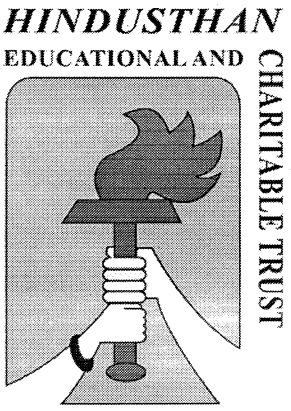

HINDUSTHAN

COLLEGE OF ENGINEERING AND TECHNOLOGY

(An Autonomous Institution)

Coimbatore – 641032

DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

Revised Curriculum and Syllabus for the Batch 2022-2026

2022 REGULATIONS

Hindusthan College of Engineering and Technology

(An Autonomous Institution, Affiliated to Anna University)

Coimbatore 641 032

DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

VISION OF THE DEPARTMENT

To achieve excellence in Electronics and Communication Engineering keeping pace with evolving technologies through quality education embedded with employability skills and ethical values for the betterment of society.

MISSION OF THE DEPARTMENT

1. To expand frontiers of knowledge by providing an inspiring and holistic learning environment.
2. To develop intellectual skills towards employability by fostering innovation and creativity in learning.
3. To inculcate professional ethics, values and entrepreneurial attitude addressing industrial and societal demands.

PROGRAME EDUCATIONAL OBJECTIVES (PEOs)

PEO 1: To prepare the graduates to solve, analyze and develop real-time engineering products by providing a strong foundation in the fundamentals of Electronics and Communication Engineering.

PEO 2: To prepare the graduates to succeed in multidisciplinary dimensions by providing adequate training and exposure to emerging technologies.

PEO 3: To prepare the graduates to become a successful leader and innovators following ethics with a sense of social responsibility for providing engineering solutions.

PROGRAME SPECIFIC OUTCOMES (PSOs)

PSO1: Graduates will be able to analyze, design and develop solutions for real-time challenges, facilitating the creation of quality products in the Electronics and Communication industry.

PSO2: Graduates will exhibit resilience in embracing emerging technologies, nurturing innovation in Signal Processing, Communication Systems, Embedded Systems, IoT, Networking and VLSI to address contemporary demands.

PROGRAME OUTCOMES (POs)

1. Engineering knowledge: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems

2. Problem analysis: Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences

3. Design / development of solutions: Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations

4. Conduct investigations of complex problems: Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions

5. Modern tool usage: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering

activities with an understanding of the limitations

6. The engineer and society: Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice

7. Environment and sustainability: Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development

8. Ethics: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice

9. Individual and team work: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings

10. Communication: Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions

11. Project management and finance: Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.

12. Life-long learning: Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

Curriculum under R2022
(for the batch admitted during 2022 – 2023)

SEMESTER I											
S. NO	**COURSE CODE**	**COURSE TITLE**	**COURSE CATEGORY**	**L**	**T**	**P**	**C**	**TCP**	**CIA**	**ESE**	**TOTAL**
THEORY											
1	22MA1101	MATRICES AND CALCULUS	BSC	3	1	0	4	4	40	60	100
THEORY WITH LAB COMPONENT											
2	22CY1151	CHEMISTRY FOR CIRCUIT ENGINEERING	BSC	2	0	2	3	4	50	50	100
3	22HE1151	ENGLISH FOR ENGINEERS	HSC	2	0	2	3	4	50	50	100
4	22EC1151	ELECTRON DEVICES	ESC	2	0	2	3	4	50	50	100
5	22IT1151/ 22CS1152	PYTHON PROGRAMMING AND PRACTICES/ OBJECT ORIENTED PROGRAMMING USING PYTHON (IBM STUDENTS ONLY)	ESC/ICC	2	0	2	3	4	50	50	100
EEC COURSES (SE/AE)											
6	22HE1071	UHV	AEC	2	0	0	2	3	40	60	100
7	22HE1072	ENTREPRENEURSHIP & INNOVATION	AEC	1	0	0	1	1	100	0	100
MANDATORY COURSE											
8	22MC1091/ 22MC1092	தமிழரும்தொழில்நுட்பமும்/Indian Constitution	MC	2	0	0	0	2	100	0	100
			TOTAL	**16**	**1**	**8**	**19**	**26**	**480**	**320**	**800**

