



(DEEMED TO BE UNIVERSITY)



ELECTRONICS & COMMUNICATION ENGINEERING

CURRICULUM & SYLLABUS

**APPLICABLE FOR B.TECH. STUDENTS
ADMITTED IN A.Y. 2017-18**

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DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

COURSE STRUCTURE

HUMANITIES AND SOCIAL SCIENCE COURSES										
Sl No	Course Code	Course Title	Type	Uni/Sch/ Dept	L	T	P	S	Cr	CH
1	17EN1201	Building Blocks of Communication Skills	HSS	UNI CORE	0	0	4	0	2	4
2	17EN3102	Instant Communication Skills	HSS	UNI CORE	0	0	4	0	2	4
3	17UC2204	Aptitude Builder -1	HSS	UNI CORE	0	0	4	0	2	4
4	17UC3105	Aptitude Builder -2	HSS	UNI CORE	0	0	4	0	2	4
5	17UC3206	Campus to corporate	HSS	UNI CORE	0	0	4	0	2	4
6	17GNXX	Foreign Language	HSS	UNI ELEC	2	0	0	0	2	2
7	17UC0007	Indian Heritage & Culture	HSS	UNI CORE	0	0	2	0	0	2
8	17UC0008	Indian Constitution	HSS	UNI CORE	0	0	2	0	0	2
9	17UC0009	Ecology & Environment	HSS	UNI CORE	2	0	0	0	2	2
10	17UC0010	Universal Human Values & Professional Ethics	HSS	UNI CORE	1	0	2	0	2	3
		Management Elective	HSS	SCH ELEC	3	0	0	0	3	3
BASIC SCIENCE COURSES										
11	17MT1101	Single Variable Calculus and Matrix Algebra	BS	SCH CORE	3	0	2	0	4	5
12	17MT1102	Foundations of Computational Mathematics	BS	SCH ELEC	3	0	0	0	3	3
13	17PH1001	Engineering Materials	BS	SCH CORE	3	0	2	0	4	5
14	17MT1203	Multivariate Calculus	BS	SCH CORE	3	0	2	0	4	5
15	17ME1001	Engineering Mechanics	BS	SCH ELEC	3	0	2	0	4	5
16	17GN1003	Basic Engineering Measurements	BS	SCH ELEC	2	0	2	0	3	4
17	17MT1204	Logic & Reasoning	BS	SCH ELEC	3	0	0	0	3	3
18	17CS2103	Discrete Mathematics	BS	SCH ELEC	2	1	0	0	3	3
19	17BT1001	Biology for Engineers	BS	SCH ELEC	2	0	0	0	2	2
ENGINEERING SCIENCE COURSES										
20	17CS1101	Problem Solving and Computer Programming	ES	SCH CORE	2	4	2	0	5	8
21	17CS1102	Data Structures	ES	SCH CORE	3	0	2	0	4	5
22	17ME1002	Engineering Graphics	ES	SCH ELEC	1	0	4	0	3	5
23	17ME1003	Workshop Practice	ES	SCH ELEC	0	0	2	0	1	2
24	17EC1101	Introduction to Electronics Engineering	ES	SCH ELEC	2	0	2	0	3	4
25	17CY1001	Engineering Chemistry	ES	SCH ELEC	3	0	2	0	4	5
26	17EE2105	Electrical Circuit Theory	ES	SCH ELEC	3	1	0	0	4	4
27	17EC2212	Electromagnetic Fields and Transmission Lines	ES	SCH ELEC	3	0	0	0	3	3

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28	17MT2009	Probability Theory & Stochastic Processes	ES	SCH ELEC	2	1	0	0	3	3
29	17CS2004	Objected Oriented Programming	ES	SCH ELEC	3	0	2	0	4	5
PROFESSIONAL CORE COURSES										
30	17EC2101	Analog Electronic Circuit Design	PC	DEPT CORE	3	0	4	0	5	7
31	17EC2102	Digital System Design	PC	DEPT CORE	3	0	2	0	4	5
32	17EC2103	Signals and Systems	PC	DEPT CORE	3	0	2	0	4	5
33	17EC2204	Computer Organization and Architecture	PC	DEPT CORE	3	0	0	0	3	3
34	17EC2205	Digital Signal Processing	PC	DEPT CORE	2	1	2	0	4	5
35	17EC2206	Analog and Digital Communication	PC	DEPT CORE	2	1	2	0	4	5
36	17EC3107	Computer Networks	PC	DEPT CORE	3	0	2	0	4	5
37	17EC3108	Electronic System Design Workshop	PC	DEPT CORE	2	0	4	0	4	6
38	17EC3109	Processors and Controllers	PC	DEPT CORE	2	1	2	0	4	5
39	17EC3110	VLSI Design	PC	DEPT CORE	2	1	2	0	4	5
40	17EC4111	Wireless Communications	PC	DEPT CORE	3	0	0	0	3	3
PROFESSIONAL ELECTIVES										
41		Professional Elective Course - 1	PE	DEPT ELEC	3	0	0	0	3	3
42		Professional Elective Course - 2	PE	DEPT ELEC	3	0	0	0	3	3
43		Professional Elective Course - 3	PE	DEPT ELEC	3	0	0	0	3	3
44		Professional Elective Course - 4	PE	DEPT ELEC	3	0	0	0	3	3
45		Professional Elective Course - 5	PE	DEPT ELEC	3	0	0	0	3	3
OPEN ELECTIVES										
46		Coding skills for engineers	OE	UNIV ELEC	0	0	10	0	5	10
47		Open Elective Course - 2	OE	UNIV ELEC	3	0	0	0	3	3
PROJECT/ TERM PAPER/ INDUSTRIAL TRAINING										
48	17IE2246	Industrial Training	PR	SCH CORE	0	0	0	0	2	0
49	17IE3247	Term Paper	PR	SCH CORE	0	0	4	0	2	4
50	17IE4048/ 17IE4049	Practice School / Project (Part - 1)	PR	UNI ELEC	0	0	12	0	6	12
51	17IE4048/ 17IE4050	Practice School / Project (Part - 2)	PR	SCH ELEC	0	0	12	0	6	12
SKILLING COURSES										
52	17TS401	Technical Skilling-1 (Lab View and MultiSim)	SK	SCH ELEC	0	0	0	6	1.5	6
53	17TS402	Technical Skilling-2(Matlab) (Communications and DSP)	SK	UNI CORE	0	0	0	8	2	8
54	17TS403	Technical Skilling-3 (VLSI-Xilinx-Vivado, ES-Keil&ARM, SP-Python, CS-Tems, IOT-Python, ML&AI-Keras)	SK	SCH ELEC	0	0	0	8	2	8

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55	17TS404	Technical Skilling-4 (VLSI-Mentor Graphics, ES-Python& RasberriPie, SP-Python, CS-BTS simulators, IOT-Open CV, ML&AI-Tensor Flow)	SK	UNI CORE	0	0	0	6	1.5	6
56	17TS405	Technical Skilling-5 (VLSI-Pspice or Cadence, ES-CC Studio, SP-VC++, CS-HFSS-CST, ML&AI-Spider)	SK	SCH ELEC	0	0	0	8	2	8
COUNSELING AND CO-CURRICULAR ACTIVITIES										
57	17GN2103	Counseling -1		SCH CORE	0	0	1	0	0	1
58	17GN2204	Counseling -2		SCH CORE	0	0	1	0	0	1
59	17GN3105	Counseling -3		SCH CORE	0	0	1	0	0	1
60	17GN3206	Counseling -4		SCH CORE	0	0	1	0	0	1
61	17GN2109	Co-curricular Activity -1		SCH CORE	0	0	0	2	0.5	2
62	17GN2210	Co-curricular Activity -2		SCH CORE	0	0	0	2	0.5	2
63	17GN3111	Co-curricular Activity -3		SCH CORE	0	0	0	2	0	2
64	17GN3212	Co-curricular Activity -4		SCH CORE	0	0	0	2	0	2
Campus Recruitment and Training Courses										
65		Technical Proficiency & Training -1	HSS	SCH ELEC	0	0	0	4	1	4
66		Technical Proficiency & Training -2	HSS	SCH ELEC	0	0	0	8	2	8
		Total			99	11	114	54	176	277

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SKILL BASED PROFESSIONAL ELECTIVES							
SIGNAL AND IMAGE PROCESSING DOMAIN							
Sr. No.	Course Code	Course Name	L	T	P	CR	CH
1	17EC3051	Digital Image Processing	3	0	0	0	3
2	17EC3052	Artificial neural networks	3	0	0	3	3
3	17EC3053	Fuzzy logic	3	0	0	3	3
4	17EC3054	Machine Learning	3	0	0	3	3
5	17EC3055	Computer vision & Applications	3	0	0	3	3
6	17EC3056	Pattern Recognition	3	0	0	3	3
7	17EC3057	Human Machine Interaction	3	0	0	3	3
8	17EC3058	Video Surveillance	3	0	0	3	3
9	17EC3059	Audio Signal Processing	3	0	0	3	3
10	17EC3060	Statistical Signal Processing	3	0	0	3	3
11	17EC3061	Adaptive Signal Processing	3	0	0	3	3
12	17EC4062	Bio Medical Signal Processing	3	0	0	3	3
13	17EC4063	Biomedical Imaging	3	0	0	3	3
14	17EC4064	Knowledge Based Systems	3	0	0	3	3
MOBILE AND COMMUNICATIONS DOMAIN							
1	17EC3065	Information Theory and Coding	3	0	0	3	3
2	17EC3066	Antennas and Wave Propagation	3	0	0	3	3
3	17EC3067	Microwave Engineering	3	0	0	3	3
4	17EC3068	Optical communications	3	0	0	3	3
5	17EC3069	Electronic Navigation systems	3	0	0	3	3
6	17EC3070	RF System Design	3	0	0	3	3
7	17EC3071	Satellite Communications	3	0	0	3	3
8	17EC3072	Smart Antennas	3	0	0	3	3
9	17EC4073	RADAR Engineering	3	0	0	3	3
10	17EC4074	EMI/EMC	3	0	0	3	3
VLSI DESIGN DOMAIN							
1	17EC3075	VLSI Technology	3	0	0	3	3
2	17EC3076	VLSI subsystem design	3	0	0	3	3
3	17EC3077	Digital IC Design and Applications	3	0	0	3	3
4	17EC3078	Design For Testability	3	0	0	3	3
5	17EC3079	Analog VLSI Design	3	0	0	3	3
6	17EC3080	MEMS Technology	3	0	0	3	3
7	17EC3081	Low Power VLSI	3	0	0	3	3
8	17EC3082	Nano Electronics	3	0	0	3	3
9	17EC4083	CAD for VLSI Design	3	0	0	3	3
10	17EC4084	Design of Semiconductor Memories	3	0	0	3	3

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COMPUTER COMMUNICATIONS DOMAIN							
1	17EC3085	Data networks & Protocols	3	0	0	3	3
2	17EC3086	Broadband Networks	3	0	0	3	3
3	17EC3087	TCP/IP Protocol Suite	3	0	0	3	3
4	17EC3088	VOIP systems	3	0	0	3	3
5	17EC3089	5G Mobile and Wireless Technology	3	0	0	3	3
6	17EC3090	Mobile Cloud Computing	3	0	0	3	3
7	17EC3091	Cloud Networking	3	0	0	3	3
8	17EC3092	Network Security	3	0	0	3	3
9	17EC4093	WLAN 802 Standards	3	0	0	3	3
10	17EC4094	IP Multimedia subsystem (IMS)	3	0	0	3	3
11	17EC4095	Emerging Technologies in Computer Communications (Cloud, IoT, NFV and SDN)	3	0	0	3	3

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S.No	Course Code	Course Name	L	T	P	CR	CH
OPEN ELECTIVES							
1	17 BT 40A1	IPR & Patent Laws	3	0	0	3	3
2	17 CE 40A2	Environmental Pollution Control Methods	3	0	0	3	3
3	17 CE 40A3	Solid and Hazardous waste management	3	0	0	3	3
4	17 CE 40A4	Remote Sensing & GIS	3	0	0	3	3
5	17 CE 40A5	Disaster Management	3	0	0	3	3
6	17 CS 40A6	Fundamentals of DBMS	3	0	0	3	3
7	17 CS 40A7	Fundamentals of Software Engineering	3	0	0	3	3
8	17 CS 40A8	Fundamentals of Information Technology	3	0	0	3	3
9	17 EC 40A9	Image Processing	3	0	0	3	3
10	17 EM 40B1	Linux Programming	3	0	0	3	3
11	17 EM 40B2	E-Commerce	3	0	0	3	3
12	17 EE 40B3	Renewable Energy Sources	3	0	0	3	3
13	17 ME 40B4	Robotics	3	0	0	3	3
14	17 ME 40B5	Mechatronics	3	0	0	3	3
15	17 ME 40B6	Operations Research	3	0	0	3	3
16	17 PH 40B7	Nano Materials & Technology	3	0	0	3	3
17	17 PE 40B8	Subsea Engineering	3	0	0	3	3
18	17 PE 40B9	Oil and Gas Management	3	0	0	3	3
19	17 GN 40C1	Self-Development	3	0	0	3	3
20	17 GN 40C2	Indian Culture and History	3	0	0	3	3
21	17 GN 40C3	Emotional Intelligence	3	0	0	3	3
22	17 GN 40C4	Professional Ethics and Values	3	0	0	3	3
23	17 GN 40C5	Behavioral Sciences	3	0	0	3	3

MANAGEMENT ELECTIVES							
1	17 MB 4051	Paradigms in Management thought	3	0	0	3	3
2	17 MB 4052	Indian Economy	3	0	0	3	3
3	17 MB 4053	Managing Personal Finances	3	0	0	3	3
4	17 MB 4054	Basics of Marketing for Engineers	3	0	0	3	3
5	17 MB 4055	Organization Management	3	0	0	3	3
6	17 MB 4056	Resources Safety and Quality Management	3	0	0	3	3
7	17 MB 4057	Economics for Engineers	2	0	0	2	2
FOREIGN LANGUAGE ELECTIVE							
1	17 GN 3051	Arabic Language	3	0	0	3	3
2	17 GN 3052	Bengali Language	3	0	0	3	3
3	17 GN 3053	Chinese Language	3	0	0	3	3
4	17 GN 3054	French Language	3	0	0	3	3
5	17 GN 3055	German Language	3	0	0	3	3

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6	17 GN 3056	Hindi Language	3	0	0	3	3
7	17 GN 3057	Italian Language	3	0	0	3	3
8	17 GN 3058	Japanese Language	3	0	0	3	3
9	17 GN 3059	Kannada Language	3	0	0	3	3
10	17 GN 3060	Russian Language	3	0	0	3	3
11	17 GN 3061	Simhali Language	3	0	0	3	3
12	17 GN 3062	Spanish Language	3	0	0	3	3

S.No	Course Code	Course Name	L	T	P	S	CR	CH
HONOURS DEGREE COURSES								
1	17EC2205	Digital Signal Processing	1	0	2	0	2	3
2	17EC2206	Analog and Digital Communication	1	0	2	0	2	3
3	17EC3107	Computer Networks	1	0	2	0	2	3
4	17EC3108	Electronic System Design Workshop	1	0	2	0	2	3
5	17EC3109	Processors and Controllers	1	0	2	0	2	3
6	17EC3110	VLSI Design	1	0	2	0	2	3
7	17EC4111	Wireless Communications	1	0	2	0	2	3

S.No	Course Code	Course Name	L	T	P	S	CR	CH
MINOR DEGREE COURSES								
1	17EC2206	Analog and Digital Communication	2	1	2	0	4	5
2	17EC2205	Digital Signal Processing	2	1	2	0	4	5
3	17EC3110	VLSI Design	2	1	2	0	4	5
4	17EC3107	Computer Networks	3	0	2	0	4	5
5	17EC4111	Wireless Communications	3	1	0	0	4	4

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SYLLABUS A.Y. 2017-18

HUMANITIES AND SOCIAL SCIENCES

BUILDING BLOCKS FOR COMMUNICATION SKILLS

Course code: 17 EN 1201

Pre Requisite: NIL

L-T-P-S: 0-0-4-0

Credits: 2

Listening & Speaking Skills: Phonetics symbols- practice- Exercises - Pronunciation- Reading Cum Speaking Practice: Enunciation- Homonyms- Homophones- Homographs: Vocabulary- Root words- Affixes- Identifying meaning from context- Synonyms & Antonyms: Word building: Escatalk: **Speaking** to persuade: Pyramid Discussion: Story-Telling and interpretation: End story: Speaking to Explain: Tell me why?

General Writing Skills: Clarity and conciseness in writing: Paragraph Writing: Identifying Topic sentences, writing topic sentence: Linkers, Coordinates: Letter Writing & E- Mail Writing: Netiquette

Reading Skills: Reading comprehension Practice Exercises: Reading for information: Reading for specifics --- theme, attitude: Types of Reading: Vertical Reading: Identifying the central idea: Speed Reading --- seven techniques to improve reading speed

Soft Skills: Introduction to soft skills: Verbal and Non-verbal communication: Cultural sensitivity: Empathy and understanding: Diversity and Acculturation

Reference Books

1. English pronunciation in use: Intermediate, 2nd edition, Mark Hancock and Sylvie Donna, Cambridge publication.
2. Speaking English Effective (English) 2nd Edition, Krishna Mohan & N P Singh, Laxmi Publications-New Delhi, 2005 print.
3. The Ace of Soft Skills, Mr. Gopaldaswamy Ramesh et al, Pearson publishers, 2010 print.
4. Effective speech, Richard W.Clark, Glencoe Pub. Co., 1988 Print.
5. Effective Business Communication, Asha Kaul, PHI Learning Private Limited, New Delhi, 2011

INSTANT COMMUNICATION SKILLS

Course code: 17 EN 3102

Pre Requisite: NIL

L-T-P-S: 0-0-4-0

Credits: 2

Speaking & Listening Skills: Group Discussions: Know yourself as a Communicator: Communicating with others: Format of GD as used in national level recruitment boards: Rules, ambience and normal practices: Do s and Don't s in Group Discussions: Helping to build confidence, improve on content and clarity: Practicing skills like Initiating, developing and concluding discussions

Structures and Written Expression: Sentence Completion: Writing Proposals: Product and process description: Agenda, Minutes and Scheduling meetings: Technical Writing Skills: Report Writing: Types of reports, Formats and how to write good reports.

READING SKILLS: Reasoning Skills: Analytical Reasoning: Critical Reasoning: Language Specific Reasoning: Vocabulary in context: Signpost words: Pejorative Signals and

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Complimentary Signals: Continuation Signals: Contrast signals: Sentence Completion: Text completion: Sentence Equivalence.

SOFT SKILLS: Seminars & Presentations: People Skills: Initiating and ending conversations: Expressing and creating interest: Initiating and ending conversations: Breaking good/bad news

Text Books

1. Professional Communication, Aruna Koneru, Tata Mc Graw- Hill Publishing Company, New Delhi, 2008 Print..
2. Technical Writing Process and Product (third edition), Sharon J. Gerson, Steven M Gerson, Pearson Education, Asia.
3. Developing Reading Skills: A Practical Guide to Reading Comprehension Exercises, Françoise Grelle. Cambridge University Press, 1981.
4. Study Reading: A Course in Reading Skills for Academic Purposes, Eric H. Glendinning, Beverly Holmström, Cambridge University Press, 2004.
5. Reasoning and Reading Level 1, Joanne Carlisle, School Specialty Intervention, 1999
6. Presentation skills. The essential guide for students, Patsy Mc Carthy & Caroline Hatcher, Sage publications, 2002.
7. Business Communication : Connecting in a Digital World, Raymond V.Leisikar, Marie. E. Flatley et al. Mc Graw Hill Education, 13 Edition, 2015 print.

APTITUDE BUILDER –I

Course Code: 17UC2204

L-T-P-S: 0-0-4-0

Pre Requisite: NIL

Credits: 2

Directed Listening and Thinking Activity (DLTA) Skills: Reading, Listening, Thinking, Writing, Presentation - Method: Flipped Classroom Writing Skills: Paraphrasing, Summarizing, Notice, Circular, Agenda, Minutes, Memo. **Body Language (Kinesics)** :Postures, gestures, eye contact Self-confidence: Self-esteem Soft Skills: The Art of Compromise, Learn to Say: “I Don’t Know”, Being organized, Showing Self-awareness, An eye on success, being self-motivated, Showing self-awareness, Find Direction from Someone Who Is Lost: “The Drifter Self-Assessment for Attainable Career Objectives--Defining a Career Objective, **Quantitative Aptitude:** Numbers, Averages and Alligations, Mensuration **Reasoning:** Cubes, Binary Logic, Ordering and Sequencing

Reference Books:

1. Daniel G.Riordan and Steven E. Pauley: Technical Report Writing Today. New Delhi: Biztantra.2004.
2. Ken Taylor. Telephoning and Teleconferencing Skills. Hyderabad:Orient Black Swan.2008.
3. E. Suresh Kumar, B. Sandhya. Communication for Professional Success. Delhi: Orient Black Swan.2013
4. Reasoning *Trainer Plus.*: Hyderabad: Brain Mapping Academy.2012

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APTITUDE BUILDER-2

Course Code: 17UC3105

L-T-P-S: 0-0-4-0

Pre Requisite: NIL

Credits: 2

Critical Reading: Reading to Identify the Theme, Reading to Identify the Central Idea; Reading to Identify the Tone, Reading to Identify Writer's Attitude, Reading to Identify Parallel Ideas, Reading to Identify Logical Conclusions. Writing Skills: Note- making and Note- taking, Report Writing. Presentation Skills- Preparing for the Presentation, Audience Analysis, Processing Information, Ice-breakers, Quotations, Presentation Structure, Say what you want to say- Say it, Say what you have said to say, Preparing for Question Hour, Funnel Effect and How to Overcome it. Trinity Guild Hall - Communication Skills - Graded Evaluation and Testing-1-8 grades. Quantitative Aptitude: Ratio and Proportion, Percentages, Profit and Loss, Simple Interest and Compound Interest. Reasoning: Number and Letter Series, Number and Letter Analogy, Coding and decoding, Odd man out. Selections.

Reference Books

1. Dr. Meenakshi Raman and Dr. Sangeetha Sarma: *Technical Communication*. Oxford University Press: Delhi.2016.
2. M. Ashraf Rizvi: *Effective Technical Communication*. New Delhi: McGraw Hill Education(India) Private Limited
3. Tom Rath: *Strengths Finder 2.0*. New York: Gallup Press.2007.
4. C. Weaver. *Reading Process and Practice*. Portsmouth US: Heinemann Educational Books.1988.

CAMPUS TO CORPORATE

Course Code: 17UC3206

L-T-P-S: 0-0-4-0

Pre Requisite: NIL

Credits: 2

Lexis -2 : Vocabulary-Analogies-Advanced Level, Words often Confused, Word Classification, Idioms and Phrases, Sentence Completions, Paragraph Jumble. Writing Skills- Resume, Email Writing, Company Profile, Briefing and Debriefing, Press note, Catch Phrases, Caption Writing **Critical Thinking**: Engineering Ethics through Case Analysis: Ford Pinto, Chernobyl, Hyatt Residency, Bhopal Gas Tragedy, Boys of Football Team-Rescue Operation from the Than Luang Cave in Thailand **Interview Skills**: Personal Interview-Concept and Practice, Telephone-Etiquette, Email-Etiquette, Dress code and Grooming, Preparing Portfolio, Group Discussion, Mock Interviews, Unconventional HR questions **Simulated Testing**: Co-Cubes, E-Litmus and Amcat Practice, Infosys Placement Papers, Wipro Placement Papers, CTS and Accenture Paper Pattern

Reference Books

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1. Ken Taylor. *Telephoning and Teleconferencing Skills*. Hyderabad: Orient Black Swan.2008.
2. E. Suresh Kumar, B. Sandhya. *Communication for Professional Success*. Delhi: Orient Black Swan.2013
3. Judith Verify. *Succeeding at Interview*. Mumbai: Viva Books Private Limited.2000
4. Norman L. Frigon, Sr.&Harry K.Jackson, Jr. *The Leader- Developing the Skills and Personal Qualities*. Mumbai: Magna Publishing Co Ltd.2000.

FOREIGN /NON NATIVE LANGUAGE ELECTIVES

Sr. No	Course Code	Course Name	Credits	L-T-P-S	Pre-Requisite
1	17FL3051	Arabic Language	2	2-0-0-0	NIL
2	17FL3052	Bengali Language	2	2-0-0-0	NIL
3	17FL3053	Chinese Language	2	2-0-0-0	NIL
4	17FL3054	French Language	2	2-0-0-0	NIL
5	17FL3055	German Language	2	2-0-0-0	NIL
6	17FL3056	Hindi Language	2	2-0-0-0	NIL
7	17FL3057	Italian Language	2	2-0-0-0	NIL
8	17FL3058	Japanese Language	2	2-0-0-0	NIL
9	17FL3059	Kannada Language	2	2-0-0-0	NIL
10	17FL3060	Russian Language	2	2-0-0-0	NIL
11	17FL3061	Simhali Language	2	2-0-0-0	NIL
12	17FL3062	Spanish Language	2	2-0-0-0	NIL

COURSE TITLE: HINDI

Hindi Vakya ka Nirman :Saamany Vyakaran, Sagna/ Sarvanam/ Vakya/ Kriya/ Vachya/ Ling/Vachan/ Karak/Ankh,Kaal/Kriyavisheshan/Visheshan/Bolchal ki bhasha/Apatith Gadya, Patyapustak se Paanch Kahaniya– Mukthidhan/Goodhad Sai/Mai Haar Gayi/Bhookh Hadthal/ Usne Kaha Tha, Hindi Bhasha ki Udhhbhav aur Hindi ki boliyaan, Hindi Sahitya ka Itihas – Char Kaal.

