensor Technology	4	-	4	136
MEEC-715	Broadband Access Technology	4	-	4	137
MEEC-717	AVR Microcontroller and its application	4	-	4	138
MEEC-719	Robotics Engineering	4	-	4	139
MEEC-721	Microwave Planar Transmission Lines & Circuits	4	-	4	140
MEEC-725	Active Networks & Filter Design	4	-	4	141
MERF-707	Smart Antennas for Mobile Communication	4	-	4	201
MESP-717	Biomedical Signal Processing	4	0	4	181
MEDC-707	Spread Spectrum Technique	4	-	4	156
Practicals/viva voce					
MEEC-751	Lab – 7 (ASN Lab)		2	1	142
MEEC-753	Lab -8 (AEME Lab)	-	2	1	142
MEEC-755*	Term Paper-III	-	-	2	142
MEEC-757	Minor Project		-	4	142
Total		**20**	**4**	**28**	

SCHEME OF EXAMINATION

M.Tech. - (Electronics & Communication Engineering)
Regular Programme

FOURTH SEMESTER EXAMINATION

Code No.	Paper	L	T/P	Credits
MEEC-752	Dissertation	-	-	24
MEEC-754*	Seminar & Progress Report	-	-	4
MEEC-756*	Term Paper-IV	-	-	2
Total				30

***Non University Exam System**

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Master of Technology
(Digital Communication)

First Semester

Code No.	Paper	L	T/P	Credits	Page no. of syllabus
MEDC-601	Advanced Digital Communication systems	4	-	4	143
MEDC-603	Optical Fiber Communication Systems	4	-	4	145
MEDC-605	Advanced Signal Processing	4	-	4	147
Elective-I (Choose any two)					
MEDC-607	Computer Communication networks	4	-	4	149
MESP-601	Signal Theory	4	-	4	160
MEVS-601	Digital System Design using Verilog	4	-	4	209
MEEC -611	Telecommunications system Modelling &Simulation.	4	-	4	121
MERF-603	Microwave Theory & Circuits	4	-	4	186
MERF-607	Radar Systems	4	-	4	190
MECS- 611	Computational Techniques using MATLAB	4	-	4	58
Practical/Viva Voce					
MEDC-651	Lab -1 (ADCS Lab)	-	2	1	151
MEDC-653	Lab – 2 (OFCS Lab)	-	2	1	151
MEDC-655	Lab -3 (ASP Lab)		2	1	151
MEDC-657*	Term Paper-I			2	151
Total		**20**	**06**	**25**	

Master of Technology
(Digital Communication)

Second Semester

Code No.	Paper	L	T/P	Credits	Page no. of Syllabus
Theory Papers					
MEDC-602	Advanced Information Theory & Coding	4	-	4	144
MEDC-604	Digital Mobile Radio Systems	4	-	4	146
MESP-602	Detection and Estimation Theory	4	-	4	161
Electives (Choose any Two)					
MEDC-606	Fading Channels	4	-	4	148
MEDC-608	Satellite Communication	4	-	4	150
MEEC-626	Fuzzy Logic & Design	4	-	4	128
MESP-608	Wavelet Transform for Signal and Image Processing	4	-	4	167
MESP-612	Digital Image Processing	4	-	4	170
MERF-604	Antenna Theory and Practice	4	-	4	187
MERF-616	RF System design	4	-	4	195
MEEC-618	ESD Using ARM microcontroller	4	-	4	126
Practical/Viva Voce					
MEDC-652	Lab -4 (AITC Lab)	-	2	1	152
MEDC-654	Lab -5 (DMRS Lab)	-	2	1	152
MEDC-656	Lab -6 (DET Lab)		2	1	152
MEDC-658*	Term Paper-II	-	-	2	152
Total		20	06	25	

Master of Technology
(Digital Communication)

Third Semester

Code No.	Subject	L	T/P	Credits	Page no. of syllabus
Theory Subjects					
MEDC-701	Advanced Mobile Computing	4	-	4	153
MEDC-703	Broadband Communication Systems & Networks	4	-	4	154
Electives(choose any Three)					
MEDC-705	High Performance Communication Networks	4	-	4	155
MEDC-707	Spread Spectrum Technique	4	-	4	156
MEDC-709	Selected topics on recent technologies in wireless & mobile communication	4	-	4	157
MEEC-701	Adhoc Sensor Networks	4	-	4	131
MEEC-707	Artificial Neural Networks	4	-	4	133
MEEC-709	Multimedia Communication	4	-	4	134
MESP-707	Speech Signal Processing	4	-	4	176
MESP-711	Optical Signal Processing	4	-	4	178
MERF-701	Electromagnetic Interference and Compatibility in System design	4	-	4	198
MERF-703	Microwave & Millimeter Integrated Circuits	4	-	4	199
MERF-707	Smart Antennas for Mobile Communication	4	-	4	201
MERF-715	Radar Signal Processing	4	-	4	205
Practical/viva voce					
MEDC-751	Lab-7 (AMC Lab)	-	2	1	158
MEDC-753	Lab – 8 (BCSN Lab)	-	2	1	158
MEDC-755*	Term Paper - III	-	-	2	158
MEDC-757	Minor Project	-	-	4	158
	Total	20	04	28	

Master of Technology
(Digital Communication)

Fourth Semester

Code No.	Paper	L/P	Credits
MEDC-752	Dissertation	-	24
MEDC-754*	Seminar & Progress Report	-	4
MEDC-756*	Term Paper-IV	-	2
Total		**-**	**30**

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SCHEME OF EXAMINATION

M.Tech. (Signal Processing)

FIRST SEMESTER

Code No.	Paper	L	T/P	Credits	Page No. of syllabus
Theory Papers					
MESP-601	Signal Theory	4	0	4	160
MEDC-601	Advanced Digital Communication	4	0	4	143
MESP-603	Analog Signal Processing	4	0	4	162
Electives (Choose any TWO)					
MESP-605	Mathematical methods in signal processing	4	0	4	164
MESP-607	Broadband communication and Information systems	4	0	4	166
MESP-609	Optimization Techniques	4	0	4	168
MEDC-607	Computer Communication Networks	4	0	4	149
MEVS-601	Digital System Design using Verilog	4	-	4	209
MEVS - 603	VLSI Technology	4	-	4	210
MERF-607	Radar Systems	4	-	4	190
MECS-611	Computational Techniques using MATLAB	4	-	4	58
Practical/Viva voce					
MESP-651	Lab -1 (ST Lab)	-	2	1	171
MESP-653	Lab -2 (ADC Lab)	-	2	1	171
MESP-655	Lab -3 (ASP Lab)	-	2	1	171
MESP-657*	Term Paper - I			2	171
Total		20	4	25	

*** NUES : Non University Examination**

SCHEME OF EXAMINATION

M.Tech. (Signal Processing)
Regular Programme

SECOND SEMESTER

Code No.	Paper	L	T/P	Credits	Page No. of Syllabus
Theory Papers					
MESP-602	Detection and Estimation Theory	4	0	4	161
MESP-604	Digital Signal Processing	4	0	4	163
MEDC-602	Advanced Information Theory & Coding	4	-	4	144
Electives (Choose any TWO)					
MESP-606	Topics in Stochastic process	4	0	4	165
MESP-608	Wavelet Transform for Signal and Image Processing	4	0	4	167
MESP-610	Mixed signal circuit design	4	0	4	169
MESP-612	Digital Image Processing	4	0	4	170
MEEC-618	ESD Using ARM microcontroller	4	-	4	126
MEEC-626	Fuzzy Logic & Design	4	-	4	128
Practicals/Viva Voce					
MESP-652	Lab – 4 (DET Lab)		2	1	172
MESP-654	Lab – 5 (DSP lab)	-	2	1	172
MESP-656	Lab – 6 (AITC Lab)	-	2	1	172
MESP-658*	Term Paper II			2	172
Total		**20**	**6**	**25**	

*** NUES : Non University Examination**

SCHEME OF EXAMINATION

M.Tech. (Signal Processing)
Regular Programme

THIRD SEMESTER EXAMINATION

Code No.	Paper	L	T/P	Credits	Page No. of Syllabus
Theory Papers					
MESP-701	Advance Digital Signal Processing	4	0	4	173
MESP-703	Statistical Signal Processing	4	0	4	174
Electives (Choose any Three)					
MESP-705	Sonar Signal Processing	4	0	4	175
MESP-707	Speech Signal Processing	4	0	4	176
MESP-709	VLSI Design of DSP Circuits	4	0	4	177
MESP-711	Optical Signal Processing	4	0	4	178
MERF-715	Radar Signal Processing	4	0	4	205
MESP-713	Selected topics in Signal Processing	4	0	4	179
MESP-715	Selected topics in Analog IC Design	4	0	4	180
MESP-717	Biomedical Signal Processing	4	0	4	181
MEEC-707	Artificial Neural Networks	4	-	4	133
Practicals/Viva Voce					
MESP-751	Lab – 7 (ADSP Lab)		2	1	182
MESP-753	Lab- 8 (SSP Lab)	-	2	1	182
MESP-755*	Term Paper – III	-	-	2	182
MESP-757	Minor Project	-	-	4	182
Total		**20**	**4**	**28**	

SCHEME OF EXAMINATION

M.Tech. (Signal Processing)
Regular Programme

FOURTH SEMESTER EXAMINATION

Code No.	**Paper**	**L**	**T/ P**	**Credits**
MESP-752	Dissertation	-	-	24
MESP-754*	Seminar & Progress Report	-	-	4
MESP-756*	Term Paper-IV	-	-	2
Total		**-**	**-**	**30**

***Non University Exam System**

NOTE:

1. The total number of credits of the Programme M. Tech. = 108.
2. Each student shall be required to appear for examination in all courses. However, for the award of the degree a student shall be required to earn the minimum of 100 credits (Elective Courses may be dropped only)

SCHEME OF EXAMINATION

M.Tech. ((RF and Microwave Engineering))
Regular Programme

FIRST SEMESTER

Code	Course	L	T/P	Credits	Page no. of Syllabus
Theory Courses					
MERF-601	Advance Electromagnetic Engineering	4	-	4	184
MERF-603	Microwave Theory & Circuits	4	-	4	186
MERF-605	RF and Microwave Passive Circuits Design.	4	-	4	188
Electives: (Chose any Two)					
MERF-607	Radar Systems	4	-	4	190
MEDC-601	Advanced Digital Communication systems	4	-	4	143
MEDC-603	Optical Fiber Communication Systems	4	-	4	145
MESP-605	Mathematical methods in signal processing	4	-	4	164
MEDC-607	Computer Communication Networks	4	-	4	149
MECS- 611	Computational Techniques using MATLAB	4	-	4	58
Practical Courses					
MERF-651	Lab 1 (AEME Lab)	-	2	1	196
MERF-653	Lab 2 (MTC Lab)	-	2	1	196
MERF-655	Lab 3 (RF & MPCD Lab)	-	2	1	196
MERF-657*	Term Paper - I	-	-	2	196
Total		**20**	**6**	**25**	

SCHEME OF EXAMINATION

M.Tech. (RF and Microwave Engineering)

SECOND SEMESTER

Code	Course	L	T/P	Credits	Page no. of Syllabus
Theory Courses					
MERF-602	Analytical and Computational Techniques in Electromagnetic	4	-	4	185
MERF-604	Antenna Theory and Practice	4	-	4	187
MERF-606	Microwave Measurement & Design	4	-	4	189
Electives (Choose any Two)					
MEDC-608	Satellite Communication	4	-	4	150
MERF--608	Antennas & Propagation for Wireless Communication Systems	4	-	4	191
MERF-610	High Frequency Semiconductor Devices & Circuits	4	-	4	192
MERF-612	Radar Signature Analysis & Imaging	4	-	4	193
MERF-614	Fuzzy logic & Neural Networks	4	-	4	194
MERF-616	RF System design	4	-	4	195
Practical Courses					
MERF-652	Lab 4 (ACTE Lab)	-	2	1	197
MERF-654	Lab 5 (ATP Lab)	-	2	1	197
MERF-656	Lab 6 (MMD Lab)	-	2	1	197
MERF-658*	Term Paper II	-	-	2	197
Total		**20**	**6**	**25**	

SCHEME OF EXAMINATION

M.Tech. (RF and Microwave Engineering)

THIRD SEMESTER

Code	Course	L	T/P	Credits	Page no. of Syllabus
MERF-701	Electromagnetic Interference and Compatibility in System design	4	-	4	198
MERF-703	Microwave & Millimeter Integrated Circuits	4	-	4	199
Elective (Choose any three)					
MERF-705	RFIC	4	-	4	200
MERF-707	Smart Antennas for Mobile Communication	4	-	4	201
MERF-709	Optimization Techniques in RF & Microwave	4	-	4	202
MERF-711	RF MEMS	4	-	4	203
MERF-713	Selected Topics in Latest Trends in RF Systems and Technologies	4	-	4	204
MERF-715	Radar Signal Processing	4	-	4	205
MERF-717	Wireless Adhoc Networks	4	-	4	206
MEDC-705	High Performance Communication Networks	4	-	4	155
MEDC-707	Spread Spectrum Technique	4	-	4	156
Practical Courses					
MERF-751	Lab 7 (EICSD Lab)	-	2	1	207
MERF-753	Lab 8 (MMIC Lab)	-	2	1	207
MERF-755*	Term Paper – III	-	-	2	207
MERF-757	Minor Project	-	-	4	207
Total		**20**	**4**	**28**	

SCHEME OF EXAMINATION

M.Tech. (RF and Microwave Engineering)

FOURTH SEMESTER EXAMINATION

Code No.	Paper	L	T/P	Credits
MERF-752	Dissertation	-	-	24
MERF--754*	Seminar & Progress Report	-	-	4
MERF-756*	Term Paper-IV	-	-	2
Total				**30**

***Non University Exam System**

NOTE:

1. The total number of credits of the Programme M. Tech. = 108.
2. Each student shall be required to appear for examination in all courses, but for the award of the degree a student shall be required to earn the minimum of 100 credits out of 108. However, only elective courses and Term Papers may be dropped towards counting for total credit of 100 to award M.Tech. Degree)

SCHEME OF EXAMINATION

M.Tech. (VLSI Design)
Regular Programme

FIRST SEMESTER EXAMINATION

Code No.	Paper	L	T/P	Credits	Page no. of Syllabus
Theory Papers					
MEVS-601	Digital System Design using Verilog	4	-	4	209
MEVS-603	VLSI Technology	4	-	4	210
MEVS -605	Advanced VLSI Design	4	-	4	212
Electives (Choose any TWO)					
MECS-607	Advanced Computer Architecture	4	-	4	56
MEVS-609	Algorithm Analysis and Design	4		4	215
MEVS-611	DSP for VLSI Design	4	-	4	217
MECS- 611	Computational Techniques using MATLAB	4	-	4	58
MEVS-613	Wireless Networks	4		4	219
MEVS-615	Research Methodologies	4		4	221
Practical / Viva Voce					
MEVS-651	Lab-1 (DSD Lab)	-	2	1	225
MEVS-653	Lab-2 (VLSI Tech. Lab)	-	2	1	225
MEVS-655	Lab-3 (Ad. VLSI Lab)	-	2	1	225
MEVS-657*	Term Paper – I			2	225
Total		**20**	**6**	**25**	

*** NUES : Non University Examination**

SCHEME OF EXAMINATION

M.Tech. - (VLSI Design)
Regular Programme

SECOND SEMESTER EXAMINATION

Code No.	Paper	L	T/P	Credits	Page no. of Syllabus
MEEC-618	ESD Using ARM microcontroller	4	-	4	126
MEVS-604	Analog VLSI Design	4	-	4	211
MEVS-606	Low Power VLSI Design	4	-	4	213
Electives (Choose any two)					
MEVS-608	Advanced DSP for VLSI Design	4	-	4	214
MEVS-610	Simulation and Circuit Modeling.	4	-	4	216
MEVS-612	System on Chip	4	-	4	218
MEVS-614	Semiconductor Memory Design	4	-	4	220
MEVS-616	Evolutionary Algorithms for VLSI Design	4	-	4	222
MEVS-618	Secured Hardware Design	4	-	4	223
MEVS-620	Probability and Stochastic Processing	4	-	4	224
MESP-612	Digital Image Processing	4	0	4	170
Practical/Viva voce					
MEVS-652	Lab-4 (ESD Lab)	-	2	1	226
MEVS-654	Lab-5 (AVLSI Lab)	-	2	1	226
MEVS-656	Lab-6 (LPVLSI Lab)	-	2	1	226
MEVS-658*	Term Paper II	-	-	2	226
Total		**20**	**6**	**25**	

*** NUES : Non University Examination**

SCHEME OF EXAMINATION

M.Tech. - (VLSI Design)

Regular Programme

THIRD SEMESTER EXAMINATION

Code No.	Paper	L	T/P	Credits	Page no. of syllabus
MEVS-701	Algorithm for VLSI Physical Design Automation	4	-	4	227
MEVS-703	VLSI Design Test and Testability	4	-	4	228
Electives (Choose any THREE)					
MEVS-705	Analog-Mixed Signal Design	4	-	4	229
MEVS-707	Hardware-Software Co-design	4	-	4	230
MEVS-709	Designing with FPGA	4	-	4	231
MEVS-711	Advanced Digital Communication System	4	-	4	232
MEVS-713	MEMS and IC Integration	4	-	4	233
MEVS-715	Network on Chip Design	4	-	4	234
MEVS-717	CMOS RF Design	4	-	4	235
MEVS-719	Circuit Interconnections and Packaging for VLSI	4	-	4	236
MEEC-705	Embedded Systems & RTOS	4	-	4	132
Practical/viva voce					
MEVS-751	Lab-7 (Algo. VLSI PDA Lab)	-	2	1	237
MEVS-753	Lab-8 (VDTT Lab)	-	2	1	237
MEVS-755*	Term Paper III	-	2	2	237
MEVS-757	Minor Project	-	-	4	237
Total		**20**	**6**	**28**	

*** NUES : Non University Examination**

SCHEME OF EXAMINATION

M.Tech. - (VLSI Design)
Regular Programme

FOURTH SEMESTER EXAMINATION

Code No.	Paper	L	T/P	Credits
MEVS-752	Dissertation	-	-	24
MEVS-754*	Seminar & Progress Report	-	-	4
MEVS-756*	Term Paper-IV	-	-	2
	Total	-	-	30

***Non University Exam System**

NOTE:

3. The total number of credits of the Programme M. Tech. = 108.
4. Each student shall be required to appear for examination in all courses. However, for the award of the degree a student shall be required to earn the minimum of 100 credits (Elective Courses may be dropped only)

SCHEME OF EXAMINATION
Master of Technology
(Computer Science & Engineering)
Weekend Programme

First Semester

Code No.	Paper	L	T/P	Credits	Page no. of Syllabus
Theory Papers					
MECS-601	Advanced Data Structures	4	-	4	53
MECS -603	Advanced Software Engineering	4	-	4	54
Electives (Choose any One)					
MECS -607	Advanced Computer Architecture	4	-	4	56
MECS -609	Enterprise Computing using JAVA	4	-	4	57
MECS-611	Computational Techniques using MATLAB	4	-	4	58
MECS- 613	Advanced Operating Systems	4	-	4	59
MECS- 615	Theory of Computation	4	-	4	60
Practical					
MECS-671	ADS Lab	0	2	1	
MECS-673	ASE lab	0	2	1	
MECS-675*	Term paper I	-	-	2	
Total		**12**	**4**	**16**	**-**

SCHEME OF EXAMINATION
Master of Technology
(Computer Science & Engineering)
Weekend Programme

Second Semester

Paper Code	Subject	L	T/P	Credits	Page No. Of Syllabus
MECS -604	Advanced Data Base Management System	4	-	4	63
MECS -606	Advanced Algorithm Analysis & Design	4	-	4	64
Electives (Choose any One)					
MEEC-618	ESD Using ARM microcontroller	4	-	4	128
MECS-608	Software Requirement & Estimation	4	-	4	65
MECS-610	Network Programming	4	-	4	66
MECS-624	Advanced Computer Graphics	4	-	4	71
Practicals					
MECS -672	ADBMS Lab	-	2	1	
MECS-674	AAAD Lab	-	2	1	
MECS-676*	Term paper II	-	-	2	
	Total	**12**	**4**	**16**	**-**

SCHEME OF EXAMINATION
Master of Technology
(Computer Science & Engineering)
Weekend Programme

Third Semester

Paper Code	Paper	L	T/P	Credits	Page no. of syllabus
MECS-701	Advanced Data Warehousing & Data Mining	4	-	4	73
MECS -605	Advances in Data & Computer Communications	4	-	4	55
Electives (Choose any One)					
MEEC-707	Artificial Neural Networks	4	-	4	135
MECS- 705	Cloud Computing	4	-	4	75
MECS-707	E-Commerce & Applications	4	-	4	76
MECS-715	Advanced Multimedia	4	-	4	80
MEEC-613	Mathematical Statistics & Data Analysis	4	-	4	123
Practicals					
MECS-771	Adv. Data Warehousing & Data Mining Lab	-	2	1	
MECS-773	Ad. In Data & Computer Communication Lab	-	2	1	
MECS-775*	Term Paper III	-	-	2	
	Total	**12**	**4**	**16**	**-**

SCHEME OF EXAMINATION
Master of Technology
(Computer Science & Engineering)
Weekend Programme

Fourth Semester

Paper Code	Subject	L	T/P	Credits	Page No. Of Syllabus
MECS-602	Object Oriented Analysis and Design	4	-	4	62
Electives (Choose any Two)					
MEEC-604	Advanced Signal Processing	4	-	4	119
MECS-612	Soft Computing	4	-	4	67
MEEC-612	Cellular & Mobile Communication	4	-	4	124
MECS-614	Modelling & Simulation	4	-	4	68
MECS-616	Software Metrics	4	-	4	69
MEIT-604	Advanced Software Project Management	4	-	4	88
MECS- 620	Distributed Computing	4	-	4	70
MESP-612	Digital Image Processing	4	-	4	172
MEIT-608	Web Semantics	4	-	4	239
Practicals					
MECS -772	OOAD Lab	-	2	1	
MECS- 774*	Term paper IV	-	-	2	
	Total	**12**	**4**	**15**	**-**

SCHEME OF EXAMINATION
Master of Technology
(Computer Science & Engineering)
Weekend Programme

Fifth Semester

Paper Code	Paper	L	T/P	Credits	Page no. of syllabus
MECS-703	Advanced Software Testing	4	-	4	74
Electives (Choose any Two)					
MECS-709	Information Storage & Management	4	-	4	77
MECS-711	Software Quality Management	4	-	4	78
MECS-713	Advanced Digital Signal Processing	4	-	4	79
MECS-717	Cyber Crime Investigations and Cyber Forensics	4	-	4	81
MECS-719	Distributed Databases	4	-	4	82
MECS-721	Network Management	4	-	4	83
MEEC-705	Embedded Systems & RTOS	4	-	4	134
MEIT-703	Information Theory & Coding	4	-	4	91
Practicals					
MECS-871	Ad. Software Testing Lab	-	2	1	
MECS-873	Minor Project	-	-	4	
	Total	**12**	**2**	**17**	**-**

SCHEME OF EXAMINATION
Master of Technology
(Computer Science & Engineering)
Weekend Programme

Sixth Semester

Paper Code	Subject	L/P	Credits
MECS – 872	Dissertation	-	24
MECS– 874*	Seminar & Progress Report	-	4
	TOTAL	-	**28**

NOTE:

1. The total number of credits of the Programme M. Tech. = 108.
2. Each student shall be required to appear for examination in all courses. However, for the award of the degree a student shall be required to earn the minimum of 100 credits (Elective Courses may be dropped only)

SCHEME OF EXAMINATION
Master of Technology
(Information Technology)
Weekend Programme

First Semester

Code No.	Paper	L	T/P	Credits	Page no. of Syllabus
Theory Papers					
MECS-601	Advanced Data Structures	4	-	4	53
MECS-603	Advanced Software Engineering	4	-	4	54
Electives (Choose any One)					
MEVS-601	Digital System Design using Verilog	4	-	4	211
MECS -607	Advanced Computer Architecture	4	-	4	56
MECS -609	Enterprise Computing using JAVA	4	-	4	57
MECS-611	Computational Techniques using MATLAB	4	-	4	58
MECS- 613	Advanced Operating Systems	4	-	4	59
MEIT-601	Introduction to Computer Security	4	-	4	85
MECS- 615	Theory of Computation	4	-	4	60
Practicals / Viva Voce					
MEIT-671	ADS lab	-	2	1	
MEIT-673	ASE Lab	-	2	1	
MEIT-675*	Term Paper I	-	-	2	
	Total	**12**	**4**	**16**	**-**

SCHEME OF EXAMINATION
Master of Technology
(Information Technology)
Weekend Programme

Second Semester

Code No.	Paper	L	T/P	Credits	Page no. of Syllabus
Theory Papers					
MEIT-602	Advanced Mobile Computing	4	-	4	87
MEIT-606	Computer Graphics & Animation	4	-	4	89
Electives (Choose any One)					
MEEC-618	ESD Using ARM microcontroller	4	-	4	128
MECS- 604	Advanced Database Management System	4	-	4	63
MECS-608	Software Requirements & Estimation	4	-	4	65
MECS-606	Advance Algorithm Analysis & Design				64
MECS-610	Network Programming	4	-	4	66
Practicals/Viva Voce					
MEIT-672	AMC Lab		2	1	
MEIT-674	CG & A Lab	-	2	1	
MEIT-676*	Term Paper II			2	
Total		**12**	**4**	**16**	**-**

SCHEME OF EXAMINATION
Master of Technology
(Information Technology)
Weekend Programme

Third Semester

Code No.	Paper	L	T/P	Credits	Page no. of Syllabus
Theory Papers					
MECS -605	Advances in Data & Computer Communications	4	-	4	55
MECS-701	Advanced Data Warehousing & Data Mining	4	-	4	73
Electives (Choose any One)					
MEEC-707	Artificial Neural Networks	4	-	4	135
MECS-715	Advanced Multimedia	4	-	4	80
MEIT-603	Cellular & Mobile Communication	4	-	4	86
MECS-707	E- Commerce & Applications	4	-	4	76
MEEC-613	Mathematical Statistics & Data Analysis	4	-	4	125
MECS -705	Cloud Computing	4	-	4	75
Practicals / Viva Voce					
MEIT-771	ADCC Lab	-	2	1	
MEIT-773	ADWDM Lab	-	2	1	
MEIT-775*	Term Paper III	-	-	2	
	Total	**12**	**4**	**16**	

SCHEME OF EXAMINATION
Master of Technology
(Information Technology)
Weekend Programme

Fourth Semester

Code No.	Paper	L	T/P	Credits	Page no. of Syllabus
Theory Papers					
MEIT-604	Advanced Software Project Management	4	-	4	88
Electives (Choose any TWO)					
MECS- 602	Object Oriented Analysis & Design	4	-	4	62
MEEC-604	Advanced Signal Processing	4	-	4	119
MEEC-606	Advanced VLSI Design	4	-	4	120
MECS-612	Soft Computing	4	-	4	67
MESP-612	Digital Image Processing	4	-	4	172
MECS-614	Modelling & Simulation	4	-	4	68
MECS-616	Software Metrics	4	-	4	69
MECS- 620	Distributed Computing	4	-	4	70
MEIT-608	Web Semantics	4	-	4	239
Practicals/Viva Voce					
MEIT-772	ASPM lab		2	1	
MEIT-774*	Term Paper-IV	-	-	2	
Total		**12**	**2**	**15**	

SCHEME OF EXAMINATION
Master of Technology
(Information Technology)
Weekend Programme

Fifth Semester

Code No.	Paper	L	T/P	Credits	Page No. of Syllabus
Theory Papers					
MEIT-703	Information Theory & Coding	4	-	4	92
Electives (Choose any TWO)					
MECS-703	Advanced Software Testing	4	-	4	74
MEIT-705	Reliability Engineering	4	-	4	93
MECS-709	Information Storage & Management	4	-	4	77
MECS-711	Software Quality Management	4	-	4	78
MECS-713	Advanced Signal Processing	4	-	4	79
MECS-717	Cyber Crime Investigations and Cyber Forensics	4	-	4	81
MECS-719	Distributed Databases	4	-	4	82
MECS-721	Network Management	4	-	4	83
MEEC-705	Embedded Systems & RTOS	4	-	4	134
Practicals/Viva Voce					
MEIT-871	ITC Lab	-	2	1	
MEIT-873	Minor Project	-	-	4	
Total		**12**	**2**	**17**	**-**

SCHEME OF EXAMINATION
Master of Technology
(Information Technology)
Weekend Programme

Sixth Semester

Paper Code	Subject	L/P	Credits
MEIT – 872	Dissertation	-	24
MEIT– 874*	Seminar & Progress Report	-	4
	TOTAL	-	**28**

NOTE:

1. The total number of credits of the Programme M. Tech. = 108.
2. Each student shall be required to appear for examination in all courses. However, for the award of the degree a student shall be required to earn the minimum of 100 credits (Elective Courses may be dropped only)

SCHEME OF EXAMINATION
Master of Technology
(Electronics & Communication Engineering)
Weekend Programme

First Semester

Code No.	Paper	L	T/P	Credits	Page no. of Syllabus
Theory Papers					
MEEC-601	Optoelectronics and Optical fibre communication	4	-	4	118
MEDC-601	Advanced Digital Communication systems	4	-	4	145
Elective (Choose any ONE)					
MECS -607	Advanced Computer Architecture	4	-	4	56
MEEC-607	Advanced Computer Networks	4	-	4	121
MEVS-601	Digital System Design using Verilog	4	-	4	211
MEIT-705	Reliability Engineering	4	-	4	93
Practicals / Viva Voce					
MEEC-671	OOFC lab	-	2	1	
MEEC-673	ADCS Lab	-	2	1	
MEEC-675*	Term Paper - I			2	
Total		12	4	16	

*** NUES : Non University examination System**

SCHEME OF EXAMINATION
Master of Technology
(Electronics & Communication Engineering)
Weekend Programme

Second Semester

Code No.	Paper	L	T/P	Credits	Page no. of Syllabus
Theory Papers					
MEIT-602	Advanced Mobile Computing	4	-	4	87
MEEC-604	Advanced Signal Processing	4	-	4	119
Electives (Choose any ONE)					
MEEC-618	ESD Using ARM microcontroller	4	-	4	128
MEDC-608	Satellite Communication	4	-	4	152
MEDC-602	Advanced Information Theory & Coding	4	-	4	146
MESP-602	Detection and Estimation Theory	4	-	4	163
Practicals/Viva voce					
MEEC-672	AMC Lab		2	1	
MEEC-674	ASP Lab	-	2	1	
MEEC-676*	Term Paper II			2	
Total		**12**	**4**	**16**	

*** NUES : Non University examination System**

SCHEME OF EXAMINATION
Master of Technology
(Electronics & Communication Engineering)
Weekend Programme

Third Semester

Code No.	Paper	L	T/P	Credits	Page no. of Syllabus
Theory Papers					
MEEC-701	Adhoc Sensor Networks	4	-	4	133
MEVS -603	VLSI Technology	4	-	4	212
Elective (Choose any ONE)					
MEVS-613	Wireless Networks	4		4	221
MECS- 611	Computational Techniques using MATLAB	4	-	4	58
MEEC -611	Telecommunications system Modelling &Simulation.	4	-	4	123
MEEC-613	Mathematical Statistics & Data Analysis	4	-	4	125
MESP-609	Optimization Techniques	4	-	4	170
Practicals / Viva Voce					
MEEC-771	ASN Lab	-	2	1	
MEEC-773	VLSI Lab	-	2	1	
MEEC-775*	Term Paper - III			2	
Total		12	4	16	

*** NUES : Non University examination System**

SCHEME OF EXAMINATION
Master of Technology
(Electronics & Communication Engineering)
Weekend Programme

Fourth Semester

Code No.	Paper	L	T/P	Credits	Page no. of Syllabus
Theory Papers					
MEEC-606	Advanced VLSI Design	4	-	4	120
Electives (Choose any TWO)					
MEEC-610	Microwave Integrated circuits	4	-	4	122
MEEC-612	Cellular & Mobile Communication	4	-	4	124
MEEC-614	Advanced Radiation Systems	4	-	4	126
MEEC-616	Telecommunication Switching and Tele-traffic Engineering	4	-	4	127
MEEC-620	Instrumentation and Control Engineering	4	-	4	129
MEEC-626	Fuzzy Logic & Design	4	-	4	130
MESP-612	Digital Image Processing	4	-	4	172
Practicals/Viva voce					
MEEC-772	Ad. VLSI Lab		2	1	
MEEC-774*	Term Paper IV			2	
Total		**12**	**2**	**15**	

*** NUES : Non University examination System**

SCHEME OF EXAMINATION
Master of Technology
(Electronics & Communication Engineering)
Weekend Programme

Fifth Semester

Code No.	Paper	L	T/P	Credits	Page no. of Syllabus
Theory Papers					
MERF-601	Advance Electromagnetic Engineering	4	-	4	186
Electives (Choose any TWO)					
MEEC-705	Embedded Systems & RTOS	4	-	4	134
MEEC-707	Artificial Neural Networks	4	-	4	135
MEEC-709	Multimedia Communication	4	-	4	136
MEEC-711	Cryptography & Coding	4	-	4	137
MEEC-713	MEMS and Sensor Technology	4	-	4	138
MEEC-715	Broadband Access Technology	4	-	4	139
MEEC-717	AVR Microcontroller and its application	4	-	4	140
MEEC-719	Robotics Engineering	4	-	4	141
MEEC-721	Microwave Planar Transmission Lines & Circuits	4	-	4	142
MEEC-725	Active Networks & Filter Design	4	-	4	143
MERF-707	Smart Antennas for Mobile Communication	4	-	4	203
MESP-717	Biomedical Signal Processing	4	-	4	183
MEDC-707	Spread Spectrum Technique	4	-	4	158
Practicals/viva voce					
MEEC-871	Ad. EM Lab		2	1	
MEEC-873	Minor Project		-	4	
Total		**12**	**2**	**17**	

*** NUES : Non University examination System**

SCHEME OF EXAMINATION
Master of Technology
(Electronics & Communication Engineering)
Weekend Programme

Sixth Semester

Code No.	Paper	L	T/P	Credits
MEEC-872	Dissertation	-	-	24
MEEC-874*	Seminar & Progress Report	-	-	4
Total				28

***Non University Exam System**

NOTE:

1. The total number of credits of the Programme M. Tech. = 108.
2. Each student shall be required to appear for examination in all courses, but for the award of the degree a student shall be required to earn the minimum of 100 credits out of 108. However, only elective courses and Term Papers may be dropped towards counting for total credit of 100 to award M.Tech. Degree)

MECS-601 Advanced Data Structure

L	T/P	C
4	0	4

INSTRUCTIONS TO PAPER SETTERS: Maximum Marks : 60
Question No. 1 should be compulsory and cover the entire syllabus. This question should have objective or short answer type questions. It should be of 20 marks.
Apart from Question No. 1, rest of the paper shall consist of four units as per the syllabus. Every unit should have two questions. However, student may be asked to attempt only 1 question from each unit. Each question should be 10 marks

Unit -1

Elementary Data Structure: Arrays , Sparse Matrices , strings , stack, queues ,Evaluation of Expressions , Linked list , Polynomials : Representation and Operations binary Trees and operations , Binary search tress : Operation and Characteristics

Unit - 2

Binary Heaps, Amortized analysis of Data structures, Balanced Search Trees, AVL trees, augmented data structure, Red Black Trees and properties

Unit - 3

Graph representation and implementation, searching of a graph, application of BFS and DFS
Data structure for Sets, Disjoint Set and Union – find problem and implementation, Basic Hash function and collision resolution Hash Tables (Universal Hashing, Perfect Hashing) implementation and Applications

Unit– 4

External sorting, Multiway search trees , B and B + Trees implementation, Digital Search Trees , Multiway Tries , Suffix Trees and applications

Text:

[T1] T. H. Cormen, C. E. Leiserson, R.L. Rivest, C. Stein, ***"Introduction to Algorithms"***, 3nd Edition, PHI.
[T2] Horowitz, Ellis, Sahni, Sartaj & Anderson-Freed, ***"Fundamentals of Data Structures in C (Second Edition)*** ", Universities Press

References:

[R1] Mark Allen Weiss (Second Edition) "Data Structures and Algorithm Analysis in C", Pearson
[R2] Robert L. Kruse Bruce P. Leung"Data Structures and Program Design in C(Second Edition)" , Pearson
[R3] M. Goodrich, R. Tamassia, and D. Mount "Data Structures and Algorithms in C++" , Wiley 2004

MECS-603	Advanced Software Engineering	L	T/P	C
		4	0	4

INSTRUCTIONS TO PAPER SETTERS: Maximum Marks : 60
Question No. 1 should be compulsory and cover the entire syllabus. This question should have objective or short answer type questions. It should be of 20 marks.
Apart from Question No. 1, rest of the paper shall consist of four units as per the syllabus. Every unit should have two questions. However, student may be asked to attempt only 1 question from each unit. Each question should be 10 marks

Unit-I
Introduction: Software Crisis, Software Processes & Characteristics, Software life cycle models, Waterfall, Prototype, Evolutionary and Spiral Models, Overview of Quality Standards like ISO 9001, SEI – CMM.

Software Requirements analysis & specifications: Requirement engineering, requirement elicitation techniques like FAST, QFD & Use case approach, requirements analysis using DFD, Data dMEionaries & ER Diagrams, Requirements documentation, Nature of SRS, Characteristics & organization of SRS.

Unit-II
Software Architecture: Role of Software Architecture, Architecture views, Component and Connector view: Components, Connectors, Architecture style for C and C view: pipe and filter, shared data style, client server style, Evaluating Architecture.
Software Project Planning:Size Estimation like lines of Code & Function Count, Cost Estimation Models, Static single & Multivariable Models, COCOMO, COCOMO-II, Putnam resource allocation model, Risk Management.

Unit-III
Software Design: Cohesion & Coupling, Classification of Cohesiveness & Coupling, Function Oriented Design, Object Oriented Design, User Interface Design.
Software Maintenance: Management of Maintenance, Maintenance Process, Maintenance Models, Reverse Engineering, Software Re-engineering, Configuration Management, Documentation.
Software Metrics:Software measurements: What & Why, Token Count, Halstead Software Science Measures, Design Metrics, Data Structure Metrics, Information Flow Metrics

Unit-IV
Software Testing:Testing process, Design of test cases, functional testing: Boundary value analysis, Equivalence class testing, Decision table testing, Cause effect graphing, Structural testing, Path Testing, Data flow and mutation testing, Unit Testing, Integration and System Testing, Debugging, Alpha & Beta Testing, Regression Testing, Testing Tools & Standards.
Software Reliability:Importance, Hardware Reliability & Software Reliability, Failure and Faults, Reliability Models, Basic Model, Logarithmic Poisson Model, Calender time Component.

Test Books:
1. K. K. Aggarwal & Yogesh Singh, “Software Engineering”, New Age International, 2001.
2. R. S. Pressman, “Software Engineering – A practitioner’s approach”, 5th Ed., McGraw Hill Int. Ed., 2001.
3. P. Jalote, “An Integrated approach to Software Engineering”, Springer Publications, 2005.

Reference Books:
1. R. Fairley, “Software Engineering Concepts”, Tata McGraw Hill, 1997.
2. Yogesh Singh, “Software Testing”, Cambridge University Press, New York, 2012.
3. Stephen R. Schach, “Classical & Object Oriented Software Engineering”, IRWIN, 1996.
4. James Peter, W. Pedrycz, “Software Engineering”, John Wiley & Sons., 1999
5. I. Sommerville, “Software Engineering”, Addison. Wesley, 1999

MECS -605 Advances in Data & Computer communications

L	T/P	C
4	0	4

INSTRUCTIONS TO PAPER SETTERS: Maximum Marks : 60
Question No. 1 should be compulsory and cover the entire syllabus. This question should have objective or short answer type questions. It should be of 20 marks.
Apart from Question No. 1, rest of the paper shall consist of four units as per the syllabus. Every unit should have two questions. However, student may be asked to attempt only 1 question from each unit. Each question should be 10 marks

Unit-I

Network Architecture and Standardization: OSI,TCP/IP Models, Network Characteristics: Types of characteristics, Performance, Reliability, Security, Methods of ensuring QoS: Application & QoS, Queue Mechanisms, Queue Analysis, Queue management algorithms, Feedback, Resource reservation, Traffic engineering.

LAN Overview, Ethernet, High-Speed Ethernet, Gigabit Ethernet, Switched LAN Basics, Wireless LANs (IEEE 802.11)

Unit-II

Virtual Circuit WAN: X.25, Frame Relay, ATM, IP WANs: Pure IP WANs, IP over ATM, MPLS, Remote Access Methods.

Addressing in TCP/IP Networks, IPv6 & ICMPv6, ARP, RARP, Unicast Routing protocols, Multicast routing protocols, Advance features of IP routers.

Unit-III

User Datagram Protocol (UDP), Transmission Control Protocol (TCP) and Stream Controlled Transmission Protocol (SCTP)

DNS, Telnet, FTP &TFTP, Electronic-mail: SMTP, POP, IMAP, SNMP, WWW: HTTP

Unit-IV

Cryptography, Network Security, Secure Transport Services: IPSec, VPN, MPLS VPN, SSL/TLS, PGP, Firewalls.

Textbooks:

1. Behrouz A. Forouzan, “TCP/IP Protocol Suit”, TMH, 3rd Ed, 2006
2. Stallings W., “Data and Computer Communications”, 7th Ed., PHI, 2007
3. N. Olifer,”Computer Networks”, 2nd Ed., Wiley,2006

References:

1. Black U, “Computer Networks-Protocols, Standards and Interfaces”, PHI, 1996
2. Wayne Tomasi, “Introduction to Data communications and Networking”, Pearson Ed. 2007
3. Tananbaum A. S., “Computer Networks”, 3rd Ed., PHI, 1999
4. Laurra Chappell (Ed), “Introduction to Cisco Router Configuration”, Techmedia

MECS -607 Advance Computer Architecture

L	T/P	C
4	0	4

INSTRUCTIONS TO PAPER SETTERS: Maximum Marks : 60
Question No. 1 should be compulsory and cover the entire syllabus. This question should have objective or short answer type questions. It should be of 20 marks.
Apart from Question No. 1, rest of the paper shall consist of four units as per the syllabus. Every unit should have two questions. However, student may be asked to attempt only 1 question from each unit. Each question should be 10 marks

Unit-I

Parallel computer models:
The state of computing, Classification of parallel computers, Multiprocessors and multicomputers, Multivector and SIMD computers.

Program and network properties:
Conditions of parallelism, Data and resource Dependences, Hardware and software parallelism, Program partitioning and scheduling, Grain Size and latency, Program flow mechanisms, Control flow versus data flow, Data flow Architecture, Demand driven mechanisms, Comparisons of flow mechanisms

Unit-II

System Interconnect Architectures:
Network properties and routing, Static interconnection Networks, Dynamic interconnection Networks, Multiprocessor system Interconnects, Hierarchical bus systems, Crossbar switch and multiport memory, Multistage and combining network.

Advanced processors:Advanced processor technology, Instruction-set Architectures, CISC Scalar Processors, RISC Scalar Processors, Superscalar Processors, VLIW Architectures, Vector and Symbolic processors

Unit-III

Pipelining: Linear pipeline processor, nonlinear pipeline processor, Collision free scheduling, Instruction pipeline Design, Mechanisms for instruction pipelining, Dynamic instruction scheduling, Branch Handling techniques, branch predMEion, Arithmetic Pipeline Design, Computer arithmetic principles, Static Arithmetic pipeline, Multifunctional arithmetic pipelines

Unit-IV
Multiprocessors and Multicomputers: Multiprocessors System Interconnects, Hierarchal Bus system, Multistage and combining networks, Three generations of multicomputer, Message Passing Mechanism Deadlock and virtual channels,

Multivector and SIMD computers: Vector Processing principals: Vector Instruction Types, Vector Access memory Schemes, Multivector Multiprocessors, Performance directed Design rules.

TEXT BOOKS:

1. Kai Hwang, “Advanced computer architecture”; TMH. 2000
2. D. A. Patterson and J. L. Hennessey, “Computer organization and design”, Morgan Kaufmann, 2nd Ed. 2002

REFERENCES:

1. J.P.Hayes, “computer Architecture and organization”; MGH. 1998
2. V.Rajaranam & C.S.R.Murthy, “Parallel computer”; PHI. 2002
3. Kai Hwang and Zu, “Scalable Parallel Computers Architecture”, MGH. 2001
4. Stalling W, “Computer Organisation & Architecture”, PHI. 2000
5. M.J Flynn, “Computer Architecture, Pipelined and Parallel Processor Design”; Narosa Publishing. 1998
6. D.A.Patterson, J.L.Hennessy, “Computer Architecture :A quantitative approach”; Morgan Kauffmann feb,2002.
7. Hwan and Briggs, “ Computer Architecture and Parallel Processing”; MGH. 1999

MECS– 609 Enterprise Computing in JAVA

L	T/P	C
4	0	4

INSTRUCTIONS TO PAPER SETTERS: Maximum Marks : 60
Question No. 1 should be compulsory and cover the entire syllabus. This question should have objective or short answer type questions. It should be of 20 marks.
Apart from Question No. 1, rest of the paper shall consist of four units as per the syllabus. Every unit should have two questions. However, student may be asked to attempt only 1 question from each unit. Each question should be 10 marks

UNIT-I

Introduction to J2EE :- n-Tier Client Server Computing and Model View Controller Architecture. Markup Languages : HTML and XML. JDBC : Drivers and Interfaces . Servlets : Servlet LifeCycle, Generic Servlet , Http Servlet , Java Server Pages : Tags , Directives , Expressions and Scriptlets , Introduction to Enterprise Java Beans, Session EJBs, Entity EJBs, JMS and message driven.

UNIT-II

Struts, Struts architecture, Struts classes - ActionForward, ActionForm, ActionServlet, Action classes , Understanding struts-config.xml , Struts Tiles , Combining Struts and Tiles, Tiles file structure , Understanding Tiles Definitions and Attributes.

UNIT-III

Hibernate: Comparison between JDBC and HIBERNATE , Principles of Object Relational Mapping, Hibernate configuration, HQL making objects persistent, Hibernate semantics, Session management, flushing, concurrency and Hibernate, Optimistic and Pessimistic Locking, Object mapping Mapping simple properties, Single and multi valued associations, Bi-directional associations, Indexed collections, Querying, Session management, Transaction integration and demarcation.

UNIT-IV

Spring: Introduction of Spring Framework: Spring Architecture, Spring Framework definition, Inversion of Control (IoC), Spring Aspect Oriented Programming Concepts : Join Point and Point Cuts.
Web Services: Interoperability in Web Services, Service-Oriented Architectures SOAP, SOAP message structure, handling errors WSDL, UDDI.

Text Books:
1. Jim Farley, William Crawford, O'Reilly and Associates, "Java Enterprise in a Nutshell", 2005
2. Brett McLaughlin, O'Reilly, "Java and XML, 2nd Edition", 2001

Reference Books:
1. Holzner , Structs : Essential skills , TMH
2. Reference Books:
3. Elliott Rusty Harold and W. Scott Means, O'Reilly, "XML in a Nutshell", 2001
4. James Cooper, "Java Design Pattern: A Tutorial", Addison Wesley
5. Govind Sesadri, "Enterprise java Computing: Application and Architectures", Cambridge University
6. Publications, 1999
7. Ivan Bayross , sharanam shah Java Server Programming , shroff Publishers

MECS-611 Computational Techniques using MATLAB

L	T/P	C
4	0	4

INSTRUCTIONS TO PAPER SETTERS: Maximum Marks : 60

Question No. 1 should be compulsory and cover the entire syllabus. This question should have objective or short answer type questions. It should be of 20 marks.