SEMESTER II											
S. NO	**COURSE CODE**	**COURSE TITLE**	**COURSE CATEGORY**	**L**	**T**	**P**	**C**	**TCP**	**CIA**	**ESE**	**TOTAL**
THEORY											
1	22MA2102	DIFFERENTIAL EQUATIONS AND LAPLACE TRANSFORM	BSC	3	1	0	4	4	40	60	100
2	22CY2101	ENVIRONMENTAL STUDIES	ESC	2	0	0	2	3	40	60	100
3	22PH2101	BASICS OF MATERIAL SCIENCE	BSC	2	0	0	2	3	40	60	100
THEORY WITH LAB COMPONENT											
4	22PH2151	PHYSICS FOR CIRCUIT ENGINEERING PROGRAMME	BSC	2	0	2	3	4	50	50	100
5	22HE2151	EFFECTIVE TECHNICAL COMMUNICATION	HSC	2	0	2	3	4	50	50	100
6	22CS2255	PROGRAMMING USING C	PCC	2	0	2	3	4	50	50	100
	22CS2253	JAVA FUNDAMENTALS (IBM STUDENTS ONLY)	ICC								
PRACTICAL											
7	22ME2001	ENGINEERING PRACTICES	ESC	0	0	4	2	2	60	40	100

EEC COURSES (SE/AE)											
8	22HE2071	DESIGN THINKING	AEC	1	0	2	2	2	100	0	100
9	22HE2072	SOFT SKILLSAND APTITUDE -1	SEC	1	0	0	1	1	100	0	100
MANDATORY COURSES											
10	22MC2091 22MC2092	தமிழர்மரபு/ **Heritage of Tamils**	MC	2	0	0	0	2	100	0	100
11	22MC2093	NCC */NSS / YRC / SPORTS / CLUBS / SOCIETY SERVICE - ENROLLMENT (COMMON)	MC	All students shall enroll, on admission, in anyone of the personality and character development programmes and undergo training for about 80 hours							
			TOTAL	**17**	**1**	**12**	**22**	**29**	**630**	**370**	**1000**

SEMESTER III											
S.NO	**COURSECODE**	**COURSETITLE**	**COURSE CATEGORY**	**L**	**T**	**P**	**C**	**TCP**	**CIA**	**ESE**	**TOTAL**
THEORY											
1	22MA3102	COMPLEX ANALYSIS AND TRANSFORMS (common to ECE, EEE,EIE)	BSC	3	1	0	4	4	40	60	100
2	22EC3201	ELECTRONIC CIRCUITS	PCC	3	0	0	3	3	40	60	100
3	22EC3202	SIGNALS AND SYSTEMS	PCC	3	0	0	3	3	40	60	100
4	22EC3203	DIGITAL ELECTRONICS	PCC	3	0	0	3	3	40	60	100
5	22EC3204	CIRCUITS AND NETWORKS	ESC	2	0	0	2	3	100	-	100
THEORY WITH LAB COMPONENT											
6	22EC3251/ 22IT3252	OOPS USING JAVA/RELATIONAL DATABASE MANAGEMENT SYSTEM (IBM STUDENTS ONLY)	ESC/ICC	2	0	2	3	3	50	50	100
PRACTICAL											
7	22EC3001	ELECTRONIC CIRCUITS LABORATORY	PCC	0	0	3	1.5	3	60	40	100
8	22EC3002	DIGITAL ELECTRONICS LABORATORY	PCC	0	0	3	1.5	3	60	40	100
EEC COURSES (SE/AE)											
9	22HE3071	SOFT SKILLS -2	SEC	1	0	0	1	1	100	0	100
10	22EC3901	MINI PROJECT 1	AEC	0	0	0	2	1	100	0	100
MANDATORY COURSES											
11	22MC3191	ESSENCE OF INDIAN TRADITIONAL KNOWLEDGE	MC	2	0	0	0	2	100	0	100
			TOTAL	**17**	**1**	**8**	**24**	**28**	**730**	**410**	**1100**