REFERENCE BOOKS:

1. Adhunik Hindi Vyakaran Tatha Rachna
2. Hindi Text For Second Year, Janata Prachuranalu (Publ.)
3. Hindi Sahitya ka Itihas by Acharya Ramachandra Shukla
4. Gadya Sandesh, Hindi Textbook for B.A., Lorven Publications

INDIAN HERITAGE & CULTURE

COURSE CODE: 17UC0007

L-T-P-S: 0-0-2-0

Pre Requisite: NIL

Credits: 2

Introduction-Concept of Culture-Culture and Civilization-General Characteristics of Indian Culture-Importance of Culture-Unity in Diversity. History and Culture through the Ages – Fundamental Unity of Harappan and Vedic Culture – Jainism and Buddhism-Mauryan Period-Post-Mauryan Period-Gupta Period-Pallavas and Cholas. Advent of Islam in India-Islam and Sufism-Islamic Art and Architecture-Bhakti Movement-Vijayanagar Period-Art

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and Architecture and Literature. Rise of the West and its impact on India-Social and Religious reformers in the 17th and 19th centuries-Press and growth of modern Indian literature-Rise of Indian Cinema-Indian Independence

Reference Books:

1. Facets of Indian Culture- Spectrum Publications
2. Ancient India: National Council of Educational Research and Training
3. Medieval India: Part I & Part II: National Council of Educational Research and Training.
4. Modern India: National Council of Educational Research and Training.
5. An Advance History of India: R.C. Majumdar, H.C. Raychaudhuri & Kalikinkar Datt: Macmillan India Ltd.
6. The Wonder that was India : A.L.Bhasham.

INDIAN CONSTITUTION

COURSE CODE: 17UC0008

L-T-P-S: 0-0-2-0

Pre Requisite: NIL

Credits: 2

Making of the Constitution: A brief analysis of National Movement. Constitutional Development with reference to Government of India Act 1909, 1919, 1935 and Indian Independence Act 1947. The Constituent Assembly of India. **Basic features of the Indian Constitution:** the Preamble, Fundamental Rights, Directive Principles of State Policy – Fundamental Duties **Government of the Union :** The Union Executive – the President and the Vice-President – The Council of Ministers and the Prime Minister – Powers and functions, The Union legislature – The Parliament – The Lok Sabha and the Rajya Sabha, Composition, powers and functions – the role of the Speaker. **Government of the State :**The Governor – the Council of Ministers and the Chief Minister – Powers and Functions, The State Legislature – composition, powers and functions. **The Indian Judicial System:** the Supreme Court and the High Courts – composition, Jurisdiction and functions, Judicial review, Judicial activism, Independence of Judiciary In India. **Election Commission:** Role and Functioning, Chief Election Commissioner and Election Commissioners

Reference Books:

1. Indian Polity' by Laxmikanth
2. Indian Administration' by Subhash Kashyap
3. 'Indian Constitution' by D.D. Basu
4. 'Indian Administration' by Avasti and Avasti
5. 'Constitutional Law of India' by Seervai H.M.
6. 'Constitution Of India' by Shukla V.N.
7. 'The Indian Constitution: Cornerstone of a Nation' by Granville Austin
8. 'Indian Constitutional Law' by M.P. Jain

ECOLOGY AND ENVIRONMENT

Course Code: 17UC0009

L-T-P-S: 2-0-0-0

Pre Requisite: NIL

Credits: 2

Syllabus: The Multidisciplinary nature of Environmental Studies - Natural Resources- Forest resources - Mining its impact on environment - Water resources - Mineral resources-. Energy resources - Land resource s- Soil erosion - Ecosystems - Biodiversity and its

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Conservation Environmental Pollution - Soil waste management - Electronic waste management, biomedical waste management - Disaster management – Environmental Legislation Environmental Impact Assessment Process.

Text Books:

1. Anubha Kaushik, C.P.Kaushik, “Environmental Studies” , New Age International, (2007).
2. Benny Joseph, “Environmental Studies”, Tata McGraw-Hill companies, New Delhi, (2009).

UNIVERSAL HUMAN VALUES & PROFESSIONAL ETHICS

COURSE CODE: 17UC0010

L-T-P-S: 1-0-2-0

Pre Requisite: NIL

Credits: 2

Syllabus: Introduction to Value Education: Understanding Value Education, Self-exploration as the Process for Value Education, Continuous Happiness and Prosperity - The Basic Human Aspirations, Right Understanding, Relationship and Physical Facilities, Happiness and Prosperity – Current Scenario, Method to fulfill the Basic Human Aspirations.

Harmony in the Human Being: Understanding the Human Being as Co-existence of Self ('I') and Body, Discriminating between the Needs of the Self and the Body, The Body as an Instrument of 'I', Understand Harmony in the Self ('I'), Harmony of the Self ('I') with the Body, Program to Ensure Sanyam and Svasthya. **Harmony in the Family and Society:** Harmony in the Family - the Basic Unit of Human Interaction, Values in Human-to-Human Relationships, 'Trust' – the Foundational Value in Relationships, 'Respect' – as the Right Evaluation, Understand Harmony in the Society, Vision for the Universal Human Order.

Harmony in the Nature (Existence): Understand Harmony in the Nature, Interconnectedness, Self-regulation and Mutual Fulfillment among the Four Orders of Nature, Realizing 'Existence is Co-existence' at All Levels, The Holistic Perception of Harmony in Existence. **Implications of the Right Understanding – a Look at Professional Ethics:** Natural Acceptance of Human Values, Definitiveness of (Ethical) Human Conduct, A Basis for Humanistic Education, Humanistic Constitution and Universal Human Order, Competence in Professional Ethics, Holistic Technologies, Production Systems and Management Models - Typical Case studies, Strategies for Transition towards Value-based Life and Profession.

Text Book:

1. R R Gaur, R Sangal and G P Bagaria, “ A Foundation Course in Human Values and Professional Ethics”, 1st Ed, Excel Books.

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MANAGEMENT ELECTIVES

PARADIGMS IN MANAGEMENT THOUGHT

COURSE CODE: 17MB3051

L-T-P-S: 3-0-0-0

Pre Requisite: NIL

Credits: 3

Management Introduction - Early management thought - Management Concept – Nature - Management as art, science, profession - Scope and functions of Management - Levels of Management - Importance of management. **Classical Approach to Management: (a) Scientific Management-** The advent of Scientific Management – Frederick W Taylor’s contributions, - Contribution by Henry L Gantt - Contribution by Frank, Lillian Gilberth. **General Administrative Approach:** Henry Fayol’s contributions towards general management – Max Weber’s Bureaucracy Approach. **Quantitative Approach:** Important contributions – TQM – implications in today’s management – Six sigma. **Behavioral Approach:** Organizational Behaviour – Contributions of Elton Mayo’s – Hawthorne studies – contributions of Mary Parker Follett – Chester Bernard. **Contemporary Approach:** Systems Theory – Contingency Theory – Chao’s Theory -Peter F Drucker Contributions – C K Prahlad’s Contribution – Porter’s theory – Worker Management – Employee Engagement – People Capability Maturity Model.

Text Book(s):

1. Management by Stephen P Robbins, Mary Coulter, Neeharika Vohra – Pearson – 10th edition

Reference Books:

1. Management by Stoner, Freeman, Gilbert – PHI – 7th edition.
2. Management A Global & Entrepreneurial Perspective – Weihrich, Cannice, Koontz – Mc Graw Hill – 13th Edition.
3. The evolution of management thought by Daniel A Wren, Arther G Bedeian : john wiley& sons

INDIAN ECONOMY

COURSE CODE: 17MB3052

L-T-P-S: 3-0-0-0

Pre Requisite: NIL

Credits: 3

SYLLABUS: Economy: Meaning, types, problems and functions – Features of Indian Economy: Circular flow of economic activity: two sector, three sector and four sector models. Sectoral distribution of the economy. Nature and features of Indian Economy; Sectoral contribution of National Income-Share of Public and Private Sectors in GDP.

Agricultural Sector of India: importance and general problems; Land Reforms, Agricultural marketing problems and remedies. Industrial Sector of India: Types, Importance and general problems: Small Scale Sector: Importance and general problems.

Tertiary Sector in India- Importance – Infrastructure Development – Transport – Roadways, Railways – Banking and Insurance –Communication – Science and Technology – Software. Personal Income distribution and causes of inequality - Unemployment causes and remedial

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measures; Poverty in India- Poverty Line – antipoverty programs. Human development: concept and measurement - Human Development Index.

Economic Planning in India: Role of Planning Commission - Over all Objectives and achievements of various Five Year Plans. 12th Five Year Plan; Economic Liberalisation: LPG strategy-General Agreement on Tariffs and Trade (GATT) - Objectives of GATT and Evolution of WTO – WTO and the Indian Economy, NABARD and World Bank.

Recommended Text Book(s):

1. G.Dutt and K.P.M.Sundaram: Indian Economy (2011), S.Chand&Co., New Delhi.
2. S.K.Mishra and V.K.Puri: Indian Economy, 30th ed., Himalaya Publishing House, New Delhi.
3. M.L.Jingan: Macro Economics, 6th ed., Konark Publishing House.

Reference Books:

1. P.K.Dhar, Indian Economy-Its growing dimension, Kalyani Publishers.
2. Alok Ghosh, Indian Economy, Its Nature and Problem, World Press.
3. A.N.Agarawal, Indian Economy- Problems of Development and Planning, New Age

MANAGING PERSONAL FINANCES

COURSE CODE: 17MB3053

L-T-P-S: 3-0-0-0

Pre Requisite: NIL

Credits: 3

SYLLABUS: Financial planning process: Introduction-Importance of Financial Planning- Process of financial planning -The planning environment-Determinants of personal income- Financial statements and plans-Concept of Time value of money - Preparing a personal balance sheet - Preparing the income and expense statement-Using personal financial statements - Ratio Analysis.

Managing Taxes: Introduction-Importance of tax planning-Basic concepts of income tax - Personal taxation -Income tax benefits on certain long term investments -Tax planning-Ethical consideration in tax planning.

Making decisions regarding houses and automobiles:- Meeting housing needs-The rental option - The home buying process - Financing the housing transaction - Housing finance institutions in India - Housing schemes in India- Automobile purchase planning.

Planning for Investments:- Types of investment vehicles-Factors considered in the choice of investments- Developing the investment strategy-Investing in Equities- Investment Process- Investing in Fixed Income Securities- Bond Market-Bond Investing Strategies- Types of Bonds-Bond Returns- Risks from Investing in Bonds

Insurance & Mutual Funds:-Insurance planning - Buying a life insurance - Life insurance products in India- Health Insurance-Need-Types and Sources of health care plans-Providers of Health care-Long term care insurance-Disability income insurance-Health Insurance in India; Mutual funds – Types of mutual fund products – Objectives of investing in Mutual funds.

Recommended Text Book(s):

1. Jack R Kapoor, “Personal Finance” Mc Graw Hill Publications, New Delhi, 2008.
2. KC Mishra and Steward Doss, “Basics of Personal Financial Planning” Cengage Learning, First Edition 2009.

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Reference books:

1. Joehnk, Billingsley and Gitman “Planning Your Personal Finances” Cengage Learning India Private Limited, Delhi, 2012.
2. Mark Hirschey and John Nofsinger “Investments Analysis” and Behavior” Mc Graw Hill Publications, New Delhi, 2008.

BASICS OF MARKETING FOR ENGINEERS

COURSE CODE: 17MB3054

L-T-P-S: 3-0-0-0

Pre Requisite: NIL

Credits: 3

Introduction and Nature of Marketing: Evolution of Marketing Concept - Core concepts of marketing - Scope and Importance of Marketing. -Difference between Selling and Marketing - Marketing Myopia - Consumer Marketing Vs. Industrial Marketing.

Understanding Consumer Behaviour: nature, scope and importance of consumer behavior – Factors influencing Consumer Behavior - Buying decision making process - Market Segmentation, Targeting and Positioning (STP).

Marketing mix - Product definition, levels of product, product classification, difference between goods and services, Product Life Cycle, New Product Development – Technology and Product Management - Concept of Pricing – Factors influencing the pricing policy – Pricing strategies - Pricing Considerations in High-Tech Markets.

Promotion mix - Marketing Communication Tools for High-Tech Markets - Channels of distribution - Supply Chain Management in High-Tech Markets - Technology Marketing, Green Marketing, Introduction to market study.

Text Books:

1. Philip Kotler and Gary Armstrong- Principles of Marketing- 17/e, Pearson Education.
2. Jakki J Mohr, Sanjit Sengupta and Stanley Slater, Marketing of High-Technology Products and Innovations, 3/e Pearson India

Reference Books:

1. V.S. Ramaswamy and S.Namakumari – Marketing Management, 4/e, Mc Millan Publications, New Delhi.
2. RajanSaxena, Marketing Management- 3/e, TMH, New Delhi.

ORGANIZATION MANAGEMENT

COURSE CODE: 17MB3055

L-T-P-S: 3-0-0-0

Pre Requisite: NIL

Credits: 3

SYLLABUS: Development of Management thought – Introduction, Various theories; Functional approach, scientific management approach, human relations approach, latest management thoughts, organization theory-classical organization, neo-classical organization theory, modern organization theory.

Organization Structure--Principles of organization, organizational theories, departmentalism, authority, power, organizing, organizational effectiveness, structuring the organization, organizational change, organization charts; types of organizations—line , functional and line and staff relations, Organizational manuals.

Motivation, Morale and behavioral science—Motivation: Characteristics, importance, Kinds of motivation. Thoughts of motivational philosophy: Gouglass Mc Gregore—X and Y theory;

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Herzberg's theory. Human needs, Incentive as motivators, Managing dissatisfaction and frustration. Morale, Absenteeism, Behavioral science, Group dynamics, Group behavior. Leadership—Meaning, importance, styles, theories, leaders Vs managers.

Management concept—Management, Administration, Organization, Difference and Relationship between Management, Administration and Organization, Importance of Management, Characteristics of management, Managerial Skills, Managerial Objectives, Harmonization of Objectives, Hierarchy of Objectives.

Industrial Relations, Trade Union and Collective Bargaining—Industrial relations, Industrial Psychology, Industrial disputes, Conflict management, Views about conflict, Labor Policy. Workers grievances, Suggestion system. Trade Unions. Collective Bargaining, Negotiations, Industrial Safety—working conditions, Accidents, Preventive measures, Safety training.

TEXT BOOKS

1. Stephen P. Robins, Organizational behavior, PHI / Pearson education, 11th edition , 2008.
2. Koontz & Wehrich., Essentials of Management, 12th edition, Tata Mc Grawhill, 2007.

REFERENCES

1. Banga & Sarma , Industrial Engineering Management including Production management, 11th edition, 2010.
2. O.P. Khanna , Industrial engineering management, Khanna publications, 2006.

RESOURCE, SAFETY AND QUALITY MANAGEMENT

COURSE CODE: 17MB3056

L-T-P-S: 3-0-0-0

Pre Requisite: NIL

Credits: 3

Resource Management (Man Power, Materials & Machinery): Introduction; Resource smoothing; Resource Leveling, Establishing workers productivity; Objectives of material management; Functions of material management department; ABC classification of materials; Inventory of materials; Material procurement; Storage management; Classification of construction equipment; Earth moving equipment; Excavation equipment; Hauling equipment; Earth compaction equipment; Hoisting equipment; Concrete plant and equipment; Time and motion study; Selection of equipment – Task consideration, cost consideration; Factors affecting the selection; Factors affecting cost owning and operating the equipment; Equipment maintenance.

Safety and Quality Management: Accident prevention program; Immediate attention in case of accident; Approaches to improve safety in construction; Safety benefits to employees, employees and customers; Prevention of fire in construction industries; Fault tree analysis; Safety information system; Safety budgeting; Importance of quality; Elements of quality; Organization for quality control; Quality assurance techniques; Documentation; Quality control circles; Total quality management; ISO 9000 – 2008.

TEXT BOOKS:

1. Construction Engineering and Management by S. Seetharaman; Umesh Publications, Nai Sarak, Delhi.
2. Fundamentals of PERT/CPM and Project Management by S.K. Bhattacharjee; Khanna

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Publishers, NaiSarak; Delhi.

REFERENCE BOOKS:

1. Construction Management and Planning by B.Sengupta and H.Guha; Tata Mc.Graw-Hill Publishing Co. Ltd., New Delhi.
2. Construction Planning, Equipment and Methods by Peurifoy R.L; MC Graw-Hill International Book Company.

ECONOMICS FOR ENGINEERS

COURSE CODE: 18MB4057

L-T-P-S: 3-0-0-0

Pre Requisite: NIL

Credits: 3

Introduction to Engineering Economics: Introduction to Economics- Flow in an economy, Law of supply and demand, Concept of Engineering Economics – Engineering efficiency, Economic efficiency, Scope of engineering economics- Element of costs, Marginal cost, Marginal Revenue, Sunk cost, Opportunity cost, Break-even analysis, Elementary economic Analysis

Unit II: Value Engineering: Make or buy decision, Value engineering – Function, aims, value engineering procedure. Interest formulae and their applications –Time value of money, Single payment compound amount factor, Single payment present worth factor, Equal payment series sinking fund factor, Equal payment series payment Present worth factor-equal payment series capital recovery factor-Uniform gradient series annual equivalent factor, Effective interest rate, Examples in all the methods.

Cash Flow: Methods of comparison of alternatives – present worth method (Revenue dominated cash flow diagram), Future worth method (Revenue dominated cash flow diagram, cost dominated cash flow diagram), Annual equivalent method (Revenue dominated cash flow diagram, cost dominated cash flow diagram), rate of return method, Examples in all the method

Replacement and Maintenance Analysis: Introduction-Types of maintenance –types of replacement Problem-Determination of economic life of an asset-Replacement of existing asset with a new asset. Depreciation- Introduction, Straight line method of depreciation, declining balance method of depreciation-Sum of the years digits method of depreciation, sinking fund method of depreciation/ Annuity method of depreciation, service output method of depreciation-Evaluation of public alternatives- introduction.

Text Books:

1. Dr. K K Patra, DhirajBhattacharjee, Engineering Economics and Costing, S. Chand & Company Ltd, New Delhi, 2013.
2. PanneerSelvam, R., *Engineering Economics*, Prentice Hall of India Ltd, New Delhi, 2001.

Reference Books:

1. Chan S.Park, *Contemporary Engineering Economics*, Prentice Hall of India, 2002. Donald.G. Newman, Jerome.P.Lavelle, *Engineering Economics and analysis* Engg. Press, Texas, 2002.
2. Degarmo, E.P., Sullivan, W.G and Canada, J.R, *Engineering Economy*, Macmillan, New York, 1984.

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3. William G. Sullivan, Elin M Wicks, and James Luxhoj, Engineering Economy, 13th edition (Prentice-Hall)

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BASIC SCIENCE COURSES

SINGLE VARIABLE CALCULUS AND MATRIX ALGEBRA

Course Code: 17MT1101

L-T-P-S: 3-0-2-0

Pre-requisite: NIL

Credits: 4

SYLLABUS:

Differential Equations: Definitions and terminology and mathematical models used in differential equations. First-order and higher-order differential equations, along with the methods of solutions and their applications. Modeling with first and higher-order also systems of linear first-order differential equations. Solutions of first order ordinary differential equations by Numerical methods.

Fourier series: Definitions and Fourier series for a periodic signal. Fourier series for simple functions. Fourier series of the summation of sinusoids directly from the definition by using Euler's formula. Solving particular solution to differential equation by Fourier series.

Matrix algebra: Solving linear System of equations by Gauss-elimination, L U decomposition and Jacobi, Gauss Seidal iteration methods, orthogonal, symmetric, skew-symmetric, Hermitian, Skew-Hermitian and unitary matrices, Eigen values, Eigen vectors and their properties, Cayley -Hamilton theorem (without proof) and its applications, and quadratic forms.

Text books:

1. Advanced Engineering Mathematics, Erwin Kreyszig. John Wiley & Sons, Inc. 10th Edition.
2. Advanced Engineering Mathematics, Greenberg, PHI Publishers, 2nd Edition.

Reference Books:

1. Differential Equations for Engineers, Wei-Chau Xie, Cambridge University Press, New York.
2. Higher Engineering Mathematics, BS Grewal. Publisher: Khanna, New Delhi.
3. Advanced Numerical Methods with MATLAB, SC Chapra, Tata McGraw-Hill.

MULTIVARIATE CALCULUS

Course Code: 17MT1203

L-T-P-S: 3-0-2-0

Pre-requisite: NIL

Credits: 4

SYLLABUS:

Differential Calculus: Partial derivatives, Jacobian, total differentiation and their applications, chain rule, Taylor's series for function of two variables, maxima and minima of functions of two variables, Lagrange's multipliers method.

Integral Calculus: Line integrals- double and triple integrals and applications to area, volume, mass & moment of inertia. Change of order of integration, change of variables in polar, cylindrical and spherical polar coordinates.

Vector Calculus: Scalar and vector point functions, gradient and directional derivative of a scalar point function, divergence and curl of a vector point function. Line, surface and volume integrals, Green's, Gauss divergence and Stoke's theorems and their applications

Partial differential equations: Formation of partial differential equations, solutions of first order linear and nonlinear PDEs by Lagrange method, solution of second order PDEs by

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method of separation of variables i.e., one dimensional wave and heat equations, Laplace equation in two dimensions. Solving Laplace equation by Finite difference method.

Text books:

1. Erwin Kreyszig, Advanced Engineering Mathematics, 10 th Edition, John Wiley & Sons, Inc, Newyork . (2015)
2. Nakhle H Asmar, Partial differential equations with Fourier series and boundary value problems, Second edition Pearson Pub.

Reference Books:

1. Michael Greenberg, Advanced Engineering Mathematics. Second edition, Prentice Hall, USA.
2. Zafar Ahsan, Differential equations and their applications, second edition, PHI
3. Higher Engineering Mathematics, B.S. Grewal, Khanna Publishers, India.

LOGIC AND REASONING

Course Code: 17MT1204

L-T-P-S: 3-0-0-0

Pre-requisite: NIL

Credits: 3

SYLLABUS:

Permutation and Combinations: Fundamental Principle of Counting, Counting Methods, Definition of permutation, Linear Permutations, Rank of a word, Circular Permutations, Definition of Combinations, Problems on Combinations

Probability: Definitions of Probability, Addition and Multiplication Theorems.

Deductions: Introduction, expressing different types of statements using Venn diagrams, Definition of complimentary pairs, Finding the conclusions using Venn diagrams for two and more statements.

Logical Connectives: Definition of simple statement, Definition of compound statement, Finding the implications for compound statements, Finding the negations for compound statements.

Binary Logic: Definition of a truth-teller, Definition of a liar, Definition of an alternator, solving problems using method of assumptions, solving analytical puzzles using binary logic. **Cubes:** Basics of a cube, Finding the minimum number of cuts when the number of identical pieces are given, Finding the maximum number of pieces when cuts are given, Problems on painted cubes of same and different colors, Problems on cuboids, Problems on painted cuboids, Problems on Dice. **Data Sufficiency:** Different models in Data Sufficiency, Problems on Data sufficiency, Problems on data redundancy.

Data Interpretation: Problems on tabular form, Problems on Line Graphs, Problems on Bar Graphs, Problems on Pie Charts. **Analytical Reasoning puzzles:** Problems on Linear arrangement, Problems on Circular arrangement, Problems on Double line-up, Problems on Selections, Problems on Comparisons. **Number and letter series:** Difference series, Product series, Squares series, Cubes series, Alternate series, Combination series, Miscellaneous series, Place values of letters.

Number and Letter Analogies: Definition of Analogy, Problems on number analogy, Problems on letter analogy, Problems on verbal analogy.

Odd man out: Problems on number Odd man out, Problems on letter Odd man out, Problems on verbal Odd man out.

Coding and decoding: Coding using same set of letters, Coding using different set of letters, Coding into a number Comparison & Elimination

Text Books

1. A modern approach to Logical reasoning, R S Agarwal, S. Chand Publications.

Reference Text Books

1. Logical Reasoning, Arun Sharma, Mc Graw Hill.

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- Analytical & Logical Reasoning, [Peeyush Bhardwaj](#), Arihant Publications.

FOUNDATIONS OF COMPUTATIONAL MATHEMATICS

Course Code: 17MT1102

L-T-P-S: 3-0-0-0

Pre-requisite: NIL

Credits: 3

SYLLABUS:

Numbers: Bodmas Rule, Fractions & Decimals, Classification of numbers, Divisibility rules, factorization, Division & Successive division, Remainders in divisions involving higher powers, LCM and HCF and Number systems.

Algebra: Powers, roots and Indices, Venn diagrams, Surds, Logarithms, Quadratic Equations & Inequalities, Progressions, Simple Equations. Transposing formulae and solving simultaneous equations.