Apart from Question No. 1, rest of the paper shall consist of four units as per the syllabus. Every unit should have two questions. However, student may be asked to attempt only 1 question from each unit. Each question should be 10 marks

Unit-I

MATLAB Usage and Computational Errors: Introduction to MATLAB, Types of Computer Errors, IEEE 64-bit Floating-Point Number Representation, Vectors in MATLAB, Efficient programming techniques
System of Linear Equations: Solution for a System of Linear Equations, Solving a System of Linear Equations, Inverse Matrix, Decomposition (Factorization), Iterative Methods to Solve Equations

Unit-II

Interpolation and Curve Fitting: Interpolation by Lagrange, Newton, and Chebyshev Polynomial, Hermite Interpolating Polynomial, Cubic Spline interpolation, Straight Line, Polynomial Curve, and Exponential Curve Fit, Fourier transform
Nonlinear Equations: Bisection Method, Regula Falsi Method, Newton Raphson Method, Secant Method, Newton Method for a System of Nonlinear Equations

Unit-III

Numerical Differentiation/Integration: Difference Approximation for First Derivative, Approximation Error of First Derivative, Numerical Integration and Quadrature, Trapezoidal Method and Simpson Method, Romberg Integration,Adaptive and Gauss Quadrature.
Ordinary Differential Equations: Euler's Method, Runge–Kutta Method, PredMEor–Corrector Method, Vector Differential Equations, Boundary Value Problem (BVP)

Unit-IV

Optimization: Unconstrained Optimization, Constrained Optimization, MATLAB Built-In Routines for Optimization, Matrices and Eigenvalues: Eigenvalues and Eigenvectors, Power Method, Jacobi Method
Partial Differential Equations: Elliptic , Hyperbolic, and Parabolic PDE, Finite Element Method (FEM) for solving PDE,

Text Books

1. "Applied Numerical methods using MATLAB", By W. Y. Yang, Wiley Publications, 2005
2. "Applied Numerical Methods with MATLAB," Steven C. Chapra, McGraw-Hill, 2005

Reference Books

1. "Numerical Methods using MATLAB", John H. Mathews, Prentice Hall
2. "Introduction to MATLAB® for Engineers", W.J Palm, McGraw-Hill

MECS-613 Advanced Operating System

L	T/P	C
4	0	4

INSTRUCTIONS TO PAPER SETTERS: Maximum Marks : 60
Question No. 1 should be compulsory and cover the entire syllabus. This question should have objective or short answer type questions. It should be of 20 marks.
Apart from Question No. 1, rest of the paper shall consist of four units as per the syllabus. Every unit should have two questions. However, student may be asked to attempt only 1 question from each unit. Each question should be 10 marks

UNIT – I

Introduction, What is an Operating System, Simple Batch Systems, Multiprogrammed Batches systems, Time-Sharing Systems, Personal-computer systems, Parallel systems, Distributed Systems, Real-Time Systems
Memory Management: Background, Logical versus Physical Address space, swapping, Contiguous allocation, Paging, Segmentation, Segmentation with Paging
Virtual Memory: Demand Paging, Page Replacement, Page-replacement Algorithms, Performance of Demand Paging, Allocation of Frames, Thrashing

UNIT – II

Processes: Process Concept, Process Scheduling, Operation on Processes, Cooperating Processes, Interprocess Communication
CPU Scheduling: Basic Concepts, Scheduling Criteria, Scheduling Algorithms, Multiple-Processor Scheduling, Real-Time Scheduling, Algorithm Evaluation
Process Synchronization: Background, The Critical-Section Problem, Synchronization Hardware, Semaphores, Classical Problems of Synchronization, Critical Regions, Monitors.

UNIT – III

Deadlocks: System Model, Deadlock Characterization, Methods for Handling Deadlocks, Deadlock Prevention, Deadlock Avoidance, Deadlock Detection, Recovery from Deadlock, Combined Approach to Deadlock Handling.
Device Management: Techniques for Device Management, Dedicated Devices, Shared Devices, Virtual Devices; Device Characteristics-Hardware Consideration, Input or Output Devices, Storage Devices, Channels and Control Units, Independent Device Operation, Buffering, Multiple Paths, Block Multiplexing, Device Allocation Consideration,
Secondary-Storage Structure: Disk Structure, Disk Scheduling, Disk Management, Swap-Space Management, Disk Reliability, Stable-Storage Implementation

UNIT – IV

Information Management: Introduction, A Simple File System, General Model of a File System, Symbolic File System, Basic File System, Access Control Verification, Logical File System, Physical File System File-System Interface: File Concept, Access Methods, Directory Structure, Protection, Consistency Semantics File-System Implementation: File-System Structure, Allocation Methods, Free-Space Management, Directory Implementation

TEXT BOOKS:

1. Madnick E., Donovan J., "Operating Systems", Tata McGraw Hill, 2001
2. Silbersachatz and Galvin, "Operating System Concepts", Pearson, 5th Ed., 2001
3. Willium Stallings, " Operating systems: Internals aaaaaand design Prinicipals., Pearson education, Sixth edition

REFERENCES:

1. Tannenbaum, "Operating Systems", PHI, 4th Edition, 2000

MECS-615 Theory of Computation

L	T	C
3	1	4

INSTRUCTIONS TO PAPER SETTERS: Maximum Marks : 60
Question No. 1 should be compulsory and cover the entire syllabus. This question should have objective or short answer type questions. It should be of 20 marks.
Apart from Question No. 1, rest of the paper shall consist of four units as per the syllabus. Every unit should have two questions. However, student may be asked to attempt only 1 question from each unit. Each question should be 10 marks

UNIT-I

Church-Turing thesis: Turing machines – Variants of Turing Machines – Hilbert's problems. Decidability: Decidable languages – Halting problem.

UNIT-II

Reducibility: Undecidable problems from Language theory – A simple Undecidable problem – Mapping Reducibility. Advanced topics in Computability Theory: The Recursion Theorem – Decidability of logical theories – Turing Reducibility.

UNIT-III

Time Complexity: Measuring Complexity – The Class P – The class NP – NPcompleteness – Additional NP-complete Problems.

UNIT-IV

Space Complexity: Savitch's Theorem – The Class PSPACE – PSPACE-completeness – The classes L and NL – NL-completeness – NL equals coNL. Intractability: Hierarchy Theorems – Relativization – CircuitComplexity.
Advanced topics in complexity theory: Approximation Algorithms – Probabilistic Algorithms – Alternation – Interactive Proof Systems – Parallel Computation – Cryptography

TEXT BOOKS:
1. Michael Sipser, Introduction to the Theory of Computation, Thomson Brook/cole, 1997.(2006)
2. John E. Hopcroft, Rajeev Motwani, Jeffrey D. Ullman, Introduction to Automata Theory, Languages and Computation, 3/E, Pearson Education, 2009.

REFERENCES
1. Peter Linz, An Introduction to formal Languages and Automata, 4/ E, Jones & Bartlett Pub, 2006.
2 Kamala Krithivasan, Rama R, Introduction to Formal Languages, Automata Theory and Computation, Pearson, 2009
3. Dr. B. N. Srinivasa Murthy, Formal Languages and Automata Theory, Sanguine Publishers, 2006.

Paper Code: MECS – 651
Subject: Lab 1

This Lab Course will be based on ADS.

Paper Code: MECS – 653
Subject: Lab 2

This Lab Course will be based on Advanced Software Engineering

Paper Code: MECS – 655
Subject: Lab 3

This Lab Course will be based on Advanced DCC

Paper Code: MECS – 657* (NUES)
Subject: Term Paper I

Paper Code: MECS – 602	L	T	C
Subject: Object Oriented Analysis & Design	4	0	4

INSTRUCTIONS TO PAPER SETTERS: **Maximum Marks : 60**

Question No. 1 should be compulsory and cover the entire syllabus. This question should have objective or short answer type questions. It should be of 20 marks.

Apart from Question No. 1, rest of the paper shall consist of four units as per the syllabus. Every unit should have two questions. However, student may be asked to attempt only 1 question from each unit. Each question should be 10 marks

UNIT I

Object Oriented Design Fundamentals: The object model - Classes and Objects, Complexity ,Classification, Notation, Process - Pragmatics - Binary and entity relationship, Object types - Object state, OOSD life cycle

UNIT II

Object Oriented Analysis: Overview of Object Oriented Analysis, Shaler/Mellor, Coad/Yourdon, Rumbagh, Booch's Approach towards the analysis, UML ,Usecase, Conceptual model, Behaviour ,Class, Analysis patterns, Overview, Diagrams, Aggregation.

UNIT III

Object Oriented Design Methods: Unified Modeling Language : UML –static view, Dynamic view, Model Management View, UML Diagrams, Collaboration - Sequence - Class - Design patterns and frameworks - Comparison with other Design methods

UNIT IV

Managing Object Oriented Development Managing analysis and design - Evaluation testing - Coding - Maintenance Metrics, case Studies In Object Oriented Development Design of foundation class libraries - Object Oriented databases - Client/Server computing - Middleware.

Text Books:

1. Craig Larmen, Applying UML and Patterns: An Introduction to Object Oriented Analysis and Design and Iterative Development, Prentice Hall (2004)
2. Booch G., Rambaugh J., Jacobson Ivar, The Unified Modeling Language User Guide, Pearson Education (2003)

Reference Books:

1.Yogesh Singh, RuchikaMalhotra , Object oriented software engineering, PHI 2012
2. Booch G, Maksimchuk, Engel, Young, Conallen and Housten, Object Oriented Analysis and Design with Applications, Addison Wesley Professional (2007)
3. Booch G., Object Oriented Analysis and Design, Addision Wesley (1994)

Paper Code: MECS – 604	L	T	C
Subject: Advanced Database Management System	4	0	4

INSTRUCTIONS TO PAPER SETTERS: Maximum Marks : 60
Question No. 1 should be compulsory and cover the entire syllabus. This question should have objective or short answer type questions. It should be of 20 marks.
Apart from Question No. 1, rest of the paper shall consist of four units as per the syllabus. Every unit should have two questions. However, student may be asked to attempt only 1 question from each unit. Each question should be 10 marks

UNIT I

Relational Databases: Integrity Constraints revisited, Extended ER diagram, Relational Algebra & Calculus, Functional, Muiltivalued and Join Dependency, Normal Forms, Rules about functional dependencies.

Query Processing and Optimization: Valuation of Relational Operations, Transformation of Relational Expressions, Indexing and Query Optimization, Limitations of Relational Data Model, Null Values and Partial Information.

UNIT II

Deductive Databases :Datalog and Recursion, Evaluation of Datalog program, Recursive queries with negation.

Objected Oriented and Object Relational Databases: Modeling Complex Data Semantics, Specialization, Generalization, Aggregation and Association, Objects, Object Identity, Equality and Object Reference, Architecture of Object Oriented and Object Relational Databases

Parallel and Distributed Databases: Distributed Data Storage – Fragmentation & Replication, Location and Fragment Transparency Distributed Query Processing and Optimization, Distributed Transaction Modeling and concurrency Control, Distributed Deadlock, Commit Protocols, Design of Parallel Databases, Parallel Query Evaluation.

UNIT III

Advanced Transaction Processing: Nested and Multilevel Transactions, Compensating Transactions and Saga, Long Duration Transactions, Weak Levels of Consistency, Transaction Work Flows, Transaction Processing Monitors.

Active Database and Real Time Databases: Triggers in SQL, Event Constraint and Action: ECA Rules, Query Processing and Concurrency Control, Compensation and Databases Recovery

Image and Multimedia Databases: Modeling and Storage of Image and Multimedia Data, Data Structures – R-tree, k-d tree, Quad trees, Content Based Retrieval: Color Histograms, Textures, etc., Image Features, Spatial and Topological Relationships, Multimedia Data Formats, Video Data Model, Audio & Handwritten Data, Geographic Information Systems (GIS)

UNIT IV

WEB Database: Accessing Databases through WEB, WEB Servers, XML Databases, Commercial Systems.

Data Warehousing: Data Warehousing Architecture, Multidimensional Data Model, Update Propagation OLAP Queries. Data Mining: Knowledge Representation Using Rules, Association and Classification Rules, Sequential Patterns, Algorithms for Rule Discovery

Case Study: Oracle Xi

Text Books:

1. Elmarsi, Navathe, Somayajulu, Gupta, “Fundamentals of Database Systems”, 4th Edition, Pearson Education, 2007
2. Garcia, Ullman, Widom, “Database Systems, The complete book”, Pearson Education, 2007
3. R. Ramakrishnan, “Database Management Systems”, McGraw Hill International Editions, 1998

Reference Books:

1. Date, Kannan, Swaminathan, “An Introduction to Database Systems”, 8th Edition Pearson Education, 2007
2. Singh S.K., “Database System Concepts, design and application”, Pearson Education, 2006.
3. Silberscatz, Korth, Sudarshan, “Database System Concepts”, Mcgraw Hill, 6th Edition, 2006
4. D. Maier, “The Theory of Relational Databases”, 1993, Computer Science Press, Rokville, Maryland
5. Ullman, J. D., “Principals of database systems”, Galgotia publications, 1999
6. Oracle Xi Reference Manual

Paper Code: MECS – 606	L	T	C
Subject: Advanced Algorithm Analysis & Design	4	0	4

INSTRUCTIONS TO PAPER SETTERS: Maximum Marks : 60

Question No. 1 should be compulsory and cover the entire syllabus. This question should have objective or short answer type questions. It should be of 20 marks.

Apart from Question No. 1, rest of the paper shall consist of four units as per the syllabus. Every unit should have two questions. However, student may be asked to attempt only 1 question from each unit. Each question should be 10 marks

UNIT I

Review of various Design and Analysis Techniques and their comparisons: Overview of Divide-and-Conquer, Dynamic Programming and Greedy Algorithms, Comparison of dynamic programming and Greedy algorithm with Knapsack as case studyTheoretical foundation of greedy algorithm, Matroids and Greedy methods, A Task Scheduling problem as a Matroid.Comparisons of all techniques with reference to their time complexity, space complexity, guaranteed optimization and Stability.

UNIT II

Review of Graph Theory, Internal Representations, Traversal algorithms, Tree, Spanning tree generation.
Maximum Flow: Flow networks, The ford-fulkerson method, Maximum bipartite matching, Push-Rebel Algorithms, The relable-to-front algorithms.
Computational Geometry: Line segments properties, determining whether any pair of segment intersects, Finding a convex hull, finding the closest pair of points

UNIT III

Matrix Operations: Solving system of linear equation, Inverting Matrices, Symmetric positive-definite matrices and least square approximation
Polynomial and FFT: Representation of polynomials, The DFT and FFT, efficient FFT implementation
Number–Theoretic Algorithm: Elementary number-theoretic notion, Greatest common divisor, modular arithmetic, solving modular linear equation, the Chinese remainder theorem, Power of an element, The RSA public-key cryptosystem, Primality testing, Integer Factorization.

UNIT IV

NP-Completeness, Polynomial time, Polynomial time verification, NP completeness and reducibility, NP-Completeness proofs. Few examples NP complete problems.
Approximation Algorithms- the vertex-cover problem, The Traveling-Salesman Problem, The set covering problem, Randomization and linear programming, Subset-sum problem.

Text Books:

1. T. H. Cormen, C. E. Leiserson, R.L. Rivest, C. Stein, "Introduction to Algorithms", 2nd Edition, PHI.

Reference Books:

1. A.V. Aho, J. E. Hopcroft, J.D. Ulman, "The Design & Analysis of Computer Algorithms", Addison Wesley.
2. V. Manber, "Introduction to Algorithms – A Creative Approach", Addison Wesley.
3. Ellis Harwitz and SartazSahani, "Fundamentals of Computer Algorithms", Galgotia.

Paper Code: MECS – 608	L	T	C
Subject: Software Requirements& Estimation	4	0	4

INSTRUCTIONS TO PAPER SETTERS: Maximum Marks : 60

Question No. 1 should be compulsory and cover the entire syllabus. This question should have objective or short answer type questions. It should be of 20 marks.

Apart from Question No. 1, rest of the paper shall consist of four units as per the syllabus. Every unit should have two questions. However, student may be asked to attempt only 1 question from each unit. Each question should be 10 marks

UNIT I

Introduction to software life cycle, Management activities in a software project,

Requirements engineering: Requirements Elicitation, Requirement Elicitation techniques, Requirement Analysis, Requirement Analysis Models, Requirement Documentation, Requirement Management

UNIT II

Size Estimation: Function Point Analysis from DFD's, ER diagram, Function Point Analysis from Use Case Diagram & Class Diagram, Mask II FPA, LOC estimation, Conversion between size measures

UNIT III

Effort, schedule & cost estimation: Estimation factors, COCOMO-II, Estimation by Analogy, Validating Software Estimates

Tools: Software Estimation Tools

UNIT IV

Industry Resources; IFPUG, UQAM-SEMRL, COSMIC, IEEE, Two latest Research papers to be covered

Text Books:

1. Kishore, Swapna, "Software Requirements and Estimation", Tata McGraw Hill, 2001

Reference Books:

1. Norman E. Fenton, "Software Metrics: A Rigorous and Practical Approach", International Thomson Computer Press, 1996.
2. B. Henderson-Sellers, "Object-Oriented Metrics, Measures of Complexity", Prentice Hall, 1996.

Paper Code: MECS – 610	L	T	C
Subject: Network Programming	4	0	4

INSTRUCTIONS TO PAPER SETTERS: **Maximum Marks : 60**

Question No. 1 should be compulsory and cover the entire syllabus. This question should have objective or short answer type questions. It should be of 20 marks.

Apart from Question No. 1, rest of the paper shall consist of four units as per the syllabus. Every unit should have two questions. However, student may be asked to attempt only 1 question from each unit. Each question should be 10 marks

UNIT I

Introduction to Systems Programming: Files, System Files, File Formats, Buffered I/O,Directories, File System, Inodes, links, fcntl, links, locks, Device I/O, Terminal I/O,ioctl(), Files and Devices ,Signals, video I/O ,Multi-Tasking

UNIT II

Processes and Inter-Process Communication: timers, polling vs interrupts, environment,fork, exec, wait, environment, exit and wait, pipe, fifos, message queues, semaphore

UNIT III

Network Programming: Sockets, Operation, Socket types, Domains Name Binding,Closing Sockets, I/O Multiplexing, Client/Server Models, Connection Based Services,Handling Out of Band Data, Connectionless Services, Design issues of Concurrent anditerative servers, Socket options

UNIT IV

XDR and Remote Procedure Calls, Network Programming at the level of ProgrammingLanguage (can use Java or Python as case study)

Text Books:

1. Unix Network Programming, W. Richard Stevens, Prentice Hall, 1998

Reference Books:

1. Internetworking with TCP/IP, Volume1, Fifth Edition, Douglas Comer, Prentice Hall,2006.
2. Internetworking With TCP/IP Volume II,Third Edition, Douglas Comer, Prentice Hall, 1999.
3. Internetworking with TCP/IP, Volume3, Douglas Comer, Prentice Hall,2000

Paper Code: MECS – 612	L	T	C
Subject: Soft Computing	4	0	4

INSTRUCTIONS TO PAPER SETTERS: Maximum Marks : 60

Question No. 1 should be compulsory and cover the entire syllabus. This question should have objective or short answer type questions. It should be of 20 marks.

Apart from Question No. 1, rest of the paper shall consist of four units as per the syllabus. Every unit should have two questions. However, student may be asked to attempt only 1 question from each unit. Each question should be 10 marks

UNIT I

Introduction: Introduction to Soft Computing Concepts, Importance of tolerance in imprecision and uncertainty, Soft Computing Constituents and Conventional Artificial Intelligence, From Conventional AI to Computational Intelligence, Fuzzy Set Theory, Neural Networks and Evolutionary Computation

Neural Networks: Overview of biological Neuro-system, Mathematical Models of Neurons, ANN architecture, Learning rules, Learning Paradigms-Supervised, Unsupervised and reinforcement Learning, ANN training Algorithms-perceptions, Training rules, Delta, Back Propagation Algorithm, Multilayer Perceptron Model, Hopfield Networks, Associative Memories, Applications of Artificial Neural Networks.

UNIT II

Introduction to Fuzzy Sets: Classical and Fuzzy Sets: Overview of Classical Sets, Membership Function, Fuzzy rule generation.

Operations on Fuzzy Sets: Compliment, Intersections, Unions, Combinations of Operations, Aggregation Operations.

Fuzzy Arithmetic: Fuzzy Numbers, Linguistic Variables, Arithmetic Operations on Intervals & Numbers, Lattice of Fuzzy Numbers, Fuzzy Equations.

Fuzzy Logic: Classical Logic, Multivalued Logics, Fuzzy Propositions, Fuzzy Qualifiers, Linguistic Hedges.

Uncertainty based Information: Information & Uncertainty, Nonspecificity of Fuzzy & Crisp Sets, Fuzziness of Fuzzy Sets, Defuzzyfication.

UNIT III

Evolutionary Computation: Genetic Algorithms and Genetic Programming, Evolutionary Programming, Evolutionary Strategies and Differential Evolution Coevolution, Different operators of Genetic Algorithms, Analysis of Selection Operations, Convergence of Genetic Algorithms

UNIT IV

Rough Sets: Introduction, Imprecise categories Approximations and Rough Sets, Reduction of Knowledge, Decision Tables, and Applications.

Hybrid Systems: Introduction of Neuro-Fuzzy Systems, Architecture of Neuro Fuzzy Networks.Fuzzy Logic bases Neural Networks, Genetic Algorithm for Neural Network Design and Learning, Fuzzy Logic and Genetic Algorithm for Optimization, Applications.

Text Books:

1. Anderson J.A, "An Introduction to Neural Networks",PHI, 1999.
2. Hertz J. Krogh, R.G. Palmer, "Introduction to the Theory of Neural Computation", Addison-Wesley, California, 1991.

Reference Books:

1. "Neural Networks-A Comprehensive Foundations", Prentice-Hall International, New Jersey,1999.
2. Freeman J.A. & D.M. Skapura. "Neural Networks: Algorithms, Applications and Programming Techniques", Addison Wesley, Reading, Mass, (1992).
3. G.J. Klir& B. Yuan, "Fuzzy Sets & Fuzzy Logic", PHI, 1995.
4. Melanie Mitchell, "An Introduction to Genetic Algorithm", PHI, 1998.

Paper Code: MECS – 614	L	T	C
Subject: Modelling & Simulation	4	0	4

INSTRUCTIONS TO PAPER SETTERS: Maximum Marks : 60
Question No. 1 should be compulsory and cover the entire syllabus. This question should have objective or short answer type questions. It should be of 20 marks.
Apart from Question No. 1, rest of the paper shall consist of four units as per the syllabus. Every unit should have two questions. However, student may be asked to attempt only 1 question from each unit. Each question should be 10 marks

UNIT I
System definition and components, stochastic activities, continuous and discrete systems, systemmodeling, types of models, static and dynamic physical models, static and dynamic mathematicalmodels, full corporate model, types of system study.

UNIT II
System simulation, why & when to simulate, nature and techniques of simulation, comparison ofsimulation and analytical methods, types of system simulation, real time simulation, hybridsimulation, simulation of pure-pursuit problem, single-server queuing system and an inventoryproblem, Monte-Carlo simulation, Distributed Lag models, Cobweb model.

UNIT III
Simulation of continuous systems, analog vs. digital Simulation, Simulation of water reservoirsystem, Simulation of a servo system, simulation of an autopilot,Discrete system simulation, fixed time-step vs. even to even model, generation of randomnumbers, test for randomness, Monte-Carlo computation vs. stochastic simulation.System dynamics, exponential growth models, exponential decay models, modified exponentialgrowth models, logistic curves, generalization of growth models, system dynamic diagrams

UNIT IV
Introduction to SIMSCRIPT: Program, system concepts, origination, and statements, defining the telephone system model.
Simulation of PERT Networks, critical path computation, uncertainties in activity duration,resource allocation and consideration.Simulation languages and software, continuous and discrete simulation languages, expressionbased languages, object oriented simulation, general purpose vs. application - oriented simulationpackages, CSMP-III, MODSIM-III.

Text Books:
1. Geoftrey Gordon, " System Simulation", PHI

Reference Books:
1. Jerry Banks, John S. C Barry L. Nelson David M. Nicol, "Discrete Event SystemSimulation", Pearson Education
2. V P Singh, "System Modeling and simulation", New Age International.
3. Averill M. Law, W. David Kelton, "System Modeling and simulation and Analysis",TMH

Paper Code: MECS – 616	L	T	C
Subject: Software Metrics	4	0	4

INSTRUCTIONS TO PAPER SETTERS: Maximum Marks : 60

Question No. 1 should be compulsory and cover the entire syllabus. This question should have objective or short answer type questions. It should be of 20 marks.

Apart from Question No. 1, rest of the paper shall consist of four units as per the syllabus. Every unit should have two questions. However, student may be asked to attempt only 1 question from each unit. Each question should be 10 marks

UNIT I

Introduction:

What is measurement and why do it? Measurement in software engineering, scope of software metrics.

The Basics of Measurement:

Representational theory, Measurement & Models, Measurement Scales and Scale Types, Meaningfulness in Measurement

UNIT II

A Goal Framework for Software Measurement:

Classifying software measures, Determining what to measure, Applying the frameworkEmpirical Investigation & Data Collection:

Four Principles of Investigation, Planning formal experiments, What is good data, How to define the data, How to collect data, When to collect data.

UNIT III

Analyzing Software Measurement Data:

Analyzing the results of experiments, Analysis Techniques, Overview of statistical tests.Measuring Internal Product Attributes, Size and Structure:

Aspects of Software Size, Length, Reuse, Functionality, Complexity, Types of Structural Measures, Modularity and information flow attributes, Object Oriented Metrics

UNIT IV

Measuring External Product Attributes:

Modeling Software Quality, Measuring aspects of quality

Measurement and Management:

Planning a measurement program, Measurement in practice, empirical research in software engineering.

Text Books:

1. Norman E. Fenton & Shari Lawrence Pfeiffer, "Software Metrics", Thomson Computer Press, 1996.

Reference Books:

1.Norman E. Fenton, "Software Metrics: A Rigorous and Practical Approach", International Thomson Computer Press, 1996.

2.B. Henderson-Sellers, "Object-Oriented Metrics, Measures of Complexity", Prentice Hall, 1996.

3.Kishore, Swapna, "Software Requirement and Estimation", Tata McGraw Hill, 2001

Paper Code: MECS – 620	L	T	C
Subject: Distributed Computing	4	0	4

INSTRUCTIONS TO PAPER SETTERS: Maximum Marks : 60
Question No. 1 should be compulsory and cover the entire syllabus. This question should have objective or short answer type questions. It should be of 20 marks.
Apart from Question No. 1, rest of the paper shall consist of four units as per the syllabus. Every unit should have two questions. However, student may be asked to attempt only 1 question from each unit. Each question should be 10 marks

UNIT I

Fundamentals of Distributed & Parallel Computing:
Architectural models for distributed and mobile computing systems, Basic concepts indistributed computing.Classification of Parallel Computers, Parallel Computer Architecture,

Distributed Operating Systems:
Overview, network operating systems, Distributed file systems, Middleware,client/server model for computing.

UNIT II

Communication:
Layered protocols, RPC, RMI, Remote objects.Basic Algorithms in Message PassingSystems, Leader Election in Rings, and Mutual Exclusion in Shared Memory,Message Passing, PVM and MPI.

Process Concepts:
Threads, Clients and Servers, Code migration, Agent based systems, Distributedobjects, CORBA, Distributed COM.

UNIT III

Synchronization:
Clock synchronization, Logical clocks, Election algorithms, Mutual exclusion,Distributed transactions, Naming concepts, Security in distributed systems.

Consistency, Replication and Fault Tolerance:
Introduction,Data-centric consistency models, Client-centric consistency models,Distribution Protocols,Consistency Protocols,Examples. Introduction to Fault Tolerance,Process Resilience,Reliable Client Server Communication,Reliable Group Communication,Distributed Commit,Recovery.

UNIT IV

Parallel Systems:
Basic Concepts: Introduction to parallel processing, Parallel processing terminology,Design of parallel algorithms, Design of Parallel Databases, Parallel Query evaluation.OperatingSystem for Parallel Computers.

Text Books:

1. Tannenbaum, A, Maarten Van Steen. Distributed Systems, Principles andParadigm, Prentice Hall India, 2002
2. Michael J. Quinn, "Parallel Computing – Theory and Practice, 2nd Edition, McGraw Hill, 1994

Reference Books:

1. Tanenbaum, A, "Modern Operating Systems", 2nd Edition, Prentice HallIndia, 2001.
2. Singhal and Shivaratri, "Advanced Concepts in Operating Systems", McGrawHill, 1994
3. Attiya, Welch, "Distributed Computing", Wiley India, 2006
4. Coulouris, Dollimore and Kindberg, "Distributed Systems", Pearson, 2009.
5. Kai Hwang and Zhi.WeiXu, "Scalable Parallel Computing", Tata McGraw-Hill, New Delhi, 2003.

Paper Code: MECS – 624	L	T	C
Subject: Advanced Computer Graphics	4	0	4

INSTRUCTIONS TO PAPER SETTERS: Maximum Marks : 60
Question No. 1 should be compulsory and cover the entire syllabus. This question should have objective or short answer type questions. It should be of 20 marks.
Apart from Question No. 1, rest of the paper shall consist of four units as per the syllabus. Every unit should have two questions. However, student may be asked to attempt only 1 question from each unit. Each question should be 10 marks

UNIT I
Raster graphics, Vector graphics, Basic raster graphics algorithms for drawing 2 D Primitives line, circles, ellipses, arcs etc., Anti aliasing and its techniques. Clipping: clipping points, line and area clipping. & polygon filling algorithm.

UNIT II
Geometric Transformation: 2D transformations like translation, rotation, scaling, reflection and shearing etc., composite transformation and homogeneous coordinate system in transformation. 3D transformations, window to viewport transformations, projection: Types of projection methods, perspective projection with different location of centre of projection.

Graphics Hardware: Hardcopy & display techniques, Input devices, image scanners etc.,

UNIT III
Modeling: parametric and non parametric. Curves and its blending methods. Uniform, non uniformcurvs, rational and non rational curves, NURBS, Surfaces and its generation techniques. Hardware and software color models and its applications in different fields.

Wireframe, surface and solid modeling, Polygon meshes and its need of approximation , Shading Techniques : Lambert, gouraud and phong methods. Illumination models: Global and local illumination model, Transparency, Shadows, Visible surface determination techniques for visible determination like Z-buffer algorithm, A buffer algorithm, scan line algorithm, area subdivision algorithm for implementation of visible surface detection. Visible surfaces ray-tracing, recursive ray tracing, radio-city methods.

UNIT IV
Procedural modeling, fractals and its generation techniques, grammar-based models, multi-particle system, concepts of hardware and software rendering. Animation: introduction to 2D and 3D animation. Dynamics and role of dynamics in animation

Text Books:
1. Foley et. al., “Computer Graphics Principles & practice”, Addison Wesley Ltd., 2003.

Reference Books:
1. R.H. Bartels, J.C. Beatty and B.A. Barsky, “An Introduction to Splines for use in Computer Graphics and Geometric Modeling”, Morgan Kaufmann Publishers Inc., 1987.
2. D. Hearn and P. Baker, “Computer Graphics”, Prentice Hall, 2003.
3. W. Newman and R. Sproul, “Principles of Interactive Computer Graphics, McGraw-Hill, 1973.
4. R. Plastock and G. Kalley, “Theory and Problems of Computer Graphics”, Schaum’s Series, McGraw Hill, 2001.
5. F.P. Preparata and M.I. Shamos, “Computational Geometry: An Introduction”, Springer-Verlag New York Inc., 1985.
6. D. Rogers and J. Adams, “Mathematical Elements for Computer Graphics”, MacGraw-Hill International Edition, 1989.
7. David F. Rogers, “Procedural Elements for Computer Graphics”, McGraw Hill Book Company, 1985.
8. Alan Watt and Mark Watt, “Advanced Animation and Rendering Techniques”, Addison-Wesley, 2002

Paper Code: MECS – 652
Subject: Lab 4

This Lab Course will be based on Object Oriented Software Engineering.

Paper Code: MECS – 654
Subject: Lab 5

This Lab Course will be based on Advanced Database Management System.

Paper Code: MECS – 656
Subject: Lab 6

This Lab Course will be based on Advanced Algorithm Analysis & Design.

Paper Code: MECS – 658* (NUES)
Subject: Term Paper II

Paper Code: MECS – 701	L	T	C
Subject: Advanced Data Warehousing &Data Mining	4	0	4

INSTRUCTIONS TO PAPER SETTERS: Maximum Marks : 60

Question No. 1 should be compulsory and cover the entire syllabus. This question should have objective or short answer type questions. It should be of 20 marks.

Apart from Question No. 1, rest of the paper shall consist of four units as per the syllabus. Every unit should have two questions. However, student may be asked to attempt only 1 question from each unit. Each question should be 10 marks

UNIT I

Review of Data Warehousing:

Introduction to Data Warehousing: Evolution of Data Warehousing, Data Warehousing concepts, Benefits of Data Warehousing, Comparison of OLTP and Data Warehousing, Why Have a Separate Data Warehouse, Problems of Data Warehousing.

Data Warehousing Architecture

Architecture: Operational Data and Data store, Load Manager, Warehouse Manager, Query Manager, Detailed Data, Lightly and Highlysummarised Data, Archive/Backup Data, Meta-Data, 2-tier, 3-tier and 4-tier data warehouse architecture

UNIT II

Multidimensional Data Modeling

Principles of dimensional modeling: From Tables and Spreadsheets to Data Cubes, the STAR schema, STAR Schema Keys, Advantages of the STAR Schema Dimensional Modeling: Updates to the Dimension tables, miscellaneous dimensions, the snowflake schema, Fact Constellations, aggregate fact tables, families of STARS, Measures: Their Categorization and Computation, Concept Hierarchies, OLAP Operations in the Multidimensional Data Model, A Starnet Query Model for Querying Multidimensional Databases

UNIT III

Data Warehouse Implementation,

Efficient Computation of Data Cubes, Indexing OLAP Data, Efficient Processing of OLAP Queries, Metadata repository, Data warehouse back-end tools and utilities

Data Preprocessing

Why preprocess the data? Data cleaning, Missing values, Noisy data, Inconsistent data, Data integration and transformation, Data reduction: Data cube aggregation,

Dimensionality reduction, Data compression, Numerosity reduction

Discretization and concept hierarchy generation for numeric data and categorical data

UNIT IV

Data Mining Basics: What is Data Mining, The knowledge discovery process, OLAP versus data mining, data mining and the data warehouse, Major Data Mining Techniques, Cluster detection, decision trees, memory-based reasoning, link analysis, neural networks, genetic algorithms, moving into data mining, Data Mining Applications, Benefits of data mining, applications in retail industry, applications in telecommunications industry, applications in banking and finance.

Text Books:

1. Morgan Kaufmann - Data Mining - Concepts and Technique
2. Paul Raj Poonia, "Fundamentals of Data Warehousing", John Wiley & Sons, 2003.

Reference Books:

1. W. H. Inmon, "Building the operational data store", 2nd Ed., John Wiley, 1999
2. Sam Anahony, "Data Warehousing in the real world: A practical guide for building decision support systems", John Wiley, 2004

Paper Code: MECS – 703	L	T	C
Subject: Advanced Software Testing	4	0	4

INSTRUCTIONS TO PAPER SETTERS: **Maximum Marks : 60**

Question No. 1 should be compulsory and cover the entire syllabus. This question should have objective or short answer type questions. It should be of 20 marks.

Apart from Question No. 1, rest of the paper shall consist of four units as per the syllabus. Every unit should have two questions. However, student may be asked to attempt only 1 question from each unit. Each question should be 10 marks

UNIT I

Introduction: Testing Process, Terminologies: Error, Fault, Failure, Test Cases, Testing Process, Limitations of Testing, Graph Theory: Graph, Matrix representation, Paths and Independent paths, Generation of graph from program, Identification of independent paths.

Functional Testing: Boundary Value Analysis, Equivalence Class Testing, Decision Table Based Testing, Cause Effect Graphing Technique.

Unit - II

Structural Testing: Control flow testing, Path testing, Data Flow Testing, Slice based testing, Mutation Testing

Software Verification: Verification methods, SRS verification, SDD verification, Source code reviews, User documentation verification, Software project audit,

Unit- III

Creating Test Cases from Requirements and use cases:

Use case diagram and use cases, Generation of Test cases from use cases, Guidelines forgenerating validity checks, Strategies for data validating, Database testing, Regression Testing:What is Regression Testing?, Regression test cases selection, Reducing the number of test cases, Risk analysis, Code coverage prioritization technique

Software Testing Activities: Levels of Testing, Debugging, Software Testing Tools, and Software test Plan

Unit- IV

Object oriented Testing: What is Object orientation?, What is Object Oriented testing?, Path Testing, State Based Testing, Class Testing,Testing Web Applications: What is Web testing?, Functional Testing, User interface Testing, Usability Testing, Configuration and Compatibility Testing, Security Testing, Performance Testing, Database testing, Post Deployment Testing , Web Metrics

Automated Test Data Generation: What is automated test data generation? Approaches to test data generation, Test data generation, using genetic algorithm, Test Data Generation Tools.

Text Books:

1. Yogesh Singh, "Software Testing", Cambridge University Press, New York, 2012
2. CemKaner, Jack Falk, Nguyen Quoc, "Testing Computer Software", Second Edition, Van Nostrand Reinhold, New York, 1993.

Reference Books:

1. William Perry, "Effective Methods for Software Testing", John Wiley & Sons, New York, 1995.
2. K.K. Aggarwal&Yogesh Singh, "Software Engineering", New Age International Publishers, New Delhi, 2005
3. Louise Tamres, "Software Testing", Pearson Education Asia, 2002
4. Roger S. Pressman, "Software Engineering – A Practitioner's Approach", Fifth Edition, McGraw-Hill International Edition, New Delhi, 2001.
5. Boris Beizer, "Black-Box Testing – Techniques for Functional Testing of Software and Systems", John Wiley & Sons Inc., New York, 1995.
6. Marc Roper, "Software Testing", McGraw-Hill Book Co., London, 1994.
7. Gordon Schulmeyer, "Zero Defect Software", McGraw-Hill, New York, 1990.
8. Watts Humphrey, "Managing the Software Process", Addison Wesley Pub. Co. Inc., Massachusetts, 1989.
9. Boris Beizer, "Software System Testing and Quality Assurance", Van Nostrand Reinhold, New York, 1984.
10. Glenford Myers, "The Art of Software Testing", John Wiley & Sons Inc., New York, 1979.
11. Boris Beizer, "Software Testing Techniques", Second Volume, Second Edition, Van Nostrand Reinhold, New York, 1990.
12. Louise Tamres, "Software Testing", Pearson Education Asia, 2002

Paper Code: MECS – 705	L	T	C
Subject: Cloud Computing	4	0	4

INSTRUCTIONS TO PAPER SETTERS: Maximum Marks : 60
Question No. 1 should be compulsory and cover the entire syllabus. This question should have objective or short answer type questions. It should be of 20 marks.
Apart from Question No. 1, rest of the paper shall consist of four units as per the syllabus. Every unit should have two questions. However, student may be asked to attempt only 1 question from each unit. Each question should be 10 marks

UNIT I
Introduction to Cloud Computing, Definition, Characteristics, Components, Cloud provider, SAAS, PAAS, IAAS and Others, Organizational scenarios of clouds, Administering &Monitoring cloud services, benefits and limitations, Deploy application over cloud, Comparison among SAAS, PAAS, IAAS, Cloud computing platforms: Infrastructure as service: Amazon EC2,Platform as Service: Google App Engine, Microsoft Azure.

UNIT II
Introduction to Cloud Technologies, Study of Hypervisors, SOAP, REST, Compare SOAP and REST, Webservices, AJAX and mashups-Web services, Mashups: user interface services, Virtual machine technology, virtualization applications in enterprises, Pitfalls of virtualization, Multi-entity support, Multi-schema approach, Multi-tenance using cloud data stores, Data access control for enterprise applications.

UNIT III
Data in the cloud: Relational databases, Cloud file systems: GFS and HDFS, BigTable, HBase and Dynamo, Map-Reduce and extensions: Parallel computing, The map-Reduce model, Parallel efficiency of Map-Reduce, Relational operations using Map-Reduce, Introduction to cloud development, Monitoring in Cloud, A grid of clouds, Mobile Cloud Computing, Sky computing, Utility Computing, Elastic Computing.

UNIT IV
Cloud security fundamentals, Vulnerability assessment tool for cloud, Privacy and Security in cloud, Cloud computing security architecture, Cloud computing security challenges, Issues in cloud computing, Implementing real time application over cloud platform, Issues in Intercloud environments, QoS Issues in Cloud, Dependability, data migration, streaming in Cloud. Quality of Service (QoS) monitoring in a Cloud computing environment, , Inter Cloud issues, , load balancing, resource optimization.

Text Books:

1. Cloud Computing : A Practical Approach, Antohy T Velte, et.al McGraw Hill,
2. Cloud Computing for Dummies by Judith Hurwitz, R.Bloor, M.Kanfman, F.Halper (Wiley India Edition)
3. Cloud Security & Privacy by Tim Malhar, S.Kumaraswammy, S.Latif (SPD,O'REILLY)

Reference Books:

1. Cloud Computing Bible by Barrie Sosinsky, Wiley India

2. Cloud Applications by George Reese, O'REILLY Publication
3. Cloud Security by Ronald Krutz and Russell Dean Vines, Wiley-India

Paper Code: MECS – 707	L	T	C
Subject: E – Commerce & Applications	4	0	4

INSTRUCTIONS TO PAPER SETTERS: **Maximum Marks : 60**
Question No. 1 should be compulsory and cover the entire syllabus. This question should have objective or short answer type questions. It should be of 20 marks.
Apart from Question No. 1, rest of the paper shall consist of four units as per the syllabus. Every unit should have two questions. However, student may be asked to attempt only 1 question from each unit. Each question should be 10 marks

UNIT I
Introduction to e-Commerce
Framework, Architecture, Benefits and Impact of e-Commerce, The Anatomy of e-Commerce applications, e-Commerce Consumer applications, e-Commerce Organisation Applications, e-commerce in India, Prospects of e-commerce.
Network Infrastructure for e-commerce
Intranet, Extranet, & Internet, Internet Backbone in India, ISP and services in India, OSI Model, Standards & Overview of TCP/IP, Internet Security, e-commerce & Internet.

UNIT II
E-commerce Models
Business-to-Business-Hubs, Market Places, Business-to-Business Exchange, Business-to-Consumer, Consumer-to-consumer, Business-to-Government, Government-to-Government.
e-Advertising& Marketing
The new age of information-based Marketing, Emergence of internet as a competitive advertising media, Market Research, Weakness in Internet Advertising, e-Advertising & Marketing in India.

UNIT III
Electronic Payment Systems
Introduction to Payment Systems, On-Line Payment Systems, Pre-Paid e-Payment System, Post-Paid e-Payment System, Requirements Metrics of a Payment System.
Electronic Data Exchange
EDI- Definitions & Applications, Standardisation and EDI, EDI- Legal Security and Privacy Issues, Advantages & Limitations of EDI.

UNIT IV
E-Security
Securing the Business on Internet- Security Policy, Procedures and Practices, Transaction Security, Cryptology, Digital Signatures, Security Protocols for Web Commerce.
e-CRM
CRM, what is e-CRM, it's Applications, The e-CRM Marketing in India, Major Trends, Global Scenario for e-CRM, CRM utility in India.

Text Books:
1. Jeffrey F.Rayport& Bernard J.Jaworski: Introduction to E-commerce, TMH, 2003.

Reference Books:
1. Kalakota& Winston: Frontiers of E-commerce, Pearson Education, Mumbai, 2002.
2. David Whiteley: E-Commerce- Strategy technologies and Applications, Tata Mac-Graw Hill, New Delhi, 2000.

Paper Code: MECS – 709	L	T	C
Subject: Information Storage & Management	4	0	4

INSTRUCTIONS TO PAPER SETTERS: **Maximum Marks : 60**

Question No. 1 should be compulsory and cover the entire syllabus. This question should have objective or short answer type questions. It should be of 20 marks.

Apart from Question No. 1, rest of the paper shall consist of four units as per the syllabus. Every unit should have two questions. However, student may be asked to attempt only 1 question from each unit. Each question should be 10 marks

UNIT I

Complexity of Information Management: Proliferation of Data, Data Center Evolution, Managing Complexity, I/O and the five pillars of technology, Storage Infrastructure, Evolution of Storage

Storage Systems Architecture: Modern Storage Systems, Storage Systems, Intelligent Disk Subsystems , Physical Disks , Back End ,Cache ,Front End , Host Environment

UNIT II

Introduction to Networked Storage: Storage Networking Overview, Direct Attached Storage, Storage Area Networks, Case study – Applying SAN concepts, Network Attached Storage, Case study – Applying NAS concepts, IP SAN, CAS, Hybrid Network Storage Based Solutions/ Emerging Technologies, Case study – Applying SAN, NAS, IP SAN concepts

UNIT III

Introduction to Information Availability: Business Continuity Overview, Data Availability, Business Continuity – Local, Case study – Applying local information availability strategies, Business Continuity – Remote, Case study – Applying remote information availability strategies, Disaster Recovery

UNIT IV

Managing and Monitoring: Monitoring in the Data Center, Case study – Monitoring exercise, Management in the Data Center, Case study – Managing exercise

Case Studies must be supported by laboratory

Text Books:

1. Marc Farley Osborne, "Building Storage Networks", Tata McGrawHill, 2001
2. Robert Spalding, "Storage Networks: The Complete Reference", Tata Mcgraw Hill, 2003

Reference Books:

1. NIIT, "Introduction to Information Security Risk Management" , Prentice-Hall of India, 2000

Paper Code: MECS – 711	L	T	C
Subject: Software Quality Management	4	0	4

INSTRUCTIONS TO PAPER SETTERS: Maximum Marks : 60
Question No. 1 should be compulsory and cover the entire syllabus. This question should have objective or short answer type questions. It should be of 20 marks.
Apart from Question No. 1, rest of the paper shall consist of four units as per the syllabus. Every unit should have two questions. However, student may be asked to attempt only 1 question from each unit. Each question should be 10 marks

UNIT I
Concepts and Overview: Concepts of Software Quality, Quality Attributes, Software Quality Control and Software Quality Assurance, Evolution of SQA, Major SQA activities, Major SQA issues, Zero defect Software. Software Quality Assurance: The Philosophy of Assurance, The Meaning of Quality, The Relationship of Assurance to the Software Life-Cycle, SQA Techniques.

UNIT II
Tailoring the Software Quality Assurance Program: Reviews, Walkthrough, Inspection, and Configuration Audits. Evaluation: Software Requirements, Preliminary design, Detailed design, Coding and Unit Test, Integration and Testing, System Testing, types of Evaluations.
Configuration Management: Maintaining Product Integrity, Change Management, Version Control, Metrics, Configuration Management Planning.

UNIT III
Error Reporting: Identification of Defect, Analysis of Defect, Correction of Defect, Implementation of Correction, Regression Testing, Categorization of Defect, Relationship of Development Phases.
Trend Analysis: Error Quality, Error Frequency, Program Unit Complexity, Compilation Frequency.

UNIT IV
Corrective Action as to Cause: Identifying the Requirement for Corrective Action, Determining the Action to be Taken, Implementing the Correcting the corrective Action, Periodic Review of Actions Taken.
Traceability, Records, Software Quality Program Planning, Social Factors: Accuracy, Authority, Benefit, Communication, Consistency, and Retaliation.

Text Books:

1. Robert Dunn, "Software Quality Concepts and Plans", Prentice-Hall, 2003.
2. Alan Gillies, "Software Quality, Theory and Management", Chapman and Hall, 2004.

Reference Books:

1. Michael Dyer, "The Cleanroom approach to Quality Software Engineering", Wiley & Sons, 1992.
2. Daniel Freedman, Gerald Weinberg, "Handbook of Walkthroughts, Inspections and Technical Reviews", Dorset House Publishing, 1990.
3. Tom Gilb, "Principles of Software Engineering Management", Addison-Wesley, 1988.
4. Tom Gilb, Dorothy Graham, "Software Inspection" Addison-Wesley, 1993.
5. Watts Humphrey, "Managing the Software Process", Addison-Wesley, 1990.
6. Watts Humphrey, "A Discipline for Software Engineering", Addison-Wesley, 1995.
7. Arthur Lowell, "Improving Software Quality An Insider's guide to TQM", 1993, Wiley & Sons

Paper Code: MECS – 713	L	T	C
Subject: Advanced Digital Signal Processing	4	0	4

INSTRUCTIONS TO PAPER SETTERS: **Maximum Marks : 60**

Question No. 1 should be compulsory and cover the entire syllabus. This question should have objective or short answer type questions. It should be of 20 marks.

Apart from Question No. 1, rest of the paper shall consist of four units as per the syllabus. Every unit should have two questions. However, student may be asked to attempt only 1 question from each unit. Each question should be 10 marks

UNIT I

Overview of the signal processing of Deterministic signals: Time domain and frequency domain response of the linear-shift invariant systems..

UNIT II

IIR Filter Design: Filter Approximation, Impulse Invariant Method, Bi-linear Transformation method filter structures, Finite word length effects, limitations of IIR filters. FIR Filter Design: Linear phase response, Windowing technique, Gibb's Phenomenon, Frequency Sampling Method, FIR Filter structures.

UNIT III

Power Spectrum Estimation, Classical Spectral Estimation, Non parametric methods for power spectrum estimation: Bartlet method, Welch method, Blackman and Tuckey method, performance anlysis of various techniqes

UNIT IV

Parametric Modeling - AR, MA, ARMA methods, Minimum variance spectral estimations. Filter Bank methods.

Text Books:

1. G. J. Proakis and D. G. Manolakis, "Digital Signal Processing, Principles, algorithms and applications", 4th ed. Pearson Education.
2. S. K. Mitra, " Digital Signal Processing" 3rd ed. TMH.

Reference Books:

1. A.V. Oppenheim and R.W. Schafer "Discrete Time Signal Processing", PHI 1992.
2. Steven M. Kay "Modern Spectral Estimation", PHI 1988.
3. Clark Cory.L, "Lab view DSP and Digital comm.", TMH 2005.
4. Roman Kuc "Introduction to Digital Signal Processing", McGraw Hill 1988.