SEMESTER IV											
S.NO	**COURSE CODE**	**COURSE TITLE**	**COURSE CATEGORY**	**L**	**T**	**P**	**C**	**TCP**	**CIA**	**ESE**	**TOTAL**
THEORY											
1	22HE4101	IPR AND START-UPS	HSC	2	0	0	2	2	40	60	100
2	22EC4201	ELECTRO MAGNETIC FIELDS	PCC	3	0	0	3	3	40	60	100

3	22EC4202	ANALOG COMMUNICATION	PCC	3	0	0	3	3	40	60	100
4	22EC4203	LINEAR INTEGRATED CIRCUITS	PCC	3	0	0	3	3	40	60	100
5	22EC4304	TRANSMISSION LINES AND WAVEGUIDES	PCC	3	0	0	3	3	40	60	100
THEORY WITH LAB COMPONENT											
6	22EC4251/ 22EC4252	CONTROL SYSTEMS/DESIGN THINKING-AN INTRODUCTION (IBM STUDENTS ONLY)	PCC/ICC	2	0	2	3	3	50	50	100
7	22EC4253	DATA COMMUNICATION AND NETWORKS	PCC	2	0	2	3	3	50	50	100
PRACTICAL											
8	22EC4001	LINEAR INTEGRATED CIRCUITS LAB	PCC	0	0	3	1.5	3	60	40	100
9	22EC4002	ANALOG COMMUNICATION LAB	PCC	0	0	3	1.5	3	60	40	100
EEC COURSES (SE/AE)											
10	22HE4071	SOFT SKILLS -3	SEC	1	0	0	1	1	100	0	100
			TOTAL	**19**	**3**	**10**	**24**	**27**	**400**	**500**	**900**

SEMESTER V											
S.NO	**COURSE CODE**	**COURSE TITLE**	**COURSE CATEGORY**	**L**	**T**	**P**	**C**	**TCP**	**CIA**	**ESE**	**TOTAL**
THEORY											
1	22EC5201	DIGITAL COMMUNICATION	PCC	3	0	0	3	3	40	60	100
2	22EC5202	ANTENNA AND WAVE PROPAGATION	PCC	3	1	0	4	3	40	60	100
3	22EC5203	MICROPROCESSORS AND MICROCONTROLLERS	PCC	3	0	0	3	3	40	60	100
4	22EC53XX/ 22EC5251	PROFESSIONAL ELECTIVE-1/ ANGULAR JS (IBM STUDENTS ONLY)	PEC/ICC	3	0	0	3	3	40	60	100
5	22EC53XX	PROFESSIONAL ELECTIVE-2	PEC	3	0	0	3	3	40	60	100
6	22EC53XX	PROFESSIONAL ELECTIVE-3	PEC	3	0	0	3	3	40	60	100
PRACTICAL											
7	22EC5001	MICROPROCESSORS AND MICROCONTROLLERS LAB	PCC	0	0	3	1.5	3	60	40	100
8	22EC5002	DIGITAL COMMUNICATION LAB	PCC	0	0	3	1.5	3	60	40	100
EEC COURSES (SE/AE)											
9	22HE5071	SOFT SKILLS -4 / FOREIGN LANGUAGES	SEC	1	0	0	1	1	100	0	100
			TOTAL	**19**	**1**	**6**	**23**	**25**	**440**	**460**	**900**