Arithmetic: Ratios, Proportion, Variation, Percentages, Profit & Loss, Simple & Compound Interest, Averages, Mixtures and Allegations, Time and Distance, Time and Work, Clocks, Calendars and Blood relations

Geometry and Mensuration: Lines & angles, triangles, quadrilaterals, polygons, circles, surface areas, volumes of 3D figures, graphs reducing non-linear laws to linear form and graphs of exponential functions.

Prescribed Text Books

- Basic Engineering Mathematics, John Bird, Fourth Edition, Elsevier.

Reference Text Books

- Quantitative Aptitude, R. S. Aggarwal, Schand Publications.
- Quantitative Aptitude - G. L. Barrons.
- Quantitative Aptitude - Abhijit Guha, Mc Graw Hills.

DISCRETE MATHEMATICS

Course code: 17CS2103

L-T-P-S: 2-1-0-0

Pre-requisite: NIL

Credits: 3

Syllabus: Sets and Sequences: Data Models. Finite Sets, Power Set, Cardinality of finite sets, Cartesian product, Properties of Sets, Vector Implementations of Sets, Cardinality of Sets, Matrices Propositional logic: Proposition logic, basic logic, logical connectives, truth tables, tautologies, contradiction, normal forms (conjunctive and disjunctive), modus ponens and modus tollens, validity, predicate logic, universal and existential quantification. Notion of proof: proof by implication, converse, inverse, contra positive, negation, and contradiction, direct proof, proof by using truth table, proof by counter example. Counting: The Basics of Counting, The Pigeonhole Principle, Permutations and Combinations, Generalized, Permutations and Combinations, Generating Permutations and Combinations, Binomial Coefficients and Identities. Advanced Counting Techniques: Applications of Recurrence Relations, Solving Linear Recurrence Relations, Divide-and-Conquer Algorithms and Recurrence Relations, Generating Functions, Inclusion–Exclusion, and Applications of Inclusion–Exclusion. Relations: Relations and Their Properties, n-ary Relations and Their Applications, Representing Relations, Closures of Relations, Equivalence Relations, Partial Orderings, Lattices. Graphs: Graphs and Graph Models, Graph Terminology and Special Types of Graphs, Representing Graphs and Graph Isomorphism, Connectivity, Euler and Hamilton Paths, Shortest-Path Problems, Planar Graphs, Graph Coloring.

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Trees: Introduction to Trees, Applications of Trees, Tree Traversal, Spanning Trees, Minimum Spanning Trees.

Text Books:

1. Kenneth H. Rosen, "Discrete Mathematics and Its Applications" Seventh Edition Mc GrawHill Publications, ISBN 978-0-07-338309-5
2. SEYMOUR LIPSCHUTZ, MARC LARS LIPSON, Schaum's Outline of Theory and Problems of DISCRETE MATHEMATICS, Revised Third Edition.

Reference Books:

1. Kenneth H. Rosen, —Discrete Mathematics and its Applications, Special Indian Edition, 7th Edition, Tata Mcgraw-Hill Publisher, New Delhi.
2. C.L.Liu, Elements of Discrete Mathematics, second edition 1985, McGraw-Hill Book Company. Reprinted 2000.
3. J .L.Mott, A.Kandel, T.P .Baker, Discrete Mathematics for Computer Scientists and Mathematicians, second edition 1986, Prentice Hall of India.
4. W.K.Grassmann and J.P.Tremblay, Logic and Discrete Mathematics, A Computer Science

BIOLOGY FOR ENGINEERS

Course code: 17BT1001

Pre-requisite: NIL

L-T-P-S: 2-0-0-0

Credits: 2

SYLLABUS: BASIC BIOLOGY: Introduction, Living organisms, Cell structure and Organelles, Organogenesis, Human Anatomy, Systems of Life: Digestion, Respiration, Circulation, Excretion, Reproduction, Thinking and coordination and Defense, Diet and Nutrition: Macro (Carbohydrates, proteins, lipids) - and Micronutrients (vitamins), Essential minerals and their role; deficiency symptoms; and their role; deficiency symptoms. Micro organisms: Classification of Microorganisms, beneficial and harmful effects of Bacteria, Fungi and Viruses. Biosensors, biomechanics and Medical Imaging technology, Applications of Biosensor in Food and Agriculture.

Text books:

1. Advanced Biotechnology; Dr RC Dubey; S Chand Publications.
2. Elements of Biotechnology; P K Gupta; RASTOGI Publications.

ENGINEERING MATERIALS

Course code: 17 PH 1001

Pre Requisite: NIL

L-T-P-S: 3-0-2

Credits: 4

Crystallography: Bonding in materials, Space lattice, basis, unit cell, Seven Crystal systems, Bravais lattice system, Reciprocal lattice, Crystal directions, Miller Indices, problems, Diffraction of Crystals, Bragg's Law, XRD, Laue, Rotating Crystal and powder XRD Techniques, Problems.

Crystal Imperfections: Point Defects, Line Defects, Surface Defects, Volume Defects, and Effects of Defects on Crystalline Properties.

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Magnetic properties: Origin of Magnetic Moment, Dia, Para, Ferro, Antiferro and Ferri Magnetism, Domain theory and Hysteresis Effect of Ferro and Ferri Magnetism, Soft and Hard Magnetic Materials.

Thermal properties: Iron-Carbon Diagram, Heat capacity, Thermal Expansion and Thermal Conductivity in Metals, Ceramics and Polymers, Heat treatment of Materials, Hardening, Tempering, Quenching and Nitriding.

Mechanical Properties: Stress, Strain, Hooke's Law, Elasticity, Plasticity, Creep, Ductility, Brittle, Hardness, Strength, Modulus of Elasticity, Fracture, Fatigue, Stress- Strain Behavior of Ductile and Brittle Materials, Hardness Tests- Vickers, Rockwell and Brinell.

Electrical Properties: Energy band theory, Band structures in Conductors, Semi conductors and Insulators, Electrical properties of conductors- Ohms, Mathiessen rule, conductivity, Mobility, Electrical properties of Semi conductors, Factors effecting the carrier concentration, Conductivity and Mobility of charge carriers. Electric properties of Insulator-Dielectrics-Types of Dielectrics, Dielectric Constant, Polarization, Types of Polarizations, Frequency Dependence of Polarization, Ferro, Piezo Electrics.

Optical properties: Optical reflectance, Optical Absorption, snell's law, Total Internal reflection in optical fibers.

Text books:

1. [William D. Callister](#), Jr. "Materials Science and Engineering: An Introduction" 6th edition, 2007, Wiley India Pvt.Ltd.
2. Charles Kittel, "Introduction to Solid State Physics" 8th edition, 2012, Wiley India Pvt.Ltd.

Reference Books:

1. Adrianus J. Dekker, "*Solid State Physics*" 1st Edition 2002, Macmillan India Ltd.
2. S. O. Pillai, "Solid state physics" Revised 6th edition, New Age International Publishers. Rangwala, Engineering Materials (Material Science), Charotar Publishing House PVT. LTD.

BASIC ENGINEERING MEASUREMENTS

Course code: 17 GN 1001

Pre Requisite: NIL

L-T-P-S: 2-0-2-0

Credits: 3

SYLLABUS:

Basic Fundamental Measuring Units: Definition and representation of Displacement(Linear/Angular), Time, Temperature. Speed, Humidity. **Measurement of Mechanical parameters:** Force, Stress, Strain, Pressure, Velocity, Acceleration, Mass and Weight. **Measurement of Electrical parameters:** Current, Voltage, Power, Energy, Power factor, Resistance, Inductance, Capacitance. **Measurement of Electronic parameters:** Oscilloscope : Amplitude, Frequency, Time period, Phase.

LIST OF EXPERIMENTS:

1. Measurement of Linear displacement using LVDT.

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2. Measurement of Strain using Strain Gauge Bridge.
3. Measurement of Voltage using MyDAQ.
4. Measurement of Current using MyDAQ.
5. Measurement of Signal parameters (Amplitude, Time period and Frequency) using DSO.
6. Measurement of Unknown resistance using Wheatstone bridge.
7. Measurement of 1 phase Power, Energy of a R-L load.
8. Measurements of Inductance using Anderson Bridge.
9. Measurement of capacitance using Schering's Bridge
10. Measurement of Angular Displacement using Potentiometer.
11. Calibration of Pressure gauge using Dead Weight Pressure Tester.
12. Characterization of Temperature Sensor (RTD,TC,Thermistor).

Text books & References:

1. Experimental methods for engineers, JP Holman, McGraw Hill Ltd.
 2. Mechanical measurements, 6/E, Thomas G Beckwith, Pearson
 3. Electrical measurements, Martin U Reissland, New Age Int.
- A course in Electrical, Electronic Measurement, AK Sawhney , Dhanpat Rai & Co

ENGINEERING MECHANICS

Course Code: 17 ME 1001

L-T-P-S: 3-0-2-0

Prerequisite: NIL

Credits: 4

Syllabus:

Statics: Two Dimensional Force systems- Introduction, Basic concepts, Laws of motion, Principle of Transmissibility of forces, Resultant of a force system, force laws, Resultant of two dimensional concurrent and Non-concurrent Force systems, Free body diagrams, Applications. **Equilibrium of Rigid bodies**–Equilibrium and Equations of Equilibrium, Lame's theorem, Type of supports and their reactions, Moments and couples, Varignon's theorem, Resultant moment and applications.

Spatial Force Systems and Trusses : Spatial force systems – Forces in space, resultant and equilibrium of spatial force system. **Truss Analysis**-Trusses-Assumptions involved in the Method of joints and sections.

Friction And Properties of Areas : Friction: Introduction, Laws of Coulomb Friction, Equilibrium of Bodies involving Dry-friction, Applications-ladder friction, wedge friction.

Centroid and Moment of Inertia: Centroids, centre of gravity, Moment of inertia- Area and Mass- polar moment of inertia, Parallel axis theorem.

Dynamics : Kinematics of Rigid Body: Introduction, Plane Motion of Rigid Body, Velocity and Acceleration under Translation and Rotational motion.**Kinetics of Rigid Body:** Introduction, Force, Mass and Acceleration, Work and Energy, Impulse and Momentum, D'Alembert's Principles and Dynamic Equilibrium.

List of Experiments

1. Calculation of Moment of Force using weight balancing technique.

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2. Determination of angle of deflection due to eccentric loading on T bar
3. Determination of Centroid for Plane laminas of straight edges
4. Determination of Centroid for Plane laminas of curved edges
5. Determination of axial forces in Trapezoidal Truss
6. Determination of axial forces in Triangular Truss
7. Understanding vectors and vector quantities
8. Calculation of Moment of Force using weight balancing technique and system of pulleys.
9. Verification of Lamie's Theorem
10. Determination of coefficient of static friction between two surfaces.
11. Determination of motion parameters using work-energy principle
12. Determination of moment of inertia of a flywheel.

Text Books:

1. Engineering Mechanics (in SI Units) / S. Timoshenko, D. H. Young, J.V. Rao/ Tata McGraw Hill.

References:

1. Engineering Mechanics / S. S. Bhavikatti/ New Age.
 2. Vector Mechanics for Engineers -Statics & Dynamics / F.P. Beer and E.R. Johnston/ Tata McGraw Hill.
 3. Engineering Mechanics-Statics and Dynamics by R. C. Hibbler, Prentice.
- Engineering Mechanics- NH Dubey/ New Age

ENGINEERING GRAPHICS

Course code: 17ME1002

Pre Requisite: NIL

L-T-P-S: 1-0-4-0

Credits: 3

Introduction to Engineering Drawing : Principles of Engineering Graphics and their significance – Drawing Instruments and their Use- Conventions in Drawing – Lettering – Geometric Constructions – Scales: Plain and Vernier scales

Orthographic Projection in First Angle Projection: Principles of Orthographic Projections- conventions- First and Third Angle, Projections of Points and Lines inclined to both planes, True lengths, traces.

Projections of Planes & Solids: Projections of regular planes inclined to both planes . Projections of Regular solids inclined to one plane

Sections and Sectional Views:-Right Regular Solids - Prism, Cylinder, Pyramid, Cone

Isometric Projections: Principles of Isometric Projection- Isometric Scale- Isometric view conventions- Isometric View of Lines, Plane Figures, simple problems

Transformation of Projections: Conversion of Isometric Views to Orthographic Views – Conventions

Dept Specific :Overview of Computer Graphics covering & Customisation & CAD Drawing

Demonstrating knowledge of the theory of CAD software, Drawing Area, Dialog boxes and windows, Shortcut menus, Command Line, Status Bar, Different methods of zoom, erase

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objects. scale settings, applying dimensions to objects and annotate; use of Layers, Create, edit and use customized layers.

Text Books:

1. Engineering Drawing, N.D.Bhat/ Charotar
2. Engineering Drawing , N.S.Parthasarathy,VelaMurali
3. Machine drawing- N.D.Bhatt., published by R.C. Patel Charotar Book Stall Tulshi Sadan, Station Road, Annad, India
4. Dash.S.S, Subramani.C, Vijayakumar.K, "Basic Electrical Engineering", First edition,Vijay Nicole Imprints Pvt.Ltd,2013
5. Printed Circuit Boards, Design, Fabrication, Assembly and testing , Dr.R.S.Khandpur
6. Printed Circuit Board Designer's , Christopher T. Robertson
7. Textbook of Engineering Drawing, K. Venkata Reddy,(Building Drawing)
8. Thermo chemical Conversion of Biomass to Liquid Fuels and Chemicals, Mark Crocker
9. Advances in Biodiesel Production: Processes and Technologies, R Luque, J A Melero

REFERENCE BOOKS:

- Shah, M.B. & Rana B.C. (2008), Engineering Drawing and Computer Graphics, Pearson Education
- Agrawal B. & Agrawal C. M. (2012), Engineering Graphics, TMH Publication
- Narayana, K.L. & P Kannaiah (2008), Text book on Engineering Drawing, Scitech Publishers
- (Corresponding set of) CAD Software Theory and User Manuals
- Machine Drawing by / Bhattacharyya / Oxford
- Machine Drawing with Auto CAD / Goutham Pohit, Goutam Ghosh / Pearson
- Electrical and Electronics Drawing, C.J. Baer
- Printed Circuit Boards: Design and Technology , By Bosshart
- Basic Biotechnology, edited by Colin Ratledge, Bjorn Kristiansen

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ENGINEERING SCIENCE COURSES

ENGINEERING CHEMISTRY

Course code: 17 CY 1001

Pre Requisite: NIL

L-T-P-S: 3-0-2

Credits: 4

ELECTRO CHEMISTRY: Single electrode potential and its measurement, Electrochemical cells, EMF series, Nernst equation, Cell emf measurement, Reversible and irreversible cells, Concentration cells, Reference electrodes--Determination of pH using glass electrode. **Storage devices :** Chemistry, construction and engineering aspects of Primary (mercury battery) and secondary (lead-Acid cell, Ni-Metal hydride cell, Lithium cells) and fuel cells--Hydrogen--Oxygen fuel cell, advantages of fuel cell. , **Fuels** – Types of fuels, Calorific value, Determination of Calorific value; **CORROSION & ITS CONTROL:** Causes and different types of corrosion and effects of corrosion. Theories of corrosion– Chemical, Electrochemical corrosion, Pitting corrosion, stress corrosion, Galvanic corrosion. Factors affecting corrosion– Nature of metal, galvanic series, over voltage, purity of metal, nature of oxide film, nature of corrosion product. Nature of environment- effect of temperature, effect of pH, Humidity, effect of oxidant. Cathodic protection, sacrificial anode, impressed current cathode, electroplating; **METAL ALLOYS:** Types of Alloys- ferrous and nonferrous alloys, Carbon steel, Alloy steel, Alloys of Cu, Al, Pb. **PHASE RULE:** phase rule applications to one and multiple component systems phase diagram. **WATER Technology:** Introduction, **Hardness:** Causes, expression of hardness – units – types of hardness, estimation of temporary and permanent hardness of water, numerical problems. Alkalinity and estimation of alkalinity of water, numerical problems. **Boiler troubles** – Scale & sludge formation, caustic embrittlement, Boiler corrosion, priming & foaming. **Softening of water:** Internal and external treatments -Lime soda, Ion exchange process. **Desalination**-reverse osmosis and electro dialysis. **POLYMERS AND PLASTICS: Basic concepts of polymers-**Types of polymerization-Plastics – Thermoplastic resins and Thermosetting resins - Compounding of plastics – Fabrication of plastics. Preparation, properties and engineering applications of: polyethylene, PVC, Teflon, Bakelite, Urea Formaldehyde. **Conducting Polymers:** Polyacetylene, polyaniline, conduction, doping and applications. **Polymer composites:** Physico Chemical properties of polymer composites and Applications. **NANO TECHNOLOGY:** Introduction, Fullerenes, Carbon nanotubes, Nanowires; properties; Synthesis of nanomaterials; Topdown & bottom up approach; Applications of nanomaterials. **GREEN CHEMISTRY: Introduction,** Green technology- Latest green laboratory technology for saving experimental resources and infrastructural framework; R4M4 (Reduce, Reuse, Recycle, Redesign; Multipurpose, Multidimensional, Multitasking, Multi-tracking;) model with special reference of survismeter, econoburette.

Text books:

1. Engineering Chemistry, Jain & Jain, Dhanpat Rai Publishing Company. New Delhi.
2. Engineering Chemistry, O G Palanna, The Tata McGraw Hill, New Delhi.

Reference Books:

1. Chemistry in Engineering and Technology, Volume 2, J C Kuriacose & J Rajaram, Tata

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McGraw Hill, New Delhi.

2. Chemistry for Engineers, Dr Rajesh Agnihotri, Wiley, New Delhi.
3. Engineering Chemistry, B. Sivasankar, The Tata McGraw Hill, New Delhi.
4. A text book of Engineering Chemistry, Shashi Chawla, Dhanpat Rai & Co. New Delhi.
5. Engineering Chemistry, C Parameswara Murthy, C V Agarwal and Andra Naidu, B S Publications, Hyderabad.
6. Engineering Chemistry, Shikha Agarwal, Cambridge University Press.

PROBLEM SOLVING & COMPUTER PROGRAMMING

Course Code: 17SC1101

L-T-P-S: 2-4-2-0

Pre-requisite: NIL

Credits: 5

Syllabus: Problem Solving Approach, **Algorithms and Algorithm Analysis**, Program Development Steps, Structure of C Program, Pre-Processor Directives, **Formatted I/O, C Tokens, Data Types:** Primitive, Extended and Derived Including Pointers, Operators, Precedence, Associativity, **Redirecting I/O** :Files and File Operations, **Control Flow Statements, Functions, Recursion**, Scope of Variables and Storage classes, **Arrays, 2-Dimensional Arrays, Dynamic Memory Allocation, Searching:** Linear Search and Binary Search, **Sorting:** Bubble Sort, **Strings, Structures and Unions**, Introduction to **Stacks**-Implementation using array, Introduction to Queues – Linear **Queue**-Implementation using array, Introduction to **Lists:** Single Linked List- Insertion, Deletion, Display.

Text Books:

1. Brian W. Kernighan, Dennis M. Ritchie, "The C Programming Language: ANSI C Version", 2/e, Prentice-Hall/Pearson Education-2005.
2. E. Balagurusamy, "Programming in ANSI C" 4th ed., Tata McGraw-Hill Education, 2008.
3. R. F. Gilberg, B. A. Forouzan, "Data Structures", 2nd Edition, Thomson India Edition-2005.

Reference Books:-

1. Mark Allen weiss, Data Structures and Algorithm Analysis in C, 2008, Third Edition, Pearson Education.
2. Horowitz, Sahni, Anderson Freed, "Fundamentals of Datastructures in C", 2nd Edition-2007.
3. Robert Kruse, C. L. Tondo, Bruce Leung, Shashi Mogalla, "Data structures and Program Design in C", 4th Edition-2007.
4. C for Engineers and Scientists – An Interpretive Approach by Harry H. Cheng, McGraw Hill International Edition-2010.
5. Jeri R. Hanly, Elliot B. Koffman, "Problem Solving and Program Design in C", 7/e, Pearson Education-2004.
6. Jean Paul Trembly Paul G. Sorenson, "An Introduction To Data Structures with applications", 2nd Edition.

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DATA STRUCTURES

Course Code: 17CS1102

L-T-P-S: 3-0-2-0

Pre-requisite: 17CS1101

Credits: 4

Syllabus: Algorithm Analysis: Mathematical Background, Model, Analyze, Running Time Calculations, Lists. **Stacks and Queues:** Abstract Data Types (ADTs), The List ADT, The Stack ADT, The Queue ADT. **Trees:** Preliminaries, Binary Trees, The Search Tree ADT— Binary Search Trees, AVL Trees, Splay Trees, Tree Traversals (Revisited), B-Trees, Red black trees. **Hashing:** General Idea, Hash Function, Separate Chaining, Hash Tables without Linked Lists, Rehashing, Hash Tables in the Standard Library, Extendible Hashing. **Priority Queues (Heaps):** Model, Simple Implementations, Binary Heap, Applications of Priority Queues. **Sorting:** Preliminaries, Insertion Sort, A Lower Bound for Simple Sorting Algorithms, Shell sort, Heap sort, Merge sort, Quick sort, Indirect Sorting, A General Lower Bound for Sorting, Bucket Sort, External Sorting. **Graph Algorithms:** Definitions, Topological Sort, Shortest-Path Algorithms, Minimum Spanning Tree.

Text Books:

1. Mark Allen Weiss, Data Structures and Algorithm Analysis in C, 2010 , Second Edition, Pearson Education.
2. Ellis Horowitz, Fundamentals of Data Structures in C: Second Edition, 2015

Reference Books:

1. A.V.Aho, J. E. Hopcroft, and J. D. Ullman, “Data Structures And Algorithms”, Pearson Education, First Edition Reprint 2003.
2. Horowitz, Sahni, Anderson Freed, “Fundamentals of datastructures in C” , Second Edition-2007.
3. R. F. Gilberg, B. A. Forouzan, “Data Structures”, Second Edition, Thomson India Edition, 2005
4. Robert Kruse, C.L. Tondo, Bruce Leung, Shashi Mogalla, “Data Structures & Program Design in C”, Fourth Edition-2007.

INTRODUCTION TO ELECTRONICS ENGINEERING

Course code: 17 EC 1101

L-T-P-S: 2-0-2

Pre Requisite: NIL

Credits: 3

Day-to-day usage of electronics. Basic components, Capacitor & types: ceramic, electrolytic, film. Inductor & types: air, iron, tapped. Resistor & types: carbon, ceramic, wire wound, LDR. Carbon resistor color code, RF inductor color code. Thermistor vs Sensistor. Switch & types. Diodes: switching, signal, photodiode, LED.

LED types: visible, IR. Common anode & cathode, patterns with LEDs, interfacing with LEDs, usage in daily life. Relay & types: EMR, SSR, usage in daily life. LCDs, usage in daily life. Temperature sensor & calibration, Microphone as a sensor. Gas sensor, calibration & response.

LDR & its usage in daily life. LDR as a sensor. IR & photodiode as a sensor pair, usage in daily life. Motor & types: DC, servo, stepper. Necessity of driver. Duty cycle. Controlling

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using PWM & driver, usage in daily life. Regulators & calibrations. Heat sink with regulators.

Sinking & sourcing. Interfacing different devices & considerations. Design sequence: requirement, visualizing, layout, datasheets, simulation, corner cases, short circuit testing, finalizing specifications. Crucial parameters: Ratings, power consumption, processing delay, dissipation, lasting, cost, replacement.

WORKSHOP PRACTICE

Course Code: 17ME1003

L-T-P-S: 0-0-2-0

Pre Requisite: NIL

Credits: 1

Common Experiments for ALL Branches:

CARPENTRY - Hands on practice on wood working operation using hand tools to prepare Lap T joint and plus joint.

FITTING - Hands on practice on preparing square fit and L fits.

TIN SMITHY - Hands on practice on sheet metal working for preparing cylindrical pipe and rectangular tray / Pipe T joint.

HOUSE WIRING - Hands on practice on electrical house stair-case and godown connections

WELDING - Hands on practice joining of metal plates using arc welding equipment

CASTING – Hands on practice on Gravity die casting for preparation of wax pipe flange / dumb bell.

MACHINE SHOP – Hands on practice on Lathe, Drilling machine tools

TEXT BOOKS:

1. P.Kannaiah and K. L. Narayana, Engineering Practices Laboratory, 2009, SciTech Publications, Chennai

REFERENCE BOOKS:

1. KLEF workshop lab manual

2. K. Venkata Reddy, “Workshop Practice Manual”, Sixth edition, 2011 print, BS Publications, Hyderabad.

3. B S Nagendra Parashar and R K Mittal, “Elements of Manufacturing Process”, 2010 print, Prentice Hall of India, New Delhi

OBJECT ORIENTED PROGRAMMING

Course code: 17CS2004

L-T-P-S: 3-0-2-0

Pre-requisite: NIL

Credits: 4

Introduction: Object-Oriented Programming, OOP Principles, Encapsulation, Inheritance and Polymorphism Java as a OOPs & Internet Enabled language, The Byte code, Data types,

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Variables, Dynamic initialization, scope and life time of variables, Arrays, Operators, Control statements, Type Conversion and Casting, Compiling and running of simple Java program. **Classes and Objects:** Concepts of classes and objects, Declaring objects, Assigning Object Reference Variables, Methods, Constructors, Access Control, Garbage Collection, Usage of static with data and methods, usage of final with data, Overloading methods and constructors, parameter passing - call by value, recursion, Nested classes. **Inheritance:** Inheritance Basics, member access rules, Usage of super key word, forms of inheritance, Method Overriding, Abstract classes, Dynamic method dispatch, Using final with inheritance, The Object class. **Packages and Interfaces:** Packages, Classpath, Importing packages, differences between classes and interfaces, Implementing & Applying interface. **Exception Handling:** Exception Handling fundamentals.