Paper Code: MECS – 715	L	T	C
Subject: Advanced Multimedia	4	0	4

INSTRUCTIONS TO PAPER SETTERS: Maximum Marks : 60
Question No. 1 should be compulsory and cover the entire syllabus. This question should have objective or short answer type questions. It should be of 20 marks.
Apart from Question No. 1, rest of the paper shall consist of four units as per the syllabus. Every unit should have two questions. However, student may be asked to attempt only 1 question from each unit. Each question should be 10 marks

UNIT I

Introduction:

Concept of Multimedia, Media & data stream, main properties of multimedia system, Data stream characteristics for continuous media Multimedia Applications, Hardware& Software requirements of multimedia product development. Basic concepts of Video & animation. Conventional animation system, Computer based animation, Authoring Tools, Categories of Authoring Tools.

UNIT II

Compression Techniques: Lossless and Lossy compression, Run length coding, Statistical Coding, Transform Coding, JPEG, MPEG, Text compression using static Huffmann technique, Dynamic Huffmann Technique, Arithmetic Technique.

Modelling: NURBS modeling, NURBS curve generating techniques, Curve editing techniques, NURBS Surface generation methods and surface editing operations for creating models.

UNIT III

Animation: Introduction, Basics of animation techniques, tweaning& morphing, Motion Graphics 2D & 3D animation. Key frame animation, Reactive animation, Path animation, imparting non linearity in to the path of the animation, character animation: Forward kinematics & Inverse kinematics techniques to animate the skeletons. Skin binding methods, Deformers and animation editors.

UNIT IV

Dynamics: Role of Dynamics in creation of animation, concept of dynamic engine. Soft bodies &Rigid bodies. Rigid bodies types and its application in creating realistic scenes. Constrains.

Rendering: Rendering types: Hardware and software rendering. Concepts of rendering globals.Interactive photo realistic rendering, Line rendering, Box rendering etc. Special Effects: Shading & Texturing Surfaces, Lighting, Special effects.

Working with MEL: Basics & Programming

Text Books:

1. FredHalsall , " Multimedia communication" Addison wesley
2. David Hillman, "Multimedia Technology & Applications", Galgotia Publications

Reference Books:

1. Andleigh and Thakrar, "Multimedia system design", PHI Publications
2. Hern and Baker, "Computer Graphics", Pearson
3. Maya manuals.

Paper Code: MECS – 717	L	T	C
Subject: Cyber Crime Investigations & Cyber Forensics	4	0	4

INSTRUCTIONS TO PAPER SETTERS: **Maximum Marks : 60**

Question No. 1 should be compulsory and cover the entire syllabus. This question should have objective or short answer type questions. It should be of 20 marks.

Apart from Question No. 1, rest of the paper shall consist of four units as per the syllabus. Every unit should have two questions. However, student may be asked to attempt only 1 question from each unit. Each question should be 10 marks

UNIT I

Introduction :Introduction to Cyber World, Types of cyber-attacks, Cyber Crime and Digital Fraud, Cyber-attacks and cyber security , Information warfare and cyber terrorism,

Overview of Types of computer forensics i.e. Media Forensics, Network forensics (internet forensics), Machine forensic, Email forensic (e-mail tracing and investigations)

UNIT II

Under Standing Computer Investigations : Preparing a Computer Investigations, Taking a systematic approach, Understanding Data recovery workstations and software, Conducting an Investigation, Completing the case. ,

Processing Crime and Incident Response: Identifying Digital evidences, Collecting evidence, Preparing for a search, Seizing and Storing Digital evidences, Digital Hashing.

UNIT III

Windows and DOS systems based Investigations: File Systems, Examining File systems, Disk Encryption, Windows registry, startup tasks, Linux Boot processes and File systems, Digital signature and time stamping, cryptography, cell phone and mobile device forensics, Email investigations, Network Forensics, SQL Injections, Steganography.

UNIT IV

Computer Forensics Tools and Software: Helix, DTsearch, S-tools, Camouflage, Recovery of Deleted files in windows and Unix , Hardware forensic tools like Port scanning and vulnerability assessment tools like *Nmap* , *Netscan*etc . Password recovery e.g. Passware, Mobile forensic tools , DOS file systems and Forensic tools, Password encryption analyzer

Text Books:

1. Computer Forensics and Investigations, 2nd edition, Nelson, Phillips, Enfinger,Steuart , Cenage Learning 2008
2. *Incident Response & Computer Forensics.*Mandia, k., Prosise, c., Pepe, m. 2nd edition. Tata-McGraw Hill, 2003.

Reference Books:

1. Digital Evidence and Computer Crime, 2nd Edition , Eoghan Casey , academic Press File System Forensic Analysis by Brian Carrier , addition Wesley
2. Windows Forensic Analysis DVD Toolkit (Book with DVD-ROM), Harlan Carvey, syngress Publication
3. EnCE: The Official EnCase Certified Examiner Study Guide, 2nd Edition , Steve Bunting , sybex Publication

Paper Code: MECS – 719	L	T	C
Subject: Distributed Databases	4	0	4

INSTRUCTIONS TO PAPER SETTERS: **Maximum Marks : 60**

Question No. 1 should be compulsory and cover the entire syllabus. This question should have objective or short answer type questions. It should be of 20 marks.

Apart from Question No. 1, rest of the paper shall consist of four units as per the syllabus. Every unit should have two questions. However, student may be asked to attempt only 1 question from each unit. Each question should be 10 marks

UNIT I

Features of Distributed and Centralized Databases, Principles Of Distributed Databases , Levels Of Distribution Transparency, Reference Architecture for Distributed Databases , Types of Data Fragmentation, Integrity Constraints in Distributed Databases, Alternative Client/Server Architectures.

UNIT II

Translation of Global Queries to Fragment Queries, Equivalence Transformations for Queries, Transforming Global Queries into Fragment Queries, Distributed Grouping and Aggregate Function Evaluation, Parametric Queries. Optimization of Access Strategies, A Framework for Query Optimization, Join Queries, General Queries.

UNIT III

The Management of Distributed Transactions, A Framework for Transaction Management , Supporting Atomicity of Distributed Transactions, Concurrency Control for Distributed Transactions, Architectural Aspects of Distributed Transactions. Concurrency Control, Foundation of Distributed Concurrency Control, Distributed Deadlocks, Concurrency Control based on Timestamps, Optimistic Methods for Distributed Concurrency Control.

UNIT IV

Reliability, Basic Concepts, Non-blocking Commitment Protocols, Reliability and concurrency Control, Determining a Consistent View of the Network, Detection and Resolution of Inconsistency, Checkpoints and Cold Restart, Distributed Database Administration, Catalog Management in Distributed Databases,

Authorization and Protection, Object Management, Object Identifier Management, Object Migration, Distributed Object Storage, Object Query Processing, Object Query Processor Architectures, Query Processing Issues, Query Execution , Transaction Management, Transaction Management in Object DBMSs , Transactions as Objects.

Text Books:

1. Distributed Database Principles & Systems, Stefano Ceri, Giuseppe Pelagatti , McGraw-Hill

Reference Books:

1. Principles of Distributed Database Systems, M.TamerOzsu, Patrick Valduriez, Pearson Education.
2. Elmarsi, Navathe, Somayajulu, Gupta, "Fundamentals of Database Systems", 4th Edition, Pearson Education, 2007

3. Garcia, Ullman, Widom, "Database Systems, The complete book", Pearson Education, 2007

Paper Code: MECS – 721 L T C
Subject: Network Management 4 0 4

INSTRUCTIONS TO PAPER SETTERS: Maximum Marks : 60
Question No. 1 should be compulsory and cover the entire syllabus. This question should have objective or short answer type questions. It should be of 20 marks.
Apart from Question No. 1, rest of the paper shall consist of four units as per the syllabus. Every unit should have two questions. However, student may be asked to attempt only 1 question from each unit. Each question should be 10 marks

UNIT I
Data communications and Network Management Overview : Analogy of Telephone Network Management, Communications protocols and Standards, Case Histories of Networking and Management, Challenges of Information Technology Managers, Network Management: Goals, Organization, and Functions, Network and System Management, Network Management System Platform, Current Status and future of Network Management.

UNIT II
SNMPV1 Network Management : Organization and Information and Information Models. Managed network: Case Histories and Examples, The History of SNMP Management, The SNMP Model, The Organization Model, System Overview, The Information Model. SNMPv1 Network Management : Communication and Functional Models.
The SNMP Communication Model, Functional model SNMP Management: SNMPv2 : Major Changes in SNMPv2, SNMPv2 System Architecture, SNMPv2 Structure of Management Information, The SNMPv2 Management Information Base, SNMPv2 Protocol, Compatibility
With SNMPv1
SNMP Management: RMON: What is Remote Monitoring? , RMON SMI and MIB, RMON1, RMON2, ATM Remote Monitoring, A Case Study of Internet Traffic Using RMON

UNIT III
Telecommunications Management Network : Why TMN?, Operations Systems, TMN Conceptual Model, TMN Standards, TMN Architecture, TMN Management Service Architecture, An Integrated View of TMN, Implementation Issues.

UNIT IV
Network Management Tools and Systems : Network Management Tools, Network Statistics Measurement Systems, History of Enterprise Management, Network Management systems, Commercial Network management Systems, System Management, Enterprise Management Solutions.
Web-Based Management : NMS with Web Interface and Web-Based Management, Web Interface to SNMP Management, Embedded Web-Based Management, Desktop management Interface, Web-Based Enterprise Management, WBEM: Windows Management Instrumentation, Java management Extensions, Management of a Storage Area Network: ,
Future Directions

Text Books:
1. Mani Subrahmanian , "Network Management, Principles and Practice", Pearson Education.

Reference Books:
1. Morris, "Network Management", Pearson Education.
2. Mark Burges, "Principles of Network System Administration", Wiley Dreamtech.
3. Paul, "Distributed Network Management", John Wiley.

Paper Code: MECS – 751
Subject: Lab 7

This Lab Course will be based on Advanced Data Warehousing & Data Mining.

Paper Code: MECS – 753
Subject: Lab 8

This Lab Course will be based on AD. Software Testing.

Paper Code: MECS – 755 * (NUES)
Subject: Term Paper III

Paper Code: MECS – 757 (NUES)
Subject: Minor Project

Paper code: MEIT-601 **L T P**
Paper: Introduction to Computer Security 4 **0 0**

INSTRUCTIONS TO PAPER SETTERS: **Maximum Marks : 60**
Question No. 1 should be compulsory and cover the entire syllabus. This question should have objective or short answer type questions. It should be of 20 marks.
Apart from Question No. 1, rest of the paper shall consist of four units as per the syllabus. Every unit should have two questions. However, student may be asked to attempt only 1 question from each unit. Each question should be 10 marks

UNIT-I

Overview of computer security: threats, vulnerabilities, controls, risk, confidentiality, integrity, availability, security policies, security mechanisms, prevention, detection, deterrence, Malicious code, viruses, Trojan horses, worms

UNIT-II

Basic Cryptography: Stream and block ciphers, Encryption, Classical cryptosystems, symmetric cryptography, asymmetric cryptography, Digital Signature, Digital certificates, Message digests and authentication codes

UNIT-III

Database Security: Security and privacy requirements, reliability, integrity, and privacy, inference data mining, k-anonymity.
Security in conventional operating systems: Memory, time, file, object protection requirements and techniques, Protection in contemporary operating systems

UNIT-IV

Network security: eavesdropping, spoofing, modification, denial of service attacks, network security techniques: firewalls, virtual private networks, Intrusion detection, techniques to provide privacy in Internet applications and protecting digital content from unintended use.
Management of security: Security policies, Risk analysis, Physical threats and controls
Legal aspects of security, Privacy and ethics

Text Books:

1. William Stallings, "Cryptography and Network Security: Principles and Practice" (5th Edition), Pearson,2011
2. Atul kahate, "Cryptography and Network Security" , Tata McGraw Hill,2004

Reference books

1. Tulloch, M, "Microsoft Encyclopedia of Networking" , Prentice Hall of India, 2001
2. Matt Bishop, "Introduction to Computer Security", Addison-Wesley, 2005
3. Michael T. Goodrich and Roberto Tamassia ,"Introduction to Computer Security", Addison Wesley, 2010

MEIT-603 **Cellular and Mobile Communication**

L	T/P	C
4	**0**	**4**

INSTRUCTIONS TO PAPER SETTERS: Maximum Marks : 60

Question No. 1 should be compulsory and cover the entire syllabus. This question should have objective or short answer type questions. It should be of 20 marks.

Apart from Question No. 1, rest of the paper shall consist of four units as per the syllabus. Every unit should have two questions. However, student may be asked to attempt only 1 question from each unit. Each question should be 10 marks

Unit-I

Basic cellular system, performance criteria, uniqueness of mobile radio environment, operation of cellular systems, planning a cellular system, analog & digital cellular systems, Elements of Cellular Radio Systems Design: General description of the problem, concept of frequency reuse channels, co-channel interference reduction factor, desired C/I from a normal case in an omni directional antenna system, cell splitting, consideration of the components of cellular systems, Introduction to co-channel interference, co-channel measurement design of antenna system, antenna parameter and their effects.

Unit-II

General introduction, obtaining the mobile point to point mode, Radio propagation characteristics: models for path loss, shadowing and multipath fading, propagation over water or flat open area,foliage loss, propagation near in distance, long distance propagation, point to point prediction modelcharacteristics,cell site, antenna heights and signal coverage cells, mobile to mobile propagation,Characteristics of antennas, antenna at cell site, mobile antennas,Frequency management, fixed channel assignment, non-fixed channel assignment, traffic & channel assignment, Why hand off, types of handoff and their characteristics, handoff analysis, dropped call rates & their evaluation.

Unit-III

Modulation methods in cellular wireless systems, OFDM, Block Coding, convolution coding and Turbo coding, FDMA/TDMA, CDMA. FDM/TDM Cellular systems, Cellular CDMA, soft capacity, Earlang capacity comparison of FDM/TDM systems and Cellular CDMA.

Unit-IV

GSM Architecture, Mobility management, Network signaling ,Frequency allocation and control, Base System andMaster System, GSM, DCS 1800, Various value added services, Mobile IP,Wireless LAN, Routing protocols forMANETs:DSDV, DSR,AODV,Role of TCP in MANTs

TEXT BOOKS:

[T1]. William, C. Y. Lee, “Mobile Cellular Telecommunications”, 2nd Edition, McGraw Hill, 1990.

[T2]. Theodore S Rappaport, “Wireless Communication Principles and Practice”, 2nd Edition, Pearson Education,2002.

REFERENCE BOOKS:

[R1]. “Mobile Communication Hand Books”, 2nd Edition, IEEE Press.

[R2]. Mischa Schwartz, “Mobile Wireless Communications”, Cambridge University Press, UK, 2005.

[R3]. Lawrence Harte, “3G Wireless Demystified”, McGraw Hill Publications, 2001.

[R4]. Kaveh Pahlavan and Prashant Krishnamurthy", Principles of Wireless Networks", PHI, 2001.

Paper Code: MEIT – 602	L	T	C
Subject: Advanced Mobile Computing	4	0	4

INSTRUCTIONS TO PAPER SETTERS: Maximum Marks : 60

Question No. 1 should be compulsory and cover the entire syllabus. This question should have objective or short answer type questions. It should be of 20 marks.

Apart from Question No. 1, rest of the paper shall consist of four units as per the syllabus. Every unit should have two questions. However, student may be asked to attempt only 1 question from each unit. Each question should be 10 marks

UNIT I

Introduction: Short history of wireless communication, Applications, Frequency for radiotransmission, Signals, Antennas, Signal propagation, Multiplexing, Modulation, SpreadSpectrum, Cellular systems (DSSS & FHSS).

Motivation for a specialized MAC: Hidden and Exposed terminals. Near and Far terminals;Multiple access with collision avoidance, Polling, Inhibit sense multiple access; CDMA:Spread Aloha multiple access

Mobile Computing Architecture: Three Tier Architecture for mobile computing, Designconsiderations, Mobile Computing through Internet. File systems: Consistency, Examples; World Wide Web: Hypertext transfer protocol, Mobile File System, Mobile databases.

UNIT II

Wireless LAN and Blue tooth(IEEE 802.11,802.15)Wireless LAN: Infrared vs. Radio transmission, Infrastructure and Ad hoc Networks : System architecture, Protocol architecture, Physical layer, Medium Access Control layer, MAC management, Future development; HIPERLAN: Protocol architecture, Physical layer, Channel access control sub layer, Medium Access Control sub layer, Information bases
and Networking.

Bluetooth: User Scenarios, Physical Layer, MAC layer, networking. Security, linkmanagement, Enterprise PCS: Office Level , Local Area Wireless: An Example of WPBX,Capacity Planning for WPBX, IrDA ZigBee, RFID, Wireless Broadband (WiMax)

UNIT III

Mobile Network and Transport LayersMobile IP: Goals, assumptions and requirements, Entities and Terminology, IP packet delivery, Agent advertisement and discovery, Registration, Tunnelling and Encapsulation, Optimizations, Reverse tunneling, Ipv6; Dynamic host configuration protocol, Dynamic Host Configuration Protocol - Routing – DSDV – DSR – Alternative Metrics.

Mobile Transport Layer: Traditional TCP: Congestion control, Slow start, Fastretransmit/fast recovery, Implications on mobility; Indirect TCP, Snooping TCP, Mobile TCP,Fast retransmit/fast recovery, Transmission/time-out freezing, Selective retransmission,Transaction oriented TCP.

UNITIV

Support for Mobility:Wireless application protocol: Architecture, Wireless datagram protocol, Wirelesstransport layer security, Wireless transaction protocol, Wireless session protocol, WAPUAProf and Caching , User Agent Profile , Caching Model , Wireless Bearers for WAP , WAPDeveloper Toolkits and application environment, Wireless telephony application, Mobileagents, Application Server, Gateways, Portals, Service Discovery, Device ManagementLanguage Support: Hypertext markup language (XHTML)-MP, Wireless mark-uplanguage; WML script,Mobile Application Languages-XML, Voice XML. Java, J2ME andJavaCard.

Wireless devices and their Operating System: PalmOS; Windows CE; EPOC; SymbianOS; Linux for Mobile Devices. Mobile Agents

Synchronization: Synchronization Software for Mobile Devices, SynchronizationProtocols,

SyncML-Synchronization Language for Mobile Computing.Introduction to Threats and Security Issues in Mobile Computing

Text Books:

1. Jochen Schiller, "Mobile communications", Addison wisely, Pearson Education.
2. Yi Bang Lin and ImrichChlamtech , "Wireless and Mobile Network Architecture", Wiley.
3. RajKamal , "Mobile Computing", Oxford.

Reference Books:

1. Rappaort, "Wireless Communications Principals and Practices".
2. P. Nicopolitidis, "Wireless Networks", John Wiley.
3. K. Pahlavan, P. Krishnamurthy, "Principles of Wireless Networks".

4. Reza B'Far, "Mobile Computing Principles: Designing and Developing Mobile Applications with UML and XML", Cambridge University Press, 2005.
5. UweHansmann, LotharMerk, Martin S. Nicklous, Thomas Stober, "Principles of Mobile Computing", Springer.
6. EvaggeliaPitoura and George Samaras, "Data Management for Mobile Computing", Kluwer Academic Publishers, 1998.

Paper Code: MEIT – 604	L	T	C
Subject: Advanced Software Project Management	4	0	4

INSTRUCTIONS TO PAPER SETTERS: Maximum Marks : 60

Question No. 1 should be compulsory and cover the entire syllabus. This question should have objective or short answer type questions. It should be of 20 marks.

Apart from Question No. 1, rest of the paper shall consist of four units as per the syllabus. Every unit should have two questions. However, student may be asked to attempt only 1 question from each unit. Each question should be 10 marks

UNIT I

Introduction to Software Project Management: Software development as a project; Stakeholders in software project; Software product, process, resources, quality, and cost; Objectives, issues, and problems relating to software projects. Overview of Project Planning: Steps in project planning; Defining scope and objectives; work breakdown structure; Deliverables and other products; time, cost, and resource estimation; Alternatives in planning, Project Evaluation: Strategic assessment; Technical assessment; Cost-benefit analysis; Cash flow forecasting; Cost-benefit evaluation techniques; Break-even analysis; Risk evaluation Selection of Appropriate Project Approach: Choosing development technology and methodology; choice of process model; Rapid application development; Waterfall model; V-process model; Spiral model; Prototyping,; Incremental delivery.

UNIT II

Software Effort Estimation : Problem in software estimation; Effort estimation techniques; Expert judgement; Estimation by analogy; Delphi technique; Algorithmic methods; Top-down and bottom-up estimation; Function point analysis; Object points; COCOMO model.

Activity Planning : Network planning model; Activity-on-arrow network; Precedence network; Forward pass; Backward pass; Critical path; Slack and float. Risk Analysis and Management : Nature and categories of risk in software development; risk Identification; Risk assessment; Risk mitigation, monitoring, and management; Evaluating schedule risk using PERT.

UNIT III

Recourse Allocation : Nature of project resources; Identifying resource requirement of activities; Allocating and scheduling resources; cost of resources; Standard, planned, and actual cost; Cost variance; time-cost trade-off. Project Tracking and Control : Measurement of physical and financial progress; Earned value analysis; Status reports; Milestone reports; Change control. Contact Management : Outsourcing of products and services; Types of contracts; Stages in contract placement; Terms of contract; Contract monitoring; Acceptance testing

UNIT IV

Managing People and Organizing Teams : Organizational behaviour; Recruitment and placement; Motivation; Group behaviour; Individual and group decision making; Leadership and leadership styles; forms of organizational structures. Software Quality Assurance: Planning for quality; Product versus process quality management; Procedural and quantitative approaches; Defect analysis and prevention; Statistical process control; Pareto analysis; Causal analysis; Quality standards; ISO 9000; Capability Maturity Model; Quality audit. Configuration Management : Configuration management process; Software configuration items; Version control; change control; Configuration audit; Status reporting.

Text Books:

1. Bob Hughes and Mike Cotterell, "Software Project Management", Third Edition 2002, McGraw-Hill
2. PankajJalote, "Software Project Management in Practice", 2002, Pearson Education Asia.

Reference Books:

1. Roger S. Pressman, "Software Engineering: A practitioner's Approach", Fifth Edition 2001 McGraw-Hill
2. Robert T. Futrell, Donald F. Shafer, and Linda I.. Shafer, "Quality Software Project Management" 2002, Pearson Education Asia.
3. Ramesh Gopalaswamy, "Managing Global Software Projects", 2003, Tata McGraw-Hill

Paper Code: MEIT – 606	L	T	C
Subject: Computer Graphics & Animation	4	0	4

INSTRUCTIONS TO PAPER SETTERS: Maximum Marks : 60

Question No. 1 should be compulsory and cover the entire syllabus. This question should have objective or short answer type questions. It should be of 20 marks.

Apart from Question No. 1, rest of the paper shall consist of four units as per the syllabus. Every unit should have two questions. However, student may be asked to attempt only 1 question from each unit. Each question should be 10 marks

UNIT I

Raster graphics, Vector graphics, Basic raster graphics algorithms for drawing 2 D Primitives line, circles, ellipses, arcs etc., Anti-aliasing and its techniques. Clipping: clipping points, line and area clipping. & polygon filling algorithm.

UNIT II

Geometric Transformation: 2D transformations like translation, rotation, scaling, reflection and shearing etc., composite transformation and homogeneous coordinate system in transformation. 3D transformations, window to viewport transformations, projection: Types of projection methods, perspective projection with different location of centre of projection.

Graphics Hardware: Hardcopy & display techniques, Input devices, image scanners etc.,

UNIT III

Modeling: parametric and non-parametric. Curves and its blending methods.Uniform, non-uniform curvs, rational and non-rational curves, NURBS, Surfaces and its generation techniques. Hardware and software color models and its applications in different fields.

Wireframe, surface and solid modeling, Polygon meshes and its need of approximation , Shading Techniques : Lambert, Gouraud and Phong methods. Illumination models: Global and local illumination model, Transparency, Shadows, Visible surface determination techniques for visible determination like Z-buffer algorithm, A buffer algorithm, scan line algorithm, area subdivision algorithm for implementation of visible surface detection. Visible surfaces ray-tracing, recursive ray tracing, radio-city methods.

UNIT IV

Animation: introduction to 2D and 3D animation. Dynamics and role of dynamics in animation. Different 3D animation techniques like key frame animation, path animation, reactive animation and Forward and Inverse Kinematics Skelton animation.

Text Books:

1. Foley et. al., “Computer Graphics Principles & practice”, Addison Wesley Ltd., 2003.

Reference Books:

1. R.H. Bartels, J.C. Beatty and B.A. Barsky, “An Introduction to Splines for use in Computer Graphics and Geometric Modeling”, Morgan Kaufmann Publishers Inc., 1987.
2. D. Hearn and P. Baker, “Computer Graphics”, Prentice Hall, 2003.
3. W. Newman and R. Sproul, “Principles of Interactive Computer Graphics, McGraw-Hill, 1973.
4. R. Plastock and G. Kalley, “Theory and Problems of Computer Graphics”, Schaum’s Series, McGraw Hill, 2001.
5. F.P. Preparata and M.I. Shamos, “Computational Geometry: An Introduction”, Springer-Verlag New York Inc., 1985.
6. D. Rogers and J. Adams, “Mathematical Elements for Computer Graphics”, MacGraw-Hill International Edition, 1989.
7. David F. Rogers, “Procedural Elements for Computer Graphics”, McGraw Hill Book Company, 1985.
8. Alan Watt and Mark Watt, “Advanced Animation and Rendering Techniques”, Addison-Wesley, 2002

Paper Code: MEIT – 651
Subject: Lab 1

This Lab Course will be based on ADS.

Paper Code: MEIT – 653
Subject: Lab 2

This Lab Course will be based on Advanced Software Engineering

Paper Code: MEIT – 655
Subject: Lab 3

This Lab Course will be based on Advanced DCC

Paper Code: MEIT – 657* (NUES)
Subject: Term Paper I

Paper Code: MEIT – 652
Subject: Lab 4

This Lab Course will be based on Advanced Mobile Computing.

40 marks: internal evaluation **60 marks: external evaluation**

Paper Code: MEIT – 654
Subject: Lab 5

This Lab Course will be based on Advanced Software Project Management.

40 marks: internal evaluation **60 marks: external evaluation**

Paper Code: MEIT – 656
Subject: Lab 6
This Lab Course will be based on Computer Graphics & Animation.

40 marks: internal evaluation **60 marks: external evaluation**

Paper Code: MEIT – 658* (NUES)
Subject: Term Paper II
100 marks: internal evaluation

Paper Code: MEIT – 703	L	T	C
Subject: Information Theory & Coding	4	0	4

INSTRUCTIONS TO PAPER SETTERS: Maximum Marks : 60

Question No. 1 should be compulsory and cover the entire syllabus. This question should have objective or short answer type questions. It should be of 20 marks.

Apart from Question No. 1, rest of the paper shall consist of four units as per the syllabus. Every unit should have two questions. However, student may be asked to attempt only 1 question from each unit. Each question should be 10 marks

UNIT I

Introduction: Uncertainty and information, measure of information, Entropy, properties of entropy, information rate, entropy of binary memory less source, extension of DMS, information measure for continuous random variables, sources with finite memory, Markov sources,

Source coding: source coding theorem, prefix coding, kraft McMillan inequality, Huffman coding, Shannon-Fano coding, Arithmetic coding, Lempel-Ziv algorithm, run length encoding and PCX format

UNIT II

Channel models: channel matrix, loss less, noise less, deterministic, binary symmetric channels, conditional and joint entropy, mutual information, properties of mutual information, channel capacity, channel coding theorem, channel coding theorem to BSC, Channel capacity theorem, Shannon limit.

UNIT III

Channel coding: Linear block codes, generator and parity check matrix, perfect codes, Hamming codes, repetition codes, decoding of linear block codes, syndrome decoding, Properties of syndrome, minimum distance consideration, error detection & correction capabilities

Cyclic codes, polynomial, division algorithm, matrix description, encoder for cyclic code, syndrome calculator, cyclic redundancy check codes, Maximum length codes, Golay codes, BCH codes, Reed Solomon codes.

UNIT IV

Convolution codes, convolution code encoder, code tree, trellis and state diagram, impulse response and polynomial description of convolution codes, maximum likelihood decoding, Viterbi algorithm, distance properties of convolution code, sequential decoding, turbo codes, turbo decoding. Trellis coded modulation, Secure coding, Introduction to cryptography

Text Books:

1. S. Haykin, Digital Communication, John Wiley & sons. 2002.
2. Ranjan Bose, Information theory, coding and Cryptography, MaGraw-hill, 2nd ed.

Reference Books:

1. T M Gover, J M Thomos, Elements of Information Theory, Wiley, 1991
2. J. H. van Lint, Introduction to coding theory, Springer, 3rd ed
3. Gravano S., Introduction to error control codes, Oxford university press, 2011
4. H. P. Hsu, Analog & Digital Communications, Schaum's outlines, The McGraw hill companies, 2nd ed.

Paper Code: MEIT – 705	L	T	C
Subject: Reliability Engineering	4	0	4

INSTRUCTIONS TO PAPER SETTERS: Maximum Marks : 60

Question No. 1 should be compulsory and cover the entire syllabus. This question should have objective or short answer type questions. It should be of 20 marks.

Apart from Question No. 1, rest of the paper shall consist of four units as per the syllabus. Every unit should have two questions. However, student may be asked to attempt only 1 question from each unit. Each question should be 10 marks

UNIT I

Concepts of Reliability:

Failure of systems and its modes: Measure of Reliability, Reliability Function, Hazard Rate MTBF and their interrelations.

Reliability Data Analysis:

Data Sources, Data Collection, Use of Reliability data, Reliability Analysis, Performance Parameters, Calculation of Failure Rate, Application of Weibull distribution.

UNIT II

System Reliability and Modeling:

Series Systems, Parallel systems, Series Parallel systems, Time dependence, Reliability determination, Standby systems, r out of n configurations, Methods of tie set and cut sets of or reliability evaluation, Simulation and Reliability Prediction, Monte Carlo Method.

UNIT III

Maintainability and Availability:

Maintainability and its equation, Factors affecting maintainability, Measures of maintainability, Mean Down Time, Availability intrinsic availability equipment availability & Mission availability, Replacement Process and Policies.

UNIT IV

Life Testing of Equipment:

Nondestructive tests, Destruction tests and their mathematic modeling, Quality and Reliability, Measurement & Prediction of Human Reliability, Reliability and safety, Safety margins in critical devices, Case studies.

Value Engineering:

Techniques in value Engineering, Structures of Engineering. Reliability Management.

Text Books:

1. K.K.Aggarwal, “Reliability Engineering”, Springer, 1993
2. A.K.Govil, “Reliability Engineering”, Tata McGraw Hill, 1993

Reference Books:

1. L.S.Srinath, “Reliability Engineering”, East West Press, 2005

Paper Code: MEIT – 751
Subject: Lab 7

This Lab Course will be based on Advanced Data Warehousing & Data Mining.
40 marks: internal evaluation **60 marks: external evaluation**

Paper Code: MEIT – 753
Subject: Lab 8
This Lab Course will be based on Information Theory & Coding.
40 marks: internal evaluation **60 marks: external evaluation**

Paper Code: MEIT – 755 * (NUES)
Subject: Term Paper III
100 marks: internal evaluation

Paper Code: MEIT – 757
Subject: Minor Project
40 marks: internal evaluation **60 marks: external evaluation**

Paper code: MEIS-601 **L T P**
Paper: Advance Computer Network **4 0 0**

INSTRUCTIONS TO PAPER SETTERS: **Maximum Marks : 60**
Question No. 1 should be compulsory and cover the entire syllabus. This question should have objective or short answer type questions. It should be of 20 marks.
Apart from Question No. 1, rest of the paper shall consist of four units as per the syllabus. Every unit should have two questions. However, student may be asked to attempt only 1 question from each unit. Each question should be 10 marks

UNIT I
Introduction to Network models-ISO-OSI, SNA, Appletalk and TCP/IP models. Review of Physical layer and Data link layers, Review of LAN (IEEE 802.3, 802.5, 802.11b/a/g, FDDI) and WAN (Frame Relay, ATM, ISDN) standards.

UNIT II
Network layer
ARP, RARP, Internet architecture and addressing, internetworking, IPv4, overview of IPv6, ICMP, Routing Protocols- RIP, OSPF, BGP, IP over ATM.

Transport layer
Design issues, Connection management, Transmission Control Protocol (TCP), User Datagram Protocol (UDP), Finite state machine model.

UNIT III
Application layer
WWW, DNS, e-mail, SNMP, RMON
Network Security: Cryptography, Firewalls, Secure Socket Layer (SSL) and Virtual Private Networks (VPN).

UNIT IV
Case study
Study of various network simulators, Network performance analysis using NS2

Text Books/ References:
1. Behrouz A. Forouzan, "TCP/IP Protocol Suit", TMH, 2000.
2. Tananbaum A. S., "Computer Networks", 3rd Ed., PHI, 1999.
4. Black U, "Computer Networks-Protocols, Standards and Interfaces", PHI, 1996.
5. Stallings W., "Data and Computer Communications", 6th Ed., PHI, 2002.
6 Stallings W., "SNMP, SNMPv2, SNMPv3, RMON 1 & 2", 3rd Ed., Addison Wesley, 1999.
7. Laurra Chappell (Ed), "Introduction to Cisco Router Configuration", Techmedia, 1999.

Paper code: MEIS-605 **L T P**
Paper: Cryptography foundation and its Applications **4 0 0**

INSTRUCTIONS TO PAPER SETTERS: **Maximum Marks : 60**
Question No. 1 should be compulsory and cover the entire syllabus. This question should have objective or short answer type questions. It should be of 20 marks.
Apart from Question No. 1, rest of the paper shall consist of four units as per the syllabus. Every unit should have two questions. However, student may be asked to attempt only 1 question from each unit. Each question should be 10 marks

UNIT-I

Theory, foundations, and applications of modern cryptography. Steganography, One-way functions; pseudo-randomness and random number generators

UNIT-II

Encryption; authentication; symmetric cryptography, asymmetric cryptography: public-key cryptosystems; digital signatures, message authentication codes

UNIT-III

Remote user authentication, notions of security; zero knowledge/ interactive proofs, multi-party cryptographic protocols, key exchange and applications,

UNIT-IV

Cryptanalysis of cryptographic primitives and protocols, such as by side-channel attacks, differential cryptanalysis, or replay attacks; and cryptanalytic techniques on deployed systems etc.

Text Books:

1. Kahate, Atul, "Cryptography and Network Security." Tata McGraw Hill, 2007.
2. Delfs, Hans, "Introduction to cryptography." Springer, 2004.

Reference Books:

1. Cryptography and Network Security by Stalling, PHI
2. Cryptography by Behrouz A. Forouzan,TMH
3. Cryptography & security services, Mechanism & application by Mogollon, Manuel, Cyber tech. Pub.
4. Cryptography and hardware security By Stalling, W PHI

Paper code: MEIS-609 **L T P**

Subject: : Decision Support Systems and Methods **4 0 0**

INSTRUCTIONS TO PAPER SETTERS: **Maximum Marks : 60**
Question No. 1 should be compulsory and cover the entire syllabus. This question should have objective or short answer type questions. It should be of 20 marks.
Apart from Question No. 1, rest of the paper shall consist of four units as per the syllabus. Every unit should have two questions. However, student may be asked to attempt only 1 question from each unit. Each question should be 10 marks

Unit-I

Introduction to decision support systems (DSS), decisions and decision makers, decisions in the organization, modeling decisions processes.

Unit-II

Group decision support systems and groupware technologies, DSS architecture, hardware and operating system platforms

Unit-III

Expert systems and artificial intelligence, Introduction to data warehousing.

Unit-IV

Introduction to Data Mining, DSS software tools, building and implementing DSS.

Text Books:

1. Adelman, L. Evaluating Decision Support and Expert Systems. New York, NY: John Wiley & Sons, 1992.
2. Alter, S. Decision Support Systems: Current Practice and Continuing Challenges. Reading, Mass.: Addison-Wesley Pub., 1980.

Reference Books:

1. Bigdoli, H. Decision Support Systems: Principles and Practices. St.Paul, MN: West Publishing, 1989
2. Mallach, E.G., Decision Support and Data Warehouse Systems", Tata McGraw Hill, 2006
3. Markas, G.M., "Decision Support Systems in the 21st Century", Pearson, 2005.
4. Burstein, Frada; Holsapple, Clyde W., Handbook on Decision Support System, Springer, 2008

Paper code: MEIS-611 **L T P**
Paper: Internet Technologies & Applications **4 0 0**

INSTRUCTIONS TO PAPER SETTERS: Maximum Marks : 60
Question No. 1 should be compulsory and cover the entire syllabus. This question should have objective or short answer type questions. It should be of 20 marks.
Apart from Question No. 1, rest of the paper shall consist of four units as per the syllabus. Every unit should have two questions. However, student may be asked to attempt only 1 question from each unit. Each question should be 10 marks

UNIT-I

Web 2.0: search, content networks, user-generated content, blogging, social networking, social media, tagging, social bookmarking, rich Internet applications, web services, location-based services, Web 2.0 monetization and business models, Evaluation of web applications, future of the Web.

UNIT-II

Extensible Hypertext Markup Language (XHTML): XHTML syntax, headings, linking, images, special characters and horizontal rules, lists, tables, forms, internal linking, meta elements.

UNIT-III

Cascading Style Sheets (CSS): separation of content and presentation, inline styles, embedded style sheets, conflMEing styles, kinking external style sheets, positioning elements, backgrounds, element dimensions, box model and text flow, media types, building a CSS drop-down menu, user style sheets.

UNIT-IV

JavaScript: client side scripting, control statements, functions, arrays, objects, events.
Document object model: objects and collections. Extensible Mark up Language (XML) and RSS: Advantages and applications, structuring data, XML namespaces, Document Type Definitions (DTDs), XML vocabularies, RSS.

Text Books:

1. Deitel H.M. and P. J. Deitel, Internet & World Wide Web. How to Program, 4/e, Prentice Hall, ISBN 0131752421, 2008
2. Freire,M., "Internet Technology & Applications" ,CRC Press-2008

Reference Book:

1. Chris Bates, "Web Programing Building Internet Applications", 2nd Edition, WILEY, Dreamtech

Paper code: MEIS-613 **L T P**
Paper: Game theory and its applications **4 0 0**

INSTRUCTIONS TO PAPER SETTERS: **Maximum Marks : 60**
Question No. 1 should be compulsory and cover the entire syllabus. This question should have objective or short answer type questions. It should be of 20 marks.
Apart from Question No. 1, rest of the paper shall consist of four units as per the syllabus. Every unit should have two questions. However, student may be asked to attempt only 1 question from each unit. Each question should be 10 marks

UNIT-I

Simple Decision Models: Optimization, making decisions, Modeling Rational Behavior, Modeling Natural Selection, Optimal Behavior. Simple Decision Process: Decision Trees, Strategic Behavior, Randomizing Strategies, Optimal Strategies. Markov

UNIT-II

Markov Decision Process, Static Games: Interactive decision Problems, Describing static Games, Solving Games using Dominance, Nash Equilibria, Existence of Nash Equilibria, Walsarian and other equilibria, Analysis of optimal strategies

UNIT-III

Finite Dynamic Games: Game trees, Information sets, Behavior Strategies, Sub Game perfection, Nash Game Equilibrium Refinements

UNIT-IV

Games with continuous strategies Sets: Infinite strategy sets, The Cournot Duopoly Model. Infinite Dynamic Games: Repeated Games, Iterated Prisoners Dilemma, Folk Theorems

Text Books:

1) James N. Webb, "Game Theory: Decision, Interaction and Evolution", Springer International Edition-2007, London
2) Andrew M. Colman, "Game theory and its applications " , Psychology Press; 1995

Reference Books:

1. Eric Rasmusen, "Games and information: an introduction to game theory ,"Wiley-Blackwell 2001
2. William F. Lucas, "Game theory and its applications", American Mathematical Society - – 1981
3. Elliott Mendelson, "Introducing game theory and its applications", CRC Press - 2004

Paper code: MEIS-615 **L T P**
Paper: Network Security and Applications **4 0 0**

INSTRUCTIONS TO PAPER SETTERS: Maximum Marks : 60
Question No. 1 should be compulsory and cover the entire syllabus. This question should have objective or short answer type questions. It should be of 20 marks.
Apart from Question No. 1, rest of the paper shall consist of four units as per the syllabus. Every unit should have two questions. However, student may be asked to attempt only 1 question from each unit. Each question should be 10 marks

Unit-I

Fundamentals and Building Security: Overview of networking security, ITU's Recommendation, X.800, OSI model, Symmetric cryptography, Public-key cryptography, Model of network security process, Defining security zones, Secure Routing, Secure LAN switching.

Unit-II

Network Security Applications: Authentication applications, E-mail security, IP security, Web security, Network Management security, System Security, Device security, Intruders, Malicious software.

Unit-III

Optical Network Security: Firewalls, VPN, IEEE 802.1x protocol, NAT and security, Opto-electronic networks, Components: fibers, amplifiers, Couplers, Isolators & Circulators, Switches, Wavelength selective switches (WSSs).

Unit-IV

QoS, Security architectures, Physical security, Vulnerabilities and attacks, Service disruption (SD), Tapping, Jamming, Reaction to attacks,

Text Books:

1) William Stallings. Network Security Essentials (2nd edition). Prentice Hall. 2003. (ISBN: 0130351288)
2) Saadat Malik, Saadat Malik. Network Security Principles and Practices (CCIE Professional Development). Pearson Education. 2002. (ISBN: 1587050250)

Reference Books:
1) Sivealingam, Kirshna, M, "Emerging Optical Network Technologies", Springer -2004
2) Rama Sawamai, Rajeev, "Optical Networks" , Elesvier -2006
3) Senior J., optical fiber communications, principles & practice, PHI.
4) William B. Jones jr., Introduction to optical fiber communication systems, Holt, Rinehart and Winston, Inc.

Paper code: MEIS-651 **L T P**

Paper: Lab –I **0 0 4**

40 marks: internal evaluation	60 marks: external evaluation

Lab will be according to the course of Advance Computer Network

Paper code: MEIS-653 **L T P**

Paper: Lab –II **0 0 4**

40 marks: internal evaluation	60 marks: external evaluation

Lab will be according to the course of Introduction to Computer Security.

Paper Code MEIS-655 **L T P**
Paper: Lab –III **0 0 4**

40 marks: internal evaluation	60 marks: external evaluation

Lab will be according to the course of Advance Database

Paper code: MEIS-657* **Total credit**
Paper: Term paper-I **2**

100 marks: internal evaluation

Paper Code: MEIS – 604	L	T	C
Subject: Security Testing	4	0	4

INSTRUCTIONS TO PAPER SETTERS: Maximum Marks : 60
Question No. 1 should be compulsory and cover the entire syllabus. This question should have objective or short answer type questions. It should be of 20 marks.
Apart from Question No. 1, rest of the paper shall consist of four units as per the syllabus. Every unit should have two questions. However, student may be asked to attempt only 1 question from each unit. Each question should be 10 marks

UNIT I

Information:

Security testing versus Traditional software testing, SQL Injection attack pattern, The paradigm shift of security testing, High level Security testing Strategies,
The fault Injection model of testing, Prioritizing your work, using tools.

How vulnerabilities get into all software:

Design versus implementation vulnerabilities, common secure design issues, poor use of cryptography, tracking users and their permissions, flawed input validation, weak structural security, programming language implementation issues, platform implementation issues, generic application security implementation issues , SQL Injection, Problems during the development process,

UNIT II

Secure software development lifecycle: Fitting security testing into software development lifecycle, security requirements, architectural and design reviews, secure coding guidelines, Black/gray/white box Testing, developing applications securely, determining exploitability.
Risk leased Security Testing: Information Gathering, Runtime Inspection, Identifying threat paths, Ranking the risks associated with vulnerability.

UNIT III

Analysis:White, grey and Black Box testing: White box testing, Black box testing, gray box testing, Fuzzers, sniffers, Debuggers, hardware, network attacks.
Generic Network Fault Injection: Network Port Discovery, Port scanning, Proxies , Injector , Building the fault injection data set.

UNIT IV

Web application:

Targeting the application, brute- force session and Resource ID's, Cookie gathering, Cross-site scripting.**Web application:** By passing Authorization, SQL injection, Database scheme Discovery, Executing commands on the SQL server, Hidden files in HTTP.

Text Books:

1. Elfriede Dustin, Luke Nelson, Chris Wysopal, "The art of Software security Testing", Addison- Wesley Professional, 2006

Reference Books:

1. Ben Walther ,Paceo Hope, " Web Security Testing Cookbook: Systematic technique to find problems fast" , O'Reilly Media.
2. Wolf Halton, Alfred Basta, " Computer Security and Penetration testing", Delmer publisher, 2007

Paper Code: MEIS-606 **L T C**
Paper: Information Security & Risk Management **4 0 4**

INSTRUCTIONS TO PAPER SETTERS: Maximum Marks : 60
1. Question No. 1 should be compulsory and cover the entire syllabus and will be of 20 marks.
2. Apart from Question No. 1, rest of the paper shall consist of four units as per the syllabus. Every unit should have two questions. However, student may be asked to attempt only 1 question from each unit. Each question should be 10 marks

UNIT I
Risk Management : Definition, Overview of Risk management, Risk identification, Threat identification, Risk assessment, Risk determination, Risk control strategies, Selecting a risk control strategy, cost benefit analysis.

UNIT II
Development of concepts required for risk-based planning and risk management of computer and system, Incident response planning, Disaster recovery planning, Crisis management, Business continuity planning, model for a consolidated contingency plan.

UNIT III
Planning for security: Information security policy, Standards and practices, Enterprise information security policy(EISP), Issue- specific security policy(ISSP), System-specific policy(SSP), ACL policies, Rule policies, Policy management Visa international security model, Hybrid framework for a blueprint of an Information security system, Design of security architecture.

UNIT IV
Technological hazards, and terrorist; implications for emergency response, vulnerability of critical infrastructures.

Text books:

1. Thomas , R Peltier, "Information risk analysis" , CRC Press-2005
2. Michael E. Whitman , "Principles of information Security", Cengage Learning.

Reference Books:

1. Nemati Hamid, " Information Security and ethics", IGI Global.
2. Bidgoli , "Handbook of information Security ", John willy& sons.

Paper Code: MEIS-608 **L T C**
Paper: Technical Foundations for E - Commerce **4 0 4**

INSTRUCTIONS TO PAPER SETTERS: Maximum Marks : 60
1. Question No. 1 should be compulsory and cover the entire syllabus and will be of 20 marks.
2. Apart from Question No. 1, rest of the paper shall consist of four units as per the syllabus. Every unit should have two questions. However, student may be asked to attempt only 1 question from each unit. Each question should be 10 marks

UNIT I
The Dot-com Debacle, Technology: The Catalyst, The Internet and the World Wide Web, Hypertext, The Value Chain, Physical and Logical Data, The Supply Chain,Intermediaries, A Bigger Picture, Technology as a Source of Competitive Advantage,Business: First Movers and First Followers, E-Commerce Categories, Numbers: The E-Commerce Pie,A Plan of Attack, The Infrastructure,The Business of E-Commerce, Growing Pains, The Future of E-Commerce.

UNIT II
The Underlying Technology: Data Communication, Networks. Data Communication Protocols, Internetworking, Client/Server Networks, The Internet's Infrastructure: Internet Service Provider, Regional Internet Service Providers, TCP/IP, the Internet's Protocols, Packet Switching, Internet Addressing, Domain Names Technology: Domain Name Registration, The IP Address, The Domain Name System, Ports, The Media Access Control Address, Address Translation. Business: Content, Connectivity, and Delivery, The E-Commerce Infrastructure.Search Engines, Browsers and Web Servers.The Uniform Resource Locator (URL), Hypertext Markup Language (HTML), Client-Side Interactivity, The Server Side, Firewalls, Web Applications, Maintaining State, Cookies, Personalized Web Pages, Security, A More Complete View of the E-Commerce Infrastructure.

UNIT III
The E-Commerce Business Environment, Value Chain and Supply Chain Integration, E-Commerce Intermediaries, Evolving E-Commerce Business Strategies. Consumer focused E-commerce: Consumer Focused (B2C) Revenue Sources, Business: eBay, Other Forms of E-Commerce, Intra Business E-commerce: Business: my Socrates, Business-to-Business E-commerce: B2B E-commerce Software and Services. E-Procurement, Customer Relationship Management, Supply Chain Management, Enterprise Resource Planning (ERP).

UNIT IV
Cybercrime and Cyber warfare, Security, Privacy and other social issues, Tiered Internet Services, E-Books, Web Services, Biometrics Authentication.

Text Books/References:

1. William S. Davis, John Benamati, E-Commerce Basics: Technology Foundations and E-Business Applications, Addison-Wesley.
2. Joseph, P.T., "E Commerce –An Indian Perspective", Prentice-Hall Of India Pvt. Limited.