SEMESTER VI											
S.NO	**COURSE CODE**	**COURSE TITLE**	**COURSE CATEGORY**	**L**	**T**	**P**	**C**	**TCP**	**CIA**	**ESE**	**TOTAL**
THEORY											
1	22HS6101	PROFESSIONAL ETHICS	HSC	3	0	0	3	3	40	60	100

2	22EC63XX/ 22EC6251	PROFESSIONAL ELECTIVE-4/ NODE JS AND MICRO SERVICES (IBM STUDENTS ONLY)	PEC/ICC	3	0	0	3	3	40	60	100
3	22EC63XX / 22EC6252	PROFESSIONAL ELECTIVE-5/ IOT AND SPRING FRAMEWORK (IBM STUDENTS ONLY)	PEC/ICC	3	0	0	3	3	40	60	100
4	22EC64XX	OPEN ELECTIVE – 1*	OEC	3	0	0	3	3	40	60	100
5	22EC64XX	OPEN ELECTIVE – 2*	OEC	3	0	0	3	3	40	60	100
THEORY WITH LAB COMPONENT											
6	22EC6253	DIGITAL SIGNAL PROCESSING	PCC	2	0	2	3	4	50	50	100
7	22EC6254	VLSI DESIGN	PCC	2	0	2	3	4	50	50	100
EEC COURSES (SE/AE)											
8	22EC6901	MINI PROJECT 2	AEC	0	0	0	2	1	100	0	100
			TOTAL	**19**	**1**	**6**	**23**	**26**	**400**	**400**	**800**

SEMESTER VII

S.NO	COURSE CODE	COURSE TITLE	COURSE CATEGORY	L	T	P	C	TCP	CIA	ESE	TOTAL
THEORY											
1	22EC7201	WIRELESS COMMUNICATION NETWORKS	PCC	3	0	0	3	3	40	60	100
2	22EC73XX/ 22EC7251	PROFESSIONAL ELECTIVE-6/ BLOCKCHAIN (IBM STUDENTS ONLY)	PEC/ICC	3	0	0	3	3	40	60	100
3	22EC74XX	OPEN ELECTIVE – 3*	OEC	3	0	0	3	3	40	60	100
4	22EC74XX	OPEN ELECTIVE – 4*	OEC	3	0	0	3	3	40	60	100
THEORY WITH LAB COMPONENT											
5	22EC7001	EMBEDDED SYSTEMS AND IOT	PCC	2	0	2	3	4	50	50	100
6	22EC7001	OPTICAL COMMUNICATION AND MICROWAVE ENGINEERING	PCC	2	0	2	3	4	50	50	100
EEC COURSES (SE/AE)											
7	22EC7901	INTERNSHIP	AEC	-	-	-	2	1	100	0	100
			TOTAL	**19**	**0**	**4**	**20**	**23**	**360**	**340**	**700**

SEMESTER VIII

S.NO	COURSE CODE	COURSE TITLE	COURSE CATEGORY	L	T	P	C	TCP	CIA	ESE	TOTAL
EEC COURSES (SE/AE)											
1	22EC8901	PROJECT WORK/GRANTED PRODUCT PATENT	AEC	0	0	20	10	20	100	100	200
			TOTAL	**0**	**0**	**20**	**10**	**20**	**100**	**100**	**200**

Note:

1. *As per the AICTE guideline, in Semesters I, II, III & IV NCC one credit subject is added as Value Added Course with Extra Credit. Further, the students who enrolled his/her name in HICET NCC and Air Wing are eligible to undergo this subject. The earned extra credits printed in the Consolidated Mark sheet as per the regulation.

students' who have opted NCC subjects in Semester I, II, III & IV are eligible to undergo NCC Open Elective Subjects.

3. The above-mentioned NCC Courses will be offered to the students who are going to be admitted in the Academic Year 2021 – 22 onwards.