Text Books:

1. Herbert Schildt, "The Complete Reference Java", 7th edition TMH.
2. Timothy A. Budd, "An Introduction to Object-Oriented Programming", 3/e, Pearson, 2008.

Reference Books:

1. Deitel & Deitel, "Java – How to program", 6th edition, PHI, 2007
2. Cay.S.Horstmann and Gary Cornell "Core Java 2, Vol 1, Fundamentals", Seventh Edition, Pearson Education.

Electromagnetic Fields & Transmission Lines

Course Code: 17EC2212

L-T-P-S: 3-0-0-0

Pre-requisite: NIL

Credits: 3

Electric and Magnetic Fields: Types of charge distributions, Coulomb's Law, Electric field intensity, electric flux density, Gauss's Law and applications, Divergence, Divergence theorem, Potential and Potential difference, Potential gradient, Poisson's and Laplace's equations. Boundary conditions on E and D, Energy density in Electrostatic field. Electric current, current densities, equation of continuity. Fundamentals of steady magnetic field, Faraday's Law of Induction, Biot - Savart's Law and applications, Ampere's circuital law, differential form of Ampere's circuital law, Curl, Stoke's theorem, Lorentz force equation, force on a current element in magnetic field, Ampere's force law. **Electromagnetic Waves:** Maxwell's Equations in Different Final Forms. Boundary Conditions. wave equation for free space, Uniform plane wave-general solution and propagation. Wave equations for conducting medium. Wave equations in phasor form, wave propagation in loss less medium, conducting medium, good dielectrics and good conductors, skin effect, Poynting theorem and Pointing vector

Guided Waves & Wave Guides : Introduction, Waves between parallel plates, Derivation of field equations between parallel plates and propagation parameters, field components for TE waves, field components of TM waves, Propagation parameters of TE and TM waves, Guided wavelength. Transverse electromagnetic wave. **Transmission lines :** General Solution, infinite line, wavelength, propagation, Reflection Coefficient, Open and short circuited lines, Insertion loss, standing wave ratio, input impedance of open and short circuited lines, power and impedance measurement on lines, Impedance matching—single matching, smith chart and its applications.

Text books:

- 1.W.H. Hayt Jr, "Engineering Electromagnetic", Mc-Graw Hill – New York, 7th Edition
- 2.EC.Jordan, "EM waves and Radiating Systems", International Edition, 2011

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3. John D Ryder, "Network Lines and fields", 2nd Edition, PHI

4. Mathew no Sadiku, "Elements of Electromagnetics", Oxford University Press, 2003.

Reference Books:

1. Joseph A Edminister, "Theory and problems of Electromagnetics", 2nd edition, Scham's Outline series, Mc-Graw Hill International.

2. Constantine A. Balanis, "Advanced Engineering Electromagnetics" John Wiley

Electrical Circuit Theory

Course Code: 17EE2105

L-T-P-S: 3-1-0-0

Pre-requisite: NIL

Credits: 4

Introduction to Electrical Circuits: Network elements and their classification. Ohm's law, Kirchhoff's law, Series and parallel combinations of R, L and C. Energy sources: Ideal, Non-ideal, Independent and dependent sources, Source transformation, star & delta transformation. Mesh and Nodal analysis. Simple problems solving with resistances, dependent and independent sources

AC Circuits: Definitions of terms associated with periodic functions: Time period, Angular velocity and frequency, RMS value, Average value, Form factor and peak factor - problem solving, Phase angle, Phasor representation, Addition and subtraction of phasors, Mathematical representation of sinusoidal quantities. Steady State Analysis of A.C Circuits: Response to sinusoidal excitation to Series and parallel RL, RC, RLC circuits. Concept of impedance and phase angle.

Network Theorems: Superposition, Reciprocity, Thevenin's, Norton's and Compensation theorems. Problem solving with resistances and independent sources. Max. Power Transfer theorem with complex load

Resonance: Series and parallel resonance. Quality factor and bandwidth

Transient analysis (DC Excitation): Series and Parallel RL and RC circuits. Simple problems.

Two port network parameters: Z, Y, ABCD, H and G parameters

Magnetic Circuits: Self & Mutual inductances, dot convention, Impedance transformation and coupled circuits. Faradays laws of electromagnetic induction: elementary treatment on rotary machines w.r.t EMF equation (Statically induced and dynamically induced EMF) and torque production, numerical problems.

TEXT BOOKS:

1. John Bird, Electrical Circuit Theory and Technology, Sixth edition, Newnes (Elsevier) publications, 2017.
2. Jacob Millman, Christor. C W. H. Hayt, J.E. Kimmerly, "Engineering circuit analysis", 8th Edition, Tata Mc-Graw Hill, 2014.
3. J. W. Nilsson and S. Riedel Electric Circuits, 9/E Pearson-Prentice Hall, 2011:
4. Electric machinery by P S Bimbhra, Khanna Publishers, 7th Edition, 2011

REFERENCE BOOKS:

1. Electric Circuits – J. Edminister and M.Nahvi – Schaum's Outlines,
2. Network Analysis by ME Van Valkenburg, Prentice Hall of India, 3rd Edition, 2000.

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3. Ashfaq Husain, "Electric Machines", 2nd Edition, Dhanpat Rai & Co, 2014.

PROBABILITY THEORY AND STOCHASTIC PROCESSES

Course Code : 17 MT 2009

L-T-P-S: 2-1-0-0

Pre-requisite: NIL

Credits: 3

SYLLABUS

Probability and Random variables: Definitions of probability, Sample space, Axioms of probability, Conditional probability, Addition, Multiplication and Baye's theorem. Random variables, joint and marginal probabilities, Mathematical Expectation.

Standard discrete and continuous distributions: Definitions and simple properties of Binomial, Poisson, Exponential and Normal distributions, Applications of the above distributions.

Correlation and Regression: Correlation coefficient for ungrouped data. Linear and Non-Linear regression.

Stochastic Processes: Discrete-Time Markov Chains, Continuous- Time Markov Chains.

Queuing models: Single and multi-server Markovian queuing models with finite and infinite capacity.

Simulation: Introduction to simulation, simulation examples, general principles, statistical models in simulation. Verification and validation of simulation models.

Text Books

- 1) Ronald E. Walpole, Sharon L. Myers and Keying Ye, "Probability and Statistics for Engineers and Scientists", 8th Edition, Pearson.
- 2) Kishore S Trivedi, "Probability & Statistics with Reliability, Queuing and Computer Science Applications", 2nd Edition, Wiley India, 2009.

Reference Books

1. Richard A Johnson, Miller & Freund's Probability and Statistics for Engineers, 11th Edition PHI, New Delhi.
2. Jerry Banks, John S Carson, Barry L Nelson, David M Nicol, Discrete- Event System Simulation, 4th Edition, Pearson..
3. Jay L. Devore, Probability and Statistics for Engineers, CENAGE learning.
4. S C Gupta and V K Kapoor , Fundamentals of Mathematical Statistics, 11th Edition, S Chand & Sons, New Delhi,

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PROFESSIONAL CORE COURSES

DIGITAL SYSTEM DESIGN

Course Code: 17EC2102

L–T–P–S : 3-0-2-

0

Pre-requisite: NIL

Credits: 4

Logic Simplification and Combinational Logic Design: Number Systems, Review of Boolean Algebra and De Morgan's Theorem, SOP & POS forms, Karnaugh maps, Binary codes, Code Conversion, Integrated Circuit Logic Gates.

Combinational Logic Functions: Adder and Subtractor, Decoders, Encoders, Multiplexers, Demultiplexers, Magnitude Comparators, Parity Generators and Checkers, BCD to seven segment decoders. Verilog HDL design for Combinational Logic Functions.

Sequential Logic Functions: NAND/NOR Latches Gated Latches, Edge- Triggered Flip-flops. Registers and Counters: Shift register, Universal Shift Register, Design of Synchronous and Asynchronous Counters, Modulus counters. Mealy and Moore machines, State diagrams and Tables, FSM, Introduction to ASM charts. Verilog HDL design for Sequential Logic Functions.

Programmable Logic Devices: Programmable Logic Array (PLA), Programmable Array Logic (PAL), Logic implementation using Programmable Devices. Complex Programmable Logic Devices, Field Programmable Gate Arrays, Applications of CPLDs and FPGAs.

Text Books:

1. Stephen Brown and Zvonko Vrane "Fundamentals of Digital Logic with Verilog Design" Second Edition, McGraw-Hill.
2. M. Morris Mano, "Digital Logic and Computer Design", Pearson

Reference Books:

1. R.P. Jain, "Modern digital Electronics", Tata McGraw Hill, 4th edition, 2009
2. J. Bhasker, "Verilog HDL Synthesis, A Practical Primer", Star Galaxy Publishing.

LIST OF EXPERIMENTS

1. LED Control Using Universal Gates.
2. Combinational Circuit Based Car Security System.
3. Design of Magnitude comparator.
4. Participant selection in Competitions Using Multiplexer.
5. Digital Display of Department Name.
6. Design of Two-digit display using IC7490.
7. Random Number Generator for Gaming Using D-Flip- flop.
8. Ring and Johnson counter.
9. Design of Ripple counter using J-K Flip-Flop.
10. Design of Automobile garage control system using counters.
11. Digital Unlocking System using Shift Register.
12. Digital Data Storage Using Semiconductor Memories.

COMPUTER ORGANIZATION AND ARCHITECTURE

Course Code : 17EC2204

L–T–P–S : 3-0-0-0

Pre-requisite: 17EC2102

Credits: 3

Computer system and its sub modules: Number System and Representation of information, Arithmetic and Logical operation and hardware implementation of Arithmetic and Logic Unit, Introduction to memory Unit, control unit and Instruction Set. Working with an ALU, Concepts of Machine level programming, Assembly level programming and High-level programming. Various addressing modes and designing of an Instruction set. Concepts of subroutine and subroutine call, use of stack for handling subroutine call and return.

CPU Design: Introduction to CPU design, Instruction interpretation and execution, Micro-operation and their RTL specification. Hardwired control CPU design. Micro programmed control CPU design. Concepts of semiconductor memory, CPU-memory interaction, organization of memory modules. Cache memory and related mapping and replacement policies. Virtual memory.

Input / Output Devices: Introduction to input/output processing, working with video display unit and keyboard and routine to control them. Program controlled I/O transfer. Interrupt controlled I/O transfer, DMA controller. Secondary storage and type of storage devices. Introduction to buses and connecting I/O devices to CPU and memory.

Pipelining: Introduction to RISC and CISC paradigm. Design issues of a RISC processor and example of an existing RISC processor. Introduction to pipelining and pipeline hazards, design issues of pipeline architecture. Instruction level parallelism and advanced issues.

Text Books:

1. William Stallings, Computer Organization and Architecture: Designing for Performance, 8/e, Pearson Education India. 2010.
2. D. A. Patterson and J. L. Hennessy, Computer Organization and Design, 4/e, Morgan Kaufmann, 2008.

Reference Books:

1. S. Tanenbaum, Structured Computer Organization, 5/e, Prentice Hall of India, 2009.
2. V. C. Hamacher, Z. G. Vranesic and S. G. Zaky, Computer Organization, 5/e, McGraw Hill, 2002.

LIST OF EXPERIMENTS

1. Design and Implementation of Binary to 7-Segment Code Converter.
2. Design and Implementation of Binary to BCD Code Converter.
3. Design of Carry-Look-Ahead Adder.
4. Design of Arithmetic Unit.
5. Design of Logical Unit and Computational Processing System for ALU Operations.
6. Implementation of Information Transmission System.
7. Development of Instruction Processing System from Fetching to Execution.
8. Design of 4-bit Universal shift register using D-FF.
9. Implementation of Cache Memory.

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10. Choice Based Control of Vending Machine.
11. Peripheral to Peripheral Data Transfer Using DMA.
12. Implementation of 3-Stage Pipelining.

ANALOG ELECTRONIC CIRCUIT DESIGN

Course Code: 17EC2101

L–T–P–S: 3-0-4-0

Pre-requisite: NIL

Credits: 5

Diodes: Concepts of diode as a switching element, diode as Limiter, design of: Clipper, half wave & full wave rectifier, Clamper, Voltage multiplier, Capacitor filters, Concepts of Regulators: Series and shunt voltage regulator, Zener diode, Design of Zener diode regulator, Concept of junction capacitance, Varactor diode, LED.

Transistors: Concepts of amplifier, Q point, load line analysis, Biasing of BJT, Self-Bias-CE, High and low frequency –small signal models of Transistors, Expression of voltage gain, current gain, input & output impedance, Designing CE amplifier, FET fundamentals, Configurations, current-voltage characteristics, Biasing of JFET, Biasing of MOSFET FET small signal model, Design and analysis of RC coupled amplifier, Concept of Feedback, Feedback amplifier configurations, Emitter follower.

Op-amps: Ideal OPAMP, Concept of differential amplifier, CMRR, Open & closed loop circuits, importance of feedback loop (positive & negative), inverting & non-inverting amplifiers, Voltage follower, Adder, Design and analysis of Integrator & Differentiator, Comparator, Schmitt Trigger, Instrumentation Amplifier. Filter Circuits: Design and Analysis of Low pass, High pass, Bandpass, Band reject filters

Design and analysis of Oscillators: Barkhausen criterion, Colpitt, Hartley's, RC Phase shift, Wien bridge, & Crystal oscillators.

555 applications: Design and analysis of Monostable & Astable multi vibrators using 555 and their applications.

Textbooks:

1. Muhammad H. Rashid, "Microelectronic Circuit Analysis and Design", Oxford Press.
2. Sedra & Smith, "Micro-Electronic Circuits theory and applications" 2nd edition, Cengage Learning.

Reference Books:

1. Jacob Millman & Christos C. Halkias, "Integrated Electronics", Tata -McGraw Hill, 2nd Edition, (2010).
2. Robert L. Boylestad and Louis Nashelsky, "Electronic Devices and Circuit Theory", PHI. 9th Edition.

LIST OF EXPERIMENTS

1. Zener diode characteristics.
2. Full Wave Rectifier without and with Filter.
3. CE Amplifier.

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4. BJT-JFET Amplifier.
5. Op-Amp as Integrator and Differentiator.
6. Design of first order & second order LPF.
7. Design of first order BPF & BSF.
8. Triangular/rectangular wave generator.
9. Monostable and Astable multivibrator using 555 timer.
10. RC Oscillators.
11. LC Oscillators.
12. Complementary Class-B Push Pull Amplifier.

SIGNALS AND SYSTEMS

Course Code: 17EC2103

L-T-P-S : 3-0-2-0

Pre-requisite: NIL

Credits: 4

Introduction: Basic Continuous Time signals. Classification of signals. Basic elementary signals; sinusoidal and exponential signals, Singularity functions: Introduction to Systems: Classification of systems, Linear time invariant (LTI) system, impulse response, Convolution and interconnections of LTI systems.

Fourier Analysis of Continuous Time Signals: Fourier Transform: Deriving Fourier transform from Fourier series, Fourier transform of standard signals, Fourier transform of periodic signals, properties of Fourier transforms, Inverse FT, Correlation of Signals. **Hilbert Transform** and their relationship with FT.

Laplace Transforms: Introduction to LT. Analysis and synthesis equations, LT of standard signals, Concept of region of convergence (ROC) for LT, Constraints on ROC for various classes of signals, Properties of L.T's, Relation between L.T's, and F.T., Inverse LT, Partial fraction expansion method. Analysis of LTI systems using LT.

Sampling and Reconstruction: Sampling theorem-Graphical and analytical proof for band limited signals, Band pass sampling, Reconstruction of signal from its samples, effect of under sampling – Aliasing.

Z-Transform: Concept of Z. Transform and its ROC (region of convergence) Inverse Z-Transform, properties of Z-Transforms.

DTFT: Analysis and synthesis equations, DTFT of standard sequences, magnitude and phase spectrum, Properties of DTFT.

Text Books :

1. Signals and Systems - A.V. Oppenheim, A.S. Willsky and S.H. Nawab, PHI, 2nd Edn.
2. Signals & Systems - Simon Haykin and Van Veen, Wiley, 2nd Edition
3. Discrete Time Signal Processing by A. V. Oppenheim and Shafer
4. Signals, Systems, and Transforms, Phillips, Parr and Riskin, Fourth Edition, Pearson Education, 2008.

Reference Books:

1. Signals, Systems & Communications - B.P. Lathi, BS Publications, 2003.
2. Signals and Systems – K R Rajeswari
3. Fundamentals of Signals and Systems- Michel J. Robert, MGH International Edition, 2008.
4. Vinay. Ingle, John G Proakis, “Digital Signal Processing Using Matlab”, Pearson

LIST OF EXPERIMENTS

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1. Characteristics of sinusoidal signals.
2. Generation and plots of Elementary C.T signals.
3. Interacting with real time signals.
4. Manipulation/operation of continuous time signals.
5. Linear convolution.
6. Fourier series representation of continuous time periodic signals.
7. Fourier transform of continuous time aperiodic signals.
8. Sampling and Reconstruction of signals.
9. Laplace transform of continuous time signals.
10. Frequency response of LTI systems.
11. Z-transform and inverse Z-transform.
12. Discrete time sequences: Frequency domain representation (DTFT).

PROCESSORS AND CONTROLLERS

Course Code: 17EC3109
Pre-requisite: 17EC2102

L–T–P–S :2-1-2-0
Credits: 4

Microprocessors: Introduction to Microprocessors, Intel Microprocessor families, 8085 & 8086 Microprocessor architectures, 8086 Register Organization, Pin Description, Physical Memory, Organization, Modes of operation. 8086 Instruction set & Assembly Language programming, Addressing modes, Instruction set, Assembler directives, simple Programs, Procedures and Macros, 8086 Interrupts.

8051 Microcontroller: Microcontroller families, 8051 Architecture, Signal Description, Register organization, Internal RAM, Special Function Registers, Interrupt control flow, Timer/Counter Operation, Serial Data Communication, and RS-232C Standard.

8051 Programming & Interfacing: Addressing modes, Instruction set, Simple Programs involving Arithmetic and Logical Instructions, Timers/Counters, Serial Communication & Interrupts. PIC Microcontroller: Introduction, Architectural overview, Memory organization, interrupts and reset, I/O ports, Timers. 8255 and 8251

Interfacing: Matrix Key Board, Stepper Motor, LCD's, DAC & ADC. using 8051 and PIC Microcontroller, Embedded C and Embedded OS

Text Books

1. D.V.Hall “Microprocessor and Interfacing”, 2nd Edition Tata McGraw Hill Publishing Company,2006.
2. Mazidi&McKinley “The 8051 Micro controller and Embedded systems: using assembles and C, 2nd edition,2007.

Reference Books:

1. A.K. Ray & K. M Bhurchandi, “Advanced Microprocessors & peripherals”, Tata McGraw Hill Publishing Company 2002.
2. Raj Kamal, “Microcontrollers - Architecture, Programming, Interfacing & System Design”, 2nd edition, Pearson Education, 2009.

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ANALOG AND DIGITAL COMMUNICATION

Course Code: 17EC2206

L-T-P-S: 2-1-2-0

Pre-requisite: 17EC2101, 17EC2102

Credits: 4

Analog Modulation Systems: Need for Modulation, Frequency Translation methods.

Linear Modulation techniques: AM, DSB-SC, SSB and VSB modulation techniques. Demodulators: Synchronous, and envelope detectors. AM systems in the presence of noise.

Angle Modulation: Phase and Frequency Modulation techniques. Narrow Band FM and Wide Band FM, Carson's Rule, Indirect and direct methods of Frequency Modulation. FM systems in the presence of noise. Pre-emphasis and De-emphasis, FM demodulation using PLL, Noise considerations in AM and FM. Transmitters and Receivers, PAM, PWM and PPM

Digital Modulation Systems: Pulse Modulation: Baseband signals. Sampling process; Quantization Process; Quantization Noise; Pulse-Code Modulation; Noise Considerations in PCM Systems(T1/E1); line coders, DPCM, DM, ADM, Matched filter receivers, Shift keying schemes (ASK, PSK, FSK), QAM, MSK, QPSK bandwidth consideration and probability of error calculations for these schemes.

Text Books:

1. Lathi, "Modern Digital & Analog Communications Systems", 2e, Oxford University Press
2. Simon Haykin and Michael Moher, "An Introduction to Analog & Digital Communications", 2nd Ed., Wiley, (2007).
3. Analog & Digital Communication by Sanjay Sharma.
4. Wayne Tomasi, "Advanced Electronic Communication Systems", 5th Edition, Pearson Education, 2009.

Reference Books:

1. H Taub & D. Schilling, Gautam Sahe, "Principles of Communication Systems", TMH, 3rd Edition, (2007).
2. Bruce Carlson, Paul B. Crilly and Janet C. Rutledge, "Communication Systems:
3. An Introduction to Signals and Noise in Electrical Communications", 4th Edition, McGraw-Hill, (2002).
4. Simon Haykin, "Communication Systems", 4th Edition, John Wiley & Sons, (2001).

LIST OF EXPERIMENTS

1. Amplitude Modulation and Demodulation.
2. DSB-SC Modulation and Demodulation.
3. Frequency Modulation using Xr 2206.
4. FM Demodulation using PLL.
5. Pulse Amplitude Modulation and Demodulation.
6. Pulse Width Modulation and Demodulation.
7. Pulse Position Modulation and Demodulation.
8. Sample and Hold.
9. ASK Modulation and Demodulation.
10. FSK Modulation and Demodulation.
11. BPSK Modulation and Demodulation.
12. ADC and DAC.

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DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

DIGITAL SIGNAL PROCESSING

Course Code : 17EC2205

L-T-P-S : 2-1-2-0

Pre-requisite: 17EC2103

Credits: 4

Analysis of LTI Systems: Discrete Time systems. Convolution; Time domain analysis of LTI systems. System Function, Impulse Response, Causality and Stability of LTI systems.
Applications of Transforms: Solutions of Linear Constant Coefficient Difference Equations.

Fourier Transformation of Discrete Time Sequences, Discrete Fourier Transform: Introduction to DFT, Properties of DFT, Circular convolution, Linear convolution using DFT. **FFT:** Introduction to FFT - Radix-2 DIT and DIF FFT Algorithms, Inverse FFT using direct FFT.

Design and Realization of Digital Filters: Digital IIR Filter Design: Introduction, Normalized Butterworth functions. Design of Digital filters using Bilinear Transformation, Impulse invariance and Step Invariance.

Design and Realization of Digital FIR Filters: Characteristics of Linear Phase FIR filters, frequency Response, Designing FIR filters using Windowing Methods.

Realization of IIR Systems: Direct form, Cascade and Parallel form structures. **Realization of FIR systems:** Realization of Direct Form, Transposed Direct Form, Direct form for Linear- Phase FIR systems and Cascade Form structures

Time-Frequency analysis , **Concept of Wavelets and its applications. Applications of DSP.**

Text Books:

1. John G Proakis, Dimtris G Manolakis, "Digital Signal Processing: Principles, Algorithms and Applications", Pearson Education.
2. Alan V Oppenherim, Ronald W Schafer, John R Back, Discrete Time Signal Processing, Pearson Education, 2nd Edition.

Reference Books:

1. Gonzalez Rafael C. and Richard E. Woods, "Digital Image Processing" Second Edition, Prentice-Hall, 2002.

LIST OF EXPERIMENTS

- 1.Generation of DT sequences and Manipulation on DT sequences.
2. Frequency domain representation of DT sequences: DFT and FFT.
3. Design and Implementation of Digital IIR Filters.
4. Design and Implementation of Digital FIR Filters.
5. Spectral effects of Decimation of discrete sequences.
6. Spectral effects of Interpolation of discrete sequences.
7. Design the analysis/synthesis of two-channel orthogonal filter bank with filter length is $N = 32$, and the lowpass passband edge frequency $\omega_p = 0.43\pi$.
8. Signal Feature Extraction using Wavelet transform.
9. Automatically Insert a watermark on an Image.
- 10.Measure similarity between two voice signals.
11. Image Edge Feature Extraction Using Masks.
12. Image Feature Extraction using Wavelet transform.

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VLSI DESIGN

Course Code : 17EC3110

L-T-P-S: 2-1-2-0

Pre-requisite: 17EC2101

Credits: 4

Introduction to IC Technology – Wafer formation, Oxidation, Deposition, Diffusion, Ion implantation, Lithography, Etching, Metallisation, Packaging. MOS, PMOS, NMOS, CMOS & BiCMOS technologies. **BASIC ELECTRICAL PROPERTIES:** Basic Electrical Properties of MOS and BiCMOS Circuits: Ids-Vds relationships, MOS transistor threshold Voltage, gm, gds, figure of merit ; Pass transistor, NMOS Inverter, Various pull ups, CMOS Inverter analysis and design, Bi-CMOS Inverters.