Paper code: MEIS - 612	L	T	C
Intrusion Detection and Information Warfare	**4**	**0**	**4**

INSTRUCTIONS TO PAPER SETTERS: Maximum Marks : 60
1. Question No. 1 should be compulsory and cover the entire syllabus and will be of 20 marks.
2. Apart from Question No. 1, rest of the paper shall consist of four units as per the syllabus. Every unit should have two questions. However, student may be asked to attempt only 1 question from each unit. Each question should be 10 marks

UNIT 1
Introduction to information warfare (IW), taxonomies of IW, cyberterrorism and information security, wireless information warfare, methods of information warfare: google bombing, creation of viruses and hactivism.

UNIT II
Intrusion detection: basic intrusion detection concepts, common intrusion detection methodologies; signature based, anomaly based, stateful protocol analysis.

UNIT III
Types of attacks: network based attack, host based attack. Denial of service attack, distributed denial of service attack, buffer overflow attack, sniffing, session hijacking, password attack, Trojan horses, viruses, worms etc.

UNIT IV
Countermeasures of information warfare:authentication, encryption, auditing, monitoring**,** various types of firewalls, different intrusion detection and prevention systems (IDPS); host based IDPS, network based IDPS, wireless IDPS. Limitations of these countermeasures of information warfare.

Text Books:
1. Handbook of Information Security, Volume 2 by HosseinBidgoli, Wiley.
2. Handbook of Information Security, Volume 3 by HosseinBidgoli, Wiley

Reference Books:

1. Cybersecurity operations handbook by Rittinghouse&Hencock, Elsevier digital press
2. Network Security and Cryptography by Bernard Menezes, Cengage Learning.
3. Cryptography and network security, by B.A. Forouzan, TMH
4. Network security essentials, by William Stallings, Pearson Education

Paper code: MEIS - 618	L	T	C
Sub.: Real Time Systems	**4**	**0**	**4**

INSTRUCTIONS TO PAPER SETTERS: Maximum Marks : 60
1. Question No. 1 should be compulsory and cover the entire syllabus and will be of 20 marks.
2. Apart from Question No. 1, rest of the paper shall consist of four units as per the syllabus. Every unit should have two questions. However, student may be asked to attempt only 1 question from each unit. Each question should be 10 marks

UNIT I

Definitions of real time systems, Typical real time applications, Hard versus soft real time systems, a reference model of Real-Time systems, commonly used approaches for real time scheduling. Real time system life cycle, structured design approaches including event-based, process-based and graph based theoretical model, Real-Time programming. Ada as a real time programming language.

UNIT II

Real time operating systems, overview, time services and scheduling mechanisms, other basic operating system functions, capabilities of commercial real time operating systems.

UNIT III

Real time data bases vs general-purpose databases, main memory databases, transactions and concurrency control issues, disk scheduling algorithms, predictability, serialization, consistency, and databases for hard real time systems.

UNIT IV

Fault tolerance techniques, definitions, fault types, fault detection, fault and error containment, redundancy, integrated failure handling.

Text Books / References:

1. Jane W.S.Liu, "Real Time Systems", Pearson Education Asia –2001.
2. Shem Tov Levi & Ashok K. Agrawala, "Real Time System Design", McGraw Hill Publishing Company –1990.
3. C.M. Krishna and Kang G.Shin, "Real Time Systems", McGraw Hill Companies Inc., 1997.

Paper Code: MEIS-701 **L T C**
Paper: Mobile and Wireless Network Security **4 0 4**

INSTRUCTIONS TO PAPER SETTERS: Maximum Marks : 60
1. Question No. 1 should be compulsory and cover the entire syllabus and will be of 20 marks.
2. Apart from Question No. 1, rest of the paper shall consist of four units as per the syllabus. Every unit should have two questions. However, student may be asked to attempt only 1 question from each unit. Each question should be 10 marks

UNIT I
Fundamental of Wireless Communication Technology, Wireless Network, Wireless Characteristics, Channels, Propagation. Types of wireless systems and their parameters, Satellite System, Cellular System, GSM, Wireless LAN, PAN, MAN and WANs, IEEE 802.11 Standards.

UNIT II
Infrastructure and Infrastructureless Network, Mobile Ad hoc Network (MANET), Wireless Sensor Network, Properties of MANET, MANET Applications, MAC (Hidden and Exposed terminal problems), MAC Protocol for MANET, Routing and various routing algorithms.

UNIT III
Security Definition, Services, Mechanisms, Spread spectrum, Frequency hopping, Encryption, Integrity check-sums, Assessment issues specifically related to wireless, Jamming, Interception, Spoofing, Fraud, Satellite Jamming, Theft of service – entertainment services on downlink, Hidden signals – theft of service – uplink, Monitoring long distance communications, Low Probability of Intercept (LPI), Circular Error Probability (CEP), Confidentiality of information, Traffic analysis, Cellular Cloning of AMPs, Privacy issues in E911/ Geolocation WLAN, WEP issues, Managing a wireless LAN interconnected to wired LAN.

UNIT IV
Security in WLAN, Security in WMAX, Security in Ad Hoc Networks, Distributed Systems Security, Key Management, Secure Routing, Cooperation in MANETs, Security of Wireless Sensor Networks, Privacy and anonymity in MANETs, Intrusion Detection Systems in MANETs, Protocol Stack, Evaluation of Security Architectures for Mobile Broadband Access.

Text books:
1. Ad Hoc Wireless Networks, Architecture and Protocols by C. Siva Ram Murthy
2. Wireless security handbook by Aron E. Earle.

Reference Book:
1. Handbook of research on wireless security by Yan zhangjunzhengmiao ma.

Paper Code: MEIS-705 **L T C**
Paper: Biometric Security **4 0 4**

INSTRUCTIONS TO PAPER SETTERS: Maximum Marks : 60
1. Question No. 1 should be compulsory and cover the entire syllabus and will be of 20 marks.
2. Apart from Question No. 1, rest of the paper shall consist of four units as per the syllabus. Every unit should have two questions. However, student may be asked to attempt only 1 question from each unit. Each question should be 10 marks

UNIT I
Over view of bio metrics - Benefits of biometric security – Verification and identification and enrollment – Basic working of biometric matching – Accuracy – False match rate – False non-match rate – Failure to enroll rate – Derived metrics – Layered biometric solutions. Biometric system security

UNIT II
Finger scan – Features – Components – Operation (Steps) – Competing finger Scan technologies – Strength and weakness. Types of algorithms used for interpretation. Facial Scan - Features – Components – Operation (Steps) – Competing facial Scan technologies – Strength and weakness. Iris Scan - Features – Components – Operation (Steps) – Competing iris Scan technologies – Strength and weakness. Voice Scan - Features – Components – Operation (Steps) – Competing voice Scan (facial) technologies – Strength and weakness.

Unit III
Authentication and Biometrics: Secure Authentication Protocols, Access Control Security Services, Authentication Methods, Authentication Protocols, Matching Biometric Samples, Verification by humans. . Matching: Two kinds of errors, Score distribution, Estimating Errors from Data, Error Rate of Match Engines, Definition of FAR and FRR. Correlation based biometric filters, Basic theory of Correlation filters

UNIT IV
Other physiological biometrics – Hand scan – Retina scan – AFIS (Automatic Finger Print Identification Systems) – Behavioral Biometrics – Signature scan- keystroke scan. Hand Geometry, Signature Verification, Positive and Negative of Biometrics
Biometrics Application – Biometric Solution Matrix – Bio privacy – Comparison of privacy factor in different biometrics technologies – Designing privacy sympathetic biometric systems. Biometric standards – (BioAPI , BAPI) – Biometric middleware Biometrics for Network Security. Statistical measures of Biometrics. Biometric Transactions.

Text Books:
1. Biometrics – Identity Verification in a Networked World – Samir Nanavati, Michael Thieme, Raj Nanavati, WILEY- Dream Tech
2. Biometrics for Network Security- Paul Reid, Pearson Education.

Reference Books:
1. Biometrics- The Ultimate Reference- John D. Woodward, Jr. Wiley Dreamtech.

Paper Code: MEIS - 707	**L**	**T**	**C**
Paper: Strategic Computing and Communication Technology	**4**	**0**	**4**

INSTRUCTIONS TO PAPER SETTERS: Maximum Marks : 60

1. Question No. 1 should be compulsory and cover the entire syllabus and will be of 20 marks.

2. Apart from Question No. 1, rest of the paper shall consist of four units as per the syllabus. Every unit should have two questions. However, student may be asked to attempt only 1 question from each unit. Each question should be 10 marks

UNIT I

(Competitive strategies for the information economy, network economics) Telecommunications and networking as applied to enterprises in the commercial and public sector.

UNIT II

A survey of the technologies and applications of telecommunications systems with emphasis on LANs and Internet technologies.

UNIT III

Selection of technologies and configurations necessary to support business applications.Competitive, economic, and political factors that influence technology innovation in public and private organizations, domestically and internationally.

UNIT IV

Management of research and development: project selection, resource allocation, technology planning, management of development projects Quality, manufacturing, and intellectual property issues.

Text Books:

1. Alex Roland, Philip Shiman ,"Strategiccomputing", 1983
2. Mark P. Haselkorn, "Strategic management of information and communication technology" , New York: Pantheon Books IEEE-2000

Paper Code: MEIS - 709	**L**	**T**	**C**
Paper: Quantum Information Processing	4	0	4

INSTRUCTIONS TO PAPER SETTERS: Maximum Marks : 60

1. Question No. 1 should be compulsory and cover the entire syllabus and will be of 20 marks.

2. Apart from Question No. 1, rest of the paper shall consist of four units as per the syllabus. Every unit should have two questions. However, student may be asked to attempt only 1 question from each unit. Each question should be 10 marks

UNIT I

Basic principles of quantum mechanics, quantum gates and circuits, classical computation vs. quantum computation, quantum computing models

UNIT II

Quantum algorithms: The prime factorization, Simon, and Grover algorithm; Classical and Quantum information theory: Entropy, information; communication channels, distinguishing two orthogonal (quantum) states, correlations between two systems, no cloning - of nonorthogonal states, density matrices and mixed states, interaction with the environment, the most famous cat!

UNIT III

Quantum cryptography: Quantum Key Distribution, BB84 protocol, Security of QKD, Implementation of QKD via photons; Breaking RSA system

UNIT IV

Quantum teleportation, Quantum hardware: Ion traps, nuclear magnetic resonance, optical cavities; Solid state implementations: Josephson junctions, quantum dots, circuit design; Quantum error correction; Fault tolerance

Text Books:

1. Dimitris G. Angelakis, "Quantuminformationprocessing"
2. Ivan S. Oliveira, Tito J. Bonagamba, "NMR quantum information processing"

Reference Books:

1. Peter Lambropoulos, David Petrosyan, "Fundamentals of quantum optics and quantum information"
2. AntonellaKarlson, "Quantum information processing and communication in Europe"
3. Gregg Jaeger, "Quantum information: an overview"

Paper Code: MEIS - 711 **L T C**

Paper: Digital Defense: Issues in Security, and Critical Infrastructure Protection 4 0 4

INSTRUCTIONS TO PAPER SETTERS: Maximum Marks : 60

1. Question No. 1 should be compulsory and cover the entire syllabus and will be of 20 marks.

2. Apart from Question No. 1, rest of the paper shall consist of four units as per the syllabus. Every unit should have two questions. However, student may be asked to attempt only 1 question from each unit. Each question should be 10 marks

UNIT I

Threats of viruses, worms, malicious codes etc., models of propagation and their epidemic spread; Methods of worm detection- Static analysis, Dynamic analysis; Limitation and Benefit of detection scheme; Future computer worms- super worm (spyBot.Keg, Mytob) .

UNIT II

Dos attacks and defense against these attacks; History and trends in DDOS attacks, DDOS tools, DDOS defense principles, DDOS defense methods; Classification of hackers, Defense against hacking- honey pots, honey nets.

UNIT III

Architecture for robust and flexible Internet services- Ninja architecture, State event- driven architecture (SEDA), CORBA, DCOM; Active networks-DAN architecture, Security issues with active networks

UNIT IV

Introduction to critical infrastructure protection (CIP)- MBVA approach, CIP issues and analysis tools, The CIKR Sectors & Governance, Design of scalable test beds for simulation of attacks against critical infrastructures- DETERS, EMULAB, Twtestbed

Text Books:

1. Matt Bishop ,"Computer Security art and science ", Second Edition, Pearson Education
2. Network security : A Hacker's Perspective Fadia,Ankit MacMillan

Reference Books:

1. Basic of network security , firewall by Niit , PHI
2. Cryptography and Network Security by Stalling, PHI
3. Lewis, T.G. (2006). *Critical Infrastructure Protection in Homeland Security: Defending a Networked Nation*. John Wiley & Sons, Inc.

Paper Code: MEIS 713	**L**	**T**	**C**
Paper: Cyber laws	4	0	4

INSTRUCTIONS TO PAPER SETTERS: Maximum Marks : 60

1. Question No. 1 should be compulsory and cover the entire syllabus and will be of 20 marks.

2. Apart from Question No. 1, rest of the paper shall consist of four units as per the syllabus. Every unit should have two questions. However, student may be asked to attempt only 1 question from each unit. Each question should be 10 marks

UNIT I

Understanding Computers, Internet and Cyber Laws, intellectual property, defamatiom, privacy concerns, censorship, cyber fraud, e-commerce law, information security legal liabilities ,insurance law, the clash of laws, cyber law dispute resolution, the law of linking, cyber crime

UNIT II

Protection of Intellectual Property Rights in Cyberspace in India, Compensation and Adjudication of Violations of Provisions of IT Act and Judicial Review, Some Important Offences under the Cyberspace Law and the Internet in India, Other Offences under the Information Technology Act in India,

UNIT III

The Role of Electronic Evidence and the Miscellaneous Provisions of the IT Act, Legal Aspects of Electronic Records/Digital Signatures, The Rules and Regulations of Certifying Authorities in India

UNIT IV

International Efforts Related to Cyberspace Laws , Fundamental Jurisdiction Principles Under International Law, Classic U.S Jurisdiction Principles, Council of Europe convention on cyber crimes.

Text Books / References:

1. Cyber Law and IT Protection, Chander Harish
2. Handbook of Information Securtiy, HosseinBidgol

Paper Code: MEIS-715	**L**	**T**	**C**
Paper: Financial Mathematics	4	0	4

INSTRUCTIONS TO PAPER SETTERS: Maximum Marks : 60

1. Question No. 1 should be compulsory and cover the entire syllabus and will be of 20 marks.

2. Apart from Question No. 1, rest of the paper shall consist of four units as per the syllabus. Every unit should have two questions. However, student may be asked to attempt only 1 question from each unit. Each question should be 10 marks

UNIT-1

Basic Financial Mathematics

Time Value of Money ,Annuities, Amortization, Yields, Bonds, Price Volatility, Duration, Convexity Introduction, Spot Rates, Extracting Spot Rates from Yield Curves, Static Spread, Spot Rate Curve and Yield Curve ,Forward Rates, Term Structure Theories, Duration and Immunization Revisited

UNIT-2

Fundamental Statistical Concepts

Basics, Regression, Correlation, Parameter Estimation, Introduction, Basics, Exchange- Traded Options, Basic Option Strategies, The Arbitrage Argument, Relative Option Prices, Put–Call Parity and Its Consequences, Early Exercise of American Options, Convexity of Option Prices, The Option Portfolio Property, Pricing Models Introduction, The Binomial Option Pricing Model, The Black–Scholes Formula, Using the Black–Scholes Formula, American Puts on a Non-Dividend-Paying Stock, Options on a Stock that Pays Dividends, Traversing the Tree Diagonally

UNIT_-3

Sensitivity Analysis of Options

Sensitivity Measures ("The Greeks"),Numerical Techniques, Corporate Securities ,Barrier Options ,Interest Rate Caps and Floors ,Stock Index Options ,Foreign Exchange Options ,Compound Options, Path-Dependent Derivatives, Forward Contracts ,Futures Contracts ,Futures Options and Forward Options, Swaps ,Stochastic Processes ,Martingales ("Fair Games") ,Brownian Motion ,Brownian Bridge

UNIT-4

Continuous-Time Financial Mathematics

Stochastic Integrals , Ito Processes , Applications, Financial Applications , Continuous-Time Derivatives Pricing, Partial Differential Equations, The Black–Scholes Differential Equation , Applications, General Derivatives Pricing ,Stochastic Volatility, Further Topics

Text Books:

1. Clarence H. Richardson," Financial Mathematics" Nabu Press 2011
2. Yuh-Dauh Lyuu ,"Financial engineering and computation" Cambridge University Press 2001

Reference Books:

1. TRIVEDI, KISHOR S. Probability and Statistics with Reliability, Queuing and Computer Science Applications. Englewood Cliffs, NJ: Prentice-Hall, 1982.
2. TAKA´ CS, LAJOS. Combinatorial Methods in the Theory of Stochastic Processes. New York: Wiley, 1967

Paper Code: MEIS-719	**L**	**T**	**C**
Paper: Security Issues in Information Systems	4	0	4

INSTRUCTIONS TO PAPER SETTERS: Maximum Marks : 60

1. Question No. 1 should be compulsory and cover the entire syllabus and will be of 20 marks.

2. Apart from Question No. 1, rest of the paper shall consist of four units as per the syllabus. Every unit should have two questions. However, student may be asked to attempt only 1 question from each unit. Each question should be 10 marks

UNIT I

Information System (IS) Security: Nature and Scope, Security of Technical Systems in Organizations: an introduction, Models for Technical Specification of Information System Security, Cryptography and Technical Information System Security.

UNIT II

Security of Formal Systems in Organizations: an introduction, Planning for Information System Security, Designing Information System Security, Information System Risk Management, Security of Informal Systems in Organizations: an introduction.

UNIT III

Corporate Governance for Information System Security, Culture and IS Security, Information System Security Standards, Legal Aspects of IS Security, Summary principles for Information System Security.

UNIT IV

Case of a Computer Hack, Botnet: Anatomy of a Case, Cases in Computer Crime. IS Security at Southam Council, Security Management at the Tower, Technology Enabled Fraud and the Demise of Drexel Burnham Lambert, Taylor City Police Department Security Breach. Developing a Security Policy at M & M Procurement, Inc.

Text Books:

1. Fundamentals of Information Systems Security (Information Systems Security & Assurance Series), David Kim, Michael G. Solomon , Jones &Bartlet Learning
2. Handbook on Information Security, HosseinBidgoli, Wiley

Reference Books:

1. Principles of Information Systems Security: Texts and Cases, 1st Edition by GurpreetDhillon, Wiley.

PRACTICALS

Paper code: MEIS-751
Paper: Lab –VII

40 marks: internal evaluation	**60 marks: external evaluation**

Lab will be based on Mobile & Wireless network security.

Paper code: MEIS-753
Paper: Lab –VIII

40 marks: internal evaluation	**60 marks: external evaluation**

Lab will be based on Computer Crime Investigation & Forensics.

Paper code:ME**IS-755***
Paper: Term paper-III

100 marks: internal evaluation

Paper code: MEIS-757
Paper: Minor Project

40 marks: internal evaluation	**60 marks: external evaluation**

Objective: Students are required select a topic of their interest and develop a minor project on it. The student will submit a synopsis at the beginning of the semester for the approval to the project committee in a specified format (available on www.ipu.ac.in). The student will have to present the progress of the work through seminars. A report must be submitted to the college for evaluation purpose at the end of the semester in a specified format.

Paper Code: MEEC-601	**L**	**T**	**C**
Paper: Optoelectronics and Optical Fibre Communication	**4**	**0**	**4**

INSTRUCTIONS TO PAPER SETTERS: Maximum Marks : 60

1. **Question No. 1 should be compulsory and cover the entire syllabus. This question should have objective or short answer type questions. It should be of 20 marks.**
2. **Apart from Question No. 1, rest of the paper shall consist of four units as per the syllabus. Every unit should have two questions. However, student may be asked to attempt only 1 question from each unit. Each question should be 10 marks**

Unit-1

Introduction: Key elements of OFC system, Advantages of Optical Fiber, Optical Spectral Bands, Channel Capacity, Windows & Spectral Bands, Wave properties, Basic Optical Fiber Structures, Ray Optics Presentation, meridional rays and skew rays, Concept of Modes in dielectric slab waveguide, mode theory for circular waveguide, linearly polarized modes, Cutoff wavelength mode field diameter, normalized frequency of single mode fiber

Unit - 2

Transmission Losses: Attenuation, Absorption, scattering, losses, Bending losses, dispersion, Intramodal & Intermodal, polarization mode dispersion, dispersion shifted, flatted & compensating fiber.

Unit-3

Sources & Detectors: LED-principle, material, double heterojunction LED, efficiency, modulation of an LED, Laser diode-Principle, modes threshold condition, efficiency, laser diode rate equation, PIN photo detector, Avalanche photodiode, photodectector noise, detector response time

Unit-4

Optical amplifiers, EDFA, Amplifier gain, WDM concepts, Fiber grating filters, Optical TDM, Subscriber multiplexing, SONET/SDH, OCDMA

Text Books:

1. Senior J., optical fiber communications, principles & practice, PHI.
2. Keiser G., optical fiber communications, McGraw-hill.

Reference Books:

1. Gowar J., optical communication systems, PHI.
2. William B. Jones jr., Introduction to optical fiber communication systems, Holt, Rinehart and Winston, Inc.
3. Fiber Optic Communication Systems by Mynbev, Pearson
4. Fiber Optic Communication Systems by G.P. Aggarwal, John Wiley & sons.

Paper Code: MEEC-604 **L T C**
Subject: Advanced Signal Processing

INSTRUCTIONS TO PAPER SETTERS: **Maximum Marks : 60**
1. Question No. 1 should be compulsory and cover the entire syllabus. This question should have objective or short answer type questions. It should be of 20 marks.
2. Apart from Question No. 1, rest of the paper shall consist of four units as per the syllabus. Every unit should have two questions. However, student may be asked to attempt only 1 question from each unit. Each question should be 10 marks

Unit I

Discrete Time Signals and Systems, Frequency Domain Representation, Z-Transforms, Discrete Fourier Transforms, Impulse Response and Transfer functions, Convolution and Correlation.

Unit II

IIR Filter Design: Filter Approximation, Impulse Invariant Method, Bi-linear Transformation method filter structures, Finite word length effects, limitations of IIR filters. FIR Filter Design: Linear phase response, Windowing technique, Gibb's Phenomenon,Frequency Sampling Method, FIR Filter structures.

Unit III

Frequency Domain Realization of Digital Filters, Radix-2 FFT Algorithm. Introduction to Multirate digital signal processing

Unit IV

Power Spectrum Estimation, Classical Spectral Estimation, Parametric Modeling - AR, MA, ARMA methods, Minimum variance spectral estimations. Principles of DSP Architecture.

Text:

1. G. J. Proakis and D. G. Manolakis, "Digital Signal Processing, Principles, algorithms and applications", 4th ed. Pearson Education.
2. S. K. Mitra, " Digital Signal Processing" 3rd ed. TMH.

References:

1. A.V. Oppenheim and R.W. Schafer "Discrete Time Signal Processing", PHI 1992.
2. Steven M. Kay "Modern Spectral Estimation", PHI 1988.
3.. Clark Cory.L, "Lab view DSP and Digital comm.", TMH 2005.
4. .Roman Kuc "Introduction to Digital Signal Processing", McGraw Hill 1988

Paper Code: MEEC-606	**L**	**T**	**C**
Paper: Advanced VLSI Design	**4**	**-**	**4**

INSTRUCTIONS TO PAPER SETTERS: **Maximum Marks : 60**

1. **Question No. 1 should be compulsory and cover the entire syllabus. This question should have objective or short answer type questions. It should be of 20 marks.**
2. **Apart from Question No. 1, rest of the paper shall consist of four units as per the syllabus. Every unit should have two questions. However, student may be asked to attempt only 1 question from each unit. Each question should be 10 marks**

Unit 1

Introduction : Basic principle of MOS transistor, Introduction to large signal MOS models (long channel) for digital design.

MOS Circuit Layout & Simulation and manufacturing: scaling, MOS SPICE model and simulation, CMOS layout: design rules, Transistor layout, Inverter layout, NMOS and CMOS basic manufacturing steps.

Unit 2

The MOS Inverter : Inverter principle, the basic CMOS inverter, transfer characteristics, logic threshold, Noise margins, switching characteristics, Propagation Delay, Power Consumption.

Combinational MOS Logic Design : Static MOS design, Ratioed logic, Pass Transistor logic, complex logic circuits.

Unit 3

Sequential MOS Logic Design

Static latches, Flip flops & Registers, Dynamic Latches & Registers, CMOS Schmitt trigger, Astable Circuits. Memory Design: ROM & RAM cells design **Dynamic MOS design :** Dynamic logic families and performances. **Clock Distribution** Clock Distribution. Input and Output Interface circuits.

Unit 4

Subsystem design

Design styles, design concepts: Hierarchy, Regularity, Modularity, Locality. CMOS Sub system design: Adders, Multipliers.

Text Books

[1] S. Kang & Y. Leblebici "CMOS Digital IC Circuit Analysis & Design"- McGraw Hill, 2003.

[2] J. Rabaey, "Digital Integrated Circuits Design", Pearson Education, Second Edition, 2003.

Reference Books

[1] Neil Weste and David Harris :" CMOS VLSI design" Pearson Education 2009.

Paper Code: MEEC-607	**L**	**T**	**C**
Paper: Advanced Computer Networks	**4**	**0**	**4**

INSTRUCTIONS TO PAPER SETTERS: **Maximum Marks : 60**

3. **Question No. 1 should be compulsory and cover the entire syllabus. This question should have objective or short answer type questions. It should be of 20 marks.**
4. **Apart from Question No. 1, rest of the paper shall consist of four units as per the syllabus. Every unit should have two questions. However, student may be asked to attempt only 1 question from each unit. Each question should be 10 marks**

Unit - I

Introduction:
Introduction to Network models-ISO-OSI, SNA, Appletalk and TCP/IP models. Review of Physical layer and Data link layers, Review of LAN (IEEE 802.3, 802.5, 802.11b/a/g, FDDI) and WAN (Frame Relay, ATM, ISDN) standards.

Unit- II
Network layer
ARP, RARP, Internet architecture and addressing, internetworking, IPv4, overview of IPv6, ICMP, Routing Protocols- RIP, OSPF, BGP, IP over ATM.

Unit- III
Transport layer
Design issues, Connection management, Transmission Control Protocol (TCP), User Datagram Protocol (UDP)
Application layer
WWW, DNS, e-mail, SNMP, RMON

Unit- IV
Network Security: Cryptography, Firewalls, Secure Socket Layer (SSL) and Virtual Private Networks (VPN). Study of various network simulators, Network performance analysis using NS2

TEXT BOOKS:
1. Behrouz A. Forouzan, "TCP/IP Protocol Suit", TMH, 2000.
2. Tananbaum A. S., "Computer Networks", 3rd Ed., PHI, 1999.

REFERENCES:
1. Black U, "Computer Networks-Protocols, Standards and Interfaces", PHI, 1996.
2. Stallings W., "Data and Computer Communications", 6th Ed., PHI, 2002.
3. Stallings W., "SNMP, SNMPv2, SNMPv3, RMON 1 & 2", 3rd Ed., Addison Wesley, 1999.
4. Laurra Chappell (Ed), "Introduction to Cisco Router Configuration", Techmedia, 1999.

Paper code: MEEC-610 **L T P**
Paper: Microwave Integrated Circuits **3 1 0**

INSTRUCTIONS TO PAPER SETTERS: **Maximum Marks : 60**
1. Question No. 1 should be compulsory and cover the entire syllabus and will be of 20 marks.
2. Apart from Question No. 1, rest of the paper shall consist of four units as per the syllabus. Every unit should have two questions. However, student may be asked to attempt only 1 question from each unit. Each question should be 10 marks

Unit I

Classification of transmission lines: Planar, quasiplanar and 3-D structures, their basic properties, field distribution and range of applications. Types of MICs and their technology, Propagating models, Analysis of MIC by conformal transformation Numerical analysis, Hybrid mode analysis, Substrate materials and fabrication steps in MIC

Unit-II

Introduction to microstrip line, slot line and coplanar wave guide

Microstrip circuit design: Introduction, Impedance transformers, Directional couplers, branch line couplers, filters, resonators. Design and Fabrication of Lumped elements for MICs, Comparison with distributed circuits

Unit-III

Non-reciprocal components and active devices for MICs: Ferromagnetic substrates and inserts, Microstrip circulators, Phase shifters, Microwave transistors, Parametric diodes and Amplifiers, PIN diodes, Transferred electron devices, IMPATT, BARITT, Avalanche diodes

Unit-IV

MMIC technology: Fabrication process of MMIC, Hybrid MICs, Configuration, Dielectric substances, thick and thin film technology, Testing methods, Encapsulation and mounting of Devices.

Text Books :

1. Microwave Engineering using Microstrip Circuits – E H Fooks, R A Zakarevicius-prentice Hall
2. Microwave Microwave Engineering By D.M.Pozar,

Reference Books:

1. G. Gonzalez, Microwave Transistor Amplifiers: Analysis and Design, 2nd ed., Prentice Hall, 1996. Reference
2. Liao S.Y.: Microwave Circuits & Devices. PHI
3. Hoffman R.K."HandBook of Microwave intergrated circuits",Artech House,Boston,1987
4. B.Bhat and , Stripline-like transmission lines for MICs, John Wiley, 1989.

Paper Code: MEEC-611 **L T C**
Paper: Telecommunication System Modeling and Simulation **3 1 4**

INSTRUCTIONS TO PAPER SETTERS: **Maximum Marks : 60**
1. Question No. 1 should be compulsory and cover the entire syllabus. This question should have objective or short answer type questions. It should be of 20 marks.
2. Apart from Question No. 1, rest of the paper shall consist of four units as per the syllabus. Every unit should have two questions. However, student may be asked to attempt only 1 question from each unit. Each question should be 10 marks

Objective: To model the random variables and random process applied to telecommunications system and to learn the methods of system simulation and performance evaluation.

UNIT – I

SIMULATION OF RANDOM VARIABLES RANDOM PROCESS

Generation of Random numbers and Sequence, Gaussian and Uniform random numbers Correlated random sequences, testing of random numbers generators, Stationary and Uncorrelated Noise, Goodness of fit test.

UNIT – II

MODELING OF COMMUNICATION SYSTEMS

Radio frequency and Optical sources, Analog and Digital signals, Communication channel and Models, Free Space channels, Multipath channel and discrete channel noise and interference.

UNIT – III

ESTIMATION OF PERFORMANCE MEASURE FOR SIMULATION

Quality of Estimator, Estimation of SNR, Probability density function and Bit Error Rate, Monte Carlo method, Importance Sampling method, Extreme Value Theory.

UNIT – IV

SIMULATION AND MODELING METHODOLOGY

Simulation Environment, Modeling considerations, Performance Evaluation techniques, Error Source Simulation, Validation. Case Studies: Simulations of QAM Digital Radio link in environment, Light wave communication link and Satellite system.

TEXTBOOKS

1 MC.Jeruchim, P.Balaban and Sam K Shanmugam, “Simulation of communication systems: Modeling, Methodology and Techniques”, Plenum Press, New York, 2001.

REFERENCES

1 Averill.M.Law and W.David Kelton, “Simulation Modeling and Analysis”, McGraw-Hill, 2000.
2 Geoffrey Garden, “System Simulation”, Prentice Hall of India, 2nd Edition, 1992.
3 W.Turin, “Performance Analysis of Digital Communication Systems”, Computer Science Press, New York, 1990.
4 Jery Banks and John S.Carson, “Discrete Event System Simulation”, Prentice Hall of India, 1984.

Paper Code: MEEC-612 **L T C**
Paper:Cellular & Mobile Communication **4 0 4**

INSTRUCTIONS TO PAPER SETTERS: Maximum Marks : 60

1. Question No. 1 should be compulsory and cover the entire syllabus. This question should have objective or short answer type questions. It should be of 20 marks.

2. Apart from Question No. 1, rest of the paper shall consist of four units as per the syllabus. Every unit should have two questions. However, student may be asked to attempt only 1 question from each unit. Each question should be 10 marks

Unit I

Introduction to Cellular Mobile Systems

A basic cellular system, performance criteria, uniqueness of mobile radio environment, operation of cellular systems, planning a cellular system, overview of generations of cellular systems.

Elements of Cellular Radio Systems Design and interference

General description of the problem, concept of frequency reuse channels, co-channel interference reduction factor, desired C/I from a normal case in an omni directional antenna system, cell splitting, consideration of the components of cellular systems. Introduction to co-channel interference, co-channel measurement design of antenna system, antenna parameter and their effects,

Unit II

Cell Coverage for Signal & antenna structures

General introduction, obtaining the mobile point to point mode, propagation over water or flat open area, foliage loss, propagation near in distance, long distance propagation, point to point prediction model- characteristics, cell site, antenna heights and signal coverage cells, mobile to mobile propagation. Characteristics of basic antenna structures, antenna at cell site, mobile antennas.

Frequency Management & Channel Assignment, Hand Off & Dropped Calls

Frequency management, fixed channel assignment, non-fixed channel assignment, traffic & channel assignment. Why hand off, types of handoff and their characteristics, dropped call rates & their evaluation.

Unit III

Modulation methods and coding for error detection and correction

Introduction to Digital modulation techniques, modulation methods in cellular wireless systems, OFDM. Block coding, convolution coding and Turbo coding. Multiple access techniques: FDMA, TDMA, CDMA;

Time-division multiple access (TDMA), code division multiple access (CDMA), CDMA capacity, probability of bit error considerations, CDMA compared with TDMA.

Unit IV

Second generation, digital, wireless systems

GSM, IS_136 (D-AMPS), IS-95, mobile management, voice signal processing and coding.

Text Books:

1 Mobile Cellular Telecommunications; 2nd ed.; William, C Y Lee McGraw Hill

2 Mobile wireless communications; Mischa Schwartz, Cambridge University press, UK, 2005

Reference Books

1 Mobile Communication Hand Book; 2nd Ed.; IEEE Press

2 Wireless communication principles and practice, 2nd Ed, Theodore S rappaport, Pearson Education.

3 3G wireless Demystified; Lawrence Harte, Mc. Graw Hill pub.

4 Principles of Wireless Networks, Kaveh Pahlavan and Prashant Krishnamurthy: PHI

5 Wireless communication theory, Blake, pub: Thomson Delmar 2004

Paper Code: MEEC-613 **L T C**
Paper: Mathematical Statistics & Data Analysis **3 1 4**

INSTRUCTIONS TO PAPER SETTERS: **Maximum Marks : 60**
1. Question No. 1 should be compulsory and cover the entire syllabus. This question should have objective or short answer type questions. It should be of 20 marks.
2. Apart from Question No. 1, rest of the paper shall consist of four units as per the syllabus. Every unit should have two questions. However, student may be asked to attempt only 1 question from each unit. Each question should be 10 marks

Unit - I

Introduction
The basic goal of statistics: draw conclusions based on data. Various aspects of statistics ranging from formulating the question, designing experiments to address the question, collecting the data, and analyzing the data, Random sample drawn from a parameterized family of distributions, Review of Probability: Sample spaces and events, Kolmogorov's axioms, principles of combinatorics including permutations and combinations, conditional probability and independence, Bayes' theorem, random variables, probability mass functions for discrete random variables, probability density functions for continuous random variables, cumulative distribution functions, expected value, mean and variance of a distribution, selected discrete and continuous distributions.

Unit – II

Collecting Data: Types of statistical studies, observational studies, basic sampling designs, Summarizing and Exploring Data, Sampling Distributions of Statistics: Sampling Distribution of the Sample Mean, Sampling Distribution of the Sample Variance, Student's t-distribution, Snedecor-Fisher's F-distribution

Unit – III

Basic Concepts of Inference: Point Estimation, Maximum Likelihood Estimation, Confidence Interval Estimation, Hypothesis Testing, Likelihood Ratio Tests; Inferences for Single Samples: Inferences on Mean (Large Samples), Inferences on Mean (Small Samples), Inferences on Variance (if time permits)

Unit - IV

Simple linear regression and correlation: The least squares method, The model for simple linear regression, Fitting a line, goodness of fit, Statistical inference with the simple linear regression model, predMEion and confidence intervals, Regression diagnostics. Multiple linear regression, The model for multiple linear regression, Goodness of fit, multiple correlation coefficient, Arrays, matrices, and linear algebra for multiple linear regression, Statistical inference for multiple regression, ANOVA tables , Introduction to Bayesian Inference, Principles of Bayesian statistics. The Bernoulli process, The Poisson process. The normal process.

Textbook:

1. *Statistics and Data Analysis* by Ajit C. Tamhane and Dorothy D. Dunlop, Prentice-Hall, 2000.
2. Probablity and statistics by Paupollis & Pillai, McGraw Hill Publication

Paper Code: MEEC-614 **L T C**
Paper: Advanced Radiation Systems **3 1 4**

INSTRUCTIONS TO PAPER SETTERS: **Maximum Marks : 60**
1. Question No. 1 should be compulsory and cover the entire syllabus. This question should have objective or short answer type questions. It should be of 20 marks.
2. Apart from Question No. 1, rest of the paper shall consist of four units as per the syllabus. Every unit should have two questions. However, student may be asked to attempt only 1 question from each unit. Each question should be 10 marks

Unit I
Basic Concepts of Radiation, Radiation from Apertures, Synthesis of Array Antennas, Microstrip Antennas, EMIs/EMC/Antenna Measurements

Unit-II
Radiation from surface current and current line current distribution,Basic antenna parameters,Radiation mechanism-Current distribution ofn Antennas,Impedance concept-Balance dto Unbalanced transformer Field equivalence principle,Rectangular and circular apertures,Uniform distribution on an infinite ground
plane,Aperture fields of Horn antenna-Babinets principle,Geometrical theory of diffgraction,Reflector antennas,Design considerations - Slot antennas

Unit-III
Types of linear arrays,current distribution in linear arrrays,Phased arrays,Optimization of Array patterns,Continuous aperture sources,Antenna synthesis techniques
Radiation mechanisms,Feeding structure,Retangular patch,Circular patch,Ring antenna.Input impedance of patch antenna,Microstrip dipole,

Unit-IV
Microstrip arrays Log periodic,Bi-conical,Log spiral ridge Guide,Multi turn loop,Travelling Wave antenna,Antenna measurement and instrumenatation ,Amplitude and Phase measurement,Gain,Directivity.Impedance and polarisation measurement,Antenna range,Design and Evaluation

Text Book:
1. Kraus.J.D.,"Antennas"II Edition,John wiley and Sons ,1997
2. Balanis.A, "Antenna Theory Analysis and Design",John Wiley and Sons,New York,1982
Reference Books:

1. Collin.R.E. and Zucker.F.,"Antenna Theory"Part I,Mc Graw Hill,New York,1969

Paper Code: MEEC-616 **L T C**
Paper: Telecommunication Switching and Tele-traffic Engineering **3 1 4**

INSTRUCTIONS TO PAPER SETTERS: **Maximum Marks : 60**
1. Question No. 1 should be compulsory and cover the entire syllabus. This question should have objective or short answer type questions. It should be of 20 marks.
2. Apart from Question No. 1, rest of the paper shall consist of four units as per the syllabus. Every unit should have two questions. However, student may be asked to attempt only 1 question from each unit. Each question should be 10 marks

Unit – I: Multiplexing

Transmission Systems, FDM Multiplexing and modulation, Time Division Multiplexing, Digital Transmission and Multiplexing: Pulse Transmission, Line Coding, Binary N – Zero Substitution, Digital Biphase, Differential Encoding, Time Division Multiplexing, Time Division Multiplex Loops and Rings.
SONET/SDH: SONET Multiplexing Overview, SONET Frame Formats SONET Operations, Administration and Maintenance, Payload Framing and Frequency Justification, Virtual Tributaries, DS3 Payload Mapping, E4 Payload Mapping, SONET Optical Standards, SONET Networks. SONET Rings: Unidirectional Path-Switching Ring, Bidirectional Line-Switched Ring.

Unit – II: Digital Switching

Switching Functions, Space Division Switching, Time Division Switching, two-dimensional switching: STS Switching, TST Switching, No.4 ESS Toll Switch, Digital Gross-Connect Systems, and Digital Switching in an Analog Environment. Elements of SSNO7 Signaling.

Unit – III: Network Synchronization Control and Management

Timing: Timing Recovery: Phase-Locked Loop, Clock Instability, Jitter Measurements, Systematic Jitter. Timing Inaccuracies: Slips, Asynchronous Multiplexing, Network Synchronization, U.S. Network Synchronization, Network Control, Network Management.

Unit – IV: Digital Subscriber Access and traffic analysis

ISDN: ISDN Basic Rate Access Architecture, ISDN U Interface, ISDN D Channel Protocol. High-Data-Rate Digital Subscriber Loops: Asymmetric Digital Subscriber Line, VDSL. Digital Loop Carrier Systems: Universal Digital Loop Carrier Systems, Integrated Digital Loop Carrier Systems, Next-Generation Digital Loop Carrier, Fiber in the Loop, Hybrid Fiber Coax Systems, and Voice band Modems: PCM Modems, Local microwave Distribution Service, Digital Satellite Services. Traffic Characterization: Arrival Distributions, Holding Time Distributions, Loss Systems, And Network Blocking Probabilities: End-to-End Blocking Probabilities, Overflow Traffic, And Delay Systems: Exponential Service Times, Constant Service Times, Finite Queues.

Text:

1. Bellamy John, “Digital Telephony”, John Wily & Sons, Inc. 3rd ed. 2000
2. Viswanathan. T., “Telecommunication Switching System and Networks”, PHI 1994

References:

1. Robert G. Winch, “Telecommunication transmission systems”, 2nd ed. TMH 2004
2. Marion Cole, “Intro. to Telecommunications” 2nd ed. Pearson education 2008.
3. Tom Sheldon, “Encyclopedia of Networking and telecom.” TMH seventh reprint2006

Paper Code: MEEC-618 **L T C**
Paper: ESD using ARM Microcontroller **4 0 4**

INSTRUCTIONS TO PAPER SETTERS: Maximum Marks : 60
1. Question No. 1 should be compulsory and cover the entire syllabus. This question should have objective or short answer type questions. It should be of 20 marks.
2. Apart from Question No. 1, rest of the paper shall consist of four units as per the syllabus. Every unit should have two questions. However, student may be asked to attempt only 1 question from each unit. Each question should be 10 marks

Objective: The objective of the paper is to facilitate the student with the understanding of embedded system design and ARM architecture in particular. The prerequisites are to have basic understanding of programming concepts and embedded programming in C and C ++, RTOS.

Unit – I

Introduction to Embedded System Design, Embedded System Architecture, Embedded System model, an overview of Programming Languages and examples of their standards, Embedded Processor: ISA Architecture Models, Application-specific ISA models, FSMD model, JVM model, CISC & RISC model, Instruction – Level Parallelism ISA model, Von Neumann & Harvard Architectures.

Unit – II

ARM Embedded System, ARM Processor Fundamentals: Registers, Pipeline, Exceptions, Interrupts and vector tables, ARM Processor family, ARM Instruction Set, Thumb Instruction Set

Unit –III

Overview of C compiler and Optimization: Register allocation, Functions Calls, Pointer aliasing, Structure arrangement, Portability issues, writing and optimizing ARM assembly code

Unit –IV

Interrupts and interrupt handling Scheme, firmware and Boot loader, Real-Time operating Systems: Context Switching, task tables and kernels, Time Slice, Scheduler algorithms: RMS, Deadline monotonic Scheduling; Priority Inversion, Tasks, Threads and process, Exceptions, Exception handling

Text books:

1. Embedded Systems Architecture by Tammy Overgaard; Elsevier Publisher; 2005
2. ARM System Developer's Guide by A.N. Sloss, D. Symes and C. Wright; Elsevier Publisher; 2006

Reference books:

1. Embedded System Design by Steve Heath, Elsveir Publisher; 2006
2. Embedded Systems by Raj Kamal, TMH; 2006
3. Embedded Microcomputer Systems, Thomson Publisher; 2005
4. Embedded system Design, Kluwer Academic Publisher; 2005
5. An Introduction to the design of small-scale embedded Systems by T. Wilmshurst, Palgrav publisher; 2001

Paper Code: MEEC-620 **L T C**
Paper: Instrumentation and Control Engineering **4 0 4**

INSTRUCTIONS TO PAPER SETTERS: Maximum Marks : 60
1. Question No. 1 should be compulsory and cover the entire syllabus. This question should have objective or short answer type questions. It should be of 20 marks.
2. Apart from Question No. 1, rest of the paper shall consist of four units as per the syllabus. Every unit should have two questions. However, student may be asked to attempt only 1 question from each unit. Each question should be 10 marks

Unit-I

Generalized Instrumentation system, Measurement systems, control system, Features of personal
computers, PC_Based Instrumentation Systems, Data Acquisition systems, PC interfaces. Signal Conditioning and Op Amp circuits.

Unit-II

Principles of Data acquisition and Interfacing
Sampling concepts, D/A converter, A/D converters, Data Acquisition Configurations, Expansion, Buses, Parallel port, Plug-in Boards, Data Acquisition using GPIB, Data Acquisition serial interfaces, Network Data Acquisition.

Unit-III

Application Examples in Measurement and Control
PC based data - Acquisition systems - Industrial process measurements, like flow temperature,pressure, and level PC based instruments development system.
Sensors and Actuators
Temperature sensor, Displacement Sensors, Pressure Sensors, Flow sensors, Actuators.

Unit-IV

Introduction to LabVIEW: Software environment, front panel, block diagram, palettes, loops, structures and tunnels, arrays, clusters, plotting data**.**
Modular Programming: Modular programming in LabVIEW, creating an icon, building a connector pane, displaying subVIs and express Vis as icons or expandable nodes,creating subVIs from sections of VIs,opening and editing subVIs, placing subVIs on block diagrams, creating stand alone applications.

Text Book:

1. Ahson, S.I. *"Microprocessors with applications in process control*", Tata McGraw-Hill Publishing Company Limited,1984
2. Jerome, PHI *Virtual Instrumentation using LabVIEW,* Jovitha, ISBN 978-81-203-40305, 2010.

References:

1. George Barney C. "*Intelligent Instrumentation*", Prentice Hall of India Pvt. Ltd., 1998
2. Krishna Kanth "*Computer based industrial control*", Prentice Hall. 1997
3. Sergio Franco, "*Design with operational amplifiers and analog integrated circutis*", TATA McGraw-Hill2002
4. S. K. Singh, "*Industrial Instrumentation and Control",* TATA McGraw-Hill. 2004
5. N. Mathivanan, "*PC-Based Instrumentation*", PHI, 2009

Paper Code: MEEC-626	**L**	**T**	**C**
Paper: Fuzzy Logic & Design	**4**	**-**	**4**

INSTRUCTIONS TO PAPER SETTERS: **Maximum Marks : 60**

1. **Question No. 1 should be compulsory and cover the entire syllabus. This question should have objective or short answer type questions. It should be of 20 marks.**
2. **Apart from Question No. 1, rest of the paper shall consist of four units as per the syllabus. Every unit should have two questions. However, student may be asked to attempt only 1 question from each unit. Each question should be 10 marks**

Unit-I

Fuzzy Arithmetic: Fuzzy Numbers, Linguistic Variables, Arithmetic Operations on intervals & Numbers, Lattice of Fuzzy Numbers, Fuzzy Equations.

Unit-II

Fuzzy Relations: Crisp & Fuzzy Relations, Projections & Cylindric Extensions, Binary Fuzzy Relations, Binary Relations on single set, Equivalence, Compatibility & Ordering Relations, Morphisms, Fuzzy Relation Equations.

Unit-III

Possibility Theory: Fuzzy Measures, Evidence & Possibility Theory, Possibility versus Probability Theory.

Fuzzy Logic: Classical Logic, Multivalued Logics, Fuzzy Propositions, Fuzzy Qualifiers, Linguistic Hedges.

Unit-IV

Uncertainty based Information: Information & Uncertainty, Nonspecificity of Fuzzy & Crisp sets, Fuzziness of Fuzzy Sets.

Applications of Fuzzy Logic:

Text Book:

1. G.J.Klir , Yuan,"Fuzzy Sets and fuzzy logic, Theory and applications", Prentice Hall India, 1995.

Reference Books:

1. John Yen, Reza Langari, "Fuzzy Logic Intelligence, Control and Information", Pearson Education, 2006.
2. Ross, "Fuzzy Logic with Engineering Applications", 2nd Edition, John Wiley, 2004.
3. H. Zimmermann, "Fuzzy Set Theory and its application

Paper code: MEEC-651 **L T/ P C**
Paper: Lab-I **0 4 2**

Lab based on Optoelectronics and OFC.

Paper code: MEEC-653 **L T/ P C**
Paper: Lab-2 **0 4 2**

Lab based on Advanced Digital Communication.

Paper code: MEEC-655 **L T/ P C**
Paper: Lab-3 **0 4 2**

Lab based on IC Technology (through Tanner Tool or Cadence Tool)

Paper code: MEEC-657* **L T/ P C**
Paper: Term Paper-I **0 4 2**

Lab based on Elective/ or Research work

*** NUES : Non University Examination**

Paper code: MEEC-652 **L T/ P C**
Paper: Lab-4 **0 4 2**

Lab based on AMC

Paper code: MEEC-654 **L T/ P C**
Paper: Lab-5 **0 4 2**

Lab based on ASP.