Chairman Bos | Dean-Academics | Principal

SEMESTER WISE CREDIT DISTRIBUTION

B.E. / B.TECH. PROGRAMMES										
S.No.	Course Area	Credits per Semester								Total Credits
		I	II	III	IV	V	VI	VII	VIII	
1	HSC	3	3	-	2	-	3	-	-	11
2	BSC	7	9	4	-	-	-	-	-	20
3	ESC	6	4	5	-	-	-	-	-	15
4	PCC	-	3	12	21	13	6	9	-	64
5	PEC	-	-	-	-	9	6	3	-	18
6	OEC	-	-	-	-	-	6	6	-	12
7	EEC	3	3	3	1	1	2	2	10	25
8	MC	□	□							
	Total	19	22	24	24	23	23	20	10	165

Credit Distribution R2022

Semester	I	II	III	IV	V	VI	VII	VIII	Total
Credits	19	22	24	24	23	23	20	10	165

LIST OF INDUSTRIAL CORE COURSES

S. No.	CODE	Courses	CAT	L	T	P	C	CIA	ESE	TOTAL
1	22CS1152	Object Oriented Programming using Python	ICC	2	0	2	3	50	50	100
2	22CS2153	Java Fundamentals	ICC	2	0	2	3	50	50	100
3	22EC3252	Relational Database Management System	ICC	2	0	2	3	50	50	100
4	22EC4252	Design Thinking-An Introduction	ICC	2	0	2	3	50	50	100
5	22EC5251	Angular JS	ICC	2	0	2	3	50	50	100

6	22EC6251	Node JS and Micro services	ICC	2	0	2	3	50	50	100
7	22EC6252	IoT and Spring Framework	ICC	2	0	2	3	50	50	100
8	22EC7251	Blockchain	ICC	2	0	2	3	50	50	100

PROFESSIONAL ELECTIVE COURSES: VERTICALS

Vertical 1 Electronic System Design	Vertical 2 Communication Systems	Vertical 3 Wireless Networks	Vertical 4 Signal and Image Processing	Vertical 5 Biomedical Technologies	Vertical 6 Diversified Courses
Foundation Skills in Integrated Product Development	Satellite Communication	Network Security	Digital Image Processing	Medical Electronics	App Development
Measurements and Instrumentation	Global Positioning Systems	Wireless Sensors and Networks	Audio Signal Processing	Medical Informatics	Web Technologies
IoT Based System Design	Under Water Communication	High Speed Networks	Machine Vision	Medical Image Processing	Ethical Hacking
PCB Design	RF System Design	Cloud Computing	Artificial Intelligence and Machine Learning	Biometric Systems	Cryptocurrency and Blockchain Technologies
ASIC Design	Software Defined Radio	Wireless Broad Band Networks	Neural Networks and Deep Learning	Medical Robotics	3D Printing and Design
Introduction to PLC Programming	Radar Technologies	Cyber Forensics	Virtual Reality and Augmented Reality	Human Computer Interface	4G/5G Communication Networks

Vertical 1
Electronic System Design

S No.	Course Code	Course Title	Category	Periods Per week			Total Contact Periods	Credits
				L	T	P		
1.	22EC5301	Foundation Skills in Integrated Product Development	PEC1	3	0	0	3	3
2.	22EC5302	Measurements and Instrumentation	PEC2	3	0	0	3	3
3.	22EC5303	IoT Based System Design	PEC3	3	0	0	3	3
4.	22EC6301	PCB Design	PEC4	3	0	0	3	3
5.	22EC6302	ASIC Design	PEC5	3	0	0	3	3
6.	22EC7301	Introduction to PLC Programming	PEC6	3	0	0	3	3