Vlsi Circuit Design Processes: VLSI Design Flow, MOS Layers, Euler path-based Stick Diagrams, Concepts of lambda-based design Rules for wires, transistors and contacts, Layout Diagrams for NMOS and CMOS Inverters and Gates, Scaling of MOS circuits, Limitations of Scaling.

Gate Level Design: Basic circuit concepts of sheet resistance, area capacitance applied to MOS circuits and calculations of delays for inverter circuits, Logical Effect

Circuit Design Flow: Concepts of Circuit simulation and Synthesis, Placement and Routing, Related Design capture tools, Design Verification Tools, CMOS TESTING : CMOS Testing, Need for testing, Test Principles, Design Strategies for test, Chip level Test Techniques, System-level Test Techniques.

Text books:

1. Essentials of VLSI circuits and systems – Kamran Eshraghian, Eshraghian Douglas and A. Pucknell, PHI, 2005 Edition.
2. Principles of CMOS VLSI Design – Weste and Eshraghian, Pearson Education, 1999.

Reference Books:

1. VLSI Design- Dr K Lal Kishore, Dr V S V Prabhakar, IK International 2010.

LIST OF EXPERIMENTS

1. Design and analysis of CMOS Inverter.
2. Design and verify Logic gates using CMOS Logic.
3. Implementation of Boolean expressions using CMOS Logic.
4. Design of half adder using CMOS Logic.
5. Design of 2:1 MUX using Pass Transistor and Transmission Gate Logic.
6. Implementation of SR Latch using CMOS Logic.
7. Design of D-Flip Flop using CMOS Logic.
8. Physical Design and Verification of Digital Logic Cells.
9. Physical Design and Verification of SRAM cell.
10. Schematic and Physical Design of Ring Oscillator.

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COMPUTER NETWORKS

Course Code: 17EC3107

L-T-P-S: 3-0-2-0

Pre-requisite: NIL

Credits: 4

Use of Computer Networks, Network Hardware, Network software, Reference models, Example Networks Physical Layer: The theoretical basis for Data Communication, Guided Transmission media, Modems, ADSL, Trunks and Multiplexing.

Switching Data Link Layer: DLL design issues. Error Detection and Correction, Elementary data link protocols, sliding window protocols. Medium Access Control Sub layer: Channel allocation problem, multiple access protocols, Ethernet.

Network Layer: Network layer design issues, Routing algorithms, congestion control algorithms, Quality of service, Internetworking, network layer in the Internet

Transport Layer: Transport service, Elements of transport protocols, Internet transport protocols: TCP&UDP, Performance Issues Application Layer: Domain Name System, Electronic Mail, and World Wide Web.

Text Books

1. Andrew S. Tanenbaum, David J. Wetherall, Computer Networks, Prentice Hall, Fifth Edition.2011
2. Behrouz A. Fourouzan, TCP/IP Protocol Suite, Tata McGraw Hill, Third Edition, 2006.

Reference Books

1. James F. Kurose, Keith W. Ross, "Computer Networking: A Top-Down Approach", Pearson Education, 2012.
2. William Stallings, Data and Computer Communications, 7/e, Pearson Edition, 2007
3. John Goerzon, Tim bower, Brandon Rhodes, foundation of python network programming, 2010, edition 2, publisher: Press

ELECTRONIC SYSTEM DESIGN WORKSHOP

Course Code: 17EC3108

L-T-P-S: 2-0-4-0

Pre-requisite: 17EC2101 & 17EC2102

Credits: 4

Electronic Systems and Classifications Micro-electronics technology, Product development process and Life Cycle. Electronic Product design and development Methodology, Designs using Sensors, Isolators, Drivers and Actuators, ADCs and DACs. Electronic systems related to: Automobile, Communication, Industrial, Instrumentation, Mechatronics, Medical and Power Electronics,

Specifications: Electronic systems and Amplifier types -Transient, Distortion, Frequency, DC and small signal specifications, Power dissipation. **Amplifier types:** Linear, Audio RF, Servo. *Interstage coupling issues in RF and UHF amplifier.*

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Electronic Systems Design process: Elements of design process (with examples) Design of Electronic Circuits (with examples), Design , assembly and testing of Low , medium and large complexity products and packaging using Analog , Digital, Micon and Electromechanical components.

PCB Fabrication and design: Artwork of PBBs using PC software, Fabrication of Single/double sided PCBs, SMD techniques, EMI/EMC compatibility, High frequency designs, PTH, Multilayer PCB desings grounding in mixed signal system. EMI/EMC:Designing for (EMC), Cabling and shielding techniques

Text books:

1. Electronic Instrument Design, 1st edition; by: Kim R.Fowler; Publisher: Oxford University Press, 2015.
2. Karl. T. Ulrich, Steven D. Eppinger, “ Product design & development”, Mc Graw Hill Companier 5th edition
3. Electronic Product Design, R.G.Kaduskar, V.B.Baru, Wiley India 2nd edition

Reference Books:

1. Printed Circuit Boards - Design & Technology, 1st edition; by: Walter Bosshart; Tata McGraw Hill
2. David a. Bell electronic devices and circuits 5th edition.
3. Monograph on Electronic circuit Design: Goyal &Khetan

WIRELESS COMMUNICATIONS

Course Code: 17EC4111

L-T-P-S: 3-0-0-0

Pre-requisite: 17EC2206

Credits: 4

GSM Technology: Evolution of wireless Technologies from 2G to 4G, Basic challenges in radio communication, frequency reuse concept, Multi-access techniques, the basic subsystems in GSM networks, elements in GSM networks, main interfaces in a GSM network, Air/Abis, Roaming and Handover, Location registration and location update, Capacity enhancement techniques.

GPRS Architecture (2.5G): SGSN and GGSN, tunneling and PDP Context, location area and routing area, Radio block encoding for three GPRS coding schemes, Edge Architecture (2.75G) and Modulation coding schemes.

CDMA & UMTS: Walsh codes PRN codes, Third-Generation (3G) Wireless Systems, SMS Architecture, Macro Diversity, CDMA codecs and Architectures, power control in CDMA, Handover in CDMA, UMTS architecture, UMTS authentication.

4G LTE: 4G Commitments. Relevant standards. EPC network SAE architecture, E-UTRAN and EPC

4G Architecture, OFDMA in detail, MIMO in LTE, LTE Data rates, VOLTE

Text Books:

1. Timo Halonen, Javier Romero, Juan Melero - GSM, GPRS and EDGE Performance_ Evolution Towards 3G_UMTS (2003, Wiley)
2. An Introduction to LTE: LTE, LTE-Advanced, SAE and 4G Mobile Communications By Christopher Cox J .E berspäc he r, H . -J . Vöge l, C . Betts
3. GSM – Architecture, Protocols and Services Third Edition tette rand C . Hartmann, © 2009 John Wiley & Sons, Ltd.
4. Wireless information networks second edition kavehpahlavan allen h.levesque

References Books

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1. ITI SAHA MISRA "Wireless Communications and Networks", Publisher-McGraw Hill India,

PROFESSIONAL ELECTIVES

(Skill based Domains)

SIGNAL AND IMAGE PROCESSING DOMAIN

DIGITAL IMAGE PROCESSING

Course Code: 17EC3051

Pre Requisite: 17EC2205

Syllabus:

L-T-P-S:2-0-2-0

Credits: 3

Image Enhancement: Digital Image definitions, Imaging geometries, Types of neighborhoods, Intensity transformations, contrast stretching, histogram equalization, Correlation and convolution, Smoothing filters, sharpening filters, gradient and Laplacian, Hotelling Transform, Fourier Transforms and properties, FFT (Decimation in Frequency and Decimation in Time Techniques), Convolution, Correlation, 2-D sampling, Discrete Cosine Transform, Frequency domain filtering.

Image Restoration: Basic Framework, Interactive Restoration, Image deformation and geometric transformations, image morphing, Restoration techniques, Noise characterization, Noise restoration filters, Adaptive filters, Linear, Position invariant degradations, Estimation of Degradation functions, Restoration from projections. **Image Segmentation:** Boundary detection based techniques, Point, line detection, Edge detection, Edge linking, local processing, regional processing, Hough transform, Thresholding, Iterative thresholding, Otsu's method, moving averages, Multivariable thresholding, Region-based segmentation, Watershed algorithm, Use of motion in segmentation

Morphological Image Processing: Basics, SE, Erosion, Dilation, Opening, Closing, Hit-or-Miss Transform, Boundary Detection, Hole filling, connected components, convex hull, thinning, thickening, skeletons, pruning, Geodesic Dilation, Erosion, Reconstruction by dilation and erosion.

Image Compression: Encoder-Decoder model, Types of redundancies, Lossy and Lossless compression, Entropy of an information source, Shannon's 1st Theorem, Huffman Coding, Arithmetic Coding, LZW coding, Transform Coding, Sub-image size selection, blocking artifacts, Run length coding, FAX compression (CCITT Group-3 and Group-4), Symbol-based coding, JBIG-2, Bit-plane encoding, Bit-allocation, Zonal Coding, Threshold Coding, JPEG, Lossless predictive coding, Lossy predictive coding, Motion Compensation

Simulation Software: MATLAB[®] Image processing Toolbox, Simulink for Image Analysis, PDEs, and Applications to Image Analysis, Python, VC++ and OpenCV implementations are encouraged.

Text Books:

1. Digital Image Processing (3rd Edition) Hardcover – August 31, 2007 by Rafael C. Gonzalez, Richard E. Woods.
2. Algorithms for Image Processing and Computer Vision Paperback – December 21, 2010 by J. R. Parker.

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Reference Books:

1. García, Gloria Bueno, Oscar Deniz Suarez, José Luis Espinosa Aranda, Jesus Salido Tercero, Ismael Serrano Gracia, and Noelia Vázquez Enano. Learning image processing with opencv. Packt Publishing Ltd, 2015.
2. <http://www.dreamincode.net/forums/showtopic9870.htm>

LIST OF EXPERIMENTS

1. Histogram processing.
2. Histogram Equalization (continuous case).
3. Histogram Equalization (Discrete case).
4. Linear Spatial Filtering.
5. Nonlinear Spatial Filtering.
6. Frequency Domain Low-pass Filtering.
7. Frequency Domain High-pass Filtering.
8. Edge detection.
9. Image Restoration.
10. Registering an Image Using Normalized Cross- Correlation.

ARTIFICIAL NEURAL NETWORKS

Course Code: 17EC3052

Pre Requisite: Matlab Skills

L–T–P –S: 3-0-0-0

Credits: 3

Introduction to Artificial Neural Networks: Introduction, history, structure and function of single neuron, neural net architectures, neural learning, use of neural networks. **Artificial Neural Networks:** McCulloch-Pitts model, different network structures, approximation of nonlinear phenomenon, MCP error correction-based learning **Logic Networks:** Boolean functions, feed-forward vs. recurrent networks, finite automata and finite state machines, harmonic analysis via Hadamard-Walsh Transform.

Weighted Networks - The Perceptron: pattern recognition via Perceptron, limitations of the perceptron, linearly separable functions, **Perceptron Learning Algorithms:** learning algorithm types (supervised vs. unsupervised), vector notation, algorithmic learning, Markov Decision Processes and Dynamic Programming.

The Back-Propagation Learning Algorithm: multi-layer perceptron networks, alternative activation functions (e.g. sigmoid), back propagation learning algorithm theory, implementation of back propagation on Feed Forward Nets. **More Advanced Neural Network Topics Overview:** clustering, k-means and k-nearest neighbours, PCA, one vs. two-layer networks, over fitting vs. under fitting, gradient descent, momentum, initial weight selection, data decorrelation, complexity theory, associative memories.

Advanced Networks: Hopfield ANN, Training and Testing algorithms. Bi – Directional Associative Memories, types, Training and testing. **Software:** Python and Matlab to simulate various network architectures, learn training and testing procedures, validate the outputs and deployment for commercial applications. **Commercially Available ANNs:** A Case study and Simulation. 1. Use ANN to recognize Hand written characters using a benchmark dataset.2.

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Study ANN and their Business applications. 3. Simulation of an industrial wastewater treatment plant using artificial neural networks and principal components analysis.

Text Books:

1. Laurene Fausett, "Fundamentals of Neural Networks" , Pearson Education, 2004.
2. Simon Haykin, "Neural Networks- A comprehensive foundation", Pearson Education, 2003.

Reference Books:

1. S.N.Sivanandam, S.Sumathi,S. N. Deepa "Introduction to Neural Networks using MATLAB 6.0", TATA Mc Graw Hill, 2006.
2. S. Rajasekharan and G. A. Vijayalakshmi pai, "Neural Networks, Fuzzy logic, Genetic algorithms: synthesis and applications", PHI Publication, 2004.

FUZZY LOGIC SYSTEMS

Course Code: 17EC3053

L–T–P–S: 3-0-0-0

Pre Requisite: Matlab Programming

Credits: 3

Introduction to Fuzzy Logic: Classical and Fuzzy Sets, Membership Function, Membership Grade, Universe of Discourse, Linguistic Variables, Operations on Fuzzy Sets: Intersections, Unions, Negation, Product, Difference, Properties of Classical set and Fuzzy sets, Fuzzy vs Probability, Fuzzy Arithmetic, Fuzzy Numbers.

Fuzzy Relations & Aggregations: Essential Elements of Fuzzy Systems, Classical Inference Rule, Classical Implications and Fuzzy Implications, Crisp Relation and Fuzzy Relations, Composition of fuzzy relations, Cylindrical Extension and Projection. Fuzzy IF-THEN rules, Inference: Scaling and Clipping Method, Aggregation, Fuzzy rule based Model: Mamdani Model, TSK model, Fuzzy Propositions, Defuzzification: MOM, COA.

Fuzzy Optimization and Neuro Fuzzy Systems: Fuzzy optimization –one-dimensional optimization. Introduction of Neuro-Fuzzy Systems, Architecture of Neuro Fuzzy Networks.

Application of fuzzy logic: Power plants, Industrial Control, AC Induction motor control, Traffic control, water treatment system, chilling systems, Washing machine Control, Fuzzy logic in DCS & PLC, Industrial Index motion control, Automatic generation control, power control, Automotive applications, Drying process control. Implement using an open source software such as python.

Text Books:

1. Timothy J. Ross, " Fuzzy Logic With Engineering Applications", Tata McGraw- Hill Inc. 2000.
2. Kwang Hyung Lee, First Course on Fuzzy Theory and Applications, Springer, 2005

References:

1. Klir, J.G. – Bo Yuan: Fuzzy Sets and Fuzzy Logic, Prentice Hall 1995.
2. Nguyen, H. T. – Walker, E. A.: Fuzzy Logic, Chapman and Hall, NY 2000.

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MACHINE LEARNING AND COMPUTING

Course Code :17EC3054

L–T–P–S: 3-0-0-0

Pre Requisite: 17EC2205

Credits : 3

Introduction: Definition of learning systems. Goals and applications of machine learning. Aspects of developing a learning system: training data, concept representation, function approximation.

Machine Learning Perception: Learning from data, Overfitting, regularization, cross-validation **Supervised Learning:** Nearest Neighbour, Naive Bayes, Logistic Regression, Support Vector Machines, Neural Networks, Decision Trees.

Unsupervised & Semi-Supervised Learning: Clustering (K-means, GMMS), Factor Analysis (PCA, LDA), **Learning Theory:** Bias and Variance, Probably Approximately Correct (PAC) Learning.

Structured Models: Bayesian Network, Hidden Markov Models, Reinforcement Learning, Applications of ML to Perception: Computer Vision, Natural Language Processing, Design and implementation Machine Learning Algorithms, Feedforward Networks for Classification, Convolutional Neural Network based Recognition using Keras, Tensorflow and OpenCV.

Simulation: Use VGG Net and AlexNet pre-trained models for face recognition and human pose estimation problems.

Text Books:

1. Mitchell, Tom. *Machine Learning*. New York, NY: McGraw-Hill, 1997. ISBN: 9780070428072.
2. MacKay, David. *Information Theory, Inference, and Learning Algorithms*. Cambridge, UK: Cambridge University Press, 2003. ISBN: 9780521642989.

Reference Books::

1. Bishop, Christopher. *Neural Networks for Pattern Recognition*. New York, NY: Oxford University Press, 1995. ISBN: 9780198538646.
2. Duda, Richard, Peter Hart, and David Stork. *Pattern Classification*. 2nd ed. New York, NY: Wiley-Interscience, 2000. ISBN: 9780471056690.
3. Hastie, T., R. Tibshirani, and J. H. Friedman. *The Elements of Statistical Learning: Data mining, Inference and Prediction*. New York, NY: Springer, 2001. ISBN: 9780387952840.

Journals:

1. IEEE Transactions on Evolutionary Computation.
2. IEEE Transactions on Pattern Analysis and Machine Intelligence.
3. Machine Vision and Applications, Springer.

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DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

COMPUTER VISION APPLICATIONS

Course Code: 17EC3055

L–T–P–S: 3-0-0-0

Pre Requisite: 17EC3051

Credits: 3

Image formation and Image Processing: Introduction to Computer Vision; Geometric primitives and transformations: Geometric primitives, 2D transformations, 3D transformations, 3D rotations, 3D to 2D projections; Image Processing: Histogram Processing, Linear filtering, Fourier transforms, Image Enhancement, Restoration.

Local Image Features Extraction: Edges: Edge detection, Edge linking; Lines: Hough transforms, Orientation Histogram, HOG, SIFT, SURF; Scale-Space Analysis- Image Pyramids and Gaussian derivative filters, Gabor Filters and DWT.

Image Segmentation and Recognition: Active contours: Snakes, Dynamic snakes and Condensation, Scissors, Level Sets; Graph-based segmentation, Texture Segmentation; Object detection: Face detection, Detecting Humans, Detecting Boundaries, Datasets and Resources.

Pattern Analysis: Clustering: K-Means, K-Medoids, Mixture of Gaussians; Classifiers: SVM, ANN, CNN; Dimensionality Reduction: PCA, LDA, ICA. **Case Study and Simulations:** Study how Facebook, Google, Netflix, LinkedIn, Instagram and Amazon use various image processing algorithms for face recognition, human identification, scene analysis and content analysis. Develop a computer vision model for face detection in the wild on KLEF campus.

Text Books:

1. Richard Szeliski, Computer Vision: Algorithms and Applications, Springer-Verlag London Limited 2011.
2. Computer Vision: A Modern Approach, D. A. Forsyth, J. Ponce, Pearson Education, 2011.

References:

1. Richard Hartley and Andrew Zisserman, Multiple View Geometry in Computer Vision, Second Edition, Cambridge University Press, March 2004.
2. K. Fukunaga; Introduction to Statistical Pattern Recognition, Second Edition, Academic Press, Morgan Kaufmann, 1990.
3. R.C. Gonzalez and R.E. Woods, Digital Image Processing, Addison- Wesley, 1992.

PATTERN RECOGNITION AND ANALYSIS

Course Code: 17EC3056

L–T–P–S: 3-0-0-0

Pre-Requisite: 17EC3051

Credits: 3

Introduction and general pattern recognition concerns: What is Pattern Recognition (PR). Pattern Recognition Approaches, Examples of PR Applications, Pattern Recognition Extensions.

Statistical pattern recognition: Introduction, Supervised, Parametric Approaches, Unsupervised Approaches. Bayes Classifier: Bayes Theorem, Minimum Error Rate Classifier, Estimation of Probabilities Comparison with the NNC, Naive Bayes Classifier.

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Hidden Markov Models: Markov Models for Classification, Hidden Markov Models, HMM Parameters, Learning HMMs, Classification Using HMMs, Classification of Test Patterns.

Syntactic (structural) pattern recognition: Introduction, Structural Analysis Using Constraint Satisfaction and Structural Matching, The Formal Language-based Approach, Learning/Training in the Language-based Approach. **Neural pattern recognition:** Nearest Neighbour Based Classifiers: Nearest Neighbour Algorithm, Variants of the NN Algorithm, Use of the Nearest Neighbour Algorithm for Transaction Databases, Minimal Distance Classifier (MDC).

Applications: Finger print recognition, Leaf classification, failure analysis of an Engineering student in a subject, predict your marks using a pattern classifier in the end exam based on the previous performances and other factors, Defective bottle elimination in a bottling plant, rice classification, food quality inspection.

Text Book:

1. R. O. Duda, P. E. Hart, and D. G. Stork, *Pattern Classification*, 2nd edition, Wiley-Inter science. ISBN 0-471-05669-3 .
2. Hastie, Tibshirani, Friedman, " The Elements of Statistical Learning," Springer.
3. Pattern Recognition, An Algorithmic Approach, M. Narasimha Murty · V. Susheela Devi, 2011, Universities Press (India) Pvt. Ltd, Co-Published by SPRINGER.

References:

1. Fukunaga, " Introduction to Statistical Pattern Recognition," Academic Press.
2. C.M. Bishop, " Pattern Recognition and Machine learning," Springer.
3. Ewens & Grant, " Statistical Methods in Bioinformatics ," Springer.

HUMAN MACHINE INTERACTION

Course Code: 17EC3057

L-T-P-S: 3-0-0-0

Pre Requisite: 17EC3051, Matlab Skills

Credits: 3

Introduction: Historical evolution of the field, Concept of usability - definition and elaboration, HCI and software engineering, GUI design and aesthetics, Prototyping techniques.

Model-based Design and evaluation: Basic idea, introduction to different types of models, GOMS family of models (KLM and CMN-GOMS, Fitts' law and Hick-Hyman's law, Guidelines in HCI: Norman's seven principles, Norman's model of interaction, Heuristic evaluation, Contextual inquiry, Cognitive walkthrough.

Empirical research methods in HCI: Experiment design and data analysis (with explanation of one-way ANOVA), Task modelling and analysis through Hierarchical task analysis (HTA), Dialog Design using FSM (finite state machines), Cognitive architecture, Object Oriented Modelling of User Interface Design.

Design -Case Studies: 1. Multi-Key press Hindi Text Input Method on a Mobile Phone, GUI design for a mobile phone based Matrimonial application, Employment Information System for unorganised construction workers on a Mobile Phone.

Text Books:

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1. Dix A., Finlay J., Abowd G. D. and Beale R. Human Computer Interaction, 3rd edition, Pearson Education, 2005.
2. Preece J., Rogers Y., Sharp H., Baniyon D., Holland S. and Carey T. Human Computer Interaction, Addison-Wesley, 1994.

Reference Books:

1. B. Shneiderman; Designing the User Interface, Addison Wesley 2000 (Indian Reprint).

VIDEO SURVEILLANCE

Course Code :17EC3058

L-T-P-S : 3-0-0-0

Pre Requisite: 17EC3051

Credits : 3

Fundamentals: Image feature extraction: Feature point detection, Scale Invariant Feature Transform, Edge Detection, Color features. Multiple View Geometry: Perspective Projection Camera Model, Epipolar Geometry, Probabilistic inference, Pattern recognition and Machine learning: SVM and AdaBoost. Background Modelling and Subtraction: Kernel Density Approximation, Background Modelling and Subtraction Algorithms.

Detection and Tracking: Pedestrian Detection and Tracking: Pedestrian detection by boosting local shape features: Tree learning algorithms, Edgelet features. Occluded pedestrian detection by part combination. Pedestrian tracking by Associating Detection Responses. Vehicle Tracking and Recognition: Joint tracking and Recognition framework, Joint appearance-motion generative model, Inference algorithm for joint tracking and recognition. Human Motion Tracking: Image feature representation, Dimension reduction and Movement dynamics learning.

Activity Recognition and Camera Networks: Human action recognition: Discriminative Gaussian Process dynamic model. Human Interaction recognition: Learning human activity, Track-body Synergy framework; Multi-camera calibration and global trajectory fusion: Non-overlapping and overlapping cameras.

Systems and Applications: Attribute-based people search, Soft biometrics for video surveillance: Age estimation from face, Gender recognition from face and body, Detection and tracking of Moving Objects.

Text Books:

1. Yunqian Ma, Gang Qian, "Intelligent Video Surveillance: Systems and Technology", CRC Press (Taylor & Francis Group), 2010.
2. Fredrik Nilsson, Communications Axis, "Intelligent Network Video: Understanding Modern Video Surveillance Systems", CRC Press (Taylor & Francis Group), 2008.

Reference Books:

1. Anthony C. Caputo, "Digital Video Surveillance and Security", Butterworth-Heinemann, 1st Ed., 2010.
2. Herman Kruegle, "CCTV Surveillance, Second Edition: Video Practices and Technology" Butterworth-Heinemann, 2nd Ed., 2006.

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AUDIO SIGNAL PROCESSING

Course Code : 17EC3059

L–T–P–S:3-0-0-0

Pre-Requisite: 17EC2103

Credits: 3

Introduction To Audio Systems: Introduction, Studio Technology, Digital Transmission System, Storage Media, Audio Components at Home, Signal Quantization, Dither, AD/DA Conversion, jitter, spectral analysis, audio and Speech processing fundamentals.

Audio Processing Systems:Digital Audio Interfaces, Single-processor System, Scalable Audio System, types of audio formats, decoding, encoding audio quality measurements, algorithms. **Equalizers:** Recursive Audio Filters, Non-recursive Audio Filters, Multi-complementary Filter Bank.