Paper code: MEEC-656 **L T/ P C**
Paper: Lab-6 **0 4 2**

Lab based on Adv. VLSI Design

Paper code: MEEC-658* **L T/ P C**
Paper: Term Paper-I **0 4 2**

Lab based on Elective/ or Research work

*** NUES : Non University Examination**

Paper Code: MEEC-701	**L**	**T**	**C**
Paper: Adhoc Sensor Networks	**4**	**-**	**4**

INSTRUCTIONS TO PAPER SETTERS: Maximum Marks : 60

1. **Question No. 1 should be compulsory and cover the entire syllabus. This question should have objective or short answer type questions. It should be of 20 marks.**
2. **Apart from Question No. 1, rest of the paper shall consist of four units as per the syllabus. Every unit should have two questions. However, student may be asked to attempt only 1 question from each unit. Each question should be 10 marks**

Unit I

Introduction to Mobile Ad Hoc Networks, Technologies for Ad Hoc Network, Issues in Ad hoc wireless Networks, Ad Hoc network applications, Fundamentals of WLANs, IEEE 802.11 Architecture , protocols ,performance and open issues. Introduction to IEEE 802.15.4, MAC Protocols for Ad Hoc Wireless Networks:
Issues, design goals and classification of MAC protocol, MACA and MACAW, Routing Protocols for Ad hoc wireless networks: Issues and classifications of routing protocols, AODV, DSR, DSDV, Multicasting Routing: Issues, Architecture reference model, and classifications of multicasting routing protocols.

Unit II

Transport layer & Security protocols
Issues and design goals in designing transport layer protocols, TCP over Ad Hoc Wireless Networks: Traditional TCP, Feedback-Based TCP, TCP-BuS, Ad Hoc and Split TCP, Security in Ad hoc wireless networks: Network security requirements, Issues and challenges, Types of Network Security Attacks, and Key management, Secure routing in Ad hoc wireless networks.

Unit III

Wire Sensor Networks: Introduction and overview of WSN, Applications of Sensor Networks, Sensor network architecture, Architecture of WSNs Hardware components, Energy consumption of sensor nodes, Operating systems and execution environments, some examples of sensor nodes, Network Architecture: Sensor networks scenarios, Optimization goals and figures of merit, Design principles for WSNs, Service interfaces of WSNs, Gateway concepts.

Unit IV

Communication Protocols:
Physical Layer and Transceiver design considerations in WSNs, Fundamentals of (wireless) MAC protocol: Low duty cycle protocols and wakeup concepts, Contention-based protocols, Schedule-based protocols, The IEEE 802.15.4 MAC protocol, Address and name management in wireless sensor networks, Localization and positioning, Routing protocols: Data Dissemination and Gathering, Routing Challenges and Design Issues in WSN, QoS in wireless sensor networks, Coverage and deployment, Advanced Application Support.

Text Book:

1. Ad HOC Wireless Networks: Architectures & Protocols , By C Siva Ram Murty & BS Manoj 2nd Ed, Pearson Education.
2. Protocols and Architectures for Wireless Sensor Networks, By Holger Karl and Andreas Willig Wiley Publisher (2014).

Reference:

1. Wireless Sensor Networks Technology, Protocols, and applications by Kazem Sohraby, Daniel Minoli, Taieb Znati, John Wiley & Sons.
2. Handbook of Ad Hoc Wireless Network, By Mohmad Illayas, CRC press

Paper Code: MEEC-705 **L T C**
Paper: Embedded Systems & RTOS **4 - 4**

INSTRUCTIONS TO PAPER SETTERS: Maximum Marks : 60
1. Question No. 1 should be compulsory and cover the entire syllabus. This question should have objective or short answer type questions. It should be of 20 marks.
2. Apart from Question No. 1, rest of the paper shall consist of four units as per the syllabus. Every unit should have two questions. However, student may be asked to attempt only 1 question from each unit. Each question should be 10 marks

Unit – I
Introduction to an embedded systems design (ESD), Role of Real-Time Operating System, Issues in Real-time Computing: Architecture issues and Operating system issues, Structure of Real-Time system, Task Classes, Performance measures for real-time systems, Properties of performance measures, traditional performance measure, Performability, Cost function and hard deadlines, Estimating program run times, Accounting for pipelining

Unit – II
Real-Time Scheduling: Clock-Driven Approach: Static, Timer-Driven Scheduler, General structure of Cyclic schedules, Cyclic Executives, Improving the average response time for aperiodic jobs, Scheduling sporadic jobs, Practical consideration and generalizations, Algorithm for constructing static schedules, Pros and Cons of clock-driven scheduling
Priority-Driven Scheduling of Periodic Tasks: Static assumption, Fixed-priority versus dynamic-priority algorithm, Rate-Monotonic and Deadline-Monotonic Algorithms, EDF algorithm, Relative merits, Schedulable utilizations of the EDF algorithm, Schedulability test for the EDF algorithm, Optimality of the RM and DM algorithm, A Schedulability test for fixed-priority tasks with short response times, Schedulability test for fixed-priority tasks with arbitrary response times, Sufficient Schedulability conditions for the RM and DM algorithms

Unit – III
Scheduling Aperiodic and Sporadic Jobs in Priority-Driven systems: Assumptions and approaches, Deferrable servers, Schedulability of deadline-driven systems in the presence of deferrable server, Sporadic server, Constant utilization, total bandwidth and weighted fair-queuing servers, Slack stealing in deadline-driven systems, Slack stealing in fixed-priority systems, Scheduling of sporadic jobs, Real time performance for jobs with soft timing constraints, A two level scheme for integrating scheduling

Unit - IV
Resource and Resource Access Control: Assumption on resources and their usage, Effects of resources contention and Resource access control, Non preemptive critical sections, basic priority-inheritance protocol, basic priority-ceiling protocol, stack based, priority-ceiling protocol, use of priority-ceiling protocol in dynamic-priority systems, preemption ceiling protocol, controlling accesses to multiple-unit resources.
Multiprocessor scheduling, resource access control and synchronization: Model of multiprocessor and distributed systems, task management, multiprocessor priority-ceiling protocol, elements of scheduling algorithm for end-to-end periodic tasks, Schedulability of fixed-priority end-to-end periodic tasks, end-to-end tasks in heterogeneous systems, predictability and validation of dynamic multiprocessor systems

Text Books:

1. Real-Time systems by Jane W. S. Liu, Pearson Education India, 2007
2. Real-Time Systems by Rajib Mall, Pearson Education India, 2011

References:

1. Real-Time Systems by C. M. Krishna and Kang G. Shin, The McGraw-Hill Companies, 2007
2. Programming Microsoft windows CE, .Net, Douglas Boling, WP publishers & Distributors.
3. Real-Time Concepts for Embedded Systems by Qing Li and Caroline Yao, CMP Books, 2005
4. Mobile Development Handbook by Andy Wigley, Daniel Moth and Peter Foot, Microsoft Press, WP Publisher, 200
5. Embedded Programming with the Microsoft .NET Micro Framework by Donald Thompson and Rob S. Miles, WP Publisher, 2007

Paper Code: MEEC-707 **L T C**
Paper: Artificial Neural Networks **4 - 4**

INSTRUCTIONS TO PAPER SETTERS: Maximum Marks : 60
1. Question No. 1 should be compulsory and cover the entire syllabus. This question should have objective or short answer type questions. It should be of 20 marks.
2. Apart from Question No. 1, rest of the paper shall consist of four units as per the syllabus. Every unit should have two questions. However, student may be asked to attempt only 1 question from each unit. Each question should be 10 marks

Unit-I
Biological analogy, Architecture classification, Neural Models, Learning Paradigm and Rule, single unit mapping and the perception.

Unit-II
Feed forward networks – Review of optimization methods, back propagation, variation on Backpropagation, FFANN mapping capability, properties of FFANN's Generalization.

Unit-III
PCA, SOM, LVQ, Adaptive Resonance Networks.

Unit-IV
Hopfield Networks, Associative Memories, RBF Networks.

Applications of Artificial Neural Networks: Regression, applications to function approximation, Classification, Blind Source Separation.

Text Book:
1. Haykin S., "Neural Networks-A Comprehensive Foundations", Prentice-Hall International, New Jersey, 1999.

References:
1. Anderson J.A., "An Introduction to Neural Networks", PHI, 1999.
2. Hertz J, Krogh A, R.G. Palmer, "Introduction to the Theory of Neural Computation",
3. Addison-Wesley, California, 1991.
4. Hertz J, Krogh A, R.G. Palmer, "Introduction to the Theory of Neural Computation", Addison-Wesley, California, 1991.
5. Freeman J.A., D.M. Skapura, "Neural Networks: Algorithms, Applications and Programming Techniques", Addison-Wesley, Reading, Mass, (1992).
6. Golden R.M., "Mathematical Methods for Neural Network Analysis and Design", MIT Press, Cambridge, MA, 1996.

Paper Code: MEEC-709 **L T C**
Paper: Multimedia Communication **4 - 4**

INSTRUCTIONS TO PAPER SETTERS: **Maximum Marks : 60**
1. Question No. 1 should be compulsory and cover the entire syllabus. This question should have objective or short answer type questions. It should be of 20 marks.
2. Apart from Question No. 1, rest of the paper shall consist of four units as per the syllabus. Every unit should have two questions. However, student may be asked to attempt only 1 question from each unit. Each question should be 10 marks

Unit-I
Multimedia Communication: Multimedia information representation. Multimedia Networks, Multimedia applications, Network QoS and application QoS.

Unit-II
Information Representation: text, image, audio and video, text and image compression, compression principles, text compression, image compression. Audio and Video compression. Audio compression. Video compression. Video compression Principles, video compression standards: H.261. H.263.PI.323, MPEG 1, MPEG 2, Other coding formats for text, speech, image and video.

Unit-III
Detailed study of MPEG 4: coding of audiovisual objects, MPEG 4 systems. MPEG 4 audio and video, profile and levels. MPEG 7 standardization process of multimedia content description, MPEG 21 multimedia framework, Significant features of JPEG 2000, MPEG 4 transport across the internet
Synchronization: notion of synchronization, presentation requirements, reference model for synchronization

Unit-IV
Introduction to SMIL: Multimedia operating System, Resource management and process management techniques.
Multimedia communication across networks: Layered video coding, error relevant video coding techniques, multimedia transport across IP networks and relevant products such as RSVP, RTP, RTCP, DVMRP, multimedia in mobile networks, multimedia broadcast networks, and content based retrieval in digital libraries.

Text Book:
1. Ze-Nian Li & Mark S. Drew, "Fundamentals of Multimedia", Pearson Education

Reference Book:

1. J.R. Ohm. "Multimedia Communication Technology", Springer International Edition, 2005.
2. K.Sayood. "Introduction to Data Compressiojn", 2nd Ed, Morgan Kauffman. Indian Edition, 2000.
3. V.Bhaskaran and K. Konstantinedes. "Image and Video Compression Standards. Algorithms and Architecture." 2nd ed, Kluwer publication, 1997.
4. Fred Halsall, "Multimedia communication", Pearson Education, 2001.

Paper Code: MEEC-711 **L T C**
Paper: Cryptography & Coding **4 - 4**

INSTRUCTIONS TO PAPER SETTERS: **Maximum Marks : 60**
1. Question No. 1 should be compulsory and cover the entire syllabus. This question should have objective or short answer type questions. It should be of 20 marks.
2. Apart from Question No. 1, rest of the paper shall consist of four units as per the syllabus. Every unit should have two questions. However, student may be asked to attempt only 1 question from each unit. Each question should be 10 marks

Unit-I

Fundamental Principles of Cryptology; Classical Cryptosystems and Their Analysis , Modern Private Key Cryptosystems: Data Encryption Standard; Advanced Encryption Standard (Rijndael)

Unit-II

Public Key Encryption (e.g., RSA, discrete log based systems) Applications of Cryptography (e.g., digital signatures, security protocols, zero-knowledge identification, games)

Unit-III

Coding Theory (error correcting codes and cryptographic applications) Techniques from Number theory, Finite fields, Elliptic curves, Probability, Complexity Theory

Unit-IV

Information Theory, Quantum Computers

Text Book:

1. Introduction to CRYPTOGRAPHY with CODING THEORY (2nd edition) - by Trappe & Washington. Prentice Hall, 2006.

Paper Code: MEEC-713 **L T C**
Paper: MEMS and Sensor Technology **4 - 4**

INSTRUCTIONS TO PAPER SETTERS: **Maximum Marks : 60**
1. Question No. 1 should be compulsory and cover the entire syllabus. This question should have objective or short answer type questions. It should be of 20 marks.
2. Apart from Question No. 1, rest of the paper shall consist of four units as per the syllabus. Every unit should have two questions. However, student may be asked to attempt only 1 question from each unit. Each question should be 10 marks

Unit-1
Sensors types and classification – mechanical, acoustic, magnetic, thermal, chemical, radiation and biosensors.

Unit-2
Micro sensors.
Sensors based on surface-acoustic wave devices.

Unit-3
Micromachining techniques
MEMS for automotive, communication and signal processing applications.

Unit-4
Modeling and simulation of microsensors and actuators. Sensors and smart structures.
Micro-opto-electro-mechanical sensors and system.

Text Books:
1. Ristic L "Sensor Technology and Devices", Artech House, London, 1994.
2. Sze S.M "Semiconductor Sensors", John Wiley, New York, 1994 Wise

Reference Book:
1. K.D. (Guest Editor) "Integrated Sensors, Microp-actuators and micro-systems (MEMS)", Special Issue of proceedings of IEEE, Vol. 86, No.8, August 1998.

Paper Code: MEEC-715 **L T C**
Paper: Broadband Access Technology **4 - 4**

INSTRUCTIONS TO PAPER SETTERS: Maximum Marks : 60
1. Question No. 1 should be compulsory and cover the entire syllabus. This question should have objective or short answer type questions. It should be of 20 marks.
2. Apart from Question No. 1, rest of the paper shall consist of four units as per the syllabus. Every unit should have two questions. However, student may be asked to attempt only 1 question from each unit. Each question should be 10 marks

Unit-I
Phone line modem-ISDN. Broadband technologies. Cable, DLS, fiber and wireless accesstechnologies.Digital subscriber lines.

Unit-II
ADSL. RADSL. IDSL. HDSL. SDSL. VDSL. Standards for XDSL andcomparison.Cable modem. DOCSIS.

Unit-III
Hub operation. Access control. Framing. Security, data link andhigher layers.Ethernet IEEE Standards and protocols ATM and IP-centric modem.Fiber access technologies and architectures. Hybrid fiber-coax systems. SDV. PON. FTTXcomparison.Broadband wireless systems, ATM, Protocols, QoS

Unit-IV

Direct broadcast satellite. MMDS. LMDS. WIDIS. 3G wireless systems . IMT2000.

Text Book:

1. N.Ransom & A.A. Azzam, Broadband Access Technologies, McGraw Hill, 1999.M.P. Clarke

References Book:

1. Wireless Access Network, Wiley, 2000.W.J. Woralski, ADSL and DSL Technologies, McGraw Hill, 1998.S. Mervana & C.Le,

2. Design and Implementation of DSL-based Access Solutions, Cisco Press,2001W. Vermillion, End-to-End DSL Architecture, Cisco

Paper Code: MEEC-717 **L T C**
Paper: AVR Microcontroller and its Application **4 - 4**

INSTRUCTIONS TO PAPER SETTERS: Maximum Marks : 60
1. Question No. 1 should be compulsory and cover the entire syllabus. This question should have objective or short answer type questions. It should be of 20 marks.
2. Apart from Question No. 1, rest of the paper shall consist of four units as per the syllabus. Every unit should have two questions. However, student may be asked to attempt only 1 question from each unit. Each question should be 10 marks

UNIT – I
Microcontroller architecture, The AVR RISC Microcontroller Architecture: AVR family architecture, Register File, Memory access and instruction Execution, I/O Memory, I/O Ports.

UNIT – II
AVR Instruction Set: Program and data addressing modes, Arithmetic & Logic Instruction, Program Control Instruction, Data Transfer Instruction

AVR Hardware Design Issues: Power source, Operating clock sources, Reset circuit

UNIT – III
Hardware & Software Interfacing with AVR: Lights & switches, Stack operation in AVR Processors, Implementing Combinational Logic, Connecting the AVR to the PC serial port, Expanding I/O, Interfacing analog to Digital converters and DAC, Interfacing with LED/LCD displays, Stepper motor interface with AVR.

UNIT – IV
Communication links for the AVR Processor: RS-232 Link, RS-422/423 link, SPI and microwave bus, IrDA Data link, CAN

AVR System Development tool: Code assembler, Code simulator, Evaluation boards, AVR emulator, Device Programmer

TEXT BOOKS:

1. Dhananjay V. Gadre, "Programming and Customizing the AVR Microcontroller", TMH 2003

Paper Code: MEEC-719 **L T C**
Paper: Robotics Engineering **4 - 4**

INSTRUCTIONS TO PAPER SETTERS: Maximum Marks : 60
1. Question No. 1 should be compulsory and cover the entire syllabus. This question should have objective or short answer type questions. It should be of 20 marks.
2. Apart from Question No. 1, rest of the paper shall consist of four units as per the syllabus. Every unit should have two questions. However, student may be asked to attempt only 1 question from each unit. Each question should be 10 marks

Unit-I

Matrix algebra, Inversion of Matrices, Rotational groups, matrix representation of co-ordinate transformation.

Manipulator kinematics: kinematics: Introduction, solvability, algebraic solution by reduction to polynomial, standard frames, repeatability and accuracy, computational considerations.

Unit-II

Manipulator dynamics: introduction, acceleration of rigid body, mass distribution, Newton's equation, Euler's equation, Iterative Newton-Euler dynamic formulation, closed dynamic equation, Lagrangian formulation of manipulator dynamics, dynamic simulation, computational consideration.

Trajectory Generation: Introduction, general considerations in path description and generation, joint space schemes, Cartesian space schemes, Path generation in runtime, Planning path using dynamic model.

Unit-III

Linear control of manipulators: Introduction, feedback and closed loop control, second order linear systems, control of second-order systems, Trajectory following control, modeling and control of a single joint.

Unit-IV

Robot Programming languages & systems: Introduction, the three level of robot programming, requirements of a robot programming language, problems peculiar to robot programming languages.

Off-line programming systems: Introduction, central issues in OLP system, cimstation, automating subtasks in OLP systems.

Text Books:

1. John J. Craig, "Introduction to Robotics", Addison Wesley publication, 2003
2. Richard D. Klafter, Thomas A. Chmielewski, Michael Negin, "Robotic Engineering – An integrated approach", PHI Publication, 2001
3. Tsuneo Yoshikawa, "Foundations of Robotics", PHI Publication, 2003

Paper Code: MEEC-721 **L T C**
Paper: Microwave Planner Transmission Lines & circuits **4 - 4**

INSTRUCTIONS TO PAPER SETTERS: **Maximum Marks : 60**
1. Question No. 1 should be compulsory and cover the entire syllabus. This question should have objective or short answer type questions. It should be of 20 marks.
2. Apart from Question No. 1, rest of the paper shall consist of four units as per the syllabus. Every unit should have two questions. However, student may be asked to attempt only 1 question from each unit. Each question should be 10 marks

Unit I:

Review of parallel plate wave-guide: analysis of TEM mode, TE Modes and TM Modes, Surface Waves on grounded dielectric slab: analysis of TE Modes, TM Modes
Strip line: study of different Modes, electrostatic solution, propagation constant, characteristic impedance, attenuation

Unit II:

Microstrip lines: properties, Quasi static and frequency dependant closed form models, modes in microstrip line. Variational method, conformal transformation, numerical analysis
Analysis for effective relative permittivity, dispersion, propagation constant, characteristic impedance, surface waves, resonance
Losses in microstrip lines. Effect of conductor thickness and shielding on propagation characteristic of microstrip.

Unit III:

Microstrip discontinuities: open end, corners, bends, steps, junctions, and gaps.
Microstrip Passive components: branch line coupler, hybrid ring coupler, power dividers, resonators, filters

Unit IV:

Introduction to slotlines, coupled lines, Coplanar lines, defective ground structure, surface integrated waveguide structure

Text Books

1. Microwave Engineering using Microstrip Circuits – E H Fooks, R A Zakarevicius-Prentice Hall
2. Microwave Microwave Engineering By D.M.Pozar,

Reference Books:

1. Microstrip Lines and Slotlines – K C Gupta-Artech Publishing
2. Foundations for microstrip design – T C Edward-John Wiley &Sons

Paper Code: MEEC-725 **L T C**
Paper: Active Networks & Filter Design **4 - 4**

INSTRUCTIONS TO PAPER SETTERS: **Maximum Marks : 60**
1. Question No. 1 should be compulsory and cover the entire syllabus. This question should have objective or short answer type questions. It should be of 20 marks.
2. Apart from Question No. 1, rest of the paper shall consist of four units as per the syllabus. Every unit should have two questions. However, student may be asked to attempt only 1 question from each unit. Each question should be 10 marks

Unit-I

Description: Active lowpass filter design. Gain-tuning and passive-tuning, immittance calculations, and high-frequency lowpass filters. Frequency and time domain analysis of lowpass, highpass, bandpass, and bandstop filters. Classical filters. Active filter classification including gain-sensitivity limitations.

Unit-II

Frequency Domain Analysis: Bode magnitude and phase response of lowpass, highpass, bandpass, bandstop, and allpass filters. Delay analysis. Dominant pole-zero analysis. Time Domain Analysis: Impulse and step response of lowpass, highpass, bandpass, bandstop, and allpass filters. Time domain approximations using Elmore's results, dominant pole-zeros, and Valley and Wallman results.

Unit-III

Classical Filter Responses: MFM, Butterworth, Chebyshev, ultraspherical and Legendre, Papoulis, inverse Chebyshev, elliptic, MFD, Bessel, equiripple delay, Gaussian, synchrously-tuned, parabolic, catenary, elliptic contour, and transitional filters. Noise response of filters.

Unit-IV

Active Filter Classification: Signal flow graphs, 2nd order RC active filters, first and second-order decompositions, Class A, A_, B, C, C_, D, and E filters. Lowpass Filters: Lowpass filter classes, filter design sheets, lowpass filter compilations, component selection, lowpass filter design examples, gain-tuned lowpass filters, passive-tuned lowpass filters, immittance calculations, high- frequency filters, alternatives to cascade design.

Textbook:

1. C.S. Lindquist, Active Network Design, Steward & Sons, CA 1977.

Paper code: MEEC-751 **L T/ P C**
Paper: Lab-7 **0 4 2**

Lab based on Adhoc Sensors Networks

Paper code: MEEC-753 **L T/ P C**
Paper: Lab-8 **0 4 2**

Lab based on Adv. Electromagnetic Engineering.

Paper code: MEEC-755* **L T/ P C**
Paper: Term Paper III **0 4 2**

Paper code: MEEC-757 **L T/ P C**
Paper: Minor Project **0 4 2**

Lab based on Elective/ or Research work

Paper code: MEEC-752 **L T/ P C**
Paper: Dissertation

Paper code: MEEC-754* **L T/ P C**
Paper: Seminar & Progress Report

Paper code: MEEC-756* **L T/ P C**
Paper: Term Paper IV

Lab based on Elective/ or Research work

Paper code: MEDC-601 **L T P**

Paper: Advance Digital Communication 4 **0 0**

INSTRUCTIONS TO PAPER SETTERS: **Maximum Marks : 60**
1. Question No. 1 should be compulsory and cover the entire syllabus and will be of 20 marks.
2. Apart from Question No. 1, rest of the paper shall consist of four units as per the syllabus. Every unit should have two questions. However, student may be asked to attempt only 1 question from each unit. Each question should be 10 marks

UNIT I

Waveform coding Techniques: Discretization in time and amplitude, linear quantizer, quantization noise power calculations, signal to quantization noise ratio, non-uniform quantizer, a-Law & μ-law, companding, encoding and PCM, Channel noise and error probability, DPCM and DM, Coding speech at low bit rates, PredMEion and adaptive filters, Baseband shaping for data transmission, PAM signals and their power spectra, Nyquist criterion, ISI and eye pattern

UNIT II

Digital modulation techniques: Binary and M-ary modulation techniques, Bit vs. symbol error probability and bandwidth efficiency, ASK, FSK, PSK Modulation techniques, comparison of QPSK, MSK & GMSK systems, Coherent and Non-Coherent detection techniques, Phase-Locked loops, Probability of error calculation for M-ary systems.

UNIT III

Equalization: Optimal Zero-Forcing Equalization, Fractionally Spaced and Transversal Filter Equalizers, Adaptive Linear Equalizer, Pass band Equalization.

Fading & Diversity: Types of diversity, Receiver Diversity, Performance analysis for Rayleigh Fading, The Diversity-Interference Trade-off.

The Gaussian MIMO Channel, Basics of MIMO systems.

UNIT IV

Error control coding: Concept of channel coding, Channel coding & Channel capacity theorems, Linear block codes, cyclic codes and convolution codes, Viterbi decoding algorithm, Turbo codes, Trellis codes, TCM.

Spread-spectrum modulation: Pseudo noise sequences, direct sequence and frequency-Hop spread spectrum, Signal-space dimensionality and processing gain.

.

Text Books:

1) Communication Systems By Simon Haykin, John Wiley and Sons,4th Edition, 2006.
2) Digital Communication-Fundamentals and Applications By Sklar, 2nd edition, Pearson Education India.

Reference Books:

1) Communication Systems Engineering, By J. G. Proakis, Prentice Hall, 2nd Edition.
2) Electronic Communication Systems, Fundamentals through Advanced, By Wayne Tomasi, 4th edition, Pearson Education India.
3) Digital communication by John R. Barry, Third edition, Springer International Edition

Paper code: MEDC-602 **L T P**
Paper: Advanced Information Theory & Coding **4 0 0**

INSTRUCTIONS TO PAPER SETTERS: **Maximum Marks : 60**
1. Question No. 1 should be compulsory and cover the entire syllabus and will be of 20 marks.
2. Apart from Question No. 1, rest of the paper shall consist of four units as per the syllabus. Every unit should have two questions. However, student may be asked to attempt only 1 question from each unit. Each question should be 10 marks

UNIT I
Measure of Information, Information contents of discrete memoryless sources, Entropy & Mutual Information, Source coding theorem: Huffman coding, Shannon-Fano coding, Lempel-Ziv algorithm, Prefix codes,

UNIT II
Channel Coding theorem, Channel capacity theorem, Channel models, BSC, DMC, Lossless, Noiseless channels, Linear Block codes, Systematic & Non-Systematic codes, Repitition codes, Hamming codes, Cyclic codes, Cyclic Redundancy check (CRC) codes, Golay codes, BCH Codes, Read-Solomon codes.

UNIT III
Convolutional codes, Polynomial representation of Convolutional codes, Tree, State and Trellis diagrams, Maximum-likelihood/Viterbi Decoding of Convolutional codes, Concept of Interleaving, Turbo Codes, Turbo decoding,

UNIT IV
Combined coding and Modulation, Trellis Coded Modulation (TCM), Mapping by set partitioning, TCM decoder, TCM for fading channels, Concept of Space time Trellis Codes.

Text Books:
1. Information Theory, Coding and Cryptography By Ranjan Bose, Tata McGraw Hill, 2002.
2. Introduction to Error Control Codes by Salvatore Gravano, Oxford University Press

Reference Books:
1, Information Theory, Inference, and Learning Algorithms By David J.C. MacKay, Cambridge University Press, 2003.
2, Entropy & Information Theory by Robert M Gray, Springer-Verlag, Newyork, INC, 1990.

Paper code: MEDC-603 **L T P**
Paper: Optical Fiber Communication Systems **4 0 0**

INSTRUCTIONS TO PAPER SETTERS: **Maximum Marks : 60**
1. Question No. 1 should be compulsory and cover the entire syllabus and will be of 20 marks.
2. Apart from Question No. 1, rest of the paper shall consist of four units as per the syllabus. Every unit should have two questions. However, student may be asked to attempt only 1 question from each unit. Each question should be 10 marks

UNIT-I
Introduction to optical fibers, Modes of propagation, Attenuation, Dispersion in single mode and multimode fibers, Non-linear optical effects.

UNIT-II
Optical sources and transmitters: LEDs, Laser diodes, Line codes (RZ, NRZ, Manchester, AMI codes), Receivers: p-i-n photodiodes, APDs, Noise sources, Signal-to Noise Ratio, Bit-error rate (BER), Optical Pre-amplifier design.

UNIT-III
Optical amplifiers: Semiconductor optical amplifier, EDFA, Dispersion Compensation: Pre-post compensation, Dispersion Compensating Fiber (DCF), Dispersion Compensating Grating (DCG) (Simulation Exercises on OptiSystem/OptiSim).

UNIT-IV
Research Directions: Wavelength Division Multiplexing (WDM) systems, Orthogonal Frequency Division Multiplexing (OFDM), Optical Code Division Multiple Access (OCDMA), Optical Time Division Multiplexing (OTDM), Solitons (Exercises on OptiSystem/OptiSim).

Text Books:
1. Fiber-Optic Communication Systems - by Mynbev - John Wiley & Sons/Pearson.
2. Fiber-Optic Communication Systems - by GP Aggarwal - John Wiley & Sons

Reference Books:
1. Optical Fiber Communications, Principles & Practice by John M. Senior , PHI, 2nd Edition.
2. Related IEEE/IEE publications

Paper code: MEDC-604 **L T P**
Paper: Digital Mobile Radio Systems **4 0 0**

INSTRUCTIONS TO PAPER SETTERS: Maximum Marks : 60
1. Question No. 1 should be compulsory and cover the entire syllabus and will be of 20 marks.
2. Apart from Question No. 1, rest of the paper shall consist of four units as per the syllabus. Every unit should have two questions. However, student may be asked to attempt only 1 question from each unit. Each question should be 10 marks

Unit-I

Overview & Classification of Mobile Communication Systems, Mobile Communication channel. Modeling of Propagation Loss, Diversity reception, Cellular System Concepts, Ways of increasing system capacity, First Generation Cellular Telephony.

Unit-II

GSM Cellular Telephony. GSM Architecture. Radio Transmission Parameters of GSM. GSM Logical Channels. GSM Burst Structures. Call setup Procedures & Handover in GSM System.
Data Transmission in GSM. HSCSD, GPRS, EDGE.

Unit-III

CDMA in Mobile Communication Systems. Spreading Sequences. Basic Transmitter & Receiver Schemes in CDMA Systems. RAKE Receiver. Multi Carrier CDMA. IS- 95 systems. Digital Cordless telephony. Wire Less Local Loops.

Unit-IV

Third Generation Mobile Communication Systems. IMT 2000. Concepts of UMTS. UTRA FDD
Mode, UTRA TDD Mode.WCDMA. CDMA 2000. Application of Smart Antennas in Cellular
Telephony. Satellite Mobile Communication Systems. Iridium, Global Start, ICO Systems.

Text Books :
1) Theodore S. Rappaport, Wireless Communications Principles & Practice, Pearson Education
2) Jochen Schiller, Mobile Communications,Pearson Education.

Reference books:
1) Hazysztof Wesolowski, Mobile Communication Systems, Wiley.
2) Raj Pandya, Mobile & Personal Communication Systems And Service, PHI.

Paper code: MEDC-605 **L T/ P C**
Paper: Advanced Signal Processing **4 0 4**

INSTRUCTIONS TO PAPER SETTERS: Maximum Marks : 60

1. Question No. 1 should be compulsory and cover the entire syllabus and will be of 20 marks.

2. Apart from Question No. 1, rest of the paper shall consist of four units as per the syllabus. Every unit should have two questions. However, student may be asked to attempt only 1 question from each unit. Each question should be 10 marks

UNIT I

Introduction Signals and signal Processing, characterization & classification of signals, Review of passive circuits and filters, Filter Approximation theory (Maximally flat and Chebeychev), of magnitude and/or delay, Ladder design and Leapfrog filter design, Practical design considerations, effect of op-amp non-idealities.

UNIT II

Linear and non-linear applications of op-amps and OTAs, Active filter (Single amplifier biquads, Multiple feedback filters, Integrator loop Multiple amplifier filters employing opamp and OTA), oscillator design using op-amps and OTAs. .Use of computers in filter design, IC timers.

UNIT III

Linear constant coefficient difference equations, Frequency domain representation of discrete-time systems, symmetry properties of the Fourier transform, Sampling of continuous-time systems.Z-transforms, Inverse Z-transform, properties of Z-transform, & its applications in system analysis & design. Discrete Fourier Transform (DFT) & its properties, computation of the DFT of real sequences, Linear Convolution using the DFT. Computation of Discrete Fourier Transform: Complexity of the DFT computation by direct method, Goertzel algorithm, Decimation –in-time FFT algorithms, Decimation-in frequency FFT algorithms.

UNIT-IV

Digital Filter Structure: Signal Flow Graph Representation, Basic FIR Digital Filter Structures: Direct forms, Transposed forms, Cascaded forms, Poly phase realization and Linear phase FIR structures. Basic IIR Filter Structures: Direct forms, Transposed forms, Cascaded realizations and Parallel realizations. All pass filters, Digital Sine-Cosine Generator.
Digital Filter Design: Design of IIR Digital filters from analog filters, Properties of FIR digital filters, Desgin of FIR filters using Windows, Computer aided design of FIR filters, Comparison of IIR and FIR digital filters.

Text Books:

1. Modern filter theory and design, edited By G. C. Temes and S. K. Mitra, Wiley, New York. 1973
2. Design of Analog Filters: Passive, Active-RC and Switched Capacitor By Laker, Ghausi and Schaumann Publisher: Prentice Hall.
3. Passive, active and digital filters By Wai-Kai Chen, Taylor and Francis.

References:

1. Continuous-time active filter design By Deliyanis, Sun and Fidler, Wiley.
2. Alan V. Oppenheim & Ronald W. Schafer, " Digital Signal Processing" PHI, 2002
3. Sanjit K. Mitra, "Digital Signal Processing: A computer based approach" TMH, Second Edition, 2003
4. Selected research papers from Journals
5. hi-Tsong Chen, "Digital Signal Processing, Spectral Computation and Filter Design" Oxford University Press, 2001
6. Monson H. Hayes, " Schaum's Outline of Digital Signal Processing", Mcgraw Hill, 1999
7. Richard W. Hammming, "Digital Filters", Dover Pubns, 1998
8. Lars Wanhammar, "DSP Integrated Circuits", Academic Press, First edition, 1999.

Paper code: MEDC-606 **L T P**
Paper: Fading Channels **4 0 0**

INSTRUCTIONS TO PAPER SETTERS: **Maximum Marks : 60**
1. Question No. 1 should be compulsory and cover the entire syllabus and will be of 20 marks.
2. Apart from Question No. 1, rest of the paper shall consist of four units as per the syllabus. Every unit should have two questions. However, student may be asked to attempt only 1 question from each unit. Each question should be 10 marks

UNIT I

Concept of fading, factors influencing fading, types of fading and characteristics of fading channels, fading margin, statistical models for multipath fading channels, optimum receivers for fading channels.

UNIT II

Radio propagation over wireless channel: General considerations about radio waves and wireless channels, propagation mechanism, free space propagation model, ground wave propagation, ionospheric propagation, channel noise and losses, satellite link, influence of multipath effect on signal propagation, fading effects to signals & frequency components, shadowing, signal outages in fading channels.

UNIT III

Introduction to channel modeling, representation of discrete channel by filter, Rayleigh fading model, Rician fading model, Nakagami fading model, comparison of Rayleigh, Rician and Nakagami Fading models.

UNIT IV

Performance of single channel receivers over fading channels, Trellis Coded Modulation (TCM), coded communications over fading channels.

Text Books:

1) Digital Communication. over Fading Channels By Marvin .K. Simon, Mohamed-Slim Alouini, John Wiley &Sons,2005.
2) Mobile Fading Channels by Matthias Patzold, John wiley & sons , 2002.

Reference Books:

1) Mobile Communication Systems by Wesolowshi.
2) Wireless Communications Principles & Practices BY Theodore S. Rappaport, second edition
3) Wireless Communications by Upena Dalal.

Paper code: MEDC-607 **L T P**
Paper: Computer Communication Networks **4 0 0**

INSTRUCTIONS TO PAPER SETTERS: Maximum Marks : 60
1. Question No. 1 should be compulsory and cover the entire syllabus and will be of 20 marks.
2. Apart from Question No. 1, rest of the paper shall consist of four units as per the syllabus. Every unit should have two questions. However, student may be asked to attempt only 1 question from each unit. Each question should be 10 marks

UNIT I

Review of data communication techniques, Data transmission, line coding, error control coding, Data switching, circuit switching, message and packet switching,

UNIT II

Network model ISO-OSI model, primitives and services, Elements of queuing. Data link control Simplex, pipelined and sliding window protocols, simplex performance analysis, X 25 data link layer, Random access techniques, Pure, slotted and finite population ALOHAs, Stability in ALOHAs.

UNIT III

Routing and congestion control static, adaptive, centralized and distributed routing procedures, congestion control, Local Area Networks LAN topologies and protocols, IEEE 802.x protocols, implementation and performance issues, High speed LANs. Switching and Bridging, Basic Internetworking (IP), Routing, Implementation and Performance.

UNIT IV

Advanced Internetworking - The Global Internet, Routing Areas, Interdomain Routing (BGP), IP version 6 (IPv6), Multicast, Multicast Addresses, Multicast Routing (DVMRP, PIM, MSDP), Multiprotocol Label Switching (MPLS), Destination-Based Forwarding, Explicit Routing, Virtual Private Networks and Tunnels, Routing among mobile devices, Challenges for Mobile Networking, Routing to Mobile Hosts (Mobile IP).

Text Books:

1. Data and Computer Communications By William Stallings, PHI,6th Edition,2002.
2. Computer Networks By Larry Peterson, Bruce Davie

Reference Books:

1. Computer Networks by Tananbaum .A.S., PHI, 3rd Edition, 1999.
2. Introduction to Data Communication & Networking by Wayne Tomasi, Pearson ,2007.
3. TCP/IP Protocol suit by Behrouz A. Forouzan, TMH, 2000.

Paper code: MEDC-608 **L T P**
Paper: Satellite Communication **4 0 0**

INSTRUCTIONS TO PAPER SETTERS: Maximum Marks : 60
1. Question No. 1 should be compulsory and cover the entire syllabus and will be of 20 marks.
2. Apart from Question No. 1, rest of the paper shall consist of four units as per the syllabus. Every unit should have two questions. However, student may be asked to attempt only 1 question from each unit. Each question should be 10 marks

UNIT-I

ORBITAL MECHANICS: Orbits, Orbit Equations, Orbital Elements-Look Angle Determination and Visibility - Orbital Perturbations, Orbit Determination, Launch Vehicles, Orbital Effects in Communication System - Performance Attitude control; Satellite launch vehicles. spectrum allocations for satellite systems.

UNIT-II

SPACECRAFT SUB SYSTEMS AND EARTH STATION: Altitude and Orbit Control, Telemetry and Tracking, Power Systems, Communication Subsystems, Transponders, Antennas, Equipment Reliability, Earth Stations, Example of payloads of operating and planned systems.

UNIT-III

SPACE LINKS: Satellite Link Design - Satellite uplink -down link power Budget, Basic Transmission Theory, System Noise Temperature, G/T Ratio, Noise Figure, Design of Down links, Domestic Satellite Systems Using Small Earth stations, Uplink Design, Design of Satellite Link for Specified (C/N).

UNIT-IV

MULTIPLE ACCESS TECHNIQUES AND NETWORK ASPECTS: Single access vs. multiple access, FDMA, TDMA, Single channel per carrier (SCPC) access - Code division multiple access (CDMA). Demand assignment techniques, Mobile satellite network design, ATM via satellite, TCP/IP via satellite - Call control, Hybrid satellite-terrestrial networks. VSATs.
SERVICES AND APPLICATIONS: Fixed and mobile services, Multimedia satellite services, advanced applications based on satellite platforms.

Text Books:

1 Dennis Roddy, “Satellite Communications”, Third Edition, Mc Graw Hill International Editions, 2001
2. Timothy Pratt, “Satellite Communication”, Addison Wesley.

Reference Books:

1. Bruce R.Elbert, "The Satellite Communication Applications Hand Book, Artech House Boston,1997.

2. Wilbur L.Pritchard, Hendri G.Suyderhood, Robert A.Nelson,"Satellite Communication Systems Engineering", 2nd Edition, Prentice Hall, New Jersey, 1993

Paper code: MEDC-651 **L T/ P C**
Paper: Lab-I **0 4 2**

Lab based on Advanced Digital Communication Systems.

Paper code: MEDC-653 **L T/ P C**
Paper: Lab-2 **0 4 2**

Lab based on OFC Systems

Paper code: MEDC-655 **L T/ P C**
Paper: Lab-3 **0 4 2**

Lab based on Advanced Signal Processing.

Paper code: MEDC-657* **L T/ P C**
Paper: Term Paper-I **0 4 2**

Lab based on Elective/ or research work

*** NUES : Non University Examination**

Paper code: MEDC-652 **L T P**
Paper: Lab-4 **0 4 2**

40 marks: internal evaluation	**60 marks: external evaluation**

Lab based on advanced ITC

Paper code: MEDC-654 **L T P**
Paper: Lab-5 **0 4 2**

40 marks: internal evaluation	**60 marks: external evaluation**

Lab based on DMRS

Paper code: MEDC-656 **L T P**
Paper: Lab-6 **0 4 2**

40 marks: internal evaluation	**60 marks: external evaluation**

Lab based on DET

Paper code: MEDC-658* **L T P**
Paper: Term Paper-II **0 4 2**

40 marks: internal evaluation	**60 marks: external evaluation**

- ***Non University Program**

The student will have to present the seminars and progress reports at the interval of four weeks during the semester. Minimum two seminars will be held during the semester.

Paper code: MEDC-701 **L T P**
Paper: Advanced Mobile Computing **4 0 0**

INSTRUCTIONS TO PAPER SETTERS: Maximum Marks : 60
1. Question No. 1 should be compulsory and cover the entire syllabus and will be of 20 marks.
2. Apart from Question No. 1, rest of the paper shall consist of four units as per the syllabus. Every unit should have two questions. However, student may be asked to attempt only 1 question from each unit. Each question should be 10 marks

Unit -1
Introduction to Personal Communication Systems, PCS Architecture. Medium Access Techniques,GSM Overview, Packet Switched Data, 2.5/3G Mobile Wireless Systems. GPRS, EDGE Systems, WCDMA & CDMA 2000 Systems.

Unit-II
Wireless Local Area Networks. IEEE 802.11, System Architecture and Protocol Architecture of
IEEE 802.11. HIPERLAN Architecture, Bluetooth Networks , Mobile Internet Protocol. IP packet Delivery. Tunneling and Encapsulation. Reverse Tunneling. IPv6.

Unit-III
Wireless Application Protocol. Networks for WAP. WAP Layered Architecture and Protocol Stack. WAP Gateways. Wireless Markup Language(WML). Programming in WML. WML Script. Voice over Internet Protocol and Convergence Technologies.

Unit-IV
Wireless Local Loop Technologies. WLL Architecture Model. Mobile AD HOC Networks. AD
HOC Routing Protocols. DSDV, DSR and AODV Routing Techniques. Quality of service in Mobile Ad hoc Networks.

Text Books :
1) Yi-Bing and Imrich Chlamtac, "Wirelwss and Mobile Networks Architectures", John Wiley &
Sons,2001.
2) Asoke k Talukder , Roopa R Yavagal, "Mobile Computing", Tata Mc Graw Hill

Reference Books:
1) Raj Pandya, Mobile & Personal Communication Systems And Service, PHI.
2) Jon W.Mark , Weihua Zhuang, " Wirelwss Communication and Networking", PHI.
3) Jochen Schiller, Mobile Communication, Pearson education

Paper code: MEDC-703 **L T P**
Paper: Broadband Communication Systems and Networks **4 0 0**

INSTRUCTIONS TO PAPER SETTERS: Maximum Marks : 60
1. Question No. 1 should be compulsory and cover the entire syllabus and will be of 20 marks.
2. Apart from Question No. 1, rest of the paper shall consist of four units as per the syllabus. Every unit should have two questions. However, student may be asked to attempt only 1 question from each unit. Each question should be 10 marks

UNIT I
Components of Broadband Communication Systems, Network Architecture, Cable Broadband, Data Network Architecture, Importance of Broadband Network, Future of Broadband Telecommunications. X.25 Technology & Frame Relay.

UNIT II
DIGITAL SUBSCRIBER LINE: DSL Technology, ADSL, HDSL, SDSL, SHDSL. Cable - Modem Technology, Cable Internet Access, Comparison Between Broadband DSL and Cable Modem Technologies, Future of DSL and Broadband Systems – XDSL.
ISDN & BISDN, ISDN Standards, ISDN Applications. ATM Technology, ATM Network, ATM Service Class, ATM Standards, ATM LAN Emulation, ATM Applications.

UNIT III
SYCHRONOUS OPTICAL NETWORK (SONET): SONET Signal, SONET Frame, SONET Components, SONET Topologies, Advantages and Disadvantages of SONET & SDH, SONET and SDH Standards.
WDM Network Elements- Optical Line Terminals, Optical Line Amplifiers, Optical Add/Drop Multiplexers, OADM Architectures, Reconfigurable OADMs, Optical Cross-connects, All-Optical OXC Configurations.

UNIT IV
NETWORK MANAGEMENT: Network Management Architecture - Network Management Protocols - Simple Management Information Protocol (SNMP) Management - Information Base (MIB) - Structure of Management Information (SMI) - Remote Network Monitoring (RMON). Network Security Requirements, Network Threats, Access Control Methods.

TEXT BOOKS:

1) Broadband Communication Systems by Cajetan Akujuobi and Matthew Sadiku, Scitech Publishing.
2) Introduction to broadband Communication Systems By Cajetan M. Akujuobi and MNO Sadiku, Chapman & Hall.

REFERENCE BOOKS:

1) Fixed Broadband Wireless System Design: The Creation of Global Mobile Communications By Harry R. Anderson; Wiley Blackwell.
2) Optical Networks A Practical Perspective by Rajiv Ramaswami, Kumar N. Sivarajan, Galen H. Sasaki.

Paper code: MEDC-705 **L T P**

Paper: High performance communication networks **4 0 0**

INSTRUCTIONS TO PAPER SETTERS: **Maximum Marks : 60**

1. Question No. 1 should be compulsory and cover the entire syllabus and will be of 20 marks.

2. Apart from Question No. 1, rest of the paper shall consist of four units as per the syllabus. Every unit should have two questions. However, student may be asked to attempt only 1 question from each unit. Each question should be 10 marks

UNIT-I

Basics of Networks: Telephone, computer, cable television and wireless network, networking principles, digitization: Service integration, network services and layered architecture, traffic characterization and QOS, networks services, network elements and network mechanisms.

UNIT-II

Packet switched networks: OSI and IP models, Fast and Gigabit Ethernets, FDDI, DQDB, frame relay, SMDS, internet working with SMDS.

Internet and TCP IP networks: overview, internet protocols, TCP and VDP, performance of TCP/IP networks circuit switched networks, SONET, DWDM, fibre to home, DSL, intelligent networks, CATV.

UN**IT-III**

ATM and Wireless networks: Main features, addressing, signaling and routing, ATM header structure, adaptation layer, management and control, BISDN, interworking with ATM, wireless channel, link level design, channel access, network design and wireless networks.

UNIT-IV

Optical networks and Switching: Optical links, WDM systems, cross-connects, optical LANs, optical paths and networks, TDS and SDS, modular switch designs, packet switching, distribution, shared, input and output buffers.

Text Books:

1. J. Warland and P. Varaiya, "High performance communication networks", Harcourt and Morgan Kauffman, London 2000
2. Sumit Kasera and Pankaj Sethi, "ATM networks", Tata McGraw Hill, 2000.

Reference Books:

1. Behrouz. A. Forouzan, "Data Communication and networking,4TH edition.
2. Leon Garacia Widjaja, "Communication networks", Tata McGraw Hill, 2000.

Paper code: MEDC-707 **L T P**
Paper: Spread Spectrum Techniques. **4 0 0**

INSTRUCTIONS TO PAPER SETTERS: Maximum Marks : 60
1. Question No. 1 should be compulsory and cover the entire syllabus and will be of 20 marks.
2. Apart from Question No. 1, rest of the paper shall consist of four units as per the syllabus. Every unit should have two questions. However, student may be asked to attempt only 1 question from each unit. Each question should be 10 marks

UNIT I
INTRODUCTION: Origin of Spread Spectrum – Spreading the Spectrum – Progress Gain – Jamming Margin – Direct Sequence System – Direct Sequence Signal Characteristics – Direct Sequence Code – Spectrum relationship – Frequency Hopping Signal Characteristics – Frequency Hopping Rate and No. of frequencies – Time Hopping – Chirp System – Hybrid Forms

UNIT II
CODE GENERATION: Coding – Maximal sequences – Linear Code Generator – Auto Correlation and Cross Correlation of codes– Composite codes – Chip rate and code length – Choosing a linear code – Generating high rate codes –Code selection and Signal spectra – Initial Synchronization – Tracking

UNIT III
MODULATION – CORRELATION AND DEMODULATION: Modulation – Balanced Modulation – Frequency Synthesis – Sending the Information – Remapping the Spread Spectrum – Effect of non synchronous input signal – Base band recovery.