Vertical 2

Communication Systems

S No.	Course Code	Course Title	Category	Periods Per week			Total Contact Periods	Credits
				L	T	P		
1.	22EC5304	Satellite Communication	PEC1	3	0	0	3	3
2.	22EC5305	Global Positioning Systems	PEC2	3	0	0	3	3
3.	22EC5306	Under Water Communication	PEC3	3	0	0	3	3
4.	22EC6303	RF System Design	PEC4	3	0	0	3	3
5.	22EC6304	Software Defined Radio	PEC5	3	0	0	3	3
6.	22EC7302	Radar Technologies	PEC6	3	0	0	3	3

Vertical 3

Wireless Networks

S No.	Course Code	Course Title	Category	Periods Per week			Total Contact Periods	Credits
				L	T	P		
1.	22EC5307	Network Security	PEC1	3	0	0	3	3
2.	22EC5308	Wireless Sensors and Networks	PEC2	3	0	0	3	3
3.	22EC5309	High Speed Networks	PEC3	3	0	0	3	3
4.	22EC6305	Cloud Computing	PEC4	3	0	0	3	3
5.	22EC6306	Wireless Broad Band Networks	PEC5	3	0	0	3	3
6.	22EC7303	Cyber Forensics	PEC6	3	0	0	3	3

Vertical 4

Signal and Image Processing

S No.	Course Code	Course Title	Category	Periods Per week			Total Contact Periods	Credits
				L	T	P		
1.	22EC5310	Digital Image Processing	PEC1	3	0	0	3	3
2.	22EC5311	Audio Signal Processing	PEC2	3	0	0	3	3
3.	22EC5312	Machine Vision	PEC3	3	0	0	3	3
4.	22EC6307	Artificial Intelligence and Machine Learning	PEC4	3	0	0	3	3
5.	22EC6308	Neural Networks and Deep Learning	PEC5	3	0	0	3	3
6.	22EC7304	Virtual Reality and Augmented Reality	PEC6	3	0	0	3	3

Vertical 5

Biomedical Technologies

S No.	Course Code	Course Title	Category	Periods Per week			Total Contact Periods	Credits
				L	T	P		
1.	22EC5311	Medical Electronics	PEC1	3	0	0	3	3
2.	22EC5312	Medical Informatics	PEC2	3	0	0	3	3
3.	22EC5313	Medical Image Processing	PEC3	3	0	0	3	3
4.	22EC6309	Biometric Systems	PEC4	3	0	0	3	3
5.	22EC6310	Medical robotics	PEC5	3	0	0	3	3
6.	22EC7305	Human Computer Interface	PEC6	3	0	0	3	3

Vertical 6

Diversified courses

S No.	Course Code	Course Title	Category	Periods Per week			Total Contact Periods	Credits
				L	T	P		
1.	22EC5314	App Development	PEC1	3	0	0	3	3
2.	22EC5315	Web Technologies	PEC2	3	0	0	3	3
3.	22EC5316	Ethical Hacking	PEC3	3	0	0	3	3
4.	22EC6311	Cryptocurrency and Blockchain Technologies	PEC4	3	0	0	3	3
5.	22EC6312	3D Printing and Design	PEC5	3	0	0	3	3
6.	22EC7306	4G/5G Communication Networks	PEC6	3	0	0	3	3

OPENELECTIVE I AND II (EMERGINGTECHNOLOGIES)

To be offered for the students other than CSE, IT, AI&ML, ECE & BIOMEDICAL

S NO.	COURSE CODE	COURSETITLE	CATEGORY	PERIODS PERWEEK			TOTAL CONTACT PERIODS	CREDITS
				L	T	P		
1	22AI6401	Artificial intelligence and Machine Learning Fundamentals	OEC	2	0	2	4	3
2	22CS6401	Blockchain Technology	OEC	2	0	2	4	3
3	22EC6401	Cyber Security	OEC	2	0	2	4	3
4	22EC6402	IoT Concepts and Applications	OEC	2	0	2	4	3
5	22IT6401	Data Science and Analytics	OEC	2	0	2	4	3
6	22BM6401	Augmented and Virtual Reality	OEC	2	0	2	4	3