Audio Room Simulation: Room Acoustics, Model-based Room Impulse Responses, Measurement of Room Impulse Responses, Simulation of Room Impulse Responses, Early Reflections, Subsequent Reverberation.

Audio Coding: Lossless Audio Coding, Lossy Audio Coding, Psychoacoustics, ISO-MPEG-1 Audio Coding, MPEG-2. Programming:audio codecs, voice codecs, Simulate aAudio codec and data converter on any software platform. Also develop a noise canceller in audio systems.

Text Books:

1. Digital Audio Signal Processing, 2nd Edition, Udo Zolzer, ISBN: 978-0-470-99785-7, A John Wiley & Sons, Ltd, Publication.
2. Audio signal processing for nextgeneration multimedia communication systems, Yiteng (Arden) Huang, Jacob Benesty, Kluwer Academic Publishers 2004.

REFERENCE BOOKS:

1. Applications of digital signal processing to audio and acoustics, Mark Kahrs and Karlheinz Brandenburg, Kluwer Academic Publishers 2002.
2. Audio signal processing and coding, Andreas Spanias, Ted Painter and Venkatraman Atti, Wiley-Interscience, A John Wiley & Sons, Inc., Publication, 2007.

STATISTICAL SIGNAL PROCESSING

Course Code : 17EC3060

L–T–P–S: 3– 0 – 0-0

Pre Requisite: 17EC2205

Credits:3

Review of random variables: Distribution and density functions, moments, independent, uncorrelated and orthogonal random variables, Central Limit theorem, Random processes, wide-sense stationary processes, autocorrelation and auto covariance functions, Gaussian Process and White noise process.

Parameter Estimation Theory: Bayesian estimation, Principle of estimation and applications, Properties of estimates, unbiased and consistent estimators, Efficient estimators; Criteria of estimation: the methods of maximum likelihood and its properties.

Estimation of signal in presence of white Gaussian Noise: Linear Minimum Mean-Square Error Filtering: Wiener Hoff Equation, FIR Wiener filter, Causal IIR Wiener filter. **Spectral**

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analysis: Estimated autocorrelation function, periodogram, Averaging the periodogram (Bartlett Method), Welch modification, Introduction to parametric and frequency methods.

Kalman filtering: State-space model and the optimal state estimation problem, discrete Kalman filter, extended Kalman filter using Matlab.

Text Books:

1. M. Hays: Statistical Digital Signal Processing and Modelling, John Willey and Sons, 1996.
2. M.D. Srinath, P.K. Rajasekaran and R. Viswanathan: Statistical Signal Processing with Applications, PHI, 1996.

ADAPTIVE SIGNAL PROCESSING

Course Code :17EC3061

L–T–P–S : 3-0-0-0

Pre Requisite: 17EC2205

Credits: 3

Adaptive systems: Definitions and characteristics - applications – properties-examples - adaptive linear combiner input signal and weight vectors - performance function-gradient and minimum mean square error - introduction to filtering-smoothing and prediction - linear optimum filtering-orthogonality - Wiener – Hopf equation-performance surface.

Searching performance surface-stability and rate of convergence: Learning curve-gradient search - Newton's method - method of steepest descent - comparison - Gradient estimation - performance penalty - variance - excess MSE and time constants – mis-adjustments

LMS algorithm convergence of weight vector: LMS/Newton algorithm - properties - sequential regression algorithm - adaptive recursive filters - random-search algorithms - lattice structure - adaptive filters with orthogonal signals

Applications-adaptive modelling and system identification: Multipath communication channel, geophysical exploration, FIR digital filter synthesis. **Inverse adaptive modelling:** Equalization, and deconvolution adaptive equalization of telephone channels-adapting poles and zeros for IIR digital filter synthesis.

Text Books:

3. B. Widrow and S.D. Stearns, Adaptive Signal Processing, Prentice Hall, Englewood Cliffs, NJ, 1985.
4. Alexander D. Poularikas, Zayed M. Ramadan, Adaptive filtering primer with MATLAB, CRC Press, 2006.

References:

4. S. Haykin, Adaptive Filter Theory, Fourth Edition, Pearson Education LPE, 2007
5. A. H. Sayed, Adaptive Filters, John Wiley & Sons, NJ, ISBN 978-0-470-25388-5, 2008.

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BIOMEDICAL SIGNAL PROCESSING

Course Code : 17EC4062

L–T–P–S:3-0-0-0

Pre Requisite: 17EC2103

Credits: 3

Introduction To Biomedical Signals - Examples of Biomedical signals - ECG, EEG, EMG etc., Tasks in Biomedical Signal Processing - Computer Aided Diagnosis. Origin of bio potentials - Review of linear systems - Fourier Transform and Time Frequency Analysis (Wavelet) of biomedical signals- Processing of Random & Stochastic signals – spectral estimation – Properties and effects of noise in biomedical instruments - Filtering in biomedical instruments. **Concurrent, Coupled and Correlated Processes - Illustration with case studies** – Adaptive and optimal filtering - Modeling of Biomedical signals - Detection of biomedical signals in noise -removal of artifacts of one signal embedded in another -Maternal-Fetal ECG - Muscle-contraction interference. Event detection – case studies with ECG & EEG - Independent Component Analysis - Cocktail party problem applied to EEG signals -Classification of biomedical signals. **Cardio Vascular Applications:** Basic ECG - Electrical Activity of the heart- ECG data acquisition – ECG parameters & their estimation - Use of multi-scale analysis for ECG parameters estimation - Noise & Artifacts- ECG Signal Processing: Baseline Wandering, Power line interference, Muscle noise filtering – QRS detection -Arrhythmia analysis. **Data Compression: Lossless & Lossy- Heart Rate Variability** – Time Domain measures - Heart Rhythm representation - Spectral analysis of heart rate variability - interaction with other physiological signals. **Neurological Applications:** The electroencephalogram - EEG rhythms & waveform - categorization of EEG activity - recording techniques - EEG applications- Epilepsy, sleep disorders, brain computer interface. Modeling EEG- linear, stochastic models – Non-linear modeling of EEG - artifacts in EEG & their characteristics and processing – Model based spectral analysis - EEG segmentation - Joint Time-Frequency analysis – correlation analysis of EEG channels - coherence analysis of EEG channels.

TEXT BOOKS

1. D.C.Reddy ,“Biomedical Signal Processing: Principles and techniques” ,Tata McGraw Hill, New Delhi, 2005
2. Willis J Tompkins , Biomedical Signal Processing -, ED, Prentice – Hall, 1993

REFERENCES BOOKS

1. R. Rangayan, “Biomedical Signal Analysis”, Wiley 2002.
2. Bruce, “Biomedical Signal Processing & Signal Modeling,” Wiley, 2001
3. Sörnmo, “Bioelectrical Signal Processing in Cardiac & Neurological Applications”
4. Semmlow, “Bio-signal and Biomedical Image Processing”, Marcel Dekker
5. Enderle, “Introduction to Biomedical Engineering,” 2/e, Elsevier, 2005

BIO-MEDICAL IMAGING

Course Code : 17EC4063

L–T–P–S : 3-0-0-0

Pre Requisite: 17EC3051

Credits:3

Syllabus:

Introduction to Biomedical Imaging: Basic definitions (biomedical imaging, body planes, structural and an atomical imaging), Physics concepts (e.g. wave equations, energy transport, chromophores and contrasts), Image formation and reconstruction, and levels of analysis, The temporal-spatial-signal matrix, Examples of imaging systems.

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Image formation and acquisition principles: Fundamental models of image formation, The imaging system, Image quality and uncertainties in image formation (digitization, quantum efficiency, metamerism, calibration, CNR, SNR), Major imaging modalities: Magnetic Resonance Imaging, Optical Imaging (inc. X-Ray, OCT, NIRS, microscopy, confocal imaging, one and two photon imaging, fluoroscopy, CT), Electrical and magnetic imaging (inc. EEG/MEG, EMG, ECG, etc), Ultrasound.

Image reconstruction: Inverse problem and the Jacobian, Regularization, Image processing and analysis, Registration, Feature extraction; edge detection, Hough transform, Filtering; Noise removal and signal enhancement, Segmentation, Domain transformation; Fourier and Wavelets.

Image interpretation: Data mining, Advanced topics on Neuroimaging, Neuroimages (EEG, fNIRS, fMRI, PET/SPECT), Analysis and Interpretation Models: Ultrasound image enhancement (De-Noising). MRI image segmentation. Compare the medical images and their contents. Use Various image processing models on medical images for content extraction and their success and failure analysis. **Case Study:** Use of IBM Watson in medical diagnostics. Design a model for miming medical image contents to diagnose a disease (Cancer, Diabetic retinopathy, liver disfunction) in real time.

Textbook:

1. Introduction to Biomedical Imaging, Andrew G. Webb. December 2002, Wiley-IEEE press.

References:

1. The Essential Physics of Medical Imaging (2nd Edition), J. T. Bushberg, J.A. Seibert, E.M. Leidholdt Jr., J. M. Boone. November 2001.

KNOWLEDGE BASED SYSTEMS

Course Code : 17EC4064

L–T–P–S: 3-0-0-0

Pre Requisite: NIL

Credits : 3

Introduction to Knowledge Based Systems: Objectives of KBS, Components, Categories, Difficulties with the KBS. Knowledge Based System Architecture – Source of Knowledge, Types of Knowledge, Basic Structure, Knowledge Bases, Inference Engine, Self-Learning, Reasoning, Explanation, Applications. Limitations of Knowledge Based Systems.

Developing Knowledge Based Systems – Knowledge Based System Development Model, Knowledge Acquisition, Techniques for Knowledge Acquisition, Sharing Knowledge, Updating Knowledge. **Knowledge Representation and Reasoning** – The propositional calculus and Resolution, Predicate calculus and Resolution, Representing Procedural Knowledge, Reasoning with Uncertain Information, Learning and Acting with Bayes Nets.

Knowledge Management - Introduction, Perspectives, Evolution, Elements of Knowledge Management, Knowledge Management Process, Tools and Technologies, Knowledge Management Roles and Responsibilities, Knowledge Management Models. Agent Based Systems – Characteristics, Types of Agents, Agent Communication Language, Multi Agent Systems.

Fuzzy Logic, Artificial Intelligence and Genetic Algorithm: Fuzzy logic and fuzzy sets: Membership functions, operations on fuzzy sets, types of fuzzy functions, Fuzzy

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relationships; Biological Neurons, Artificial Neurons, Neural Network Architecture; Genetic Algorithms, Genetic cycles, Basic Operations of a Genetic algorithm.

Text Books:

1. Rajendra Akerkar, Priti Sajja, “Knowledge-Based Systems”, Jones & Bartlett Learning, 1st Ed., 2010.
2. Nils J Nilsson “Artificial Intelligence – A New Synthesis”, Morgan Kaufman Publishers 1st Ed., 2003.

Reference Books:

1. Cornelius T Leondes, “Knowledge-Based Systems: Techniques and Applications”, Academic Press, 1st Ed., 2000.
2. Elias M Awad, Hassan M Ghaziri, “Knowledge Management”, Pearson Education, 1st Ed., 2007.

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MOBILE & COMMUNICATIONS DOMAIN

INFORMATION THEORY & CODING

Course Code: 17EC3065

L-T-P-S: 3-0-0-0

Pre Requisite: NIL

Credits : 3

Introduction: Measure of information, Average information content of symbols in long independent and dependent sequences, Entropy calculation for extension of source. Mark-off statistical model for information source, Entropy and information rate of mark-off source.

Encoding of source output Shannon's encoding algorithm for dependent and independent sequences. Discrete communication channels, Continuous channels. Source coding theorem, Huffman coding, discrete memory less Channels, Mutual information, Properties of mutual information, Channel Capacity. Channel coding theorem, Differential entropy and mutual information for continuous ensembles, Channel capacity Theorem

Error Control coding: Introduction, Types of errors, examples, Types of codes Linear Block Codes: Matrix description, Error detection and correction, Standard arrays and table look up for decoding.

Binary cycle codes: Algebraic structures of cyclic codes, encoding using an (n-k) bit shift register, Syndrome calculation, BCH codes, RS Codes, Olay codes, Shortened cyclic codes, Burst error correcting codes. Burst and Random Error correcting codes.

Convolution Codes: Block diagram of encoder, Impulse response of encoder, Time domain approach and Transform domain approach. State representation and state diagram, Tree diagram, trellis diagram.

Text Books

1. K. Sam Shanmugam, "Digital and Analog communication systems", John Wiley, (1996).
2. Simon Haykin, "Digital communication", John Wiley, (2003).
3. R Bose, "Information Theory, Coding and Cryptography", TMH 2007

Reference books:

1. Elements of Information Theory by Thomas Cover, Joy Thomas
2. Channel Codes: Classical and Modern by William Ryan, Shu Lin
3. Information Theory and Reliable Communication by Robert Gallager
4. Kennedy, "Electronic Communication systems", McGraw Hill, 4th Ed., 1999.

ANTENNAS AND WAVE PROPAGATION

Course Code: 17EC3066

L-T-P-S: 3-0-0-0

Prerequisite: 17EC2212

Credits: 3

SYLLABUS:

Radiation Fields and Antenna Fundamentals: Concept of Vector Potential, Radiation of Small Current Element. Radiation of Short Dipole, Radiation from Half-Wave Dipole and its Radiation Resistance & Quarter-Wave Monopole. Antenna Parameters like Radiation Patterns, Directivity, Gain, Radiation Resistance, Polarization, Effective Length and Effective Area and Antenna efficiency.

Antenna Arrays and Antenna Types: Two Element Arrays, N- Element Linear Arrays – BSA, EFA, Directivity N-Element Linear Array with Uniform Spacing, Non-Uniform Amplitudes, Binomial Arrays, Principal of Pattern Multiplication Related Problems. Antenna Types: Travelling Wave, Folded Dipole, Yagi –Uda, Vee, Rhombic, Helical, Horn, Slot, Biconical Antenna, Reflector and Lens Antennas.

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Antenna Measurements: Introduction, Impedance/VSWR measurements, scattering parameters Types of Ranges: Anechoic Chamber, Elevated Ranges, Slant Range Ground Ranges, Near Field Ranges, CATR, Radiation Pattern Measurements, Gain Measurements.

Wave Propagation: The Three basic types of Propagation; Ground wave, space wave & sky wave propagation. Ground Wave propagation: Attenuation characteristics for Ground Wave Propagation, Sommerfield analysis of Ground wave, Losses due to earth constants. Space Wave propagation: Effect of curvature of an Ideal earth, Atmospheric effects in Space-wave propagation, Duct Propagation, Maximum range of distance for LOS. Sky Wave Propagation: Structure of Ionosphere Propagation, Refraction and Reflection of sky waves by Ionosphere, Critical frequency, Skip distance, Maximum usable Frequency, Virtual Height.

Text Books

- 1.C.A Balanis, "Antenna Theory", John Wiley & Sons, 2nd ed.
- 2.E.C. Jordan and K.G. Balmain, "Electromagnetic Waves and Radiating Systems". 2nd ed., Pearson
3. Evans, Gray E, " Antenna Measurements Techniques", Artech House, Inc
4. J S Hollis, T J Lyon, L Clayton, " Microwave Antenna Measurements, Scientific Atlanta, Inc

Reference Books

- 1.John D Kraus, "Antennas". 2nd ed., Mc Graw-Hill
- 2.William Gosling, "Radio Antennas And Propagation, Newnes
- 3.F.E.Terman , "Radio Engineering", McGraw Hill
- 4.Warren L. Stutzman, Gary A. Thiele," Antenna Theory and Design, Second Edition , John Wiley & Sons, Inc
- 5.Yi Huang, Kevin Boyle ," Antennas From Theory to Practice, John Wiley and Sons
- 6.Vincent F. Fusco, "Foundations of Antenna Theory and Techniques, Pearson Education

MICROWAVE ENGINEERING

Course Code: 17EC3067

L-T-P-S: 3-0-0-0

Pre-requisite: NIL

Credits: 3

Syllabus:

Microwave devices: Introduction to microwave Components, Reflex klystron, TWT, phase shifters, Microwave bends, E-plane Tee, H-plane Tee, Magic Tee, Directional Coupler, Isolator, Circulator & their Scattering.

Transformers & Resonators: Parameters, Impedance Transformers – Quarter wave Transformers, Microwave Resonators – Rectangular and Cylindrical Resonators, Obstacles in waveguides-Introduction, Posts in Waveguides, Diaphragms in Waveguides, Waveguide Junctions, Waveguide Feeds, Excitation of Apertures.

Filters and periodic structures: Design of Narrow Band Low Pass, Band Pass and High Pass Filters, maximally flat and Chebyshev Designs, Introduction to Periodic Structures, Floquet's Theorem, Circuit Theory Analysis of Infinite and Terminated Structures.

Millimetre wave circuits: Wave Propagation in microstrip lines, Discontinues in Microstrips, Parallel Coupled lines, Power Dividers, Microwave and Millimetre Wave Integrated Circuits.

Text Books:

1. Roger F. Harrington, "Time-Harmonic Electromagnetic Fields", McGraw-Hill.
2. Robert E Collin, "Foundation for Microwave Engineering", McGraw-Hill.

Reference Books:

1. "Analysis Methods for RF, Microwave, and Millimetre-Wave Planar Transmission Line

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Structures”, by Cam Nguyun.

OPTICAL COMMUNICATION

Course Code: 17EC3068

L-T-P-S: 3-0-0-0

Prerequisite: 17EC2206

Credits:3

Overview of optical fiber communication: Optical Fiber Communication system, optical fiber waveguides, types of fibers, cutoff wave length.

Transmission characteristics of optical fibers: Introduction, Attenuation, absorption, scattering losses, bending loss, dispersion, Intra model dispersion, Inter model dispersion.

Optical Sources and Detectors: Introduction, LED’s, LASER diodes, Photo detectors, Photo detector noise, Photo diodes

Fiber Couplers and Connectors: Introduction, fiber alignment and joint loss, single mode fiber joints, fiber splices, fiber connectors and fiber couplers.

Analog and Digital Links: Analog links – Introduction, overview of analog links, CNR, multichannel transmission techniques, RF over fiber, key link parameters, Radio over fiber links. Digital links – Introduction, point-to-point links, System considerations, link power budget, resistive budget, short wave length band, transmission distance for single mode fibers, Power penalties.

WDM and Components: WDM standards, Interferometer, multiplexer, Isolators and circulators, active optical components, variable optical attenuators, tunable optical fibers, dynamic gain equalizers, optical drop multiplexers, polarization controllers, chromatic dispersion compensators, tunable light sources.

Optical Amplifiers and Networks: Optical amplifiers, basic applications and types, semiconductor optical amplifiers, EDFA. **OPTICAL NETWORKS:** Introduction, SONET / SDH, Optical Interfaces, SONET/SDH rings, High – speed light – waveguides. OTDR, FTTX networks, digital cross connects.

Text Books:

1. Senior, John M., and YousifJamro, M., Optical fiber communications: principles andpractice, Prentice Hall, (2009) 2nded.
2. Ramaswami Rajiv, Kumar N. Sivarajan, Optical Networks: A Practical Perspective, MorganKaufmann Publishers, Elsevier (2004).
3. Willebrand Heinz, Ghuman Baksheesh. S., Free Space Optics: Enabling Optical Connectivityin Today’s Networks, Sams (2001).

Reference Books:

1. Ajoy Kumar Ghatak and K. Thyagarajan, Optical Electronics, Cambridge UniversityPress (2001) 2nded.
2. Bahaa E. A. Saleh, Malvin C. Teich, Fundamentals of Photonics, John Wiley & Sons, (2013) 2nded.
3. Mukherjee, Biswanath, Optical WDM Networks, Springer (2006).
4. Murthy, C. Siva Ram, Mohan Gurusamy, WDM Optical Networks: Concepts, Design, andAlgorithms, Prentice Hall of India (2001).
5. Maier, Marti, Optical Switching Networks, Cambridge University Press (2008).
- 6.Sivalingam, Krishna M., Subramaniam, Suresh, Emerging Optical Networks Technologies:Architectures, Protocols, and Performance, Springer (2004).

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Course Code: 17EC3069

L-T-P-S: 3-0-0-0

Prerequisite: 17EC2206

Credits: 3

Navigation Systems: Brief History of Navigation-Methods of Radio Navigation-Terrestrial and Satellite Navigation Systems-Inertial Navigation System-Inertial Measurement Unit-Accelerometers-Gyroscopes-Magnetometers-Coordinate Systems-ECI, ECEF, ENU and NED.

Analysis on Global Positioning Systems (GPS): Segments of GPS-Positioning using carrier phase measurements-GPS error sources-Differential GPS-Error minimizing using DGPS, GPS receiver architecture-Code and Carrier tracking loops-Signal detection and acquisition in Novatel GPS receiver.

Applications of Electronic Navigation Systems: GPS and INS in aircraft management- Low-Cost commercial GPS receiver-Low Cost IMU MEMS sensor-Attitude Determination-Role of Kalman Filtering in GPS/INS sensor fusion-Loosely coupled schemes-Tightly coupled schemes, UAVs for agriculture applications, google maps, missile and marine navigation applications, mining, location based services and remote sensing application.

Text Books:

5. Misra P, Enge P. "Global positioning system: Signals, measurements and performance", Second Edition, Ganga-Jamuna Press, 2011.
6. Mohinder S. Grewal, Lawrence R. Weill and Angus P. Andrews "Global Positioning Systems, Inertial Navigation Systems and Integration", Second Edition, John Wiley and Sons, 2007.

References:

1. Hofmann-Wellenhof, Bernhard, Herbert Lichtenegger, and James Collins. Global positioning system: theory and practice. Springer Science & Business Media, 2012.
2. Paul D. Groves "Principles of GNSS, inertial, and multisensor integrated navigation systems", Artech house, 2013.
3. Salychev, Oleg Stepanovich. "Applied Inertial Navigation: problems and solutions" Moscow, BMSTU press, 2004.

RF SYSTEM DESIGN

Course Code: 17EC3070

L-T-P-S: 3-0-0-0

Prerequisite: 17EC2206

Credits: 3

INTRODUCTION Overview of RF System design, RF behaviour of passive components, basics of transmission lines, S parameters, smith chart. **RF DIODE AND BJT:** RF diodes-bipolar junction transistor - RF field effect transistor-high electron mobility transistors-diode models-transistor models-measurement of active devices-scattering parameter device characterization. **IMPEDANCE MATCHING:** Impedance matching using discrete components-microstrip line matching networks, amplifier classes of operation and biasing networks. **CHARACTERISTICS OF AMPLIFIERS:** Characteristics of amplifier-amplifier power relations-stability consideration-constant gain-broadband, high power, and multistage

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amplifiers. **HIGH FREQUENCY OSCILLATORS:** Basic oscillator model-high frequency oscillator configuration-basic characteristics of mixer.

Text Book

1. Reinhold Ludwig, Gene Bogdanov, "RF circuit design, theory and applications", Pearson Asia Education, 2nd edition, 2009.
2. Reinhold Ludwig and Powel Bretchko, "RF Circuit Design – Theory and Applications", Pearson Education Asia, First Edition.

SATELLITE COMMUNICATIONS

Course Code: 17EC3071

L-T-P-S: 3-0-0-0

Prerequisite: 17EC2206

Credits: 3

Introduction: Basic Concepts of Satellite Communications, Frequency Allocations for Satellite Services, Applications. Types of satellites orbits, LEO, MEO and GEO satellites, Satellite in the context of India. *Orbital Mechanics:* Look Angle determination

Satellite Subsystems: Attitude and Orbit Control System, Telemetry, Tracking, Command and Monitoring, Power Systems, Communication Subsystems, Satellite Antennas.

Satellite Link Design: Basic Transmission Theory, System Noise Temperature and G/T Ratio, Design of Down Links, Up Link Design, Design Of Satellite Links For Specified C/N, *System Design Examples*-DOMSAT, INSAT, INTELSAT and INMARSAT. Satellite- based personal communication.

Multiple Access Techniques: Frequency Division Multiple Access (FDMA), Inter-modulation, Calculation of C/N, Time Division Multiple Access (TDMA), Frame Structure, Satellite Switched TDMA, Onboard Processing, Code Division Multiple Access (CDMA), *Satellite RF impairments:* Rain attenuation, Space weather effects on Satellite communications, Atmospheric drag. *Satellite Navigation & Global Positioning System:* Radio and Satellite Navigation, GPS Position Location Principles, GPS Receivers and Codes, Satellite Signal Acquisition, GPS Navigation Message, GPS Signal Levels, GPS Receiver Operation. TCP over satellite, ITU regulations, Standards and examples, DBS and DBB.

Text Books:

1. Satellite Communications – Timothy Pratt, Charles Bostian and Jeremy Allnutt – Wiley Publications– Second Edition, 2003.
2. Satellite Communications – L.Pritchard, Robert A Nelson and Henri G.Suyderhoud – Pearson Publications – Second Edition.

Reference Books:

1. Satellite Communications – M. Richharia, BS Publications, Second Edition.
2. Fundamentals of Satellite Communications – K.N. Raja Rao, PHI, 2004.
3. Satellite Communication – D.C Agarwal, John Khanna Publications, 5th Ed.
4. Satellite Communications – Dennis Roddy, McGraw Hill, 4th Edition, 2009.
5. Satellite Communications - Robert M Gagliardi, DTS Publishers Ltd.