UNIT IV
SYNCHRONISATION: Noise figure and Cochannel users - Dynamic range and AGC - Propagation Medium - Overall Receiver-Transmitter Design – Ranging Techniques – Direction finding – Special Antennas.
APPLICATIONS OF SPREAD SPECTRUM METHODS: Space Systems – Avionics Systems – Test Systems and Equipment – Message Protection – Position Location – Test and Evaluation of Spread Spectrum Systems – Sensitivity, Selectivity, Jamming Margin, Synchronous acquisition, loss of Synchronization – Signal to noise ratio Vs Interference level – Process gain – FCC Method – Cross Correlation – Transmitter Measurements.

TEXT BOOKS:

1. R.C. Dixon, “Spread Spectrum Systems with commercial appications”, Wiley Interscience, 3rd Edition,1994
2. George Cooper & Clare. D. Mc Gillen, “Modern Communications and Spread Spectrum”, Mc Graw Hill, 1985.

REFERENCE BOOKS:

1. M.K. Simon, J.K. Omura, R.A. Scholtz , “Spread Spectrum Communications Handbook, Elctronic Edition”, McGraw Hill, 1st Edition, 2001.
2. Rodger E. Ziemer, Roger L. Peterson, David E. Borth, “Introduction to Spread Spectrum Communications”, Prentice Hall Inc., 1995.

Paper code: MEDC-709 **L T P**
Paper: Selected topics on Recent Technologies in Wireless & Mobile Comm' n **4 0 0**

INSTRUCTIONS TO PAPER SETTERS: **Maximum Marks : 60**
1. Question No. 1 should be compulsory and cover the entire syllabus and will be of 20 marks.
2. Apart from Question No. 1, rest of the paper shall consist of four units as per the syllabus. Every unit should have two questions. However, student may be asked to attempt only 1 question from each unit. Each question should be 10 marks

UNIT I

Wireless Multiple Access and Multiplexing Techniques,Time-Domain and Frequency-Domain Analyses of Signals and Systems, Spread Spectrum Techniques Wireless Channel Parameters (Delay Spread and Doppler Spread), Comparison between Signal (OFDM & CDMA) Parameters and Channel Parameters, Brief Reviews on Random Variables and Probability Modeling

UNIT II

Direct Sequence Spread Spectrum Techniques, Walsh Code , Pseudo Random Code , Mean and Variance of Random Codes. Rake Receiver, Capacity Analysis & Power Control, Multipath Effects (Delay Spread and Distortion) and Rake Receiver Approach, Capacity Analysis of Cellular CDMA Communication Systems, Power Control in CDMA Communication Systems

UNIT111

Synchronous CDMA, Auto and Cross Correlations of Spreading Codes and Signals, Synchronous Code Division Multiple Access (CDMA) Systems , Bit-Error-Rate Analysis of Synchronous CDMA Systems

Asynchronous CDMA Systems, Multiuser Interference Analysis and Chip-shape Function Design, Bit-Error-Rate Analysis of Asynchronous CDMA Systems

UNIT IV

Ultra Wideband (UWB) Communications, Radio Frequency IDentification (RFID) Technology, Miscellaneous Modern Wireless Communication Techniques and Systems

TEXTBOOKS

(1) Mobile wireless communications , author Mischa Schwartz , publisher Cambridge
(2) **Wireless Communication, 1/e author** Upena Dalal, publisher oxford

REFERENCES

(1) OFDM Baseband Receiver Design for Wireless Communications by Tzi-Dar Chiueh, Pei-Yun Tsai, Wiley
(2) From GSM to LTE: An Introduction to Mobile Networks and Mobile Broadband by Martin Sauter, Wiley

Paper code: MEDC-751 **L T/ P C**
Paper: Lab-7 **0 4 2**

40 marks: internal evaluation	60 marks: external evaluation

Lab based on AMC.

Paper code: MEDC-753 **L T/ P C**
Paper: Lab-8 **0 4 2**

40 marks: internal evaluation	60 marks: external evaluation

Lab based on BCSN

Paper code: MEDC-755 **L T/ P C**
Paper: Minor Project **0 4 2**

40 marks: internal evaluation	60 marks: external evaluation

Objective: Students are required select a topic of their interest and develop a minor project on it. The student will submit a synopsis at the beginning of the semester for the approval to the project committee in a specified format (available on www.ipu.ac.in). The student will have to present the progress of the work through seminars. A report must be submitted to the college for evaluation purpose at the end of the semester in a specified format.

Paper code: MEDC-757* **L T/ P C**
Paper: Term Paper-III **0 4 2**

40 marks: internal evaluation	60 marks: external evaluation

- ***Non University Program**

The student will have to present the seminars and progress reports at the interval of four weeks during the semester. Minimum two seminars will be held during the semester.

Paper code: MEDC-752 **Total credit**
Paper: Dissertation **24**

: Evaluation based on Final Thesis of the work done

Objective: Students are required to select a topic of their interest and prepare a dissertation on it. The student will submit a synopsis at the beginning of the semester for the approval from the project committee in the specified format. Synopsis must be submitted within two weeks. The first defense, for the dissertation work, should be held with in one month.
Dissertation Report must be submitted in specified format (available on www.ipu.ac.in) to the college for evaluation purpose.

Paper code: MEDC-754* **total credit**
Paper: Seminar & Progress report **4**

100 marks: internal evaluation

Paper code: MEDC-757* **L T/ P C**
Paper: Term Paper-IV **0 4 2**

40 marks: internal evaluation **60 marks: external evaluation**

- ***Non University Program**

The student will have to present the seminars and progress reports at the interval of four weeks during the semester. Minimum two seminars will be held during the semester.

Paper code: MESP-601 L T/P C

Paper: Signal Theory **4 0 4**

INSTRUCTIONS TO PAPER SETTERS: Maximum Marks : 60

1. Question No. 1 should be compulsory and cover the entire syllabus and will be of 20 marks.

2. Apart from Question No. 1, rest of the paper shall consist of four units as per the syllabus. Every unit should have two questions. However, student may be asked to attempt only 1 question from each unit. Each question should be 10 marks

UNIT I

Representation of deterministic signal: Orthogonal representation of signals, Dimensionality of signal spaces, Construction of orthogonal basis functions. Time-bandwidth relationship: RMS duration and bandwidth, uncertainty relations.

UNIT II

Random Processes: Concept of random variables, functions on joint-PDF, joint-CDF of random variables, Ist and IInd characteristic function, Definition and classification, stochastic integrals, WSS processes, Fourier transforms of random processes, correlation functions, Ergodicity, power spectral density.

UNIT III

Transformations of random processes by linear systems, Representation of random processes (via sampling, K-L expansion and narrow band representations), special random processes (white Gaussian noise, Wiener-Levy processes, shot-noise processes, Markov processes).

UNIT IV

Optimum Filtering: Matched filters for deterministic signals in white and coloured Gaussian noise. Wiener filters for random signals in white and coloured Gaussian noise. Discrete and continuous time filters.

Text books:

1) Probability, Random Variables and Stochastic Processes By A. Papoulis, S. Pillai, McGraw-Hill.
2) Probability, Random Variables, and Random Processes, (Schaum's Outline Series) By H. Hsu, McGraw Hill.

Reference Book

1. Probability, Random Processes, and Estimation Theory for Engineers (Second Edition) By H Stark, J. Woods, Prentice Hall.

Paper code: MESP-602 **L T/ P C**
Paper: Detection and Estimation Theory **4 0 4**

INSTRUCTIONS TO PAPER SETTERS: **Maximum Marks : 60**
1. Question No. 1 should be compulsory and cover the entire syllabus and will be of 20 marks.
2. Apart from Question No. 1, rest of the paper shall consist of four units as per the syllabus. Every unit should have two questions. However, student may be asked to attempt only 1 question from each unit. Each question should be 10 marks

UNIT I

Classical Detection and Estimation Theory, Karhunen-Loeuve Transform and its application to Detection of signals in Gaussian noise, Waveform estimation, Linear estimation problems, Wiener filtering, Kalman filtering.

UNIT II

Classical detection Theory: Binary and m-ry hypothesis testing, Bayes' criterion, NP test, the general Gaussian problem, min-max test, erasure decision problem;

UNIT III

Classical estimation theory: random parameter estimation; MMSE absolute error cost function, uniform error cost function estimators, CRLB for random parameter case, non-random parameter estimation; ML estimator, CRLB.

UNIT IV

Composite and non-parametric hypothesis testing; Sign test, Wilcoxon test.

Text Books/ References:

1) Detection, Estimation and Modulation Theory vol-I By Harry.L.Van Trees, John Wiley & Sons Inc.
2) Signal Detection and Estimation By Mourad Barkat, Artech House London.

Paper code: MESP-603 **L T/ P C**
Paper: Analog Signal Processing **4 0 4**

INSTRUCTIONS TO PAPER SETTERS: Maximum Marks : 60
1. Question No. 1 should be compulsory and cover the entire syllabus and will be of 20 marks.
2. Apart from Question No. 1, rest of the paper shall consist of four units as per the syllabus. Every unit should have two questions. However, student may be asked to attempt only 1 question from each unit. Each question should be 10 marks

UNIT I
Approximation theory of magnitude and/or delay, review of passive circuits and filters,

UNIT II
Practical design considerations, effect of op-amp non-idealities, Linear and non-linear applications of op-amps and OTAs, Active filter/oscillator design using op-amps and OTAs, Various design methods,

UNIT III
Use of computers in filter design, IC timers, IC Function generators, Multipliers, PLL.

UNIT IV
Elements of switched capacitor circuits, CCD and SAW filters, D/A and A/D converters.

Text books:

1) Modern filter theory and design, edited By G. C. Temes and S. K. Mitra, Wiley, New York. 1973
2) Design of Analog Filters: Passive, Active-RC and Switched Capacitor By Laker, Ghausi and Schaumann Publisher: Prentice Hall.

Reference Books

1. Passive, active and digital filters By Wai-Kai Chen, Taylor and Francis.
2. Continuous-time active filter design By Deliyanis, Sun and Fidler, Wiley.
3. Selected research papers from Journals

Paper code: MESP-604 **L T/ P C**
Paper: Digital Signal Processing **4 0 4**

INSTRUCTIONS TO PAPER SETTERS: Maximum Marks : 60
1. Question No. 1 should be compulsory and cover the entire syllabus and will be of 20 marks.
2. Apart from Question No. 1, rest of the paper shall consist of four units as per the syllabus. Every unit should have two questions. However, student may be asked to attempt only 1 question from each unit. Each question should be 10 marks

UNIT-I

Introduction

Signals and signal Processing, characterization & classification of signals, typical Signal Processing operations, example of typical Signals, typical Signals Processing applications.

Time Domain Representation of Signals & Systems

Discrete Time Signals, Operations on Sequences, Linear shift-invariant systems, Stability and Causality, Linear constant coefficient difference equations, Frequency domain representation of discrete-time systems, symmetry properties of the Fourier transform, Sampling of continuous-time systems.

Transforms

UNIT-II

Z-transforms, Inverse Z-transform, properties of Z-transform, & its applications in system analysis & design. Discrete Fourier Transform (DFT) & its properties, computation of the DFT of real sequences, Linear Convolution using the DFT.

UNIT-III

Digital Filter Structure

Block Diagram representation, Signal Flow Graph Representation, Equivalent Structures, Basic FIR Digital Filter Structures: Direct forms, Transposed forms, Cascaded forms, Poly phase realization and Linear phase FIR structures. Basic IIR Filter Structures: Direct forms, Transposed forms, Cascaded realizations and Parallel realizations. All pass filters, Digital Sine-Cosine Generator.

Digital Filter Design

Design of IIR Digital filters from analog filters, Properties of FIR digital filters, Desgin of FIR filters using Windows, Computer aided design of FIR filters, Comparison of IIR and FIR digital filters.

UNIT-IV

Computation of Discrete Fourier Transform

Complexity of the DFT computation by direct method, Goertzel algorithm, Decimation –in-time FFT algorithms, Decimation-in frequency FFT algorithms.

Text Books:

1. Alan V. Oppenheim & Ronald W. Schafer, " Discrete Signal Processing" PHI, 2002
2. Sanjit K. Mitra, "Digital Signal Processing: A computer based approach" TMH, Second Edition, 2003

References:

1. Chi-Tsong Chen, "Digital Signal Processing, Spectral Computation and Filter Design" Oxford University Press, 2001.
2. Monson H. Hayes, " Schaum's Outline of Digital Signal Processing", Mcgraw Hill, 1999.
3. Richard W. Hammming, "Digital Filters", Dover Pubns, 1998.
4. Lars Wanhammar, "DSP Integrated Circuits", Academic Press, First edition, 1999.
5. Simon S. Haykin, "Adaptive Filter Theory, "Prentice Hall, 3rd Edition.
6. Digital Signal Processing: WITH DSP Laboratory Using MATLAB: A Computer-Based Approach (Paperback) by Sanjit K. Mitra, McGraw-Hill.
7. Computer-Based Exercises for Signal Processing Using MATLAB 5 (MATLAB Curriculum Series) by J. H. McClellan et. al., Prentice- Hall.

Paper code: MESP-605 **L T/ P C**
Paper: Mathematical Methods in Signal Processing **4 0 4**

INSTRUCTIONS TO PAPER SETTERS: **Maximum Marks : 60**
1. Question No. 1 should be compulsory and cover the entire syllabus and will be of 20 marks.
2. Apart from Question No. 1, rest of the paper shall consist of four units as per the syllabus. Every unit should have two questions. However, student may be asked to attempt only 1 question from each unit. Each question should be 10 marks

UNIT I
Introduction to Linear Algebra basics, Generalized inverses, regularization of ill-posed problems.

UNIT II
Eigen and singular value decompositions, generalized problems,

UNIT III
Interpolation and approximation by least squares and minimax error criteria,

UNIT IV
Optimization techniques for linear and nonlinear problems, Applications in various areas of signal processing.

Text book/ References:

1) Linear Algebra By Hofmann and Kunze, Prentice Hall.
2) Solving Least Squares Problems By Charles L. Lawson and Richard J. Hanson, SIAM Prentice Hall.

Paper code: MESP-606 **L T/ P C**
Paper: Topics in Stochastic Processes **4 0 4**

INSTRUCTIONS TO PAPER SETTERS: Maximum Marks : 60
1. Question No. 1 should be compulsory and cover the entire syllabus and will be of 20 marks.
2. Apart from Question No. 1, rest of the paper shall consist of four units as per the syllabus. Every unit should have two questions. However, student may be asked to attempt only 1 question from each unit. Each question should be 10 marks

UNIT I
Martingale convergence theorem, stopping times, sequential analysis,

UNIT II
Ergodic Theory: Measure preserving transformations, stationary processes, mixing conditions, ergodic theorem,

UNIT III
Shannon-Millan-Breiman theorem, Markov chainsasymptotic stationarity, indecomposability, ergodicity.

UNIT IV
Continuous time processes: Separability, continuity, measurability, stochastic integral.

Text Books/References:

3) Stochastic processes By Emanuel Parzen, Holden Day.
4) An Introduction to Stochastic Process By Adhir K. Basu, Alpha Science International.

Paper code: MESP-607 **L T/ P C**
Paper: Broadband Communication and Information Systems **4 0 4**

INSTRUCTIONS TO PAPER SETTERS: Maximum Marks : 60
1. Question No. 1 should be compulsory and cover the entire syllabus and will be of 20 marks.
2. Apart from Question No. 1, rest of the paper shall consist of four units as per the syllabus. Every unit should have two questions. However, student may be asked to attempt only 1 question from each unit. Each question should be 10 marks

UNIT I
Fundamentals of telecom systems, Principles of communication and signaling,

UNIT II
Fundamentals of transmission; mathematical models for Electrical Engineering networks, Tele-traffic engineering:

UNIT III
Telecom Management Networks, Protocols, Architectures for Broadband Networks,ATM, SDH/SONET;

UNIT IV
Access and Hybrid Networks; All optical networks.

Text book/References:

1) Introduction to broadband Communication Systems By Cajetan M. Akujuobi and MNO Sadiku, Chapman & Hall.
2) Fixed Broadband Wireless System Design: The Creation of Global Mobile Communications By Harry R. Anderson; Wiley Blackwell.

Paper code: MESP-608 **L T/ P C**
Paper: Wavelet Transforms for Signal and Image Processing **4 0 4**

INSTRUCTIONS TO PAPER SETTERS: Maximum Marks : 60
1. Question No. 1 should be compulsory and cover the entire syllabus and will be of 20 marks.
2. Apart from Question No. 1, rest of the paper shall consist of four units as per the syllabus. Every unit should have two questions. However, student may be asked to attempt only 1 question from each unit. Each question should be 10 marks

UNIT I
Basics of functional Analysis; Basics of Fourier Analysis; Spectral Theory; Time-Frequency representations;

UNIT II
Non-stationary Processes; Continuous Wavelet Transforms; Discrete Time-Frequency Transforms;

UNIT III
Multi resolution Analysis; Time-Frequency Localization; Signal Processing Applications;

UNIT IV
Image Processing Applications

Text Books/References:

1) Wavelet Transforms & Time-Frequency Signal Analysis (Hardcover) By Lokenath Debnath, Birkhauser (USA).
2) Wavelet Transforms: Introduction to Theory and Applications By Raghuveer M. Rao, Ajit S. Bopardikar, Rochester Institute of Tech Addison-Wesley.
3) A Wavelet Tour of Signal Processing By Stephane Mallat, Elsevier.

Paper code: MESP-609 **L T/ P C**
Paper: Optimization Techniques **4 0 4**

INSTRUCTIONS TO PAPER SETTERS: Maximum Marks : 60
1. Question No. 1 should be compulsory and cover the entire syllabus and will be of 20 marks.
2. Apart from Question No. 1, rest of the paper shall consist of four units as per the syllabus. Every unit should have two questions. However, student may be asked to attempt only 1 question from each unit. Each question should be 10 marks

UNIT-I
Introduction: Statement of an Optimization problem, Classification of Optimization problems

Classical Optimization Techniques: Single variable optimization, Multivariable optimization with no constraints– Hessian matrix, Multivariable saddle point, Optimization with equality constraints – Lagrange multiplier method, Multivariable optimization with inequality constrains – Kuhn-Tucker conditions.

UNIT-II
One-Dimensional Minimization Methods: Elimination Methods, UnrestrMEed Search Method, Fibonacci Methods, Interpolation Methods – Quadratic and Cubic Interpolation Methods

Integer Programming: Gomory's Cutting Plane Method for Integer Linear Programming, Formulation and Solution of Integer Polynomial and Non-linear problems.

Unit III

Unconstrained Minimization Methods: Univariate and pattern search method, steepest descent method, Newton method, Powell method.

Constrained Minimization Methods: Characteristics of a constrained problem, Direct Methods of feasible directions, Indirect Methods of interior and exterior penalty functions

UNIT-IV

Genetic Algorithm: Introduction to GA, fitness function, GA operators, Unconstrained and constrained optimization using Genetic algorithm, Global optimization using GA.

Text Books

1. "Engineering optimization: Theory and practice"-by S. S.Rao, New Age International (P) Limited, 3rd edition, 1998.
2. Optimization Concepts and Applications in Engineering – Ashok D.Belegundu and Tirupathi R Chandrupatla — Pearson Education.

References

1. "Operations Research : An Introduction" – by H.A. Taha, PHI Pvt. Ltd., 6th edition
2. "Optimization for Engineering Design: Algorithms and Examples", Kalyanmoy deb, PHI publication
3. "Genetic Algorithm in Search Optimization and Machine Learning", D.E. Goldberg, Addision-Wesley Publication, 1989

Paper code: MESP-610 **L T P**
Paper: Mixed Signal Circuit Design **4 0 0**

INSTRUCTIONS TO PAPER SETTERS: Maximum Marks : 60
1. Question No. 1 should be compulsory and cover the entire syllabus and will be of 20 marks.
2. Apart from Question No. 1, rest of the paper shall consist of four units as per the syllabus. Every unit should have two questions. However, student may be asked to attempt only 1 question from each unit. Each question should be 10 marks

UNIT I
Sampling and Aliasing, SPICE Models for DACs and ADCs, Nyquist and Oversampled Converters, Ideal DAC, Ideal ADC, Viewing the Quantization Noise Spectrum Using Simulations, Voltage Spectral Density, Data Converter SNR, Effective Number of Bits, Clock Jitter, Improving SNR Using Averaging,

UNIT II
Decimating Filters for ADCs, Interpolating Filters for DACs, Sinc Filters, Discrete Analog Integrator, Modulators, Noise-Shaping Fundamentals and Data Converters, First-Order, Second-Order Noise-Shaping and Topologies; Higher-Order, Multibit, Cascaded and Bandpass Modulators; Submicron CMOS:

UNIT III
Overview, Models and Circuit Design; CMOS Process Flow, Capacitors and Resistors; SPICE MOSFET Modeling, Digital Circuit Design, Switch and Delay Elements; Analog Circuit Design: Biasing, Op-Amp Design, Circuit Noise, Thermal Noise, Noise Equivalent Bandwidth, MOSFET Noise,

UNIT IV
Noise Performance of a Cascade of Amplifiers, Implementing Data Converters, R-2R Topologies for DACs, Voltage-Mode and Current-Mode R-2R DAC, Topologies Without an Op-Amp, Implementing ADCs, Implementing the S/H, Cyclic and Pipeline ADC.

Text Books/ References:

1) CMOS: Mixed-signal Circuit Design By R. Jacob Baker, Wiley-IEEE Press,
2) Analog VLSI Circuits and Principles By Shih-Chii Liu, Jörg Kramer, Giacomo Indiveri, Tobias Delbrück and Rodney Douglas, The MIT Press.

Paper code: MESP-612 **L T/ P C**
Paper: Digital Image Processing **4 0 4**

INSTRUCTIONS TO PAPER SETTERS: Maximum Marks : 60
1. Question No. 1 should be compulsory and cover the entire syllabus and will be of 20 marks.
2. Apart from Question No. 1, rest of the paper shall consist of four units as per the syllabus. Every unit should have two questions. However, student may be asked to attempt only 1 question from each unit. Each question should be 10 marks

UNIT I
Introduction to 2-D Signals and Systems, Image Digitization, Image Transforms, Image Data Compression: Transform Domain Coding, Predictive Coding, JPEG. Image Enhancement:

UNIT II
Image Restoration: Inverse Filtering, Algebraic Approach to Restoration, Wiener (LMS) approach, Constrained Least Squares Restoration, Interactive and other methods for restoration.

UNIT III
Image Reconstruction: The Filtered Back-Projection Algorithm, Algebraic reconstruction Method. Image Segmentation: Detection of Discontinuities, Edge Linking and Boundary Detection,

UNIT IV
Thresholding, Region-Oriented Segmentation, Selected Topics of Current Interest (for example multi-resolution analysis, morphological processing etc.).

Text books/ References:

1) Digital Image Processing By R. C. Gonzalez and R. E. Woods, Prentice-Hall.
2) Digital Image Processing and Computer vision By Milan Sonka, CL-Engineering Publisher.

Paper code: MESP-651	**L T/ P C**
Paper: Lab-I	**0 4 2**

Lab based on Signal Theory.

Paper code: MESP-653	**L T/ P C**
Paper: Lab-2	**0 4 2**

Lab based on Advanced Digital Communication.

Paper code: MESP-655	**L T/ P C**
Paper: Lab-3	**0 4 2**

Lab based on Analog Signal Processing.

Paper code: MESP-657*	**L T/ P C**
Paper: Term Paper-I	**0 4 2**

*** NUES : Non University Examination**

Paper code: MESP-652 **L T P**
Paper: Lab-4 **0 4 2**

40 marks: internal evaluation	60 marks: external evaluation

Paper code: MESP-654 **L T P**
Paper: Lab-5 **0 4 2**

40 marks: internal evaluation	60 marks: external evaluation

Paper code: MESP-656 **L T P**
Paper: Lab-6 **0 4 2**

40 marks: internal evaluation	60 marks: external evaluation

Paper code: MESP-658* **L T P**
Paper: Term Paper-II **0 4 2**

40 marks: internal evaluation	60 marks: external evaluation

Paper code: MESP-701 **L T /P C**
Paper: Advance Digital Signal Processing **4 0 4**

INSTRUCTIONS TO PAPER SETTERS: Maximum Marks : 60
1. Question No. 1 should be compulsory and cover the entire syllabus and will be of 20 marks.
2. Apart from Question No. 1, rest of the paper shall consist of four units as per the syllabus. Every unit should have two questions. However, student may be asked to attempt only 1 question from each unit. Each question should be 10 marks

UNIT I
Methods for fast computation of DFT including FFT, NTT and WTFA, Noise analysis of digital filters,
Review of Discrete random signal processing: Discrete random processes, expectations, variance, co-variance, scalar product, energy of discrete signals, Parseval's theorem,

UNIT II
Wiener Khintchine relation, power spectral density, sample auto correlation, spectral factorization theorem, discrete random signal processing by linear systems, simulation of white noise, low-pass filtering of white noise. Power Spectral Estimation: Non-parametric methods, correlation method, co-variance estimator, performance analysis of estimators, unbiased, consistent estimators, periodogram estimator, model based approach,

UNIT III
AR, MA, ARMA signal modeling, parameter estimation using Yule-Walker method.Multirate Digital Signal Processing: Mathematical description of change of sampling rate, interpolation and decimation, continuous time model, Direct digital domain approach,

UNIT IV
decimation by an integer factor, interpolation by an integer factor, single and multistage realization, polyphase realization, application to sub band coding, Architecture and Applications of Digital Signal Processors.

Text books:

1) Digital Signal Processing: Principles, Algorithms, and Applications by S K Mitra, McGraw Hill.
2) Probability and Random Processes with Applications to Signal Processing By H.Stark and J.W.Woods, Prentice Hall.

Reference Books

1. **Digital Signal Processing** (4th Edition) :John G. **Proakis,** Dimitris K Manolakis
2. Probability, **random** variables and **stochastic processes, Populis**, A., Pillai, S. U.4th edn, Mc-Graw Hill, 2002.
3. Digital Signal Processing By Monson Hayes, Schaum's Outline, McGraw Hill.
4. Digital Signal Processing: WITH DSP Laboratory Using MATLAB: A Computer-Based Approach By Sanjit K. Mitra, McGraw-Hill.
5. Computer-Based Exercises for Signal Processing Using MATLAB 5, MATLAB Curriculum Series By J. H. McClellan et. al., Prentice- Hall.

Paper code: MESP-703 **L T /P C**
Paper: Statistical Signal Processing **4 0 4**

INSTRUCTIONS TO PAPER SETTERS: Maximum Marks : 60
1. Question No. 1 should be compulsory and cover the entire syllabus and will be of 20 marks.
2. Apart from Question No. 1, rest of the paper shall consist of four units as per the syllabus. Every unit should have two questions. However, student may be asked to attempt only 1 question from each unit. Each question should be 10 marks

UNIT I
Mathematical preliminaries, Wiener filtering and MMSE estimates, Linear predication, Levinson-durbin algorithm and lattice.

UNIT II
Filters: Overview of Spectral Estimation Methods. Adaptive Algorithms: 1)-LMS Algorithm, Convergence Analysis, Adaptive Noise Cancellar;

UNIT III
Least Squares Algorithm: General Weighted Least Squares Methods, Recursive Least Squares Algorithm, Fast Least Squares Algorithm to AR modeling case,

UNIT IV
Special Topics, Introduction to array processing.

Text Books/References:

1) Statistical Signal Processing By Manolakis, Ingle and Kogan, Wiley.
2) An Introduction to Statistical Signal Processing By Gray and Davisson, Cambridge University Press

Paper code: MESP-705 **L T /P C**
Paper: Sonar Signal Processing **4 0 4**

INSTRUCTIONS TO PAPER SETTERS: Maximum Marks : 60
1. Question No. 1 should be compulsory and cover the entire syllabus and will be of 20 marks.
2. Apart from Question No. 1, rest of the paper shall consist of four units as per the syllabus. Every unit should have two questions. However, student may be asked to attempt only 1 question from each unit. Each question should be 10 marks

UNIT I
Range Doppler resolution, Spatial processors, Incoherent temporal processors,

UNIT II
Coherent processors including deltic correlators, Doppler filtering,

UNIT IV
Fast Fourier transform processors, Matched filtering hyperbolic FM systems,

UNIT V
Target identification.

Text book/References:

1) Principles of Radar and Sonar Signal Processing By Francois Le Chevalier, Artech House Publishers.
2) Sonar Signal Processing By Nielsen, Richard O., Artech House Publishers.

Paper code: MESP-707 **L T/ P C**
Paper: Speech Signal Processing **4 0 4**

INSTRUCTIONS TO PAPER SETTERS: Maximum Marks : 60
1. Question No. 1 should be compulsory and cover the entire syllabus and will be of 20 marks.
2. Apart from Question No. 1, rest of the paper shall consist of four units as per the syllabus. Every unit should have two questions. However, student may be asked to attempt only 1 question from each unit. Each question should be 10 marks

UNIT I

Introduction: Digital speech processing, Digital transmission and storage of speech, speech synthesis systems, speaker verification and identification systems, speech coding, speech recognition and enhancement of speech quality

Speech Production Mechanism: Physiological model, Articulatory phonetics, Acoustic phonetics, Digital Model of speech signal

UNIT II

Time Domian Methods for Speech Processing: Time domain parameters of Speech signal – Methods for extracting the parameters Energy, Average Magnitude, Zero crossing Rate, Short Time Auto Correlation Function, Pitch period estimation using Auto Correlation Function.

Frequency Domain Method for Speech Processing: Relevant properties of fast Fourier transform and Z-transform for speech recognition, Short Time Fourier analysis: Fourier transform and linear filtering interpretations, Filter bank analysis

UNIT III

Homomorphic speech analysis: Homomorphic speech signal deconvolution, Real and complex cepstrum, Applications of cepstrum analysis to speech signals
Linear Predictive Analysis of speech: Basic Principles of linear predictive analysis, Auto correlation method, Covariance method, Solution of LPC equations, Cholesky method, Durbin's Recursive algorithm

UNIT IV

Statistical models for Speech recognition: Vector quantization models applications in speaker recognition, Gaussian mixture modeling for speaker and speech recognition, hidden Markov modeling for isolated word and continuous speech recognition

Text Books:

1) Discrete time speech signal Processing: Principles & Practices, Thomas F. Quatieri, Prentice Hall PTR, 2001
2) Digital Processing of Speech signals, L.R.Rabiner and R.W.Schaffer, Prentice Hall -1979

Reference books

1. Fundamentals of Speech Recognition, L.R. Rabiner and B. H. Juang, Prentice Hall, 1993.
2. Speech and Audio Signal Processing, Ben Gold and Nelson Morgan, John Wiley and Sons, 2000
3. Discrete Time Processing of Speech Signals, J.R. Deller, J.H.L. Hansen and J.G. Proakis, John Wiley, IEEE Press, 1999.
4. Hidden Markav Models for Speech Recognition, XD Haung, Y Ariki, MA Jack, Edinburgh University Press

Paper code: MESP-709 **L T/ P**
Paper: VLSI Design of DSP Circuits **4 0 4**

INSTRUCTIONS TO PAPER SETTERS: Maximum Marks : 60
1. Question No. 1 should be compulsory and cover the entire syllabus and will be of 20 marks.
2. Apart from Question No. 1, rest of the paper shall consist of four units as per the syllabus. Every unit should have two questions. However, student may be asked to attempt only 1 question from each unit. Each question should be 10 marks

UNIT I
Introduction to DSP systems, loop bound and Iteration bound. Pipelining and parallel processing, Retiming; definition, properties and techniques.

UNIT II
Unfolding; algorithm, properties and applications, Folding transformation and register minimization, Systolic architecture design, Fast convolution; Cook-toom algorithm, Winograd algorithm, Iterated and cyclic convolution.

UNIT III
Algorithmic strength reduction in Filters and Transforms, Pipelined and Parallel recursive and adaptive filters, Scaling and round-off noise, Digital lattice filter structures; Schur algorithm, low-power CMOS lattice IIR filters, Bit-level arithmetic architectures; bit serial filter design,

UNIT IV
Distributed arithmetic, Redundant arithmetic, Numerical strength reduction, Synchronous wave and asynchronous pipelines, Low-power design; power reduction techniques and power estimation approaches, Programmable digital signal processors.

Text Books/ References:

1) VLSI Digital Signal Processing Systems: Design and Implementation By Keshab K. Parhi, Wiley-Interscience.
2) DSP Processor Fundamentals: Architectures and Features By Phil Lapsley, Jeff Bier, Amit Shoham and Edward A. Lee, IEEE Press Series on Signal Processing.

Paper code: MESP-711 **L T/ P C**
Paper: Optical Signal Processing **4 0 4**

INSTRUCTIONS TO PAPER SETTERS: Maximum Marks : 60
1. Question No. 1 should be compulsory and cover the entire syllabus and will be of 20 marks.
2. Apart from Question No. 1, rest of the paper shall consist of four units as per the syllabus. Every unit should have two questions. However, student may be asked to attempt only 1 question from each unit. Each question should be 10 marks

UNIT I
Basic Signal Parameters, Spatial Signals, Geometrical Optics, Refraction Lens Formulas, Fresnel Transform, Fourier Transform, Spectrum Analysis.

UNIT II
Light Sources, Raster-Format, Spectrum Analyzer, Spatial Filtering. Interferometric Methods for Constructing Filters, Multiplexed Filters, Reference Function Optical Processors, Optical Signal Processor and Filter Generator, Effects of Small Displacements of Spatial Filters, Non-linear optical signal processing.

UNIT III
Acousto-Optic Devices, Spatial Light Modulators, Time Delays and Notation Phase-Modulation, Notation Applications of Acousto-Optic Devices, Acousto-Optic Power Spectrum Analyzers, A Basic Spectrum Analyzer, The Signal-to-Noise Ratio, Heterodyne Systems and Spectrum Analysis, Spatial and Temporal Frequencies: The Mixed Transform. Distributed Local Oscillator, Photodetector Geometry and Bandwidth.

UNIT IV
Comparison of the Heterodyne and Power Spectrum, Hybrid Heterodyne Spectrum Analyzer, Decimated Arrays and Cross-Spectrum Analysis, Heterodyne Transform and Signal Excision, Space-Integrating Correlators, Time-Integrating Systems, Two-Dimensional Processing.

Text books/ References:

1) Optical Signal Processing By Anthony VanderLugt, Wiley-Interscience.
2) Signal Processing using Optics: Fundamentals, Devices, Architectures, and Applications By Bradley G Boone, Oxford University Press.
3) Related research papers from IEEE/IEE publicaions.

Paper code: MESP-713 **L T/ P C**
Paper: Selected topics in Signal Processing **4 0 4**

INSTRUCTIONS TO PAPER SETTERS: **Maximum Marks : 60**
1. Question No. 1 should be compulsory and cover the entire syllabus and will be of 20 marks.
2. Apart from Question No. 1, rest of the paper shall consist of four units as per the syllabus. Every unit should have two questions. However, student may be asked to attempt only 1 question from each unit. Each question should be 10 marks

Course contents will be decided by the Board of Studies of USICT at the beginning of the semester.

Paper code: MESP-715 **L T/ P C**
Paper: Selected Topics in Analog IC Design **4 0 4**

INSTRUCTIONS TO PAPER SETTERS: Maximum Marks : 60
1. Question No. 1 should be compulsory and cover the entire syllabus and will be of 20 marks.
2. Apart from Question No. 1, rest of the paper shall consist of four units as per the syllabus. Every unit should have two questions. However, student may be asked to attempt only 1 question from each unit. Each question should be 10 marks

UNIT I
Review of bipolar and MOS transistor models, Circuit simulation using SPICE, Theory and design of operational amplifiers, Definition and measurement of performance characteristics,

UNIT II
Bipolar, BiCMOS and CMOS operational amplifiers, CMOS OTAs, circuit design examples,

UNIT III
operational mirrored amplifiers, Current-conveyors and their variants, current-feedback amplifiers, Current Mode Signal Processing. Techniques of Non linearity cancellation in analog CMOS circuits,

UNIT IV
Translinear-principle and its applications Log-domain and square-domain circuits

Text books:

1) Fundamentals of Microelectronics By Behzad Razavi, Wiley.
2) Analog VLSI: Signal and Information By Mohammed Ismail and Terri Fiez, McGraw Hill.

Reference Books

1. Analog integrated circuit design By D.A. John and Ken Martin, John Wiley.
2. Analog VLSI Circuits and Principles By Shih-Chii Liu, Jörg Kramer, Giacomo Indiveri, Tobias Delbrück and Rodney Douglas, The MIT Press.
3. Design of Analog CMOS Integrated Circuits By Behzad Razavi, McGraw-Hill.
4. Selected research papers from Journals

Paper code: MESP-717 **L T/ P C**
Paper: Biomedical Signal Processing **4 0 4**

INSTRUCTIONS TO PAPER SETTERS: Maximum Marks : 60
1. Question No. 1 should be compulsory and cover the entire syllabus and will be of 20 marks.
2. Apart from Question No. 1, rest of the paper shall consist of four units as per the syllabus. Every unit should have two questions. However, student may be asked to attempt only 1 question from each unit. Each question should be 10 marks

UNIT I

Biomedical signal processing, biomedical applications of the wavelet transform, Analog versus digital circuitry Biomedical Signals and Images ECG and evolution of pacemakers: Hear, Cardiac Signals, Cardiac electrophysiology, relation of ECG components to cardiac events, clinical applications, History and development of Cardiac pacing, new features in modern pacemakers. Speech Signals: The source-filter model of speech production, spectrographic analysis of speech. Speech Coding: Analysis-synthesis systems, channel vocoders, linear prediction of speech, linear prediction vocoders.Imaging Modalities: Survey of major modalities for medical imaging: ultrasound, X-ray, CT, MRI, PET, and SPECT.MRI: Physics and signal processing for magnetic resonance imaging. Surgical Applications: A survey of surgical applications of medical image processing.

UNIT II

Sampling Revisited: Sampling and aliasing in time and frequency, spectral analysis. Image processing I: Extension of filtering and Fourier methods to 2-D signals and systems. Image processing II: Interpolation, noise reduction methods, edge detection, homomorphic filtering.Wavelet versus Fourier Analysis: Fourier transform, Windowing function, Wavelet transform (continuous-time and complex continuous-time), Signal processing with the wavelet transform (Singularity detection, denoising and compression).

UNIT III

Analog wavelet filters: The need for approximation; complex first order, Pade approximation, L_2 approximation, Bessel-Thomson, Filanovsky's, Fourier series methods Optimal state-space description: State-space description, dynamic range optimization, Sparsity; Orthogonal transformations, Canonical form, Biquad structure, Sensitivity Ultra Low-power integrator design: G_m-C filters; nA/V CMOS triode transconductor, pA/V Delta-Gm transconductor Translinear (log-domain) filters; Class-A log domain filter designs Low-power class-AB sinh integrators; state-space formulation for class-AB log-domain integrators, companding sinh integrartor Ultra low-power biomedical system design: Dynamic translinear cardiac sense amplifier for pacemakers QRS-complex wavelet detection using CFOS, Wavelet filter design, Morlet wavelet filter.

UNIT IV

Probability and Random Signals:Estimating PDFs: Practical techniques for estimating PDFs from real data: Random signals I: Time averages, ensemble averages, autocorrelation functions, crosscorrelation functions, Random signals II: Random signals and linear systems, power spectra, cross spectra, Wiener filters. Blind source separation: Use of principal component analysis (PCA) and independent component analysis (ICA) for filtering. Image Segmentation and Registration: Image Segmentation: statistical classification, morphological operators, connected components. Image Registration I: Rigid and non-rigid transformations, objective functions. Image Registration II: Joint entropy, optimization methods.

Text books/ References:

1) Ultra low-power biomedical Signal Processing, S. A. P. Haddad and W. A. Serdijn, Springer
2) Clifford, G., F. Azuajae, and P. McSharry. Advanced Methods and Tools for ECG Data Analysis. Norwood, MA: 9780201180756.
3) Rabiner, L. R., and R. W. Schafer. Digital Processing of Speech Signals. Upper Saddle River, NJ: Prentice-Hall, 1978. ISBN: 9780132136037.

Paper code: MESP-751 **L T/ P C**
Paper: Lab-7 **0 4 2**

40 marks: internal evaluation	60 marks: external evaluation

Paper code: MESP-753 **L T/ P C**
Paper: Lab-8 **0 4 2**

40 marks: internal evaluation	60 marks: external evaluation

Paper code: MESP-755 **L T/ P C**
Paper: Minor Project **0 4 2**

40 marks: internal evaluation	60 marks: external evaluation

Objective: Students are required select a topic of their interest and develop a minor project on it. The student will submit a synopsis at the beginning of the semester for the approval to the project committee in a specified format (available on www.ipu.ac.in). The student will have to present the progress of the work through seminars. A report must be submitted to the college for evaluation purpose at the end of the semester in a specified format.

Paper code: MESP-757* **L T/ P C**
Paper: Term Paper-III **0 4 2**

40 marks: internal evaluation	60 marks: external evaluation

Paper code: MESP-752 **total credit**
Paper: Dissertation **24**

: Evaluation based on Final Thesis of the work done

Objective: Students are required to select a topic of their interest and prepare a dissertation on it. The student will submit a synopsis at the beginning of the semester for the approval from the project committee in the specified format. Synopsis must be submitted within two weeks. The first defense, for the dissertation work, should be held with in one month.
Dissertation Report must be submitted in specified format (available on www.ipu.ac.in) to the college for evaluation purpose.

Paper code: MESP-754* **total credit**
Paper: Seminar & Progress report **4**

100 marks: internal evaluation

- ***Non University Program**

The student will have to present the seminars and progress reports at the interval of four weeks during the semester. Minimum two seminars will be held during the semester.

Paper code: MESP-756* **total credit**
Paper: Term Paper -IV **2**

100 marks: internal evaluation

- ***Non University Program**

The student will have to present the seminars and progress reports at the interval of four weeks during the semester. Minimum two seminars will be held during the semester

Paper code: MERF-601 **L T/P C**
Paper: Advanced Electromagnetic Engineering **4 - 4**

INSTRUCTIONS TO PAPER SETTERS: **Maximum Marks : 60**
1. Question No. 1 should be compulsory and cover the entire syllabus and will be of 20 marks.
2. Apart from Question No. 1, rest of the paper shall consist of four units as per the syllabus. Every unit should have two questions. However, student may be asked to attempt only 1 question from each unit. Each question should be 10 marks

Unit I:

The Source Concept, Duality, Uniqueness, Image Theory, The Equivalence Principal, Fields in Half-space, The Induction Theorem, Reciprocity, Green's Function

Unit II:

The Wave Function, Plane Waves, The Rectangular Waveguide, Alternative Mode Sets The Rectangular Cavity, Partially Filled Waveguide, The Dielectric-Slab Waveguide, Surface-Guided Waves, Modal Expansion of Fields, Current in Waveguides

Unit III:

The Wave Function, The Circular Waveguide, Radial Waveguides, The Circular Cavity Other Guided Waves, Source of Cylindrical Waves, Two-dimensional Radiation, Waves Transformations, Scattering by Cylinders, Scattering by Wedges, Three-dimensional Radiation

Unit IV:

The Wave Function, The Spherical Cavity, Orthogonality Relationships, Space as a Waveguide, Other Radial waveguide, Other resonators

Text Books:

1) Introduction to Electrodynamics By David J. Griffith, John Wiley & Sons,3rd Edition.

Reference Books:

2) Time Harmonic Electromagnetic Fields By R.F Harrington, McGraw Hill, 1961.
3) Electromagnetic Waves and Radiating Systems By Jordan and Balmain, Pretice Hall,2nd Edition.

Paper code: MERF-602 **L T/P C**
Paper: Analytical and Computational Techniques in Electromagnetic 4 - 4

INSTRUCTIONS TO PAPER SETTERS: **Maximum Marks : 60**
1. Question No. 1 should be compulsory and cover the entire syllabus and will be of 20 marks.
2. Apart from Question No. 1, rest of the paper shall consist of four units as per the syllabus. Every unit should have two questions. However, student may be asked to attempt only 1 question from each unit. Each question should be 10 marks

Unit I:
Complex Variables: Cauchy's integral theorem, Fourier transform integrals with singularity, Singularity extraction technique, Branch point integrals. Saddle point.

Unit II:
Stationary phase method for evaluation of radiation integrals. Special Functions : Bessel functions, fresnel integrals, etc

Unit III:
Computational Techniques : Classification based on integral and differential equation solution, time domain and frequency domain solutions.

Unit IV:
Introduction to Finite-difference, FDTD, finite element techniques in electromagnetics with applications. Perturbations of Cavity Walls, Cavity-material Perturbations, Waveguide Perturbations and Variational Techniques

Text Books:
1) Analytical & Computational Methods in Electromagnetics by Ramesh Garg, Artech House, 2008.

Reference Books:
2) Computational Methods for Electromagnetic & Optical Systems by Partha P. Banerjee, CRC Press, 2nd Edition.

Paper code: MERF-603 **L T/P C**
Paper: Microwave Theory and Circuits **4 - 4**

INSTRUCTIONS TO PAPER SETTERS: **Maximum Marks : 60**
1. Question No. 1 should be compulsory and cover the entire syllabus and will be of 20 marks.
2. Apart from Question No. 1, rest of the paper shall consist of four units as per the syllabus. Every unit should have two questions. However, student may be asked to attempt only 1 question from each unit. Each question should be 10 marks

Unit I:
Review of EM Theory: Maxwell's equations, fields in media and boundary conditions, wave equation and basic plane wave solutions, plane waves in dielectric and conducting media, energy and power.

Unit II:
Transmission lines and waveguides: field analysis of transmission lines, terminated lossless terminated line, quarter wave transformer, lossy transmission lines closed and dielectric guides, planar transmission lines.

Unit III:
Microwave Network analysis: Impedance and equivalent voltages and currents, scattering matrix and other parameters, signal flow graphs and network representation. Impedance matching and tuning.

Unit IV:
Analysis of planar transmission lines. Analysis of Coupled Transmission Line Structures, microwave resonators.

Text Books:

1. Microwave Engineering By D.M.Pozar, John Wiley & Sons, 3rd Edition.

Reference Books:

2. Microwave Devices and Circuits By Samuel Y. Liao, Prentice Hall of India,3rd Edition.

Paper code: MERF-604 **L T/P C**
Paper: Antenna Theory and Practice **4 - 4**

INSTRUCTIONS TO PAPER SETTERS: Maximum Marks : 60
1. Question No. 1 should be compulsory and cover the entire syllabus and will be of 20 marks.
2. Apart from Question No. 1, rest of the paper shall consist of four units as per the syllabus. Every unit should have two questions. However, student may be asked to attempt only 1 question from each unit. Each question should be 10 marks

Unit I:

Review of electromagnetic theory, Antenna and their different types, Radiation Mechanism and Current Distribution, Fundamental Parameters related to antenna (Radiation Pattern, Radiation Power Density, Directivity, Gain, Beamwidth, Antenna Efficiency, Bandwidth, Polarization, Radiation Efficiency, Antenna Factor) Radiation Integrals, Auxiliary Potential Functions and Construction of Solution, Solution of the inhomogeneous vector Potential Wave Equation, Far Field Radiation

Unit II:

Infinitesimal dipole, Small Dipole, Finite length and Half-Wavelength Dipole – Analysis using assumed current Distribution Small Circular loop, Circular Loop with constant current, Two Element Array N-Element Linear Array with uniform amplitude and spacing, Broadside and End-Fire Array, N-Element Linear Array: Three Dimensional Characteristic

Unit III:

Long Wire – Designing, V and Rhombic Antenna – Designing, Helical Antenna – Designing of normal and axial mode, Rectangular apertures with different configurations---With analysis Circular Apertures, E-Plane Sectoral Horn – Analysis and Design, H-Plane Sectoral Horn – Analysis and Design

Pyramidal Horn

Unit IV:

Basic of Microstrip Antenna, Designing of Rectangular Microstrip Antenna, Antenna Ranges, Gain Measurement, Radiation Pattern Measurement, Anechoic Chamber

TEXT BOOK

1. Antenna Theory Analysis and Design by C.A.Balanis , 3rd Edition Wiley Publication.

REFERENCE BOOK

1. Antenna Theory and Design by R.S.Elliot, Revised Edition, Wiley Publication(IEEE Press).
2. Antenna by J.D. Kraus, 3rdEdition , McGraw Hill.
3. Electromagnetic Waves and Radiating Systems By Jordan and Balmain, Prentice Hall, 2ndEdition.
4. Antenna Theory and Design by W.L.Stutzman and G.A.Thiele, Wiley Publication

Paper code: MERF-605 **L T/P C**

Paper: RF and Microwave Passive Circuits Design. **4 - 4**

INSTRUCTIONS TO PAPER SETTERS: **Maximum Marks : 60**

1. Question No. 1 should be compulsory and cover the entire syllabus and will be of 20 marks.

2. Apart from Question No. 1, rest of the paper shall consist of four units as per the syllabus. Every unit should have two questions. However, student may be asked to attempt only 1 question from each unit. Each question should be 10 marks

Unit I:

Transmission lines for microwave circuits; waveguides. Stripline, microstrip, slot line, microwave circuit design principles; passive circuits.

Unit II:

Theory of Reflections, Design of Transformers, Tapered transformers, Impedance transformers, filters, hybrids, isolators etc., Design of Filters various Types Low Pass Band Pass and Band Stop. Analysis of Coupled Line Transmission Lines, Coupled Line Filters

Unit III:

Couplers in Planar Transmission Line and waveguide circuits: Directional coupling, hybrids, Power combining, transformer equivalent circuits, double tuned transformers, Transformers with magnetic and iron cores. Transmission lines, transformers and baluns. Waveguides, matching in waveguide circuits, waveguide junctions, coaxial lines, resistance impedance bridge, standing waves

Unit IV:

Techniques for Measurement of microwave signals and Passive Circuits.

Text Books:

1. Microwave Engineering By D.M.Pozar, John Wiley & Sons,3rd Edition.
2. Microwave Devices and Circuits By Samuel Y. Liao, Prentice Hall of India,3rd Edition.

Reference Books:

3. Advanced RF & Microwave Circuit Design by Matthew M.Radmanesh, Pub-Authorhouse, Jan 2009.

Paper code: MERF-606 **L T/P C**
Paper: Microwave Measurement and Design **4 - 4**

INSTRUCTIONS TO PAPER SETTERS: Maximum Marks : 60
1. Question No. 1 should be compulsory and cover the entire syllabus and will be of 20 marks.
2. Apart from Question No. 1, rest of the paper shall consist of four units as per the syllabus. Every unit should have two questions. However, student may be asked to attempt only 1 question from each unit. Each question should be 10 marks

Unit I:
Experiments in basic microwave measurements. Measurements of Frequency, Cavity Type Frequency Meters and Frequency Counters, Measurement of Power, Measurement of VSWR, Slotted Line Measurements, Measurement of Scattering Parameters, Acceptance Test Procedures for Microwave Circuits, Oscilloscopes for Microwave Measurements.

Unit II:
VNA, Passive and active circuit characterization using network analyzer. Power Sweep and Frequency sweep Measurements. Measurement of System parameters such as MDS, Dynamic range and 1 dB Compression Points,

Unit III:
FFT Analysers, Spectrum analyzer and noise figure measurements, Y Factor Method for Noise Measurements., Measurements of Mixers and up- converters, Modulation Analyzers. Constellation Analyzers.

Unit IV:
Time Domain Reflectometry. Measurements of Impedance, Measurement of Insertion and Differencial Phas, PC based automated microwave measurements; integration of measurement and design of microwave circuits.

Text Books:
1) Microwave Measurements, By E.L.Giunzton, McGraw Hill, 1957.
2) Microwave Measurements, By R.J. Collier and A.D. Skinner, The Institution of Engineering and Technology, 1985

Reference Books:
3) Handbook of Microwave Measurements By Sucher and Fox, John Wiley & Sons, 3rd Edition.

Paper code: MERF-607 **L T/P C**
Paper: Radar Systems **4 - 4**

INSTRUCTIONS TO PAPER SETTERS: **Maximum Marks : 60**
1. Question No. 1 should be compulsory and cover the entire syllabus and will be of 20 marks.
2. Apart from Question No. 1, rest of the paper shall consist of four units as per the syllabus. Every unit should have two questions. However, student may be asked to attempt only 1 question from each unit. Each question should be 10 marks

UNIT-I

Introduction to radar systems: History, Radar modalities, Electromagnetic spectrum, basic operating principles (detection, ranging, Doppler, importance of phase), radar system components

Radar Equation and Radar Cross Section: The Decibel, term analysis and relation to basic radar components, system temperature, hard target versus distributed target, radar cross section and scattering basics

UNIT-II

Pulse, MTI and ATC Radar: Basic Elements of Pulse Radar, Radar Coverage, radar Parameters, determination of fundamental parameters of pulse radar.

Probability of False Alarms, Probability of Detection, Minimum detection signal , Pulse Compression Techniques , Matched Filter receiver. MTI Radar, Coherent MTI Radar, radar adaptability and anti-clutter device.

UNIT-III

Function of ATC Radar, Receiver, Transmitter, Indicator unit, Phased Array Radar and Applications.

Fundamentals of Radar signal processing: Superheterodyne reception, I and Q demodulation, Pulsed-Doppler analysis, Matched Filtering, Ambiguity function, Pulse compression, Hard target (detection of signals in noise), Synthetic Aperture Radar (SAR), Doppler weather radar, Ionospheric sounding, Incoherent scatter radar

UNIT-IV

High resolution Radar: radar system target and surface imaging. Concepts and definitions, modern radar design, wideband waveforms and signal processing, synthetic high resolution radar, and synthetic aperture radar concepts.

Applications

Text Books

1. Radar Handbook by M.I.Skolonik , Tata Mc-Graw-Hill**,** 3rd Edition.

Reference Books

2. Modern Radar Systems Analysis by David K. Barton,Artech House, 1998.
3. Radar Systems Principles by Harold R. Raemer, CRC Press, 1996.
4. Radar System Analysis & Modelling by David K.Barton, Artech House, 2004.

Paper code: MERF-608 **L T P**
Paper: Antenna and propagation for wireless communication Systems **4 0 0**

INSTRUCTIONS TO PAPER SETTERS: **Maximum Marks : 60**
1. Question No. 1 should be compulsory and cover the entire syllabus and will be of 20 marks.
2. Apart from Question No. 1, rest of the paper shall consist of four units as per the syllabus. Every unit should have two questions. However, student may be asked to attempt only 1 question from each unit. Each question should be 10 marks

Unit 1: Concept of a wireless channel. Electromagnetic spectrum. Aims of cellular systems. Cellular networks. Frequency bands for mobile radio systems. Traffic. Multiple access schemes and duplexing (FDMA,TDMA,CDMA).

Unit 2:Propagation mechanisms: Introduction . Reflection refraction and transmission(lossless media,lossy media,typical reflection and transmission coefficients).Rough surface scattering. Geometrical optics(Principles,Formulation).Diffraction(Single knife edge diffraction,other diffracting obstacles GTD).

Unit 3:Antenna Fundamentals: Principles(Necessary conditions for radiation, Near field and Far field Regions,Far Field radiation from wires).Antenna Parameters.Practical dipoles.Antenna arrays.Horn antennas.Loop antennas.Helical antennas.Patch antennas.

Unit 4:Basic propagation models: Path loss prediction models. Concept of macrocell,microcell,picocell.Indoor propagation within building(Ray tracing models for picocells,reduced complexity UTD indoor model).Antenna for mobile systems(Mobile terminal antennas,Base station antennas)

Text Books:
1). Antennas and Propagation for Wireless
Communication Systems by Simon R. Saunders, Alejandro Aragón-Zavala,(2nd Edition Wiley publications).
Reference book:
1). Wireless communication principles and practice by Rappaport,second edition
2).E.CJordan and Balmain,"Electro magnetic waves and radiating systems,"PHI

Paper Code : MERF-610
Paper : High frequency Semiconductor Devices and circuits

INSTRUCTIONS TO PAPER SETTERS: Maximum Marks : 60

1. Question No. 1 should be compulsory and cover the entire syllabus and will be of 20 marks.

2. Apart from Question No. 1, rest of the paper shall consist of four units as per the syllabus. Every unit should have two questions. However, student may be asked to attempt only 1 question from each unit. Each question should be 10 marks

UNIT 1

Review of Semiconductor properties Band Theory, electrical properties, optical properties,, Types of semiconductors, Materials for Microwave semiconductor devices; Si, GaAs, GaN, Inp

UNIT 2

Microwave Field Effect Transistors, MESFETs; Principle of operation, Small signal equivalent circuit, Cutoff frequency and maximum oscillations frequency, transfer characteristics, HEMTs : Heterojunction BJTs; 2-DEG formation, performance characteristics, Electronic applications, Amplifier design using MESFET/HEMTs

UNIT 3

Transferred electron Devices; Gunn diodes, Gunn Effect, RWH theory, Modes of Gunn operation, LSA Diode, InP Diodes

UNIT 4

Avalanche Transit-time devices ; IMPATT diodes; TRAPATTs, BARITT diode Schotky diodes, Tunnel diodes and their applications

Reference

1. Microwave Devices and Circuits by Samuel Y. Liao, Pearson
2. Semiconductor Physics and devices by Donald A. Neamen, Tata McGraw Hill

Paper code: MERF-612 **L T/P C**
Paper: Radar Signature Analysis & Imaging **4 - 4**

INSTRUCTIONS TO PAPER SETTERS: **Maximum Marks : 60**
1. Question No. 1 should be compulsory and cover the entire syllabus and will be of 20 marks.
2. Apart from Question No. 1, rest of the paper shall consist of four units as per the syllabus. Every unit should have two questions. However, student may be asked to attempt only 1 question from each unit. Each question should be 10 marks

UNIT I

Radar equation and Radar Cross Section. Methods for RCS estimation: GO, PO, GTD and PTD techniques.

UNIT II

Ray tracing. RCS of simple and complex targets. RCS enhancement. Scattering by imperfectly conducting surfaces;

UNIT III

Maliuzhinets' formulation and characterization of Absorbers. Methods of RCS reduction.

UNIT IV

Frequency domain target signatures. Real array Imaging radars. Synthetic array Radars. Signal processing methods.

Paper code: MERF-614 **L T P**
Paper: Fuzzy Logic and Neural Networks. 4 **0 0**

INSTRUCTIONS TO PAPER SETTERS: **Maximum Marks : 60**
1. Question No. 1 should be compulsory and cover the entire syllabus and will be of 20 marks.
2. Apart from Question No. 1, rest of the paper shall consist of four units as per the syllabus. Every unit should have two questions. However, student may be asked to attempt only 1 question from each unit. Each question should be 10 marks

UNIT I

Neural networks characteristics, Artificial neural network terminology, Learning, Basic learning laws, Supervised, Unsupervised, Re-inforcement learning, Models of artificial neural networks: simple layer perception, feed forward multilayer perceptron, Hopfield networks, competitive learning.

UNIT II

Applications of neural networks for adaptive filtering and adaptive pattern recognition, System identification, System modeling using recurrent neural networks, Optimization, VLSI implementation of neural networks.

UNIT III

Basic concepts of fuzzy logic, Fuzzy vs. Crisp set, Linguistic variables, Membership functions, Operations of fuzzy sets, Fuzzy IF- THEN rules, Variable inference techniques, De-Fuzzification, Basic fuzzy inference algorithm, Fuzzy system design, Industrial applications.

UNIT IV

Hybrid systems: Neuro-Fuzzy hybrid systems, Optimization and their applications.

Text Books:

1. Introduction to artificial neural systems - by J.M. Zurada.(Jaico Pub)
2. Neural Networks & Fuzzy Logic - by Bart Kosko

Reference Books

1. Li Min Fu," Neural Networks in Computer Intelligence", McGraw-Hill, Inc.
2. M. H. Hassun, “Fundamentals of Artificial Neural Networks”, PHI.
3. Fuzzy logic with engineering application - by ROSS J.T (Tata Mc)
4. Fuzzy System Design Principles, Building Fuzzy IF-THEN Rule Bases – by Riza C.Berkiu & Trubatch, IEEE Press.
5. Neural Networks - by Simon Haykin
6. Related research publications from IEEE/IEE.

Paper code: MERF-616 **L T/P C**
Paper: RF System Design **4 - 4**

INSTRUCTIONS TO PAPER SETTERS: Maximum Marks : 60
1. Question No. 1 should be compulsory and cover the entire syllabus and will be of 20 marks.
2. Apart from Question No. 1, rest of the paper shall consist of four units as per the syllabus. Every unit should have two questions. However, student may be asked to attempt only 1 question from each unit. Each question should be 10 marks

UNIT-I

Introduction:, Radio receivers. Radiometers, Active and Passive Sensors, Noise emission for Passive Radiometers, Rx and Tx System Design, Receiver Noise Figure and Dynamic Range, Noise figure, Noise Temperature, Noise Figure in Cascaded Circuits, Noise Figure of a Mixer Circuit, Dynamic Range, 1 dB Compression Point, Minimum Detectable Signal, Inter-modulation and Intercept Points.

UNIT-II

Mixer and Detector circuits. Mixers and Down-converters-Operating Theory, Single ended Mixers, Single balanced Mixers and double balanced Mixers. Harmonic and Sub-harmonic Mixers, Up-converters, FET Mixers, Non Linear Analysis Techniques, Detector Operating Theory, Detector Sensitivity, Detector Circuits, Rectennas, RF Switches, Rotary vane Switches, PIN Diode, Ferrite Switches, ABCD Matrices for Circuit Building Blocks, Modulators and Attenuators, Biasing Techniques, Ferrite Phase shifters, PIN Diode Phase Shifters-Transmission and Reflection Type Phase Shifters, Phased Arrays, Power Combiners, Feed Networks, Transistor Switches and Phase Shifters.

UNIT-III

Amplifiers and power supplies: Power Gain, Power Gain for Unilateral Transistors, Stability Considerations, Constant Gain Circles for the Unilateral Case, Constant Noise Figure Circles, Amplifier specifications-gain, bandwidth and impedance, stability, amplifier design, noise considerations, class C class D amplifiers, Low Noise Amplifiers, High power amplifiers. Bandwidth Considerations, Broad Band Amplifiers, DC Bias Techniques.

UNIT-IV

Oscillators, General Theory of Oscillators, General Theory of Reflection Amplifiers, Injection Locked Amplifiers. PLL: Relaxation oscillators, series resonant oscillators, negative resonant oscillators, oscillator dynamics, stability, oscillator noise, design examples, phase locked loops-loop dynamics, analysis, frequency synthesizers.

TEXT BOOKS:

1) Microwave Receiver with Electronic Warfare Application, James Bao-Yen Tsui, John Wiley & Sons, 2nd Edition.
2) Microwave Solid-State Circuits & Applications, Kai Chang, John Wiley & Sons,2nd Edition.
3) RF System Design of Transceivers for Wireless Communication by Qizheng Gu, Springer-Verlag New York, May 2006

REFERENCE BOOKS:

1) Practical RF System Design by William F.Egan,Wiley-IEEE Press,April 2003.
2) RF MicroElectronics by Behzad Razavi, Prentice Hall,1998.

Paper code: MERF-651 **L T/ P C**
Paper: Lab-I **0 4 2**

Lab based on Advanced Electromagnetic Engineering.

Paper code: MERF-653 **L T/ P C**
Paper: Lab-2 **0 4 2**

Lab based on Microwave Theory and Circuits.

Paper code: MERF-655 **L T/ P C**
Paper: Lab-3 **0 4 2**

Lab based on RF and Microwave Passive Circuit Design.

Paper code: MERF-657* **L T/ P C**
Paper: Term Paper-I **0 4 2**

Lab based on elective/or research work.

*** NUES : Non University Examination**

Paper code: MERF-652 **L T P**
Paper: Lab-4 **0 4 2**

Lab based on Analytical and computational technicques.

40 marks: internal evaluation	**60 marks: external evaluation**

Paper code: MERF-654 **L T P**
Paper: Lab-5 **0 4 2**

Lab based on Antenna Theory

40 marks: internal evaluation	**60 marks: external evaluation**

Paper code: MERF-656 **L T P**
Paper: Lab-6 **0 4 2**

Lab Based on Microwave Measurement

40 marks: internal evaluation	**60 marks: external evaluation**

Paper code: MERF-658* **L T P**
Paper: Term Paper-II **0 4 2**

40 marks: internal evaluation	**60 marks: external evaluation**

Paper code: MERF-701 **L T/P C**
Paper: Electromagnetic Interference & Compatibility in System Design **4 - 4**

INSTRUCTIONS TO PAPER SETTERS: **Maximum Marks : 60**
1. Question No. 1 should be compulsory and cover the entire syllabus and will be of 20 marks.
2. Apart from Question No. 1, rest of the paper shall consist of four units as per the syllabus. Every unit should have two questions. However, student may be asked to attempt only 1 question from each unit. Each question should be 10 marks

Unit I:
Aspects of EMC with examples, Common EMC units, EMC requirements for electronic systems, Radiated emissions, Conducted emissions, ESD. Application of EMC design, Wires, PCB lands, Component leads, resistors, capacitors, inductors and ferrites.

Unit II:
Electro-mechanical devices, Digital circuit devices. Mechanical switches (as suppression), Simple emission models for wires and PCB lands, Lice impedance stabilization network (LISN),

Unit III:
Power supply filters. Power supplies including SMPS . Three conductor lines and crosstalk, Shielded wires, Twisted wires, Multi-conductor lines and effects of incident fields, Shielding, Origin effects, prevention of ESD event, its hardware and immunity.

Unit IV:
System design for EMC, Grounding, System configuration, PCB design .

Text Books:

1) EMI Trouble Shooting Techniques By Michel Mardiguian, McGraw Hill, July 1999.

Reference Books:

2) Introduction to Electromagnetic Comaptibility By Clayton Paul, John Wiley & Sons, 2nd Edition, Jan 2006.
3) EMI/EMC Computational Modelling Hand Book By Bruce Archambeault, Ramahi, Brench, Springer Publication, Aug 2001.

Paper code: MERF-703 **L T P**

Paper: Microwave and Millimeter Wave Circuits **4 0 0**

INSTRUCTIONS TO PAPER SETTERS: **Maximum Marks : 60**

1. Question No. 1 should be compulsory and cover the entire syllabus and will be of 20 marks.

2. Apart from Question No. 1, rest of the paper shall consist of four units as per the syllabus. Every unit should have two questions. However, student may be asked to attempt only 1 question from each unit. Each question should be 10 marks

Unit I:

Introduction, types of MICs and their technology, propagating models, Analysis of MIC by conformal transformation, Variational Approach, Transverse Transmission Line Techniques, Finite Difference method, losses in micro-strip, Analysis of basic transmission lines for millimeter wave frequencies. Circuit Design and Applications, Microwave Network Parameters, Launching Methods, Design of Circuit Elements and Components, Hybrid Integrated Circuits using Planar Transmission Line Methods.

Unit II:

Introduction to Millimeter Wave Circuits, Millimeter waves and their applications, Finline and E-Plane Integrated Circuits, Integrated finline, Dielectric guides and its variants, non-radiative guide, H-guide and groove guide. Analysis techniques-Approximation Methods, Rigorous Methods, Spectral Domain, Spectral Domain Immittance Approach, Modal Analysis,

Unit III:

Finline structures and analysis, Transitions for various transmission lines, Resonators, Discontinuities, Measurement Techniques, Design of millimeter wave devices couplers, power dividers, filters, oscillators, mixers, switches, phase shifters and amplifiers Integrated Planar Hybrids with Waveguide-Finline-Planar Transmission Lines.

Unit IV:

Technology Advancements, Fabrication processes, Multilayer hybrid MICs/ MMIC techniques, thick and thin film technology, encapsulation, mounting and packaging of devices, Multi Chip Modular Technology, LTCC and HTCC Technology for Integration of Millimeter Wave and Microwave Circuits.

TEXT BOOKS:

1. Microwave Integrated Circuits By Frey, Artech House, 2nd edition.
2.Strip line Like Transmission Lines, By Koul and B Bhat, New Age, 1984.

REFERENCE BOOKS:

1. Numerical Techniqiues for Microwave and Millimeter Wave Passive Structures By Tatsuo Itoh, John Wiley, 1989.
2. Analysis Methods for RF, Microwave, and Millimeter-Wave Planar Transmission
3. Line Structures, CAM NGUYEN, JOHN WILEY & SONS, INC.
4. Analysis and Designs and applications of Finlines, B. Bhat and Koul, Artech House, 1989

Paper code: MERF-705 **L T/P C**
Paper: RFIC **4 - 4**

INSTRUCTIONS TO PAPER SETTERS: Maximum Marks : 60
1. Question No. 1 should be compulsory and cover the entire syllabus and will be of 20 marks.
2. Apart from Question No. 1, rest of the paper shall consist of four units as per the syllabus. Every unit should have two questions. However, student may be asked to attempt only 1 question from each unit. Each question should be 10 marks

UNIT I

Brief history of RFIC Technology, Advantages and disadvantages of RFICs, RFIC Technologies. Brief description of a typical GaAs RFIC foundry Process. Analysis of microstrip and coupled line in layered medium., Analysis of on-chip Inductor, Capacitor, Resistor.

UNIT II

Description on latest RF based technology like BiCMOS, SiG etc. Transistor circuits BJT and CMOS, Biasing circuits Modelling of active devices (MESFET) and passive devices (R, L, C, Microstrip line, Coplanar Waveguide etc) in a typical GaAs RFIC process.
Basic Procedure of the design of GaAs RFICs, Introduction to CAD tools and simulation software for RFIC design.

UNIT III

Basic circuit topology and RFIC realisation of Wilkinson power divider, branch line coupler, Low Noise amplifier, Mixer, Phase shifter, Voltage Controlled Oscillator, SPST & SPDT Switch, Attenuator, Balun.
High frequency analog circuits, Analog multiplier, mixer, PLL, Low noise Amplifiers

Unit IV

Basic circuit topology and RFIC realisation of Active inductors, Active circulators, Active Filters. Applications of RFICs, Advantages of System on chip.
Oscillators, Power Amplifier

Text Books:

1) Robertson I.D. , "MMIC Design " the institution of electrical engineers.

Reference Books:

2) Goyal Ravender, "Monolithic microwave Integrated Circuits: technology & design" Artech House.
3) Marsh Steve, " Practical MMIC design" Artech House.

Paper code: MERF-707 **L T P**

Paper: Smart Antennas for Mobile Communications **4 0 0**

INSTRUCTIONS TO PAPER SETTERS: **Maximum Marks : 60**

1. Question No. 1 should be compulsory and cover the entire syllabus and will be of 20 marks.

2. Apart from Question No. 1, rest of the paper shall consist of four units as per the syllabus. Every unit should have two questions. However, student may be asked to attempt only 1 question from each unit. Each question should be 10 marks

Unit I

Statistical signal processing concepts, Basics of mobile wireless communications.

Unit II:

Radio-frequency signal modeling and channel characterization.

Unit III:

Smart antennas and generalized array signal processing. Source localization problem, Joint angle and delay estimation.

Unit IV:

Smart antenna array configurations, Mobile communication systems with smart antennas.

TEXT BOOKS:

1. Smart Anteena for Wireless Communications: With MATLAB by Frank Gross, Mc Graw Hill,Sept 2005.
2. Smart Anteena Engineering by Ahmed El- Zooghby, Artech House, July 2005.

REFERENCE BOOKS:

1. Smart Anteena for Mobile Communications by Mohamed El-Said Shaban, BSD License, Sept 2009.

2. Channels,Propagation & Antennas for Mobile Communications by R. Vaughan & J. Bach Anderson, Iet Publications, 2003.

Paper code: MERF-709 **L T P**

Paper: Optimization in RF and Microwave Circuits **4 0 0**

INSTRUCTIONS TO PAPER SETTERS: **Maximum Marks : 60**

1. Question No. 1 should be compulsory and cover the entire syllabus and will be of 20 marks.

2. Apart from Question No. 1, rest of the paper shall consist of four units as per the syllabus. Every unit should have two questions. However, student may be asked to attempt only 1 question from each unit. Each question should be 10 marks

Unit 1

Introduction to Optimization Root Finding versus Optimization, Categories of Optimization, Minimum-Seeking Algorithms, Exhaustive Search, Analytical Optimization , Optimization Based on Line Minimization, Natural Optimization Methods, Biological Optimization, Multiobjective optimization, Constraint handling, Implementation tools.

Search Engine Optimization: Techniques and Tools

Unit 2

Neural Networks

Introduction, Biological Neurons, Artificial Neurons – various models, transfer functions; Learning methods, Stability and Convergence, Functional units for Pattern Recognition tasks; Single Layered Perceptron, Multi Layered Perceptron, Examples.

Unit 3

Genetic Algorithm: Population, Mutation, Crossover, Fitness function, Single objective and Multi

objective Gas, Binary coded GA, Real coded GA, Application of GA to various problems.

Unit 4

Swarm Intelligence (SI): Particle Swarm Optimization (PSO): Biological background, Model of

swarming, Algorithm, Properties of PSO, Discrete versions, Formulation of problem, Application

of PSO to various problems, Bacterial Foraging Optimization (BFO): Basics, Formulation of problem, and Application of BFO to various problems.

Ant Colony Optimization (ACO): Biological background, Ant algorithm, Ant system, Max-minant system, NP-Hard problem, Data network routing problem, Application of ACO to various problems.

Reference Books:

1. Bio-inspired Artificial Intelligence: Theories, Methods, and Technologies: *Claudio Mattiussi and Dario Floreano, PHI, ISBN: 978-81-203-3935-4.*

2. Ant Colony Optimization: *Thomas Stutzle and Marco Dorigo, PHI, ISBN: 81-203-2684-9.*

3. Genetic Algorithm: *Goldberg*

Paper Code: MERF-711 **L T/P C**
Paper: RF MEMS **4 - 4**

INSTRUCTIONS TO PAPER SETTERS: Maximum Marks : 60
1. Question No. 1 should be compulsory and cover the entire syllabus and will be of 20 marks.
2. Apart from Question No. 1, rest of the paper shall consist of four units as per the syllabus. Every unit should have two questions. However, student may be asked to attempt only 1 question from each unit. Each question should be 10 marks

Unit I:
Introduction: RF MEMS for Microwave Applications, Mechanical Modeling of MEMS Devices: Static Analysis, Mechanical Modeling of MEMS Devices: Dynamic Analysis.

Unit II:
Electromagnetic Modeling of MEMS Switches, MEMS Switch Library, MEMS Switch Fabrication and Packaging, MEMS Switch Reliability and Power Handling.

Unit III:
Design of MEMS Switch Circuits, MEMS Phase Shifters, Distributed MEMS Phase Shifters and Switches, MEMS Varactors and Tunable Oscillators, Micro machined Inductors Reconfigurable MEMS Networks, Filters, Antennas, and Subsystem, Phase Noise Analysis of MEMS Circuits, Phase Shifters, and Oscillators, Future Work in RF MEMS.

Unit IV:
Detailed Analysis and Measurements of Inter-modulation Distortion and Power Handling in RF MEMS Switches, Varactors, and Tunable Filters., Mechanical, Electrical, and Thermal Properties of RF MEMS Materials.

Text Books:
1) RF MEMS Theory, Design & Technology By Gabreil M. Rebeiz, Wiley Interscience, June 2002.

Reference Books:
2) RF MEMS and their Applications By Vijay K Varadan, K.J.Binoy,K.A.Jose,Wiley Interscience,Dec 2002.
3) Practical MEMS by Ville Kaajakari, Small Gear Publication, March 2009.

Paper Code: MERF-713 **L T/P C**
Paper: Selected topics in latest trends in RF Systems and Technologies 4 - 4

INSTRUCTIONS TO PAPER SETTERS: **Maximum Marks : 60**
1. Question No. 1 should be compulsory and cover the entire syllabus and will be of 20 marks.
2. Apart from Question No. 1, rest of the paper shall consist of four units as per the syllabus. Every unit should have two questions. However, student may be asked to attempt only 1 question from each unit. Each question should be 10 marks

Syllabus will be design by the Board of studies of USICT at the beginning of semester.

Paper code: MERF-715 **L T/P C**
Paper: Radar Signal Processing **4 - 4**

INSTRUCTIONS TO PAPER SETTERS: **Maximum Marks : 60**
1. Question No. 1 should be compulsory and cover the entire syllabus and will be of 20 marks.
2. Apart from Question No. 1, rest of the paper shall consist of four units as per the syllabus. Every unit should have two questions. However, student may be asked to attempt only 1 question from each unit. Each question should be 10 marks

UNIT I
Modern signal processing techniques for high range-resolution radar systems, One- and two-dimensional signals,

UNIT II
high resolution radar, synthetic aperture radar, inverse synthetic aperture radar, radar tomography, ultra-wideband radar.

UNIT III
Coherent Radar Signal Processing, Signal characterization via the ambiguity function Characterization, One- and two-dimensional Fourier Processing,

UNIT IV
SAR and ISAR, Impulse radar

Text Books:

1) Fundamentals of Radar Signal Processing by Mark A. Richards, Artech House Publishers, 2nd Edition.

Reference Books:

2) Principles of Radar and Sonar Signal Processing By Francois Le Chevalier, Artech House Publishers, 2002.
3) Adaptive Radar Signal Processing by Simon Haykin, Wiley Interscience, 2006.

Paper code: MERF-717 **L T/P C**
Paper: Wireless Adhoc Networks **4 - 4**

INSTRUCTIONS TO PAPER SETTERS: Maximum Marks : 60
1. Question No. 1 should be compulsory and cover the entire syllabus and will be of 20 marks.
2. Apart from Question No. 1, rest of the paper shall consist of four units as per the syllabus. Every unit should have two questions. However, student may be asked to attempt only 1 question from each unit. Each question should be 10 marks

UNIT I

Introduction to adhoc networks – definition, characteristics features, applications. Characteristics of Wireless channel, Adhoc Mobility Models: Indoor and out door models.

UNIT II

MAC Protocols: design issues, goals and classification. Contention based protocols- with reservation, scheduling algorithms, protocols using directional antennas. IEEE standards: 802.11a, 802.11b, 802.11g, 802.15. HIPERLAN.

UNIT III

Network protocols, Routing Protocols: Design issues, goals and classification. Proactive Vs reactive routing, Unicast routing algorithms, Multicast routing algorithms, hybrid routing algorithm, Energy aware routing algorithm, Hierarchical Routing, QoS aware routing.

UNIT IV

Transport layer: Issues in designing- Transport layer classification, adhoc transport protocols. Security issues in adhoc networks: issues and challenges, network security attacks, secure routing protocols. Cross layer Design: Need for cross layer design, cross layer optimization, parameter optimization techniques. Integration of adhoc with Mobile IP networks.

TEXTBOOKS

1. C.Siva Ram Murthy and B.S.Manoj, Ad hoc Wireless Networks Architectures and protocols, 2nd edition, Pearson Education. 2007
2. Charles E. Perkins, Ad hoc Networking, Addison – Wesley, 2000

REFERENCES:

1. Mohammad Ilyas, The handbook of adhoc wireless networks, CRC press, 2002.

Paper code: MERF-751 **L T/ P C**
Paper: Lab-7 **0 4 2**

Lab based on EM Interference and compatibility in system design

40 marks: internal evaluation	**60 marks: external evaluation**

Paper code: MERF-753 **L T/ P C**
Paper: Lab-8 **0 4 2**

Lab based on Microwave & Mm IC

40 marks: internal evaluation	**60 marks: external evaluation**

Paper code: MERF-755 **L T/ P C**
Paper: Minor Project **0 4 2**

40 marks: internal evaluation	**60 marks: external evaluation**

Objective: Students are required select a topic of their interest and develop a minor project on it. The student will submit a synopsis at the beginning of the semester for the approval to the project committee in a specified format (available on www.ipu.ac.in). The student will have to present the progress of the work through seminars. A report must be submitted to the college for evaluation purpose at the end of the semester in a specified format.

Paper code: MERF-757* **L T/ P C**
Paper: Term Paper-III **0 4 2**

40 marks: internal evaluation	**60 marks: external evaluation**

Paper code: MERF-752 **total credit**
Paper: Dissertation **24**

: Evaluation based on Final Thesis of the work done

Objective: Students are required to select a topic of their interest and prepare a dissertation on it. The student will submit a synopsis at the beginning of the semester for the approval from the project committee in the specified format. Synopsis must be submitted within two weeks. The first defense, for the dissertation work, should be held with in one month.
Dissertation Report must be submitted in specified format (available on www.ipu.ac.in) to the college for evaluation purpose.

Paper code: MERF-754* **total credit**
Paper: Seminar & Progress report **4**

100 marks: internal evaluation

Paper code: MERF-756* **L T/ P C**
Paper: Term Paper-IV **0 4 2**

- ***Non University Program**

The student will have to present the seminars and progress reports at the interval of four weeks during the semester. Minimum two seminars will be held during the semester.

Paper Code: MEVS - 601	**L**	**T**	**C**
Paper: Digital System Design with Verilog	**4**	**-**	**4**

INSTRUCTIONS TO PAPER SETTERS: **Maximum Marks : 60**

1. **Question No. 1 should be compulsory and cover the entire syllabus. This question should have objective or short answer type questions. It should be of 20 marks.**
2. **Apart from Question No. 1, rest of the paper shall consist of four units as per the syllabus. Every unit should have two questions. However, student may be asked to attempt only 1 question from each unit. Each question should be 10 marks**

Unit-1

ASIC Design Flow, Architecture and configuration of (Xilinx)Virtex series FPGA, Principles Hardware Description Languages, Y-Chart, Review of Synchronous and Asynchronous Design, Types of HDLs, Introduction to Verilog, Language Constructs ,Modeling style, Assignment Structures, Delays and Continuous Assignments, Assignment to Vectors, Operators,

Unit-2

Design of Adder, Subtractor, Decoders, Encoders, Multiplexer, code Converter. Behavioral Modeling: Functional Bifurcation, Initial & Always Construct, multiple always blocks, Program flow control and looping, Parallel blocks, force-release construct, design of sequential circuits using verilog: Register, Counters, Timing and Delays model, path delay modeling, timing check

Unit 3

Introduction of behavioral modelling, functional bifurcation, initial & always construct, procedural assignment statement, Delay in Procedural statements, Timing Control Statements, If and If-else, case statement assign-deassign, repeat construct, loop construct: repeat, for, while & forever, sequential and parallel blocks, force-release construct, design of flip flop, shift register and counters using Verilog

Unit-4

Data Subsystems, Storage Modules, Functional Modules, Data paths, Control Subsystems, Micro programmed Controller, Structure of a micro programmed controller, Micro instruction Format, Micro instruction sequencing, Micro instruction Timing, Basic component of a micro system, memory subsystem design.

Text Books:

[1] Verilog HDL by Samir Palnitkar, Pearson Pub.
[2] M. Ercegovac, T. Lang and L.J. Moreno, "Introduction to Digital Systems", Wiley,2000

Reference Books:

[1] Digital Design by Frank Vahid, Wiley, 20063.
[2] Introduction to Digital Systems by M. Ercegovac, T. Lang and L.J. Moreno, Wiley,2000.
[3] Fundamental of digital Logic with Verilog design by S. Brown & Z. Vransesic, TMH.
[4] Design through Verilog HDL by T.R. Padmanabhan& B. Bala Tripura Sundari, Wiley Pub. 2007

Paper Code: MEVS-603	**L**	**T**	**C**
Paper: VLSI Technology	**4**	**-**	**4**

INSTRUCTIONS TO PAPER SETTERS: **Maximum Marks : 60**

1. **Question No. 1 should be compulsory and cover the entire syllabus. This question should have objective or short answer type questions. It should be of 20 marks.**
2. **Apart from Question No. 1, rest of the paper shall consist of four units as per the syllabus. Every unit should have two questions. However, student may be asked to attempt only 1 question from each unit. Each question should be 10 marks**

Unit 1

Cleanroom technology - Clean room concept – Growth of single crystal Si, surface contamination, Chemical Mechanical Polishing, wafer preparation, DI water, RCA and Chemical Cleaning. Processing considerations: Chemical cleaning, getting the thermal Stress factors etc.

Epitaxy : Physical Vapour Deposition, Vapors phase Epitaxy Basic Transport processes & reaction kinetics, doping & auto doping, equipments, & safety considerations, epitaxial defects, molecular beam epitaxy, equipment used, film characteristics, SOI structure.

Unit 2

Oxidation :Growth mechanism & kinetics, Silicon oxidation model, interface considerations, orientation dependence of oxidation rates thin oxides. Oxidation technique & systems dry & wet oxidation. Masking properties of SiO_2.

Diffusion :Diffusion from a chemical source in vapor form at high temperature, diffusion from doped oxide source, Ion Implantation, Annealing and diffusion from an ion implanted layer.

Unit 3

Lithography

Optical Lithography: optical resists, contact & proximity printing, projection printing, electron lithography: resists, mask generation. Electron optics: roster scans & vector scans, variable beam shape. X-ray lithography: resists & printing, X ray sources & masks. Ion lithography.

Unit 4

Etching

Reactive plasma etching, AC & DC plasma excitation, plasma properties, chemistry & surface interactions, feature size control & apostrophic etching, ion enhanced & induced etching, properties of etch processing. Reactive Ion Beam etching, Specific etches processes: poly/polycide. Trench etching.

Metallisation - Different types of metallization, uses & desired properties

Text Books

[1] S.M. Sze, " VLSI Technology", John Wiley & Sons, 2000.

Reference Books

[1]B.G. Streetman, "Solid State Electronics Devices", Prentice Hall, 2002.

[2] Wai-Kai Chen,"VLSI Technology" Wiley, March 2003.

Paper Code: MEVS – 604	**L**	**T**	**C**
Paper: Analog VLSI Design	**4**	**-**	**4**

INSTRUCTIONS TO PAPER SETTERS: **Maximum Marks : 60**

1. **Question No. 1 should be compulsory and cover the entire syllabus. This question should have objective or short answer type questions. It should be of 20 marks.**
2. **Apart from Question No. 1, rest of the paper shall consist of four units as per the syllabus. Every unit should have two questions. However, student may be asked to attempt only 1 question from each unit. Each question should be 10 marks**

Unit 1

Introduction to analog design - Levels of abstraction, Robust analog design, MOS Device Models, MOS Device Capacitances, MOS small signal model, long channel vs. short channel, Single stage amplifier- Basic concepts, Common Source Stage, Source follower, Common Gate stage, Cascode Stage

Unit 2

Differential amplifiers - Single ended and Differentials Operation, Common Mode Response Differential pair with MOS loads, Gilbert Cell. Passive and Active Current Mirrors – Basic current mirrors, Cascode Current Mirrors, Active Current Mirrors. Frequency Response of Amplifiers – General Considerations, CS stage, Source Followers, CG stage, Cascode stage, Differential Pair. Feed Back – General Considerations, Feedback Topologies, Effect of Loading.

Unit 3

Operational Amplifiers – General Considerations, One stage and two stage Op Amps, Gain boosting, Comparison, Common-mode Feedback, Input Range limitations, Slew Rate, Power Supply Rejection, Stability and Frequency compensations – General Considerations, Multipole System, Phase Merging, Frequency Compensation, and Compensation of Two Stage Op-Amp.

Unit 4

Voltage controlled oscillator, Phase Locked Loops (PLL) – Simple PLL, Charge Pump PLLs, Introduction to Switched - Capacitor Circuits – General Considerations, Sampling Switches, , Switched Capacitor Amplifiers, Switched Capacitor Integrator, Switched Capacitor Common Mode Feedback.

Text Books:

[T1] Design of Analog CMOS integrated circuits Behzad Razavi McGraw-Hill International edition - ISBN-0-07-118815-0, 2001

[T2] Analog integrated circuit Design, David A. Johns & Ken Martin - John- Wiley & Sons, Inc. New York. ISBN-0-471-14448-7

Reference Books :

[R1] CMOS: Circuit Design, layout, and simulation, R. Jacob, Baker and David E. Boyce, Prentice Hall of India. ISBN - 81-203-1682-7

[R2] Applications and Design with analog integrated circuits, 2 nd Edition - J. Michael Jacob, Prentice Hall of IndiaISBN-81-203-1015-2

[R3] Design and applications of analog Integrated Circuits, Sidney Soclof , Prentice Hall of India, -ISBN - 81 - 203 - 2 55 2 - 4 , 1991

Paper Code: MEVS-605	**L**	**T**	**C**
Paper: Advanced VLSI Design	**4**	**-**	**4**

INSTRUCTIONS TO PAPER SETTERS: Maximum Marks : 60

3. **Question No. 1 should be compulsory and cover the entire syllabus. This question should have objective or short answer type questions. It should be of 20 marks.**
4. **Apart from Question No. 1, rest of the paper shall consist of four units as per the syllabus. Every unit should have two questions. However, student may be asked to attempt only 1 question from each unit. Each question should be 10 marks**

Unit 1

Introduction [T1,T2]: Basic principle of MOS transistor, Introduction to large signal MOS models (long channel) for digital design.

MOS Circuit Layout & Simulation and manufacturing: scaling, MOS SPICE model and simulation, CMOS layout: design rules, Transistor layout, Inverter layout, NMOS and CMOS basic manufacturing steps.

Unit 2

The MOS Inverter [T1]: Inverter principle, the basic CMOS inverter, transfer characteristics, logic threshold, Noise margins, switching characteristics, Propagation Delay, Power Consumption.

Combinational MOS Logic Design [T1] : Static MOS design, Ratioed logic, Pass Transistor logic, complex logic circuits.

Unit 3

Sequential MOS Logic Design [T1]

Static latches, Flip flops & Registers, Dynamic Latches & Registers, CMOS Schmitt trigger, Astable Circuits. Memory Design: ROM & RAM cells design **Dynamic MOS design [T1]:** Dynamic logic families and performances.

Clock Distribution [T1] [T2]Clock Distribution. Input and Output Interface circuits.

Unit 4

Subsystem design [T2, R1]

Design styles, design concepts: Hierarchy, Regularity, Modularity, Locality. CMOS Sub system design: Adders, Multipliers.

Text Books

[T1] S. Kang & Y. Leblebici "CMOS Digital IC Circuit Analysis & Design"- McGraw Hill, 2003.

[T2] J. Rabaey, "Digital Integrated Circuits Design", Pearson Education, Second Edition, 2003.

Reference Books

[R1] Neil Weste and David Harris :" CMOS VLSI design" Pearson Education 2009.

Paper Code: MEVS-606	L	T	C
Paper: Low Power VLSI Design	4	-	4

INSTRUCTIONS TO PAPER SETTERS: Maximum Marks : 60

1. **Question No. 1 should be compulsory and cover the entire syllabus. This question should have objective or short answer type questions. It should be of 20 marks.**
2. **Apart from Question No. 1, rest of the paper shall consist of four units as per the syllabus. Every unit should have two questions. However, student may be asked to attempt only 1 question from each unit. Each question should be 10 marks**

Unit-1

Introduction[T1] [T2]: Need for low power VLSI chips, Sources of power dissipation on Digital Integrated circuits. Emerging Low power approaches. Physics of power dissipation in CMOS devices.

Device & Technology Impact on Low Power [R1]: Dynamic dissipation in CMOS, Transistor sizing & gate oxide thickness, Impact of technology Scaling, Technology & Device innovation. Power estimation Techniques

Unit 2

Simulation Power analysis [T1]: SPICE circuit simulators, gate level logic simulation, capacitive power estimation, static state power, gate level capacitance estimation, architecture level analysis, data correlation analysis in DSP systems. Monte Carlo simulation. Probabilistic power analysis: Random logic signals, probability & frequency, probabilistic power analysis techniques, signal entropy.

Unit 3

Low Power Techniques[T1] : Circuit level: Power consumption in circuits. Flip Flops & Latches design, high capacitance nodes, low power digital cells library. Logic level: Gate reorganization, signal gating, logic encoding, state machine encoding, pre-computation logic.

Unit 4

Low power Architecture & Systems[T1] Power & performance management, switching activity reduction, parallel architecture with voltage reduction, flow graph transformation, low power arithmetic components, low power memory design.

Low power Clock Distribution[T2]: Power dissipation in clock distribution, single driver Vs distributed buffers, Zero skew Vs tolerable skew, chip & package co design of clock network.

Text Books:

[T1] Gary K. Yeap, "Practical Low Power Digital VLSI Design", KAP, 2002
[T2] Rabaey, Pedram, "Low power design methodologies" Kluwer Academic, 1997

Reference Books:

[R1] Kaushik Roy, Sharat Prasad, "Low-Power CMOS VLSI Circuit Design" Wiley, 2000.

Paper Code: MEVS-608	L	T	C
Paper: Advanced DSP for VLSI Design	4	-	4

INSTRUCTIONS TO PAPER SETTERS: Maximum Marks : 60

1. **Question No. 1 should be compulsory and cover the entire syllabus. This question should have objective or short answer type questions. It should be of 20 marks.**
2. **Apart from Question No. 1, rest of the paper shall consist of four units as per the syllabus. Every unit should have two questions. However, student may be asked to attempt only 1 question from each unit. Each question should be 10 marks**

Unit 1: DISCRETE RANDOM SIGNAL PROCESSING

Discrete Random Processes, Expectations, Variance, Co -Variance, Scalar Product, Energy of Discrete Signals - Parseval's Theorem, Wiener Khintchine Relation - Power Spectral Density - Periodogram – Sample Autocorrelation - Sum Decomposition Theorem, Spectral Factorization Theorem - Discrete Random Signal Processing by Linear Systems - Simulation of White Noise - Low Pass Filtering of White Noise

Unit 2 : SPECTRUM ESTIMATION

Non-Parametric Methods-Correlation Method - Co-Variance Estimator - Performance Analysis of Estimators - Unbiased, Consistent Estimators-Periodogram Estimator-Barlett Spectrum Estimation-Welch Estimation-Model based Approach - AR, MA, ARMA Signal Modeling-Parameter Estimation using Yule-Walker Method.

Unit 3: LINEAR ESTIMATION AND PREDICTION

Maximum likelihood criterion-efficiency of estimator-Least mean squared error criterion -Wiener filter-Discrete Wiener Hoff equations-Recursive estimators-Kalman filter-Linear prediction, prediction error-whitening filter, inverse filter-Levinson recursion, Lattice realization, and Levinson recursion algorithm for solving Toeplitz system of equations.

Unit 4: ADPATIVE FILTERS

FIR adaptive filters-Newton's steepest descent method - adaptive filter based on steepest descent method-Widrow Hoff LMS adaptive algorithm- Adaptive channel equalization-Adaptive echo chancellor-Adaptive noise cancellation-RLS adaptive filters-Exponentially weighted RLS-sliding window RLS-Simplified IIR LMS adaptive filter

MULTIRATE DIGITAL SIGNAL PROCESSING

Mathematical description of change of sampling rate - Interpolation and Decimation - continuous time model - Direct digital domain approach - Decimation by an integer factor - Interpolation by an integer factor - Single and multistage realization - poly phase realization - Application to sub band coding - Wavelet transform and filter bank implementation of wavelet expansion of signals.

Text Book:

[T1] Monson H.Hayes, " Statistical Digital Signal Processing and Modeling ", John Wiley and Sons, Inc., New York, 1996.

Reference Books:

[R1]. Sopocles J.Orfanidis, " Optimum Signal Processing ", McGraw Hill, 1990.
[R2]John G.Proakis, Dimitris G.Manolakis, " Digital Signal Processing ", Prentice Hall of India, 1995

Paper Code: MEVS-609	**L**	**T**	**C**
Paper: Algorithm Analysis and Design	**4**	**0**	**4**

INSTRUCTIONS TO PAPER SETTERS: **Maximum Marks : 60**

1. **Question No. 1 should be compulsory and cover the entire syllabus. This question should have objective or short answer type questions. It should be of 20 marks.**
2. **Apart from Question No. 1, rest of the paper shall consist of four units as per the syllabus. Every unit should have two questions. However, student may be asked to attempt only 1 question from each unit. Each question should be 10 marks**

Unit 1

Introduction to Algorithm, The role of algorithms in computing, Asymptotic notation, asymptotic analysis of recurrence relations, probabilistic analysis and randomized algorithm, the hiring problem, indicator random variables, Divide and conquer paradigm – Merge sort, Inversion counting, Dynamic Programming – Matrix Chain multiplication, Longest Common subsequence, optimal binary search trees Greedy Algorithm –Activity Selection problem, Theoretical foundation of greedy algorithm, Task Scheduling problem, Comparison of dynamic programming and Greedy algorithm with Knapsack as case study

Unit 2

Graphs: Review of Graphs (Representation, Depth First Search, Breath First search, Kruskal and Prim Algorithm, Dijkstra's Algorithm) Flow networks: Ford-Fulkerson method, comparison Networks, Zero-one Principle, Bitonic Sorting Network, Merging Network, Sorting Network

Unit 3

Matrix Operation (Properties, Strassen's Algorithm, Solution of linear equation, Matrix inversion) Polynomial and FFT, Representation of polynomials, The DFT and FFT, efficient FFT implementation Number–Theoretic Algorithm, Elementary number-theoretic notion, Greatest common divisor, modular arithmetic, solving modular linear equation, the Chinese remainder theorem

Unit 4

NP-Completeness, Polynomial time, Polynomial time verification, NP completeness and reducibility, NP-Completeness proofs Approximation Algorithms- the vertex-cover problem, Traveling-Salesman Problem, set covering problem

Text Books:

[T1] T. H. Cormen, C. E. Leiserson, R.L. Rivest, C. Stein, "Introduction to Algorithms", 2nd Edition, PHI.

Reference Books:

[R1] A.V. Aho, J. E. Hopcroft, J.D. Ulman, "The Design & Analysis of Computer Algorithms", Addison Wesley.
[R2] V. Manber, "Introduction to Algorithms – A Creative Approach", Addison Wesley.
[R3]Ellis Harwitz and Sartaz Sahani, "Fundamentals of Computer Algorithms", Galgotia.