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DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

SMART ANTENNAS

Course Code: 17EC3072

L-T-P-S: 3-0-0-0

Prerequisite: 17EC2212

Credits:3

Smart Antennas: Introduction, Need for Smart Antennas, Overview, Smart Antenna Configurations, Switched-Beam Antennas, Adaptive Antenna Approach, Space Division Multiple Access (SDMA), Architecture of a Smart Antenna System, Receiver, Transmitter, Benefits and Drawbacks, Basic Principles, Mutual Coupling Effects.

DOA Estimation Fundamentals: Introduction, Array Response Vector, Received Signal Model, Subspace-Based Data Model, Signal Auto-covariance, Conventional DOA Estimation Methods, Capon's Minimum Variance Method, Subspace Approach to DOA Estimation, MUSIC Algorithm, ESPRIT Algorithm, Uniqueness of DOA Estimates.

Beamforming Fundamentals: Classical Beamformer, Statistically Optimum Beam forming Weight Vectors, Maximum SNR Beam former, Multiple Side-lobe Canceller and Maximum, SINR Beam former, Minimum Mean Square Error (MMSE), Direct Matrix Inversion (DMI), Linearly Constrained Minimum Variance (LCMV).

Integration and Simulation of Smart Antennas: Overview, Antenna Design, Mutual Coupling, Adaptive Signal Processing Algorithms, DOA, Adaptive Beam forming, Beam forming and Diversity Combining for Rayleigh-Fading, Channel, Trellis-Coded Modulation (TCM) for Adaptive Arrays, Smart Antenna Systems for Mobile Ad Hoc Networks (MANETs).

Text Books:

1. Constantine A. Balanis & Panayiotis I. Ioannides, "Introduction to Smart Antennas", Morgan & Claypool Publishers' series-2007
2. Joseph C. Liberti Jr., Theodore S Rappaport - "Smart Antennas for Wireless Communications IS-95 and Third Generation CDMA Applications", PTR – PH publishers, 1st Edition, 1989.

Reference Books:

1. T.S Rappaport - "Smart Antennas Adaptive Arrays Algorithms and Wireless Position Location", IEEE press 1998, PTR – PH publishers 1999.
2. Lal Chand Godara, "Smart Antennas", CRC Press, LLC-2004.

RADAR ENGINEERING

Course Code: 17EC4073

L-T-P-S: 3-0-0-0

Prerequisite: 17EC2212

Credits:3

Introduction: Basic Radar, Block Diagram of Pulse Radar, Radar equation, Detection of signals in noise, Receiver noise and signal to noise ratio, integration of Radar pulses, PRF and Range Ambiguities, Doppler Effect, FM CW Radar.

MTI Radar: Introduction, Delay line cancellers, Clutter Attenuation, MTI improvement factor, N-pulse delay line canceller, Non recursive and Recursive filters.

Tracking: Sequential Lobing Radar, Conical Scan and Monopulse acquisition and tracking, Types of Duplexers and receiver protectors, Air Traffic Control applications.

Transmitter and Receivers: Introduction, Linear- Beam Power Sources, Magnetron, Crossed- Field Amplifiers, Other RF Power Sources. The Radar Receivers, Receiver Noise Figure, Duplexers and Receiver Protectors, Radar Displays.

Radar Applications: SAR, LIDAR, OTH radar, remote sensing radar, airport surveillance radar, weather / meteorological radar, ground penetration radar, through-wall radar, automobile radar.

TEXT BOOKS

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1. Merrill I Skolnik, "Introduction to Radar Systems", 3rd Edition, TMH, (2003).
2. William L. Melvin, James A. Scheer, "Principles of Modern Radar", SciTech Publishing.

REFERENCE BOOKS

1. Peyton Z Peebles Jr, "Radar Principles", John Wiley Inc., (2004)
2. Donald R Wehner, "High Resolution Radar", Artchtech house.

EMI/EMC

Course Code:17EC4074

L-T-P-S: 3-0-0-0

Prerequisite: 17EC2212

Credits:3

EMI Environment: Sources of EMI, Conducted and Radiated EMI, Transient EMI, EMI – EMC Definitions and Units of Parameters. EMI Specifications/Standards/Limits: Units of specifications, Civilian Standards and Military Standards.

EMI Control Techniques: Shielding, Filtering, Grounding, Bonding, Isolation Transformer, Transient Suppressors, Cable Routing, Signal control, Component Selection and mounting.

EMC Design Guidelines and Choice of passive components for EMC: EMC Design Guidelines: Typical Sub systems in Electronic Equipment, Transmitters, Receivers, Antenna Systems, Power Supplies, Motors, Control Devices, Digital Circuits, Digital Computers. Capacitors, Inductors, Transformers, Resistors, Conductors, Ferrite Beads, Coaxial Connectors, Conductive Gaskets.

EMI Measurements: MI Test Instrument / Systems, EMI Test, EMI Shielded Chamber, Open Area Test Site, TEM cell Antennas

Textbook

1. V P Kodali, "Engineering EMC Principles, Measurements and Technologies", IEEE Press,
2. Bernard Kieser, "Principles of Electromagnetic Compatibility", Artech House 3rd Edition.
3. Henry W. Ott, "Electromagnetic Compatibility Engineering", A John Wiley & Sons publication.

References

1. Clayton R Paul, "Electromagnetic Compatibility", John Wiley.
2. Tim Williams, "EMC for Product Designer", Elsevier.
3. PR Chatterton, "Electromagnetic Theory to practical design", Wiley.
4. Sonia Ben Dhia, "Electromagnetic Compatibility as Integrated Circuits", Springer.

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DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

VLSI DESIGN DOMAIN

VLSI TECHNOLOGY

Course Code : 17EC3075

L-T-P-S: 3-0-0-0

Pre-requisite: 17EC3110

Credits: 3

Introduction to IC Fabrication: Environment of IC Technology: Concepts of Clean room, Classification and Design Concepts, basic fabrication steps and their Importance Czochralski crystal growing, processes considerations, Wafer cleaning processes.

Oxidation, diffusion, Ion Implantation and Lithography techniques: Oxidation technologies in VLSI, Vapor phase Epitaxy, Molecular Beam Epitaxy, Oxidation of Poly Silicon, Diffusion and Ion Implantation Process, Optical Lithography, Electron Lithography, X-Ray Lithography, Ion Lithography, Plasma properties, Feature Size control and Anisotropic Etch mechanism, reactive Plasma Etching techniques and Equipment.

Deposition techniques, CVD, APCVD, LPCVD, PECVD and other deposition Methods; plasma assisted Deposition, Physical vapor deposition, sputtering techniques, Rapid Thermal Process. Metallization: Introduction, Failure mechanisms in metal interconnects Multi-level Structures. Rapid Thermal Processing: Introduction, RTP techniques; Etching: Reactive Plasma etching Techniques and Equipment, Wet Chemical etching.

Assembly Techniques and Packaging of VLSI Devices: NMOS IC Technology – CMOS IC Technology – MOS Memory IC technology - Bipolar IC Technology – IC Fabrication, Package types – packaging design considerations – VLSI assembly technology – Package fabrication technology

Text books:

1. .K. Goser, P. Glosekotter & J. Dienstuhl, “Nanoelectronic and Nanosystems–From Transistors to Molecular Quantum Devices”, Springer, (2004).
2. Rainer Waser, “Nanoelectronics and Information Technology: Advanced Electronic Materials Novel and Devices”, Wiley VCH, (2005).
3. George W. Hanson, “Fundamentals of Nanoelectronics”, Prentice Hall, (2008).

Reference Books:

1. S.M.Sze, “VLSI Technology”, McGraw Hill Second Edition. 1998.
2. James D Plummer, Michael D. Deal, Peter B. Griffin, “Silicon VLSI Technology: Fundamentals Practice and Modeling”, Prentice Hall India.2000.
3. Wai Kai Chen, “VLSI Technology” CRC Press, 2003

VLSI SUBSYSTEM DESIGN

Course Code : 17EC 3076

L-T-P-S: 3-0-0-0

Pre-requisite: 17EC3110

Credits: 3

Design Methodology: structured design strategies; hierarchy; PLAs; standard-cell design; full-custom design; physical design styles.

Data Path Subsystems: adders; one/zero detectors; comparators; counters; shifters; multipliers. Memory and Array Subsystems: SRAM, DRAM, Read Only Memory, Serial Access Memories, Content-addressable Memory.

Special-purpose Subsystems: Packaging: package options, chip-to-package connections, package parasitic, heat dissipation. Power distribution I/Os: basic I/O pad circuits, level converters. Clock: Clock system architecture, global clock generation and distribution, local clock gates, clock skew budgets.

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Implementation Strategies: custom arrays; semicustom and structured arrays; custom circuit design; cell-based design methodology.

Text books:

1. Neil H. E. Weste, David. Harris and Ayan Banerjee, “CMOS VLSI Design”, Pearson Education, Third Edition, (2004).
2. Jan M. Rabaey, AnanthaChandrakasan, BorivojeNikolic, “Digital Integrated Circuits” Pearson Education, Second Edition, (2003)

Reference Books:

1. Wayne Wolf, “Modern VLSI Design”, 2nd Edition, Prentice Hall, (1998).
2. Sung-Mo Kang, Yusuf Leblebici, “CMOS Digital Integrated Circuits”, TMH, Third Edition, (2003).

DIGITAL IC DESIGN AND IT'S APPLICATIONS

Course Code : 17EC3077

L-T-P-S : 3-0-0-0

Pre-requisite : 17EC1101

Credits:3

MOS Inverters: Introduction, Definitions and Properties, Static CMOS Inverter, Static and Dynamic Power Dissipation, CMOS inverter delay time definitions and calculations

Designing Combinational Logic Gates in CMOS: Introduction, Static CMOS Design, Dynamic CMOS Design, Power Consumption in CMOS Gates.

Designing Sequential Logic Gates in CMOS: Introduction, Static Sequential Circuits Dynamic Sequential Circuits, Non-Bistable Sequential Circuits, Logic Style for Pipelined Structures. Timing Issues in Digital Circuits: Introduction, Clock Skew and Sequential Circuit Performance, Clock Generation and Synchronization.

Designing Arithmetic Building Blocks: Introduction, The Adder: Definition, Circuit and Logic Design, The Multiplier: Definition, The Shifter: Definition, Power Considerations in Data path Structures. Designing Memory: Introduction, Semiconductor Memories - An Introduction, The Memory Core: RAM, ROM, Memory Peripheral Circuitry

Text books:

1. Gary Yeap, “Practical low power digital VLSI design”, Kluwer Academic Publishers, 2002
2. Massoud Pedram, Jan M. Rabaey , “Low power design methodologies “, Kluwer Academic Publishers

Reference Books:

1. Kaushik Roy, Sharat Prasad, “Low Power CMOS VLSI Circuit Design”, Wiley, 2002
2. Yeo “CMOS/BiCMOS ULSI low voltage low power,”, Pearson Education Publishers, Boston, 1995. (Added)

DESIGN FOR TESTABILITY

Course Code : 17EC3078

L-T-P-S: 3-0-0-0

Pre-requisite: 17EC3110

Credits:3

Basic Concepts: Need for testing, Levels of Abstraction, Reliability concepts, Reliability and failure rate, Relation between reliability and MTBF, Maintainability, Availability, series and parallel systems, Failure and faults, Modelling of faults, Temporary faults. Fault simulation, combinational and Sequential SCOAP measures

Fault Tolerant Design: Importance of fault tolerance, Basic concepts of fault tolerance, Static redundancy, schemes of fault redundancy, Time redundancy, Software redundancy, Fail-Safe Operation.

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Fault diagnosis and testing, Test generation for combinational logic circuits: Fault table method, Path sensitization, Boolean difference, Basic ATPG algorithms, Detection of multiple faults in combinational logic circuits, ATPG for non-stuck-at faults, Test generation for sequential logic circuits, Random testing, Signature analysis.

Design for Testability: Controllability and Observability, Design of testable combinational circuits, Design of testable sequential circuits: Scan path technique, Scan golden rules, hierarchical and top-down scan design, boundary scan basics, LSSD, RAS, JTAG.

Built in self test: BIST concepts, BIST design rules, ATPG for BIST, BIST architectures, Memory BIST, RAM fault models, Test generation of RAM, Low power BIST, Thermal aware testing.

TEXT BOOKS

1. M.L. Bushnell and V.D. Agrawal, "Essentials of Electronic Testing for Digital, Memory and Mixed-Signal VLSI Circuits", Kluwer Academic Publishers.
2. M. Baranovichi, M.A. Breuer and A.D. Friedman, "Digital Systems and Testable Design", Jaico Publishing House.

REFERENCE BOOKS

1. P.K. Lala, "Digital Circuit Testing and Testability", Academic Press.
2. A.L Crouch, "Design Test for Digital ICs and Embedded Core Systems", Prentice-Hall International.

ANALOG VLSI DESIGN

Course Code: 17EC3079

L-T-P-S: 3-0-0-0

Pre-requisite: 17EC2101

Credits:3

Basic MOS Device physics: MOSFET operation, Drain current equation, MOSFET large and small signal models, second order effects; **Single Stage Amplifiers:** Single Stage (CS,CG,CD) amplifiers, single stage amplifiers with different loads, Cascode Stage, folded cascode, design of amplifier stages; frequency response of CS,CD,CG.

Passive & Active Current Mirrors: Basic current mirrors, Cascode current mirror, Active Current Mirrors - large signal analysis, small signal analysis, Band-gap References: Supply independent biasing, Temperature independent references;

Differential and Operational Amplifiers: Basic Differential Pair, Common mode response, differential pair with MOS loads, Op-Amp topologies-One stage, two stage, cascade, Folded Cascade, Comparison; Gain boosting, slew rate, power supply rejection.

Feedback: Properties of Feedback, Feedback equation, Feedback topologies and effect of loading, Effect of Feedback on Noise. Ring oscillators, LC oscillators, cross-coupled oscillators, Colpitts oscillator, One-port oscillator, and voltage controlled oscillators. Simulation of oscillators using SPICE.

Text Books

1. Behzad Razavi, "Design of Analog CMOS Integrated Circuits", Tata Mc Graw Hill, (2005)

Reference Books

1. Jacob Baker, "CMOS Mixed Signal Circuit Design", John Wiley, (2008)
2. P. R. Gray and R. G. Meyer, Analysis and design of Analog Integrated circuits 4th Edition, Wiley Student Edition, 2001.
3. D. A. Johns and K. Martin, Analog Integrated Circuit Design, Wiley Student Edition, 2002

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DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

MEMS Technology

Course Code :17EC3080

L-T-P-S: 3-0-0-0

Pre-Requisite : NIL

Credits : 3

Overview of MEMS: MEMS and Microsystems - Microsystems and microelectronics, Benefits of miniaturization, Working principle of micro system - Micro sensors, Micro actuators, MEMS with Micro actuators. Materials For MEMS, Scaling Laws in Miniaturization, MEMS Design Considerations

Micro fabrication: Introduction, Fabrication Process - Photolithography, Ion implantation, Oxidation, Chemical vapor deposition (CVD), Physical vapor deposition, Deposition by Epitaxy, Etching, Manufacturing Process -Bulk Micromachining, Surface Micromachining and LIGA Process.

Microsystems design, Assembly and Packaging: Micro system Design - Design consideration, process design, Mechanical design, Mechanical design using MEMS. Mechanical packaging of Microsystems, Microsystems packaging, interfacing in Microsystems packaging, packaging technology, selection of packaging materials, signal mapping and transduction

Case Study of MEMS Devices: MEMS with Micro sensors: Pressure sensors, Temperature sensors, Humidity sensors, Accelerometers, Gyroscopes, Biomedical Sensors, Chemical sensors, Optical Sensors. MEMS with micro actuators: Microgrippers, Micromotors, Micro gears, Micropumps. RF MEMS devices: Switch parameters- Basics of switching - Mechanical Switches-Electronic switches for RF and microwave applications - Approaches for low-actuation-voltage switches, Case study of MEMS pressure sensor Packaging.

TEXT BOOKS

Tai-Ran Hsu, MEMS and Microsystems: Design, Manufacture, and Nanoscale Engineering, 2nd Edition, John Wiley & Sons, Inc., Hoboken, New Jersey, 2008.

REFERENCES

1. Marc Madou, "Fundamentals of Micro Fabrication" CRC Press
2. Mohamed Gad-el-Hak, "The MEMS Handbook", CRC Press
3. Gabriel M Rebeiz, "RF MEMS - Theory Design and Technology", John Wiley, 2004
4. Mohamed Gad-el-Hak, "The MEMS Handbook", CRC Press, 2002
5. Chang Liu, "Foundations of MEMS", Pearson Indian Print, 1st Edition, 2012

LOW POWER VLSI DESIGN

Course Code : 17EC3081

L-T-P-S: 3-0-0-0

Pre-requisite: 17EC3110

Credits: 3

Introduction: Need for low power VLSI chips, Emerging Low Power Approaches, Sources of Dissipation in Digital Integrated Circuits, Basic Principles of Low Power Design, Physics of power dissipation in CMOS FET Devices, noise margin.

Probabilistic Power Analysis: Random logic signals, probability & frequency, probabilistic power analysis techniques. **Circuit:** Transistor and Gate Sizing, Network Restructuring and Reorganization, Flip Flops & Latches design, low power digital cells library. **Logic Level:** Gate reorganization, signal gating, logic encoding, state machine encoding, pre-computation logic.

Low Power Clock Distribution: Power dissipation in clock distribution, single driver Vs distributed buffers, Zero skew Vs tolerable skew, chip & package co design of clock network.

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Low Power Architecture & Systems: Power & performance management, switching activity reduction, parallel architecture with voltage reduction, flow graph transformation.

Special & Advanced Techniques: Power Reduction in Clock Networks, CMOS Floating Node, Power gating techniques, Low Power Bus, Delay Balancing, Low Power Techniques for SRAM, Adiabatic Computation, Pass Transistor Logic Synthesis, Asynchronous Circuits.

BoS Approved Text books:

1. Gary Yeap, "Practical low power digital VLSI design", Kluwer Academic Publishers, 2002
2. Massoud Pedram, Jan M. Rabaey, "Low power design methodologies", Kluwer Academic Publishers

BoS Approved Reference Books:

1. Kaushik Roy, Sharat Prasad, "Low Power CMOS VLSI Circuit Design", Wiley, 2002
2. Yeo "CMOS/BiCMOS ULSI low voltage low power", Pearson Education Publishers, Boston, 1995. (Added)

NANOELECTRONICS

Course Code :17EC3082

L-T-P-S: 3-0-0-0

Pre-requisite: 17PH1001

Credits: 3

Introduction to Nanoelectronics: Nanotechnology potential, Development of Microelectronics, Region of Nanostructures, Complexity Problem, Challenge initiated by Nanoelectronics, Top-down and bottom-up approach and Nanostructures.

Quantum electron devices: From classical to quantum physics: upcoming electronic devices, Electrons in mesoscopic structure, Short channel MOS transistor, Split gate transistor, Electron wave transistor, Electron spin transistor, Quantum Cellular Automate, Quantum Dot Array.

Nano electronics with tunnelling Devices: Tunnelling Element, Technology of RTD, digital circuit design based on RTD, Principles of Single Electron Transistor (SET), SET circuit design – comparison between FET and SET circuit designs. Nanofabrication: Nano patterning of nanostructures (e-beam/X-ray, Optical lithography, STM/AFM- SEM & Soft-lithography).

Memory devices and sensors: Nano ferroelectrics, Ferroelectric Random-Access Memory, circuit design, thin film properties and integration. Calorimetric sensors, Electrochemical cells, Surface and bulk acoustic devices, Gas sensitive FETs, Resistive semiconductor gas sensors, Electronic noses, Identification of hazardous solvents and gases, Semiconductor sensor array.

BoS Approved Text books:

1. .K. Gosser, P. Glosekotter & J. Dienstuhl, "Nanoelectronic and Nanosystems–From Transistors to Molecular Quantum Devices", Springer, (2004).
2. Rainer Waser, "Nanoelectronics and Information Technology: Advanced Electronic Materials Novel and Devices", Wiley VCH, (2005).
3. George W. Hanson, "Fundamentals of Nanoelectronics", Prentice Hall, (2008).

BoS Approved Reference Books:

1. Mick Wilson, Kamali Kannangara, Geoff smith, "Nanotechnology: Basic Science and Emerging Technologies", Overseas press, (2005).
2. W.R. Fahrner, "Nanotechnology and Nanoelectronics: Materials, Devices, Measurement Techniques", Springer, (2010).

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3. Branda Paz, "A Handbook on Nanoelectronics", Vedams books, (2008).

CAD FOR VLSI DESIGN

Course Code : 17EC4083

L-T-P-S: 3-0-0-0

Pre-requisite: 17EC3110

Credits:3

VLSI Design Methodologies: Introduction to VLSI Design methodologies - Review of Data structures and algorithms - Review of VLSI Design automation tools - Algorithmic Graph Theory and Computational Complexity - Tractable and Intractable problems - general purpose methods for combinatorial optimization.

Design Rules: Layout Compaction - Design rules - problem formulation - algorithms for constraint graph compaction - placement and partitioning - Circuit representation - Placement algorithms - partitioning

Floor Planning: Floor planning concepts - shape functions and floor plan sizing - Types of local routing problems - Area routing - channel routing - global routing - algorithms for global routing. **Simulation:** Simulation - Gate-level modelling and simulation - Switch-level modelling and simulation - Combinational Logic Synthesis - Binary Decision Diagrams - Two Level Logic Synthesis.

Modelling And Synthesis: High level Synthesis - Hardware models - Internal representation - Allocation - assignment and scheduling - Simple scheduling algorithm - Assignment problem - High level transformations.

Text Books:

1. S.H. Gerez, "Algorithms for VLSI Design Automation", John Wiley & Sons, (2002).
2. N.A. Sherwani, "Algorithms for VLSI Physical Design Automation", Kluwer Academic Publishers, (2002).

DESIGN OF SEMICONDUCTOR MEMORIES

Course Code : 17EC4084

L-T-P-S: 3-0-0-0

Pre-requisite: 17EC3110

Credits:3

Random Access Memory Technologies: Static Random-Access Memories: Cell Structures, Architecture Peripheral Circuit Operation, SRAM Cell, Noise Margin, and Noise, Bipolar SRAM Technologies, Advanced SRAM Architectures and Technologies, Application, Dynamic Random-Access Memories: CMOS DRAMs, Cell Theory and Advanced Cell Structures, Advanced DRAM Designs and Architecture, Application.

Non-volatile Memories: Masked Read-Only Memories, High Density ROMs, Programmable Read-Only Memories, Erasable Programmable Road- Only Memories, Electrically Erasable PROMs, Flash Memories. Memory Fault Modelling, Testing, and Memory Design for Testability and Fault Tolerance.

Reliability and Radiation Effects: General Reliability Issues, RAM Failure Modes and Mechanism, Non-volatile Memory, Design for Reliability, Reliability Screening and Qualification. Single Event Phenomenon, Radiation Hardening Process and Design Issues, Radiation Hardness Assurance and Testing - Radiation Dosimetry-Wafer Level Radiation Testing.

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Advanced Memory and Packaging Technologies: Ferroelectric Random-Access Memories, Gallium Arsenide FRAMs, Analog, Magneto resistive RAM, Experimental Memory Devices: Quantum mechanical switch and Single electron memory. Memory Hybrids and MCMs (2D)-Memory Stacks and MCMs (3D), Memory Cards-High Density Memory Packaging Future Directions.

Text books:

1. Ashok K.Sharma, “Semiconductor Memories Technology, Testing and Reliability”, Prentice-Hall of India Private Limited, New Delhi, (1997).
2. David A. Hodges,” Semiconductor Memories “,John Wiley & Sons Inc (November 1, 1972)

Reference Books:

1. Luecke Mize Care, “Semiconductor Memory design & application”, Mc-Graw Hill.
2. Belty Prince, “Semiconductor Memory Design Handbook”.
3. Mikhail I. Dyakonov, “Spin Physics in Semiconductors to Perel Memory”.
4. “Memory Technology design and testing”, IEEE International Workshop on: IEEE Computer Society Sponsor (S), (1999).
- 5.Brent Keeth, R. Jacob Baker,”DRAM circuit design “,IEEE, 2001.

COMPUTER COMMUNICATIONS DOMAIN

DATA NETWORKS AND PROTOCOLS

Course Code :17EC3085

L–T–P–S :3-0-0-0

Pre-requisite: 17EC3107

Credits:3

Introduction: Use of Computer Networks, Network Hardware, Network software, Reference models, RS232 Interface, Example Networks

Physical Layer: The theoretical basis for Data Communication, Guided Transmission media, Modems, ADSL, Trunks and Multiplexing, switching, E1/T1 protocol, SONET

CO2:Data Link Layer: DLL design issues. Error Detection and Correction, Elementary data link protocols, sliding window protocols. ATM protocol

Medium Access Control Sub layer: Channel allocation problem, multiple access protocols, Ethernet, Data link Layer switching, MPLS protocol

CO3: Network Layer: Network layer design issues, Routing algorithms and protocols, congestion control algorithms, Quality of service, Internetworking, network layer in the Internet, IPV4 and IPV6 protocols, X.25 protocol, PDP context

CO4:Transport Layer: Transport service, Elements of transport protocols, Internet transport protocols: TCP&UDP, Performance Issues , Congestion control, Tunneling protocols and VPN networks.Application Layer: Domain Name System, Electronic Mail, World Wide Web, HTTP, FTP, SIP.

Textbooks:

1. Andrew S. Tanenbaum, David J. Wetherall, Computer Networks, Prentice Hall, Fifth Edition. 2011

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2. Behrouz A. Fourouzan, TCP/IP Protocol Suite, Tata McGraw Hill, Third Edition, 2006.
3. William Stallings, Data and Computer Communications, 7/e, Pearson Edition, ,2007

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BROADBAND NETWORKS

Course Code :17EC3086

L – T – P – S:3-0-0-0

Pre-requisite: 17EC3110

Credits:3

CO 1 - Fundamental concepts: Broadband communication- Concepts, Network architecture, Standards, - Internet-Based Networks : TCP/IP Protocol suite, IP addresses, Next-Generation Internet, QOS, VoIP Networks, IMS over view, SIP - Network and Services Convergence, Extranet Technologies, Topologies and Design Standards

CO 2 - Networking Technologies: X.25 and Frame Relay, Virtual Circuits, X.25 Protocols, Frame Relay Networks and standards Fiber Technology and Topologies, SONET protocol and frame structures, Network components and topologies, Next-Generation Networks, DCC, VPNs, Architecture, Tunneling Protocol, IpSec, VPN Standards, MPLS architecture, ISDN and BISDN, ISDN Topologies, ATM Technology: Protocol, Layers and Network configurations and LANs, Ip over ATM.

CO 3 Access Networks: DSL and ADSL: Network Concepts, 32 PSK and 32 QAM, CAP and DMT, XDSL flavours and derivatives, DSLAM, ADSL LANs. Cable Modem Systems: DOCSIS standard, Interactive Set top box and IPTV. PONs: Architectures of APON, BPON, EPON, GPON, WDM PON, HFC broadband network and link budget

CO 4 Wireless Networks: Wireless Data Services: WLAN standards, protocols and layers, 802.XX Technologies, Wireless ATM, PAN architectures,. Cellular communications concepts, Overview of GSM, GPRS CDMA, HSPA, LTE and WiMax. Overview of Satellite Communication, VSAT networks, DBS and MMDS Applications

Text Books:

1. Introduction to Broadband Communication Systems by Cajetan M. Akujuabi · Matthew N O Sadiku
2. BUILDING BROADBAND NETWORKS by Marlyn Kemper Littman, Ph.D.,

TCP/IP PROTOCOL SUITE

Course Code: 17EC3087

L-T-P-S: 3-0-0-0

Pre-requisite: 17EC3110

Credits:3

The Internet Address Architecture, Link Layer, ARP: Address Resolution Protocol, The Internet Protocol (IP), System Configuration: DHCP and Auto configuration, Firewalls and Network Address Translation (NAT), ICMPv4 and ICMPv6: Internet Control Message Protocol, Broadcasting and Local Multicasting (IGMP and MLD), User Datagram Protocol (UDP) and IP Fragmentation, Name Resolution and the Domain Name System (DNS), TCP: The Transmission Control Protocol, TCP Connection Management, TCP Timeout and Retransmission, TCP Data Flow and Window Management, TCP Congestion Control, TCP Keepalive, Security: EAP, IPsec, TLS, DNSSEC, and DKIM, Case Study: Simulation Of Network

Protocols Using NS.

Text Books :

1. Richard Stevens W, "TCP/IP Illustrated Volume 1", 2nd Edition, Prentice Hall of India/ Pearson Education, New Delhi, (2014).

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2. Douglas E Comer, "Internetworking with TCP/IP- Volume I", Prentice Hall of India/Pearson Education, New Delhi, Fourth Edition,(2002).

Reference Books:

1. Washburn K and Evans J, "TCP/IP", Addison Wesley, USA, Second Edition, (2003).
2. Behrouz A Forouzan, "Local Area Networks", Tata McGraw Hill Publishing Company, New Delhi, (2002).

VOIP Systems

Course Code :17EC3088

L – T – P – S :3-0-0-0

Pre-requisite: 17EC3110

Credits:3

Classical Telephony: Line Side/Trunk Side switching, Isochronous Transport, PSTN Signaling ,PCM, digital channel & bandwidth constraints,SS7,Services.

IP Networking Review (simple):Protocol layering, encapsulation, Ethernet, QoS at layer 2, IP, UDP, TCP,IP Addressing (network, subnet, NAT),IP Routing (RIP, OSPF).

Overview of VoIP Architectures and Protocols: Peer protocols (SIP, H323): signaling, call routing, Master-slave protocols (MGCP/Megaco et.al.): signaling, call routing, SS7 Transport (SIP-T), RTP and Codecs, RTP and RTCP: real time traffic over ip (rfc 1789), Codecs (compression, bandwidth, quality), Waveform codecs (G711, G726), CLEP codecs (G729, G723, etc.), Bandwidth control (VAD, dynamic packing, etc.).

SIP: Signaling Protocol Components (RFC 3261),SIP language elements, call flows,, Network routing: Proxies, Servers, Services, Advanced Routing, Presence/Chat, SIMPLE, ENUM, DNS, Firewalls, NATand STUN. Network QoS and QoS Mechanisms (DFWQ, MPLS)

Text Book:

1. Internet Communications Using SIP, Henry Sinnreich and Alan Johnston, Willey (second edition 2006).
2. IP Telephony, Oliver Hersent, Jean-Pierre Petit, and David Gurle, Wiley (2005).

References:

1. Johnston, A. (2015). SIP: Understanding the Session Initiation Protocol, Fourth Edition. (ISBN: 1608078639). Chappell, L. (2013). Wireshark 101: Essential Skills for Network Analysis (Wireshark Solutions). (ISBN 1793939723)

5G MOBILE AND WIRELESS TECHNOLOGY

Course Code: 17EC3089

L-T-P-S:3-0-0-0

Pre-requisite: 17EC3110

Credits:3

Introduction to 5G: IoT and 5G, Global initiatives, Standardization activities. 5G use cases examples and system concept: Extreme mobile broadband, Machine-type communications Dynamic radio access network. **5G architecture:** NFV and SDN, RAN architecture, Functional architecture, LTE and 5G integration, Physical architecture, Machine-type communications, Fundamental techniques for MTC Massive MTC, Low-latency MTC.

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Device-to-device (D2D) communications: RRM D2D, Multi-hop D2D Multi-operator D2D. **Milli-meter wave communications:** Spectrum and regulations, Hardware technologies for mmW, Deployment scenarios, Architecture and mobility, Beam forming. 5G RAN technologies Access design principles, Multi-carrier with filtering: Non-orthogonal schemes, Dense radio access, V2X access communication. **Massive MIMO systems:** Resource allocation, transceiver algorithms, RF implementations in massive MIMO, Channel models, JT CoMP in 5G. **Relaying and wireless network coding:** Multi-flow backhauling and multi-flow relaying Interference management, mobility management, and dynamic reconfiguration in 5G. Network deployment types. Spectrum challenges in 5G, Spectrum toolbox. 5G wireless propagation channel models, Modeling requirements and scenarios, The METIS channel models

Text book:

5G Mobile and Wireless Communications Technology by AFIF OSSEIRAN, JOSE F . MONSERRAT, PATRICK MARSCH

MOBILE CLOUD COMPUTING

Course Code: 17EC3090

L-T-P-S:3-0-0-0

Pre-requisite: 17EC3110

Credits:3

Cloud Computing - Concept, Characteristics, Service models IaaS, PaaS, SaaS, Deployments- Public and private. Various Service Models. Mobile cloud computing: Concepts and techniques, Wireless Optimizations of Data Processing and Storage in Mobile Clouds, Cloud computing performance, DAG, Case Study, Green CC, Pre-emptable Algorithm in MCC, Resource Allocation Mechanism, Messaging Methods, Advance Reservation vs. Best-Effort, RA algorithms, Round-Robin, List Scheduling, Min-Min. Big Data and Service Computing in CC: BIG DATA concepts and processing, Phase reconfigurable shuffle, Spilling, Reduce Side Security Issues and Solutions: Concepts, Issues, Data Over-Collect, Privacy Control, Trust Management, Multi-Tenancy, Taxonomy threat, Data Mining, Attack Interfaces, Various Threat models. Privacy Protection: Infrastructure Security, Data Security and Storage. Mobile Identity and Access Management, Data Life Cycle, Monitoring-Based Solutions, Access Control-Based Solutions, Web Services in CC: Overview, Web Services Architecture, Simple Object Access Protocol, JavaScript Object Notation, Service-Oriented Architecture and integration, WS-Security Framework

Text Books

1) MOBILE CLOUD COMPUTING Models, Implementation, and Security by Meikang Qiu and Keke Gai

2) MOBILE CLOUD COMPUTING -- Architectures, Algorithms and Applications BY Debashis De

CLOUD NETWORKING

Course :17EC3091

L-T-P-S:3-0-0-0

Pre-requisite: 17EC3110

Credits:3

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Introduction to Cloud Networking: Networking Basics, The network stack, Packets and frames, Network equipment, Interconnect, Cloud Data Center, Cloud Networking, Characteristics of Cloud Networking, Ethernet usage, Virtualization, Convergence, Scalability, Software. Data Center Evolution: Mainframes to the Cloud: The Data Center Evolution, Computer Networks, Ethernet, Enterprise versus Cloud Data Centers, Movement to the Cloud.

Switch Fabric Technology: Switch Fabric Architecture Overview, Switch Fabric Topologies, Congestion Management, Flow Control, Traffic Management, Switch Chip Architecture Examples, Cloud Data Center Networking Topologies: Traditional Multi-tiered Enterprise Networks, Data Center Network Switch Types, Flat Data Center Networks, Rack Scale Architectures, Network Function Virtualization.

Data Center Networking Standards: Ethernet Data Rate Standards, Virtual Local Area Networks, Data Center Bridging, Improving Network Bandwidth, Remote Direct Memory Access. Server Virtualization and Networking: VM Overview, Virtual Switching, PCI Express, Edge Virtual Bridging, VM Migration.

Network Virtualization: Multi-tenant Environments, Traditional Network Tunneling Protocols, VXLAN, NVGRE, Tunnel locations, Load balancing Software defined networking : Data Center Software Background, OpenStack, Open Flow, Network Function Virtualization, SDN Deployment.

Text books:

1. Gary Lee, "Cloud Networking - Understanding Cloud-based Data Center Networks", Elsevier, (2014).

Reference books

1. Andrew Tanenbaum," Computer networks", 5/e, PHI,

2. Larry L. Peterson, Bruce S. Davie." Computer Networks a system approach", 2/Harcourt Asia PTE LTD., (2007)

NETWORK SECURITY

Course Code :17EC3092

L–T–P–S:3-0-0-0

Pre-requisite: 17EC3110

Credits:3

CO 1: Physical Network Security: Physical layer security,Copper and Optical Media, **Data Centre and Enterprise network:** LAN Security and Resilient Network Topologies,

CO 2: Router Mechanisms for security: Router and Switch Architectures, Lookup and Classification Algorithms, Packet scheduling and fair queuing, Queuing and Scheduling Algorithms,**Network configuration security:** Internet Policy Routing,

CO 3: Securing Distributed and networked systems: Securing Distributed Algorithms, **Big picture:** Physical Security, Wireless Media, Malware, QoS and Multicast.

CO 4: Current topics in Network security: Web and DNS security, Wireless Security, Covert Channels in Networks, Quantum Cryptography/ Communication, Security of Internet

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Architectures, Secure Multiparty Computation , Anomaly Detection and Traffic Analysis, Operational Network Security, Intrusion Detection Algorithms, Data Mining for Intrusion Detection, Traffic Anomaly Detection and DHT Security.

References:

1. Charlie Kaufman, Radiaperlman, Mike Speciner, *Network Security Private Communication in Public World*, Second Edition, 2004, Pearson.
2. William Stallings, *Network Security Essentials-Applications & Standards*, Pearson.
3. Eric Maiwald, *Fundamentals of Network Security*, 2004, Osborne/McGraw Hill, Dreamtech Press
4. Network Security -- Private Communication in a Public World, Charlie Kaufman, Radia Perlman and Mike Speciner, 2nd Edition, Prentice-Hall, 2002, ISBN 0-13-046019-
5. Network Algorithmics, 1st Ed. (2004), by George Varghese.
6. LAN Wiring, 3th Ed. (2007), by James Trulove.
7. LAN Switch Security: What Hackers Know About Your Switches, 1st Ed. (2007), by Eric Vyncke and Christopher Paggen.
8. Building Resilient IP Networks, 1st Ed. (2012), by Kok-Keong Lee and Beng-Hui Ong.
9. CSSP All-In-One Exam Guide, 6th Ed. (2012), by Shon Harris.
10. <http://www.cs.illinois.edu/~caesar/courses/CS598.S13/syllabus.html>

WIRELESS LAN 802 STANDARDS

Course Code :17EC4093

L – T – P – S :3-0-0-0

Pre-requisite: 17EC3110

Credits:3

CO 1: Wi Fi (IEEE 80.11): Wired and Wireless transmission techniques: wireless modems, Smart receiving techniques, integration of voice and data traffic. Wi Fi :Network topologies, Protocol Architecture, Different Physical Layeres, Data Link Layer, MAC layer, Hiper LAN: Wireless ATM Functions, Mobility, Security, Service sets, Public Hotspot, 802.11 family and derivatives, WiFi application scenarios

CO 2: Bluetooth (IEEE 802.15.1) : Concept, Device Types, Pi-connects and Scatter nets, Device connectivity, Network scenarios, Protocol architecture, Throughputs, OSI Layer Stack, Physical layer, Baseband layer, Channels, Link Manager, LLC (L2CAP), Adaptation Protocol, RFCOMM, SDP, HCI, BNEC. IP over Bluetooth, Application scenarios, Bluetooth vs. Wi-Fi.

CO 3: Zigbee (IEEE 802.15.4): Concept, Device types, Zig bee basics, Networking examples, Connectivity, Industry applications scenarios, OSI Protocol layers Physical layer (900 MHz and 2400 MHz), MAC, Frame structures, , Architecture, Network topologies,, Zigbee security, Bluetooth vs Zigbee

CO 4: WiMAX (IEEE 802.16) : WiMax concepts , Protocol layers, MAC layer, Physical Layer, OFDM concept, , Broadband wireless, Link analysis TX/RX, Path loss and link budget, Antenna techniques, MIMO and beam forming, Network topologies, Application scenarios Comparison of all technologies

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Text Books:

1. HoudaLabioud, Hossam Afifi, Costantino de Santis - Wi-Fi, Bluetooth, Zigbee and WiMax (2007, Springer)
2. Nathan J. Muller - Bluetooth Demystified (2000, McGraw-Hill Professional Publishing)
3. Mobile Broadcasting with WiMAX: Principles, Technology, and Applications by Amitabh KumarShahinFarahani PhD - ZigBee Wireless Networks and Transceivers (2008, Newnes)

IP MULTIMEDIA SUBSYSTEMS

Course Code :17EC4094

L – T – P – S :3-0-0-0

Pre-requisite: 17EC3110

Credits:3

CO-1 Introduction:Trends for telephony services, Evolution of mobile networks, Next Generation Networks, IMS,, IMSservice examples.**IMS Architecture:** Origin of IMS,IMS Standards,IMSconcepts,IMSArchitecture,Core network and Access networkArchitecture reference models, Components and functions,Control Plane and Data plane in IMS, IMSInterface reference points, User identities

CO2 IMS Protocol Stacks:Session Initiation Protocol, DIAMETER and H.248/Megaco, RTP and RTCP, IMS service path. IMS Layer mapping.

CO-3 IMS Operation:IMS and the DNS, IMS session setup, IMS registration, IMS call flow examples, IMS to IMS call, IMS Charging, IMS Security, IMS Scenarios, Role of application servers, Examples.

CO-4 IMS and PSTN: Interoperability between PSTN and IMS, Comparison of PSTN, GSM and IMS networks, Establishing a call with the PSTN.Layer 2 and 3 Messages for call flow.

Text books:

1. The IMS: IP Multimedia Concepts and Services, 3rd Edition, Wiley
2. IP Multimedia Subsystem (IMS) Handbook, CRC Press
3. The IP Multimedia Subsystem (IMS): Session Control and Other Network Operations, McGraw-Hill

Reference Book

1. The 3G IP Multimedia subsystem (IMS)-merging the internet and the cellular worlds third edition by Gonzalo Camarillo Ericsson, Finland. Miguel A. Garcia-Martin Ericsson,Spain

EMERGING TECHNOLOGIES-SDN, NFV,CLOUD AND IOT

Course Code :17EC4095

L – T – P – S :3-0-0-0

Pre-requisite: 17EC3110

Credits:3

MODERN NETWORKING: Elements of Modern Networking:Modern Network Architectures,Network Convergence, Unified Communications, Types of Network and Internet Traffic, Big Data, Cloud Computing, and Mobile Traffic, Congestion Control; SDN and NFV;**SDN:** SDN Approach;; SDN/NFV Standards, SDN Data Plane and OpenFlowin detail. SDN Control Plane in detail, SDN Application Planein detail Data Center Networking;; Information-Centric Networking

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VIRTUALIZATION

Network Functions Virtualization: NFV Concepts and Architecture in detail, NFV Reference Architecture; NFV Functionality, NFV Use Cases; SDN and NFV, Virtual LANs;; IEEE 802.1Q VLAN Standard;; Nested VLANs; OpenFlow IPsec VPNs;; MPLS VPNs;; Virtual Tenant Network;;

Quality of Service: QoS Architectural Framework;; Integrated Services Architecture;; DiffServ, IP Performance Metrics;; OpenFlow QoS. **QoE: User Quality of Experience;** QoE Strategies in Practice;; Applications of QoE. Network Design Implications of QoS and QoE, Service-Oriented QoE Versus QoS Service Monitoring. **MODERN NETWORK ARCHITECTURE: Cloud Computing :** Basic Concepts;; Cloud Services;; SaaS;; PaaS;; IaaS;; XaaS;; Cloud Deployment Models;; Cloud Architecture;; SDN and NFV from Cloud perspective;; ITU-T Cloud Computing Functional Reference Architecture **The Internet of Things: Components:** The IoT Era;; Scope of IoT;; Components of IoT-Enabled Things (Sensors, Actuators, Microcontrollers, Transceivers, RFID). **The Internet of Things: Architecture and Implementation :** IoT Architecture;; ITU-T IoT Reference Model;; IoT World Forum Reference Model;; IoT Implementation;; IoTivity

Text book:

1. Foundations of Modern Networking SDN, NFV, QoE, IoT, and Cloud William Stallings (With contributions by: Florence Agboma, British Sky Broadcasting, Sofiene Jelassi, Assistant Professor, University of Monastir, Tunisia)

SKILLING COURSES

Skilling(LabVIEW and MultiSim)

Course Code :17TS401

L-T-P-S: 0-0-0-8

Pre-requisite: C programming, Mathematics

Credits: 2

Introduction To LabVIEW: Introduction to graphical system design (GSD), working on GSD platform, Benefits of GSD, Text based programming Vs LabVIEW, Introduction to LabVIEW Environment, Front Panel Window Toolbar, Block Diagram Window Toolbar, Introduction to VIs, Data types, Data Representation, Coercion dot, Selecting a Tool, Shortcut Keys, Basic debugging techniques, Introduction to Digital Electronics, Boolean operations, Digital Circuit design, string operations, Various Display Types (Normal, code, Password, HEX display), Exploring string functions

Graphical Programming using LabVIEW: Introduction to loop concept, Type of Loops, For loop, Nested For loop, While loop (Stop if true and Continue if True), hybrid nested loop, Feedback Node, Shift Register and Stack Shift register, Introduction to tunnel and its type, Auto-Indexing, Last Value, Concatenating, Introduction to Arrays, operations of Array Functions, 1-D Array, 2-D Array, Introduction to Clusters, Cluster Function, Difference between Array and Cluster, Chart, Graph, Difference between Chart and Graph by Execution Exercise, Signal Generation and Plotting, Introduction to parallelism, Local Variable, Global Variable, Property Nodes, Invoke Nodes,

Structures Using LabVIEW: Introduction to Case structures, Case Control using Enumerated data type, Enum with type definition, Introduction to Flat Sequence, Create New Sub VI from Scratch, Input and Output Sub VI Connectors, Icon Editor, Making Sub VI from existing VI, Using Sub VIs Exercises, Finding Errors, Error handling and Debugging Techniques.

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File I/O: Introduction to File I/O, Reading a Data from file, Writing a Data to file, Understanding File I/O using RefNum, File I/O Function Pallet, Introduction to Event Structure and operations, Design Technique, Introduction to Architecture, State machine Architecture.

Synchronization and Communication: producer and consumer (Multiple Loops/Parallel programming), Master Slave Architecture Exercises, Difference between Producer Consumer and Master Slave Architecture.

MultiSim: Simulation Using MultiSim, Using various instruments like Multimeter, Function Generator, Oscilloscope, Wattmeter, Bode plotter, IV analyzer using MultiSim, using Measurement Probe and Current Probe in MultiSim. Introduction to Simulation Analysis Using MultiSim, AC analysis, DC operating Point, Fourier Analysis, Transient Analysis, Noise Analysis, Distortion Analysis, DC Sweep, Parameter Sweep using MultiSim.

Software Tool:

NI LabVIEW, NI MultiSim.

Text Books:

1. John Essick “Hands-On Introduction to LabVIEW for Scientist and Engineers”, , OXFORD University Press, Second Edition.
2. DavidBaez-Lopez & Felix E. Guerrero- Castro “Circuit Analysis with MultiSim”, Morgan & Claypool Publisher.

Reference Books:

1. J. Travis & Jim Kring “LabVIEW for Everyone”, , PRENTICE Hall , Third Edition.
2. Nilsson& Riedel “Introduction to MultiSim”, , 9th Edition

Skilling (Matlab)

Course Code :17TS402

L-T-P-S: 0-0-0-8

Pre-requisite: C programming, Mathematics

Credits: 2

Introduction to MATLAB Programming: Matlab Interactive Sessions, Menus and the toolbar, Computing with Matlab, Script files and the Editor Debugger, Matlab Help System, Programming in Matlab.

Arrays: Multidimensional Arrays, Element by Element Operations, Polynomial Operations Using Arrays, Cell Arrays, Structure Arrays. **Functions & Files:** Elementary Mathematical Functions, User Defined Functions, Advanced Function Programming, Working with Data Files.

Programming Techniques: Program Design and Development, Relational Operators and Logical Variables, Logical Operators and Functions, Conditional Statements, Loops, The Switch Structure, Debugging Mat Lab Programs.

Data types and Plotting: Numeric Types, Characters and Strings, Dates and Time, Categorical Arrays, Structures, Cell Arrays, Function Handles, Data Type Identification, Data Type Conversion. Plotting: XY- plotting functions, Subplots and Overlay plots, Special Plot types, Interactive plotting, Function Discovery, Regression, 3-D plots .

File Input/Output:

Saving/reading binary files and making calls to the operating system, Input/output of data to/from an ASCII file.

Applications:

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Digital signal Processing Experiments: Filter Designs and Transforming of signals from domain to domain. Digital Image Processing: Reading and Writing of image, Morphological Operations of an Image. Artificial Neural Networks: create a Neuron Model, Differentiate Learning Methods, Training the Data with Neural network.

Software Tool:

Matlab.

Text Books:

1. Attaway, S., "A Practical Introduction to Programming and Problem Solving". Third Edition. Elsevier. San Fransisco

Reference Books:

1. Hahn B., and D. Valentine, "Essential Matlab for Engineers and Scientists: 5th Edition", 2013, Academic Press. Waltham, MA.
2. Hart, David and Clinton Wolfe, "Getting Started with MATLAB," 1999, Indiana University, University Information Technology Services

Skilling (HFSS)

Course Code :17TS405

L-T-P-S: 0-0-0-8

Pre-requisite: NIL

Credits: 2

Introduction to Electromagnetic Simulation Tools & HFSS: Conventional modelling Vs EM-Tools, Method of analysis for various EM-Tools, Introduction about Getting started with HFSS tool, Creating a project, Working with geometries, Drawing models, Assigning materials, Assigning boundaries, creating the ports, Creating solution setup

Optimization and Post Processing : Generation of the results (S-parameters, VSWR, Impedance, Smith Chart, Radiation Patterns, Field Distributions etc), Parametric analysis, Tuning of the dimensions, exporting the models and results, Importing the models and results.

Design of Antennas with HFSS: Design of dipole antenna, Design of microstrip line fed patch antenna, Design of probe fed microstrip antenna, Design of Triangular antenna, Design of slot antenna.

Design of Microwave Communication Modules: Design and analysis of microstrip low pass filter, Design and analysis of microstrip High pass filter, Design and analysis of microstrip Band pass filter, Design and analysis of Coaxial Tee

Software Tool:

High Frequency Structure Simulator

Text Books:

1. Antenna Theory Analysis and Design by Constantine A Balanis, John Wiley Publishing, 2011

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2. Microstrip Antenna Design Handbook by Ramesh Garg, Artech House, 2001.
3. Microwave filters, impedance-matching networks, and coupling structures by Leo Young, Artech House Publishing, 2010.

Reference Books:

1. HFSS user Guide, Ansys.com