Paper Code: MEVS - 610	**L**	**T**	**C**
Paper: Simulation and Circuit Modeling	**4**	**0**	**4**

INSTRUCTIONS TO PAPER SETTERS: **Maximum Marks : 60**

1. **Question No. 1 should be compulsory and cover the entire syllabus. This question should have objective or short answer type questions. It should be of 20 marks.**
2. **Apart from Question No. 1, rest of the paper shall consist of four units as per the syllabus. Every unit should have two questions. However, student may be asked to attempt only 1 question from each unit. Each question should be 10 marks**

Unit 1[T1]

Introduction, Main data structure & program organization, Geometrical manipulations, Ion implantation. .

Unit 2 [T1]

A novel measurement technique for 2D implanted ion distributions, Introduction to partial differential equation solver.

Unit 3 [T1]

The merged multi grid method, Isothermal device modeling & simulation. .

Unit 4 [T1]

Non-Isothermal device modeling & simulation, hydrodynamic device modeling & simulation.

Text Books

[T1] Circuit, Device and Process Simulation: Mathematical and Numerical Aspects by Graham F. Carey (Editor), W. B. Richardson, C. S. Reed, B. Mulvaney, John Wiley & Sons; 1st edition. 1996.

Reference Books:

[R1] Process and Device Simulation for MOS-VLSI Circuits, edited by P. Antognetti, D.A. Antoniadis , Robert W. Dutton, W.G. Oldham, Kluwer Academic Publisher, 2000.

Paper Code: MEVS – 611	**L**	**T**	**C**
Paper: DSP for VLSI Design	**4**	**-**	**4**

INSTRUCTIONS TO PAPER SETTERS: Maximum Marks : 60

1. **Question No. 1 should be compulsory and cover the entire syllabus. This question should have objective or short answer type questions. It should be of 20 marks.**
2. **Apart from Question No. 1, rest of the paper shall consist of four units as per the syllabus. Every unit should have two questions. However, student may be asked to attempt only 1 question from each unit. Each question should be 10 marks**

Unit 1: VLSI DSP

Data Flow graph representation, Iteration Bound, Pipelining and Parallelism; Re-timing techniques, Unfolding-algorithm, properties and applications of unfolding, Folding transformation, register minimization in folded architectures, folding of multirate systems

Unit 2: Architecture Design

DSP system architectures, Systolic Array Design Methodology, Shared memory architectures. Mapping of DSP algorithms onto hardware, Implementation based on complex PEs, Shared memory architecture with Bit serial PEs. Pipelined and Parallel Architectures for Recursive and Adaptive Filters

Unit 3 : Arithmetic Architectures

Bit level arithmetic architectures, redundant arithmetic, synchronous and asynchronous pipeline, low power design

UNIT 4: Case Study: TMS320CXX PROCESSOR

Architecture –Data formats, Addressing modes, Instruction sets and operations, Block diagram of DSP starter kit, Programs for processing real time systems

Text Book

[T1] K. K. Parhi, VLSI Digital Signal Processing Systems : Design and Implementation, Wiley,1999
[T2] B.Venkataramani and M.Bhaskar, "Digital Signal Processors – Architecture Programming and Application" -Tata McGraw Hill Publishing Company Limited. New Delhi, 2008

Reference Books:

[R1] P. Lapsley, J. Bier, A. Shoham and E. A. Lee, DSP Processor Fundamentals : Architectures and Features, Wiley/IEEE,2001.
[R2] P. Pirsch, Architectures for Digital Signal Processing, Wiley, 1998.
[R3] T. Glokler and H. Meyr, Design of Energy-Efficient Application Specific Instruction Set Processors, Kluwer, 2004.
[R4] V. K. Madisetti, VLSI Digital Signal Processors, Butterworth-Heinemann/IEEE Press, 1995.

Paper Code: MEVS - 612	**L**	**T**	**C**
Paper: System-on-chip	**4**	**0**	**4**

INSTRUCTIONS TO PAPER SETTERS: Maximum Marks : 60

1. **Question No. 1 should be compulsory and cover the entire syllabus. This question should have objective or short answer type questions. It should be of 20 marks.**
2. **Apart from Question No. 1, rest of the paper shall consist of four units as per the syllabus. Every unit should have two questions. However, student may be asked to attempt only 1 question from each unit. Each question should be 10 marks**

UNIT-1

Logic Gates

Introduction. Combinational Logic Functions. Static Complementary Gates. Switch Logic. Alternative Gate Circuits. Low-Power Gates. Delay Through Resistive Interconnect. Delay Through Inductive Interconnect.

Unit-2

Combinational Logic Networks.

Introduction. Standard Cell-Based Layout. Simulation. Combinational Network Delay. Logic and Interconnect Design. Power Optimization. Switch Logic Networks. Combinational Logic Testing.

Sequential Machines.

Introduction. Latches and Flip-Flops. Sequential Systems and Clocking Disciplines. Sequential System Design. Power Optimization. Design Validation. Sequential Testing.

Unit-3

Subsystem Design

Introduction. Subsystem Design Principles. Combinational Shifters. Adders. ALUs. Multipliers. High-Density Memory. Field-Programmable Gate Arrays. Programmable Logic Arrays. References. Problems.

Unit-4

Floor-planning

Introduction, Floor-planning Methods – Block Placement & Channel Definition, Global Routing, Switchbox Routing, Power Distribution, Clock Distributions, Floor-planning Tips, Design Validation. Off-Chip Connections – Packages, The I/O Architecture, PAD Design.

Text Book:

[T1] Wayne Wolf , " Modern VLSI Design – System – on – Chip Design", Prentice Hall, 3rd Edition , 2008.

Reference Book:

[R1] Wayne Wolf , " Modern VLSI Design – IP based Design", Prentice Hall, 4th Edition , 2008.

Paper Code: MEVS – 613	**L**	**T**	**C**
Paper: Wireless Networks	**4**	**-**	**4**

INSTRUCTIONS TO PAPER SETTERS: **Maximum Marks : 60**

1. **Question No. 1 should be compulsory and cover the entire syllabus. This question should have objective or short answer type questions. It should be of 20 marks.**
2. **Apart from Question No. 1, rest of the paper shall consist of four units as per the syllabus. Every unit should have two questions. However, student may be asked to attempt only 1 question from each unit. Each question should be 10 marks**

Unit 1

Introduction to Personal Communication Services (PCS): PCS architecture, Mobility management, Networks signaling.

Global system for Mobile Communication (GSM) system overview: GSM Architecture, Mobility Management, Network signaling.

Unit 2

General Packet Radio Services (GPRS): GPRS architecture, GPRS Network nodes. Enhanced Data rates for GSM Evolution (EDGE), Mobile Data Communication: WLANs (Wireless LANs) IEEE 802.11 standard, Mobile IP. Wireless Application Protocol (WAP): The Mobile Internet standard, WAP Gateway and Protocols, Wireless Markup Languages (WML).

Unit 3

Third Generation (3G) Mobile Services: Introduction to International Mobile Telecommunications 2000 (IMT 2000) vision, Wideband Code Division Multiple Access (W-CDMA), and CDMA 2000, Quality of services in 3G. Fourth Generation (4G) Mobile services: Introduction to Long Term Evaluation (LTE), Orthogonal Frequency Division Multiple Access (OFDMA), Multi-In Multi-Out Antenna system (MIMO), LTE-Advanced Wireless local Loop (WLL): Introduction to WLL architecture, WLL technologies, WMAN (Wireless MAN), IEEE802.16 standard, WiMAX

Unit 4

Global Mobile Satellite Systems: Case studies of IRIDIUM and GLOBALSTAR systems.

Bluetooth technology. Wireless Sensor Networks: Introduction, Architecture, ZigBee protocol, Applications.

Text Books:

[T1] Yi –Bing Lin & Imrich Chlamatac ,"Wireless and mobile Networks Architecture," John Wiley & Sons Publication, 2001.

[T2] Raj Pandya, "Mobile & Personnel communication Systems and Services", Prentice Hall India, 2001.

[T3] Theodore S. Rappaport, "Wireless Communication- Principles and practices," 2nd Ed. Pearson Education Pvt. Ltd, 2003.

[T4] Jochen Schiller, "Mobile communications," Pearson Education Pvt. Ltd., 2002.

[T5] Singhal & Bridgman, " The Wireless Application Protocol," Pearson Education, 2004.

References Books :

[R1] Hensmann, Merk, & Stober, "Principles of Mobile Computing," 2nd Ed., Springer International Edition, 2003.

[R2] Talukdar & Yaragal, "Mobile Computing," TMH, 2005.

[R3] Smith & Collins, "3G Wireless Networks," TMH, 2007.

Paper Code: MEVS - 614	**L**	**T**	**C**
Paper: Semiconductor Memory Design	**4**	**0**	**4**

INSTRUCTIONS TO PAPER SETTERS: **Maximum Marks : 60**

1. **Question No. 1 should be compulsory and cover the entire syllabus. This question should have objective or short answer type questions. It should be of 20 marks.**
2. **Apart from Question No. 1, rest of the paper shall consist of four units as per the syllabus. Every unit should have two questions. However, student may be asked to attempt only 1 question from each unit. Each question should be 10 marks**

Unit-1

Introduction to Advanced Semiconductor Memories – Overview, Developments & Directions. SRAM Technologies – Basic SRAM Architecture & Cell Structures, SRAM selection Considerations, High Performance SRAMs, Advanced SRAM Architectures.

Unit-2

Low Voltage SRAMS, SOI SRAMS, BiCMOS SRAM, CAM. Memory Peripheral Circuitry – The Address Decoder, Sense Amplifier, Voltage References, Drivers / Buffers, Timing & Control, Memory Reliability & Yield. Power Dissipation in Memories – Sources of Power Dissipation, Partitioning of the Memory, Addressing the active power dissipation, Data Retention Dissipation.

Unit-3

DRAM – Technology & Evolution & Trends, DRAM Timing Specifications, EDO DRAMs, EDRAM, Synchronous DRAM, Enhanced Synchronous DRAM, Cache DRAM.

Unit-4

NON VOLATILE MEMORY – Introduction, Floating Gate cell Theory & Operations, Charge Transport Mechanisms, and Nonvolatile Memory Cell & Array Design, UV-EPROM cells & EEPROM Cells, Flash Memory Cells.

Flash Memory Architectures – NOR, NAND, DINOR & AND Architecture Flash Memories. Multilevel Nonvolatile Memories, Ferroelectric Memories.

Text Books:

[T1] Ashok K Mishra , "Advanced Semiconductor Memories", IEEE Press, Wiley & Sons, 2009.

[T2] Jan M .Rabaey, Anantha Chandrakasan, Borivoje Nikolic, "Digital Integrated Circuits – A Design Perspective", 2nd edition Prentice Hall Publication, 2011

Reference Books:

[R1] S. Kang & Y. Leblebici "CMOS Digital IC Circuit Analysis & Design"- McGraw Hill, 2003.

[R2] Betty Prince, "Semiconductor Memories: A Handbook of Design, Manufacture and Application", John Wiley & Sons Publication.

Paper Code: MEVS – 615	**L**	**T**	**C**
Paper: Research Methodologies	**4**	**-**	**4**

INSTRUCTIONS TO PAPER SETTERS: **Maximum Marks : 60**

3. **Question No. 1 should be compulsory and cover the entire syllabus. This question should have objective or short answer type questions. It should be of 20 marks.**
4. **Apart from Question No. 1, rest of the paper shall consist of four units as per the syllabus. Every unit should have two questions. However, student may be asked to attempt only 1 question from each unit. Each question should be 10 marks**

Unit 1: Introduction to Research Methodology

Meaning of research, objectives of research, meaning of research, motivation in research, types of research, scope of educational research, characteristics and prerequisites of educational research, types of educational research, research approaches, significance of research, research methods versus methodology, research and scientific method, importance of knowing how research is done, research process, criteria of good research, necessity of defining the problem.

Unit II: Techniques for Research Methodology

Defining research problems, hypothesis formulation, developing a research plan, research design, features of a good design, different research designs, and important concepts related to research design, methods for data collection.

Unit III: Data Analysis and Statistical Techniques

Data and their analyses, quantitative methods and techniques, Measure of central tendency, measures of variation, frequency distribution, analysis of variance methods, identifying the distribution with data, parameter estimation, Goodness-of-Fit tests-Chi-Square test, K-S Goodness-of-Fit test, Correlation analysis, Regression analysis, time series and forecasting, Introduction to discriminate analysis, factor analysis, cluster analysis, conjoint analysis. Sampling methods, test of hypothesis

Unit IV : Algorithmic Research and Simulation

Algorithmic research problems, types of algorithmic research, types of solution procedure, steps of development of algorithm, steps of algorithmic research, design of experiments, steps of modeling, operations research models, application of models. Need for simulation, types of simulation, simulation language, fitting the problem to simulation study, simulation models, output analysis.

Books:

[R1]Research Methodologies, R. Panneerselvam, Prentice Hall, 2007.
[R2] Research in Education, Best John V. and James V Kahn, Wiley eastern, 2005.
[R3] Elements of Educational Research, Sukhia, S.P., P.V. Mehrotra, and R.N. Mehrotra, PHI publication, 2003.
[R4] Methodology of Research Education, K. Setia, EEE publication, 2004.
[R5] Research methodology, Methods and Techniques, Kothari, C.R., 2000.

Paper Code: MEVS - 616	**L**	**T**	**C**
Paper: Evolutionary Algorithms for VLSI Design	**4**	**0**	**4**

INSTRUCTIONS TO PAPER SETTERS: **Maximum Marks : 60**

1. **Question No. 1 should be compulsory and cover the entire syllabus. This question should have objective or short answer type questions. It should be of 20 marks.**
2. **Apart from Question No. 1, rest of the paper shall consist of four units as per the syllabus. Every unit should have two questions. However, student may be asked to attempt only 1 question from each unit. Each question should be 10 marks**

Unit 1

Logic synthesis & verification: Introduction to combinational logic synthesis, Binary Decision Diagram, Hardware models for High-level synthesis, Basic VLSI automation Algorithms: Partitioning, Placement, floor planning & pin assignment, routing.

Unit 2

Basic Principles of Evolutionally Algorithms, Mutually dependent problems, Heuristic minimization, CAD of IC, Biological background, Genetic algorithm and Evolutionary algorithms, Extension of the concept.

Unit 3

Characteristics of Problem instances: Size of problem instance, Quality speed trade-off, Performance evaluations: Measuring performance, Design space exploration, Quality versus Speed

Unit 4

EA Tools, GAME: The Environment, Applications, Applications of EAS: Logic synthesis, mapping, testing, guidelines for CAD applications, Heuristic Learning: The learning model, Minimization of decision diagrams

Text Books:

[T1] Evolutionary Algorithms for VLSI CAD , Rolf Drechsler Springer; 1st edition (May 31, 1998)

Reference Books:

[R1] Christophn Meinel & Thorsten Theobold, "Algorithm and Data Structures for VLSI Design", KAP, 2002.
[R2] Trimburger," Introduction to CAD for VLSI", Kluwer Academic publisher, 2002.

Paper Code: MEVS - 618	**L**	**T**	**C**
Paper: Secured Hardware Design	**4**	**0**	**4**

INSTRUCTIONS TO PAPER SETTERS: **Maximum Marks : 60**

1. **Question No. 1 should be compulsory and cover the entire syllabus. This question should have objective or short answer type questions. It should be of 20 marks.**
2. **Apart from Question No. 1, rest of the paper shall consist of four units as per the syllabus. Every unit should have two questions. However, student may be asked to attempt only 1 question from each unit. Each question should be 10 marks**

Unit 1

Introduction to security attacks, services and mechanism, introduction to cryptography. Conventional Encryption: Conventional encryption model, classical encryption techniques- substitution ciphers and transposition ciphers, cryptanalysis, stereography, stream and block ciphers. Modern Block Ciphers: Block ciphers principals, Shannon's theory of confusion and diffusion, fiestal structure, data encryption standard(DES), strength of DES, differential and linear crypt analysis of DES, block cipher modes of operations, triple DES, IDEA encryption and decryption, strength of IDEA, confidentiality using conventional encryption, traffic confidentiality, key distribution, random number generation.

Unit 2

Introduction to graph, ring and field, prime and relative prime numbers, modular arithmetic, Fermat's and Euler's theorem, primarily testing, Euclid's Algorithm, Chinese Remainder theorem, discrete logarithms. Principals of public key crypto systems, RSA algorithm, security of RSA, key management, Diffle-Hellman key exchange algorithm Elganel encryption.

Unit 3

Message Authentication and Hash Function: Authentication requirements, authentication functions, message authentication code, hash functions, birthday attacks, security of hash functions and MACS, MD5 message digest algorithm, Secure hash algorithm(SHA).Digital Signatures: Digital Signatures, authentication protocols, digital signature standards (DSS), proof of digital signature algorithm.

Unit 4

Introduction to elliptic curves: Weierstrass equation, group law, projective space and points at infinity, elliptic curve in different characteristics, other models. Elliptic curve cryptography: elliptic curve-based Diffie-Hellman, El Gamal and Digital Signature Algorithm

Text Books:

[T1] William Stallings, "Cryptography and Network Security: Principals and Practice", Prentice Hall, New Jersy.

Reference Books

[R1] Johannes A. Buchmann, "Introduction to Cryptography", Springer-Verlag.
[R2] . Bruce Schiener, "Applied Cryptography".

Paper Code: MEVS - 620	**L**	**T**	**C**
Paper: Probability and Stochastic processing	**4**	**0**	**4**

INSTRUCTIONS TO PAPER SETTERS: Maximum Marks : 60

1. **Question No. 1 should be compulsory and cover the entire syllabus. This question should have objective or short answer type questions. It should be of 20 marks.**
2. **Apart from Question No. 1, rest of the paper shall consist of four units as per the syllabus. Every unit should have two questions. However, student may be asked to attempt only 1 question from each unit. Each question should be 10 marks**

Unit 1: Introduction to Probability and Stochastic Processing
Probability models, Algebra of events, probability axioms, conditional probability, aye"s rules, Bernoulli traits. Discrete Random Variables: Discrete random variables, probability mass functions, discrete distribution functions-Bernoulli, Binomial, geometric, Poisson, hyper geometric & uniform distributions, probability generating function.

Unit 2
Continuous Random variable: Exponential distribution, memory less property, application to reliability, hypo exponential, Erlang, Gamma, hyper exponential & Normal distributions, order statistics, distribution of sums.

Unit 3
Stochastic Process, Classification, Discrete and continuous time markov chain, Poisson process, renewal process, littles formula, Erlang Loss Model, M/M/1 Queue, M/M/m Queue Multidimensional Queue. Queueing Networks. Definitions and Notation. Performance Measures. Product-Form Queuing Networks. Algorithms for Product-Form Networks, priority Networks.

Unit 4
Solution Techniques: Steady-State Solutions of Markov Chains, Solution for a Birth Death Process, Matrix-Geometric Method: Quasi-Birth-Death Process, Heisenberg Matrix: Non-Markovian Queues, Transient analysis, stochastic Petri nets, Numerical Solution: Direct Methods, Numerical Solution: Iterative Methods, Comparison of Numerical Solution Methods, Performance Measures,

Text Book
[T1] Papoulis, A., Probability , Random Variables and Stochastic Processes, Third Edition, McGraw-Hill.

Reference Book
[R1] K.S Trivedi: Probability and Statistics, PHI, 3rd Ed.
[R2] S.P Gupta, Statistical Methods, Sultan Chand and Sons.
[R3] V.K Kapoor and S.C Gupta, Fundamentals of Statistics, Sultan Chand and Sons.

Code No: MEVS-651	**L**	**P**	**C**
Lab-1	**-**	**2**	**1**

Experiment of the lab will be based on Digital System Design with Verilog.

Code No. : MEVS-653	**L**	**P**	**C**
Lab-2:	**-**	**2**	**1**

Experiment of the lab will be based on VLSI Technology.

Code No: MEVS-655	**L**	**P**	**C**
Lab-3	**-**	**2**	**1**

Experiment of the lab will be based on advanced VLSI Design.

Code No: MEVS-657*	**L**	**P**	**C**
Term paper-1		**-**	**2**

Lab Experiment/Lab- project will be based on Elective/s/Research work

* Non University Exam

Code No: MEVS-652	**L**	**P**	**C**
Lab-1	**-**	**2**	**1**

Experiment of the lab will be based on ESD

Code No. : MEVS-654	**L**	**P**	**C**
Lab-2:	**-**	**2**	**1**

Experiment of the lab will be based on Analog VLSI Design.

Code No: MEVS-656	**L**	**P**	**C**
Lab-3	**-**	**2**	**1**

Experiment of the lab will be based on low power VLSI Design

Code No: MEVS-658*	**L**	**P**	**C**
Term paper-2		**-**	**2**

Lab Experiment/Lab- project will be based on Electives

- NUES: Non University Exam

Paper Code: MEVS - 701	**L**	**T**	**C**
Paper: Algorithm for VLSI Physical Design Automation	**4**	**0**	**4**

INSTRUCTIONS TO PAPER SETTERS: Maximum Marks : 60

1. **Question No. 1 should be compulsory and cover the entire syllabus. This question should have objective or short answer type questions. It should be of 20 marks.**
2. **Apart from Question No. 1, rest of the paper shall consist of four units as per the syllabus. Every unit should have two questions. However, student may be asked to attempt only 1 question from each unit. Each question should be 10 marks**

Unit 1

VLSI automation Algorithms[T1]:
Introduction, Physical design flow, Partitioning: problem formulation, classification of partitioning algorithms, Group migration algorithms, simulated annealing & evolution,

Unit 2
Placement, floor planning & pin assignment[T1]: problem formulation, simulation base placement algorithms, other placement algorithms, constraint based floor planning, floor planning algorithms for mixed block & cell design. General & channel pin assignment.

Unit 3
Global Routing[T1]: Problem formulation, classification of global routing algorithms, Maze routing algorithm, line probe algorithm, Steiner Tree based algorithms.
Detailed routing[T1]: problem formulation, classification of routing algorithms, single layer routing algorithms, two layer channel routing algorithms, switchbox routing algorithms.

Unit 4
Over the cell routing & via minimization[T1]: two layers over the cell routers constrained & unconstrained via minimization.
C**ompaction[T1]:** problem formulation, one-dimensional compaction, two dimension based compaction.

Text Books:

[T1] Naveed Shervani, "Algorithms for VLSI physical design Automation", Kluwer Academic Publisher, Second edition, 2005.

***References** Books:*

[R1] Christophn Meinel & Thorsten Theobold, "Algorithm and Data Structures for VLSI Design", KAP, 2002.

[R2] Rolf Drechsheler : "Evolutionary Algorithm for VLSI", Second edition, 2002

[R3] Trimburger," Introduction to CAD for VLSI", Kluwer Academic publisher, 2002

Paper Code: MEVS - 703	**L**	**T**	**C**
Paper: VLSI Design Test and Testability	**4**	**0**	**4**

INSTRUCTIONS TO PAPER SETTERS: Maximum Marks : 60

1. **Question No. 1 should be compulsory and cover the entire syllabus. This question should have objective or short answer type questions. It should be of 20 marks.**
2. **Apart from Question No. 1, rest of the paper shall consist of four units as per the syllabus. Every unit should have two questions. However, student may be asked to attempt only 1 question from each unit. Each question should be 10 marks**

Unit 1

Introduction: The need for testing, the problems of digital and analog testing, Design for test, Software testing. **Faults in Digital circuits:** General introduction, Controllability and Observability, Fault Modeling- Logic, RTL and Structure level models, Compiled Simulation, Event- Driven Simulation, Delay Models, Element Evaluation, Hazard Detection, Gate-Level Event- Driven Simulation, Simulation Engines. Fault models - Stuck-at faults, Bridging faults, intermittent faults.

Unit 2

Digital test pattern generation: Test pattern generation for combinational logic circuits, Manual test pattern generation, Automatic test pattern generation - Roth's D-algorithm, Developments following Roth's D-algorithm, Pseudorandom test pattern generation, Test pattern generation for sequential circuits, Exhaustive, non-exhaustive and pseudorandom 70 test pattern Generation, Delay fault testing.

Unit 3

Signatures and self test: Input compression Output compression Arithmetic, Reed-Muller and spectral coefficients, Arithmetic and Reed-Muller coefficients, Spectral coefficients, Coefficient test signatures, Signature analysis and Online self test.

Unit 4

Testability Techniques: Functional Testing- Basic Issues, Exhaustive, pseudo exhaustive testing, Partitioning and ad hoc methods and Scan-path testing, Testability – Ad-Hoc design for testability, Board level and System level DFT approach, Some advance scan concepts, BIST-memory BIST, Logic BIST, Hardware description languages and test.

Testing of Analog and Digital circuits: Testing techniques for Filters, A/D Converters, RAM, Programmable logic devices and DSP.

Text Books

[1] VLSI Testing: digital and mixed analogue digital techniques. Stanley L. Hurst Pub:Inspec/IEE ,1999.

[2] M L Bushnell and V D Agrawal, "Essentials of Electronic Testing for Digital, Memory and Mixed-Signal VLSI Circuits'", Springer, 2005.

Reference Books:

[1] Digital systems testing and testable design - Miron Abramovici et al , Computer Science Press (1991)

[2] Test generation for VLSI chips by VD Agrawal and SC Seth, IEEE Computer Society Press (2003) ISBN 0-8186-8786 -X.

Paper Code: MEVS - 705	**L**	**T**	**C**
Paper: CMOS Analog-mixed Signal design	**4**	**0**	**4**

INSTRUCTIONS TO PAPER SETTERS: **Maximum Marks : 60**

1. **Question No. 1 should be compulsory and cover the entire syllabus. This question should have objective or short answer type questions. It should be of 20 marks.**
2. **Apart from Question No. 1, rest of the paper shall consist of four units as per the syllabus. Every unit should have two questions. However, student may be asked to attempt only 1 question from each unit. Each question should be 10 marks**

Unit 1

Analog and discrete-time signal processing, introduction to sampling theory. Analog continuous-time filters: passive and active filters. Basics of analog discrete-time filters and Z-transform. Switched-capacitor filters. Non-idealities in switched-capacitor filters. Switched-capacitor filter architectures.

Unit 2

Basics of data converters: Successive approximation ADCs, Dual slope ADCs, High-speed ADCs (e.g. flash ADC, pipeline ADC and related architectures), High-resolution ADCs (e.g. delta-sigma converters

Unit 3

DAC, Mixed-signal layout, Interconnects and data transmission, Voltage-mode signaling and data transmission, Current-mode signaling and data transmission, Introduction to frequency synthesizers and synchronization.

Unit 4

Basics of PLL, Analog PLL, Digital PLL, DLL,

Text / Reference Books:

1. CMOS mixed-signal circuit design by R. Jacob BakerWiley India, IEEE press, reprint 2008.
2. Analog Circuit design, layout and simulation by R. Jacob Baker Revised second edition, IEEE press, 2008.
3. Design of analog CMOS integrated circuits by Behad Razavi,McGraw-Hill, 2003.

Paper Code: MEVS - 707	**L**	**T**	**C**
Paper: Hardware/Software Codesign	**4**	**0**	**4**

INSTRUCTIONS TO PAPER SETTERS: Maximum Marks : 60

1. **Question No. 1 should be compulsory and cover the entire syllabus. This question should have objective or short answer type questions. It should be of 20 marks.**
2. **Apart from Question No. 1, rest of the paper shall consist of four units as per the syllabus. Every unit should have two questions. However, student may be asked to attempt only 1 question from each unit. Each question should be 10 marks**

Unit 1

Introduction [T1]: Motivation hardware & software co-design, system design consideration, research scope & overviews. Hardware Software back ground: Embedded systems, models of design representation, the virtual machine hierarchy, the performance3 modeling, Hardware Software development.

Unit 2

Hardware Software co-design research[T1]: An informal view of co-design, Hardware Software tradeoffs, crosses fertilization, typical co-design process, co-design environments, limitation of existing approaches, ADEPT modeling environment. Co-design concepts: Functions, functional decomposition, virtual machines, Hardware Software partitioning, Hardware Software partitions, Hardware Software alterations, Hardware Software trade offs, co-design.

Unit 3

Methodology for co-design[T1]: Amount of unification, general consideration & basic philosophies, a framework for co-design. Unified representation for Hardware & Software : Benefits of unified representation, modeling concepts. An abstract Hardware & Software model : Requirement & applications of the models, models of Hardware Software system, an abstract Hardware Software models, generality of the model.

Unit 4

Performance evaluation[T1]: Application of t he abstract Hardware & Software model, examples of performance evaluation .Object oriented techniques in hardware design: Motivation for object oriented technique, data types, modeling hardware components as classes, designing specialized components, data decomposition, Processor example.

Text Books:

[T1] Sanjaya Kumar, James H. Ayler "The Co-design of Embedded Systems: A Unified Hardware Software Representation", Kluwer Academic Publisher, 2002.

Reference Books:

[R1] H. Kopetz, Real-time Systems, Kluwer, 1997.
[R2] R. Gupta, Co-synthesis of Hardware and Software for Embedded Systems, Kluwer 1995.
[R3] S. Allworth, Introduction to Real-time Software Design, Springer-Verlag, 1984.
[R4] Peter Marwedel, G. Goosens, Code Generation for Embedded Processors, Kluwer Academic Publishers, 1995.

Paper Code: MEVS – 709	**L**	**T**	**C**
Paper: Designing with FPGA	**4**	**0**	**4**

INSTRUCTIONS TO PAPER SETTERS: **Maximum Marks : 60**

1. **Question No. 1 should be compulsory and cover the entire syllabus. This question should have objective or short answer type questions. It should be of 20 marks.**
2. **Apart from Question No. 1, rest of the paper shall consist of four units as per the syllabus. Every unit should have two questions. However, student may be asked to attempt only 1 question from each unit. Each question should be 10 marks**

Unit 1

FPGA-Based Systems

Introduction, Basic Concepts, Digital Design and FPGAs, FPGA-Based System Design, Hardware Description Languages overview, The Logic Design Process, Logic Implementation for FPGAs.

Unit 2

FPGA Fabrics

Introduction, FPGA Architectures, SRAM-Based FPGAs, Permanently Programmed FPGAs, Chip I/O, Circuit Design of FPGA Fabrics, Architecture of FPGA Fabrics

Unit 3

Combinational Logic

Introduction, Combinational Network Delay, Power and Energy Optimization, Arithmetic Logic

Unit 4

Physical Design for FPGAs : Architecture- Introduction, Behavioral Design, Design Methodologies.
Large-Scale Systems : Introduction, Busses, Platform FPGAs, Multi-FPGA Systems, Novel Architectures

Text Book:

[T1] FPGA-Based System Design By: Wayne Wolf Publisher: Prentice Hall, 2004.

Reference Books:

[R1] Z Navabi, "Embedded Core design with FPGA", McGraw Hills, 1st edition, 2006.
[R2] Evgeni Stavinov, "100 power Tips for FPGA", OutputLogic.com (May 18, 2011)

Paper Code: MEVS - 711	**L**	**T**	**C**
Paper: Advance Digital Communication System	**4**	**0**	**4**

INSTRUCTIONS TO PAPER SETTERS: Maximum Marks : 60

1. **Question No. 1 should be compulsory and cover the entire syllabus. This question should have objective or short answer type questions. It should be of 20 marks.**
2. **Apart from Question No. 1, rest of the paper shall consist of four units as per the syllabus. Every unit should have two questions. However, student may be asked to attempt only 1 question from each unit. Each question should be 10 marks**

Unit 1: Modulation Techniques

Digital Modulation Techniques :- Analysis, Generation and Detection (Block Diagram), Spectrum and Bandwidth of Amplitude Shift Keying (ASK), Binary Phase Shift Keying (BPSK), Differential Phase Shift Keying (DPSK), Offset and Non-offset Quadrature Phase Shift Keying (QPSK), M-ary PSK, Binary Frequency Shift Keying (BFSK), M-ary FSK, Minimum Shift Keying, Quadrature Amplitude Modulation (QAM), Comparison of digital modulation techniques on the basis of probability of error, Matched Filter.

Unit 2: Pulse Modulation

Sampling of Signal, Sampling Theorem for Low Pass and Band Pass Signals, Aliasing, Pulse Amplitude Modulation (PAM), Time Division Multiplexing (TDM), Channel Bandwidth for PAM-TDM Signal, Types of Sampling, Instantaneous, Natural and Flat Top Sampling, Aperture Effect, PPM and PDM techniques, Pulse Code Modulation (PCM), Signal-to-Noise Ratio in PCM, Companding, Data Rate and Bandwidth of Multiplexed PCM Signal, Inter-symbol Interference, Eye Diagram, Line Coding NRZ, RZ, Biphase,, Differential PCM (DPCM), Delta Modulation (DM), and Adaptive Delta Modulation (ADM), Slope Overload Error ,Granular Noise ,Comparison of various system in terms of Bandwidth and Signal-to-Noise Ratio.

Unit 3: Random Processes

Concept of Probability, Relative Frequency and Probability Conditional Probability and Independent Events, Random Variables, Discrete Random Variables, Cumulative Distribution Function(CDF), Probability Density Function(PDF),Statistical Averages (Means), Chebyshevs Inequality, Central Limit Theorem

Unit 4: Spread Spectrum Modulation

Pseudo noise sequences, notion of spread spectrum, direct sequence spread spectrum with coherent binary phase shift keying, signal space dimensionality and processing gain, probability of error, frequency hop spread spectrum, maximum length and Golay codes.

Text Books:

[T1] B. Sklar, Digital Communication, Pearson Education.
[T2] Tomasi: Advanced Electronics Communication Systems, 6th Edition, PHI

References:

[R1] Taub & Schilling, Principles of Communication system, TMH.
[R2] Lathi B.P., Modern Analog and Digital Communication systems, Oxford Uni. Press.
[R3] Haykin Simon, Digital Communication, Wiley Publication.
[R4] Proakis, Digital communication, McGraw Hill
[R5] Schaum‟s Outline series, Analog and Digital Communication.
[R6] Singh and Sapre: Communication System, TMH
[R7] Couch: Digital and Analog Communication, Pearson Education
[R8] David Smith: Digital Transmission Systems, Springer- Macmillan India Ltd

Paper Code No : MEVS–713	**L**	**T**	**C**
Paper : MEMS and IC Integration	**4**	**0**	**4**

INSTRUCTIONS TO PAPER SETTERS: **Maximum Marks : 60**

1. **Question No. 1 should be compulsory and cover the entire syllabus. This question should have objective or short answer type questions. It should be of 20 marks.**
2. **Apart from Question No. 1, rest of the paper shall consist of four units as per the syllabus. Every unit should have two questions. However, student may be asked to attempt only 1 question from each unit. Each question should be 10 marks**

Unit 1

Overview of CMOS process in IC fabrication, MEMS system-level design methodology: Overview of MEMS, Overview of Microsystems fabrication Processes, Bulk Micromachining, Surface micromachingin, LIGA Process, Microsystem Design: Design Considerations, Process design, Mechanical Design, Mechanical Design using FEM, CAD.

Unit 2

Equivalent Circuit representation of MEMS, : working principles of Microsystem, scaling laws in miniaturatization, materials for MEMS and Microsystem, signal-conditioning circuits and sensor noise calculation.

Unit 3

Pressure sensors with embedded electronics(Analog/Mixed signal): Accelerometer with transducer, Gyroscope, RF MEMS switch with electronics.

Unit 4

Bolo meter design. RF MEMS : Introduction to RF MEMS, Elements of RF circuit Design, Material and application of RF MEMS and Optical MEMS.

Text Books:

[T1] Gregory T.A. Kovacs, Micromachined Transducers Sourecbook, The McGraw-Hill, Inc. 1998
[T2] Stephen D. Senturia, Microsystem Design, Kluar Publishers, 2001
[T3] Nadim Maluf, An Introduction to Microelectromechanical Systems Engineering, Artech House, 2000.
[T4] M.H. Bao, Micro Mechanical Transducers, Volume 8, Handbook of Sensors and Actuators, Elsevier, 2000.
[T5] H. J. De Los Santos, Introduction to Microelectromechanical (MEM) Microwave Systems, Artech, 1999.

Reference Books

[R1] Masood Tabib-Azar, Microactuators, Kluwer, 1998.
[R2] Ljubisa Ristic, Editor, Sensor Technology and Devices, Artech House, 1994
[R3] D. S. Ballantine, et. al., Acoustic Wave Sensors, Academic Press, 1997
[R4] James M.Gere and Stephen P. Timoshenko, Mechanics of Materials, 2nd Edition, Brooks/Cole Engineering Division, 1984

Paper Code No : MEVS – 715	**L**	**T**	**C**
Paper : Network on Chip Design	**4**	**0**	**4**

INSTRUCTIONS TO PAPER SETTERS: **Maximum Marks : 60**

1. **Question No. 1 should be compulsory and cover the entire syllabus. This question should have objective or short answer type questions. It should be of 20 marks.**
2. **Apart from Question No. 1, rest of the paper shall consist of four units as per the syllabus. Every unit should have two questions. However, student may be asked to attempt only 1 question from each unit. Each question should be 10 marks**

Unit 1

Basic Concepts of Network-on-Chip [T1] : Introduction to interconnection networks, Walk through of a simple network, Topology basics, Constraints and measures, Butterfly networks, Cube networks. Concentration and slicing, Non-blocking topologies, Topology overflow and wrapup, Routing basics and taxonomy, Oblivious routing. Adaptive routing, Routing mechanics

Unit 2

Flow Control and Deadlock T1]: Flow control basics. Resources and allocation strategies, Circuit switching. Store and forward. Dropping flow control. Misrouting. Cut through. Wormhole flow control, Virtual channels. Deadlock and livelock. Principles of deadlock. Buffer deadlock and channel deadlock. Deadlock in cyclic networks. Inter-dimension deadlock. Avoiding deadlock with virtual channels. The turn models.

Unit 3

Router Micro-architecture [T1]: Basic router. Input buffers and buffer organization. Internal switch organization: crossbars, dimension-ordered, and multistage, Router datapath components, router pipelining, router delay Models, Allocators. Arbiters. The allocation problem - allocating VCs to packets and bandwidth to flits. Bipartite matching. Naïve allocation. Separable allocators. Wavefront allocation.

Unit 4

Network Performance Analysis and Reliability [T1]: Network performance analysis, Analysis of networks with dropping flow control. Analysis of blocking, The effects of buffers, Simulation vs. analysis, The effect of traffic patterns, Load balance and route diversity, Definition of Reliability and Availability, Failure mechanisms and fault models, Path diversity, Pragmatics and self-healing

Text Books:

[T1] William J Dally, Principles and Practices of Interconnection Networks (The Morgan Kaufmann Series in Computer Architecture and Design) , Morgan Kaufmann; 1 edition (January 1, 2004)

Reference Books:

[R1] Sao-Jie Chen , Ying-Cherng Lan , Wen-Chung Tsai ,Yu-Hen Hu, Reconfigurable Networks-on-Chip, Springer; 2012 edition (December 15, 2011)

[R2] Tim Kogel, Rainer Leupers , Heinrich Meyr , Integrated System-Level Modeling of Network-on-Chip enabled Multi-Processor Platforms, Springer, 1st ed. 2006 edition (November 19, 2010)

[R3] Giovanni De Micheli , Luca Benini , Networks on Chips: Technology and Tools (Systems on Silicon), Morgan Kaufmann; 1 edition (August 3, 2006)

Paper Code No : MEVS – 717 **L T C**
Paper : CMOS RF Design **4 0 4**

INSTRUCTIONS TO PAPER SETTERS: Maximum Marks : 60

1. **Question No. 1 should be compulsory and cover the entire syllabus. This question should have objective or short answer type questions. It should be of 20 marks.**
2. **Apart from Question No. 1, rest of the paper shall consist of four units as per the syllabus. Every unit should have two questions. However, student may be asked to attempt only 1 question from each unit. Each question should be 10 marks**

Unit 1

Introduction : RF systems – basic architectures, Transmission media and
Reflections, Maximum power transfer.
Passive RLC Networks: Parallel RLC tank, Q , Series RLC networks, matching Pi match, T match. Passive IC Components: Interconnects and skin
Effect, Resistors, capacitors Inductors Review of MOS device.

Unit 2

Distributed Systems: Transmission lines, reflection coefficient, The wave equation,Lossy transmission lines, Smith charts – plotting gamma.
High frequency Amplifier design :Bandwidth estimation using open-circuit time constants Bandwidth estimation using short-circuit time constants Risetime, delay and bandwidth Zeros to enhance bandwidth Shunt-series amplifiers,
tuned amplifiers Cascaded amplifiers.

Unit 3

Noise :Thermal noise, flicker noise review Noise figure.
LNA Design: Intrinsic MOS noise parameters, Power match versus noise match Large signal performance, design examples & Multiplier based mixers
Mixer Design : Subsampling mixers.
RF Power amplifier design :Class A, AB, B, C amplifiers, Class D, E, F amplifiers RF Power amplifier.

Unit 4

VCO : Resonators Negative resistance oscillators. PLL Design : Linearized PLL models, Phase detectors, charge pumps, Loop filters, Frequency synthesis and oscillators : Frequency division, integer-N synthesis, Fractional frequency
Synthesis. Phase noise: General considerations. Radio architectures: GSM radio architectures, CDMA, UMTS radio architectures

Text Books

[T1] The Design of CMOS Radio-Frequency Integrated Circuits by Thomas H. Lee. Cambridge University Press, 2004.

[T2]RF Microelectronics by Behzad Razavi. Prentice Hall, 1997.

Reference Books:

[R1] B. Razavi "RF Microelectronics" PHI, 1998.
[R2] R. Jacob Baker, H.W. Li, D.E. Boyce " CMOS Circiut Design, layout and Simulation" PHI,1998.
[R3] Y.P. Tsividis "Mixed Analog and Digital Devices and Technology", TMH 1996.

Paper Code: MEVS – 719	**L**	**T**	**C**
Paper: Circuit Interconnections & Packaging for VLSI	**4**	**-**	**4**

INSTRUCTIONS TO PAPER SETTERS: **Maximum Marks : 60**

1. **Question No. 1 should be compulsory and cover the entire syllabus. This question should have objective or short answer type questions. It should be of 20 marks.**
2. **Apart from Question No. 1, rest of the paper shall consist of four units as per the syllabus. Every unit should have two questions. However, student may be asked to attempt only 1 question from each unit. Each question should be 10 marks**

Unit 1 [T1]

Microelectronics Interconnection : Signal transmission in interconnects, problems in interconnects, physical factors in interconnection design, On-Chip interconnection Technology, Scaling trends, Electrical reference connection scheme, Package level interconnection technology, scaling trends, power voltage distribution and switching noise.

Unit 2 [T1]

Interconnection Modeling: Physical foundation for circuit model of interconnections, TEM waves, Quasi-TEM Model, Simplification of RLGC Model, Lossless transmissions line model: resistive driver model, effect of signal rise time, CMOS driver with open circuit load, Lossy Transmission model: Effect of semiconductor substrate, optimum line model selection, Cross talk effect in digital circuits,

Unit 3 [T1]

Packaging Interconnects: Packaging structure, Body fabrication technology, External connections, chip connections, Lumped electrical parameter modeling of packages, calculation of circuit parameters, concept of partial conductance, skin effect calculations, Power distribution modeling from EM simulation

Unit 4[T1]

Simulation of package effect : effect of SSN, effect of crosstalk, techniques for avoidance of crosstalk, switching noise avoidance, Noise detection in logic circuits, ATPG for stuck-at fault, ATPG for crosstalk, other test techniques

Text Books:

[T1] Interconnection Noise in VLSI Circuits (Paperback), Francesc Moll, Miquel Roca, Springer; 2004 edition (December 14, 2011)

Reference Books:

[R1] Circuits, Interconnections, and Packaging for VLSI , H. B. Bakoglu , Addison-Wesley Pub (Sd) (January 1990)

Code No: MEVS-751	**L**	**P**	**C**
Lab-1	**-**	**2**	**1**

Experiment of the lab will be based on AVDA

Code No. : MEVS-753	**L**	**P**	**C**
Lab-2:	**-**	**2**	**1**

Experiment of the lab will be based on VLSI Testing.

Code No: MEVS-755*	**L**	**P**	**C**
Term paper-3		**-**	**2**

Lab Experiment/Lab- project will be based on Electives

*NUES: Non University Exam

Paper Code: MEVS - 757	**L**	**T**	**C**
Lab: Minor Project			**6**

The student will submit a synopsis at the beginning of the semester for the approval to the school project committee in a specified format. The student will have to present the progress of the work through seminars and progress report. A report must be submitted to the school for evaluation purpose at the end of the semester in a specified format.

Code No: MEVS-752 **C**
Subject: Dissertation **24**

The student will submit a synopsis at the beginning of the semester for the approval from the school project committee in a specified format. Synopsis must be submitted within a two weeks. The first defense, for the dissertation work, should be held with in a one month. Dissertation Report must be submitted in a specified format to the school for evaluation purpose.

Code No: MEVS-754* **C**
Subject: Seminar & Progress Report **4**

The student will have to present the progress of the dissertation work through seminars and progress reports at the interval of four weeks.

Code No: MEVS-756* **C**
Subject: Term paper4 **2**

*NUES: Non University Exam

Paper Code: MEIT-608 **L T C**
Subject: Web Semantics **4 0 4**

INSTRUCTIONS TO PAPER SETTERS: **Maximum Marks : 60**

1. **Question No. 1 should be compulsory and cover the entire syllabus. This question should have objective or short answer type questions. It should be of 20 marks.**
2. **Apart from Question No. 1, rest of the paper shall consist of four units as per the syllabus. Every unit should have two questions. However, student may be asked to attempt only 1 question from each unit. Each question should be 10 marks**

UNIT – I

Review of Internet and Web, it's origin and growth, W3C, various versions of Web, Limitations of present web, Semantic Web as the next generation web and it's various concerns. Semantic Web roadmap, it's need and goal, capabilities and limitations, various issues, applications.

UNIT – II

Tim Berner's Lee architecture of Semantic Web (various versions), it's various technologies and tools. Basic elements of HTML & XML, Examples, XML, XMLS, XML Query Language, RDF, RDFS, RDF/XML, URI, Cryptography concerns and issues. Programming and mathematical concerns.

UNIT – III

Ontology as a backbone for incorporating semantics and it's various significant concerns and issues, SPARQL Semantics execution and Query processing, optimization and execution along with implementation illustrations for filtering RDF using Jena and twinkle tool.

UNIT – IV

Significant concerns of Web Semantics like Semantic Web Services, Software agents, Search Engines, Information Extraction and Retrieval, Semantic Annotation, NLP, Web usage mining, Social Networks for Network Analysis and visualization etc.

TEXT BOOKS

1. Berners-LEE, Godel and Turing, "Thinking on the Web", Wiley, 2006.
2. Devedzic V, "Semantic Web Education", Springer, 2006
3. John Hebeler and Matthew Fisher, "Semantic Web Programming", Wiley, 2009
4. Karin Breitman and Marco," Semantic Web: Concepts, Technologies and Applications", 2009
5. Rajendra Akerkar, "Foundations of the Semantic Web:XML,RDF and Ontology",2009,Oxford.

REFERENCES

1. Geroimenko and Chen, "Visualizing the Semantic Web", Springer, 2004.
2. Passin, "Explorer's guide to the Semantic Web", Manning, 2004.
3. Pascal, Krotzsch and Rudolph, "Foundations of Semantic Web Technologies", SRC Press.
4. Grigoris Antoniou and Paul Groth, "A Semantic Web Primer", 2012
5. Peter, Gergely and Tamas, "The Semantic Web explained-the technology and mathematics behind web 3.0", Cambridge University Press, 2014.

Paper Code: MEIS-607	**L**	**T/P**	**C**
Subject: Advanced Operating System	**4**	**0**	**4**

INSTRUCTIONS TO PAPER SETTERS: **Maximum Marks : 60**

Question No. 1 should be compulsory and cover the entire syllabus. This question should have objective or short answer type questions. It should be of 20 marks.

Apart from Question No. 1, rest of the paper shall consist of four units as per the syllabus. Every unit should have two questions. However, student may be asked to attempt only 1 question from each unit. Each question should be 10 marks

UNIT – I

Competitive study of OS: UNIX, Multics.

UNIT – II

Unix file system -Measurements, The log- structured file system , server less Network file system , The coda file system.

UNIT – III

AFS, Virtual memory, user level virtual memory, software fault isolation , On -demand distillation . X - kernel , active message, Global network scheduling, Network optimization , synchronization scheduling .

UNIT – IV

Extensible operating system, issue of security in OS, cryptographic file system.

TEXT BOOKS/ REFERENCES:

1. A.S Tannenbaum, "Operating Systems Concept", Addition Wesley, 2002
2. Silbersachatz and Galvin, "Operating Systems Concept", Addition Wesley, 2002
3. Charles Crowley, "Operating Systems", Tata McGraw-Hill Edition
4. Branch Hansen.P , "Operating Systems Principles",Prentice-Hall,1973
5. Tannenbaum, A.S, "Modern Operating Systems", Pearson,2007