OPEN ELECTIVE I AND II

To be offered for the students other than AUTO, AERO, AGRI, MECH, MCTS, CIVIL, EEE, CHEMICAL, FOOD TECH, E&I

S NO.	COURSE CODE	COURSETITLE	CATEGORY	PERIODS PERWEEK			TOTAL CONTACT PERIODS	CREDITS
				L	T	P		
1	22AE6401	Space Science	OEC	3	0	0	3	3
2	22MT6401	Introduction to Industrial Engineering	OEC	3	0	0	3	3
3	22MT6402	Industrial Safety and Environment	OEC	3	0	0	3	3
4	22CE6401	Climate Change and its Impact	OEC	3	0	0	3	3
5	22CE6402	Environment and Social Impact Assessment	OEC	3	0	0	3	3
6	22ME6401	Renewable Energy System	OEC	3	0	0	3	3
7	22ME6402	Additive Manufacturing systems	OEC	3	0	0	3	3
8	22EI6401	Introduction to Industrial Instrumentation and Control	OEC	3	0	0	3	3
9	22EI6402	Graphical Programming using Virtual Instrumentation	OEC	3	0	0	3	3
10	22AU6401	Recent Trends in Automotive Technology	OEC	3	0	0	3	3
11	22AU6402	Automotive Vehicle Safety	OEC	3	0	0	3	3
12	22EE6401	Digital Marketing	OEC	3	0	0	3	3
13	22EE6402	Research Methodology	OEC	3	0	0	3	3
14	22FT6401	Traditional Foods	OEC	3	0	0	3	3
15	22AG6401	Urban Agriculture and Organic Farming	OEC	3	0	0	3	3
16	22CH6401	Biomass and Bio Refinery	OEC	3	0	0	3	3

Note: Non-Circuit Departments can add one Open Elective course in the above list to offer for the circuit branches

OPEN ELECTIVE III

Students shall choose any one of the open elective courses such that the course content or title not belong to their own programme.

S NO.	COURSE CODE	COURSE TITLE	CATEGORY	PERIODS PERWEEK			TOTAL CONTAC T PERIODS	CREDITS
				L	T	P		
1	22EC7401	Mobile Devices -Tools and Technology	OEC	3	0	0	3	3

OPEN ELECTIVE IV

SL. NO.	COURSE CODE	COURSE TITLE	CATEGORY	PERIODS PERWEEK			TOTAL CONTAC T PERIODS	CREDITS
				L	T	P		
1	22LS7401	General studies for competitive examinations	OEC	3	0	0	3	3
2	22LS7402	Human Rights, Women Rights and Gender equity	OEC	3	0	0	3	3

3	22LS7403	Indian ethos and Human values	OEC	3	0	0	3	3
4	22LS7404	Financial independence and management	OEC	3	0	0	3	3
5	22LS7405	Yoga for Human Excellence	OEC	3	0	0	3	3
6	22LS7406	Democracy and Good Governance	OEC	3	0	0	3	3
7	22LS7407	NCC Level - II	OEC	3	0	0	3	3

Enrollment for B.E. / B. TECH. (HONOURS) / Minor Degree (optional)

A student can also optionally register for additional courses (18 credits) and become eligible for the award of B.E. / B. Tech. (Honours) or Minor Degree. For B.E. / B. Tech. (Honours), a student shall register for the additional courses (18 credits) from semester V onwards. These courses shall be from the same vertical or a combination of different verticals of the same programme of study only. For minor degree, a student shall register for the additional courses (18 credits) from semester V onwards. All these courses have to be in a particular vertical from any one of the other programmes.

Clause 4.10 of Regulation 2022 is applicable for the Enrolment of B.E. / B. TECH. (HONOURS) / Minor Degree (Optional).

HONOUR DEGREE VERTICAL COURSES

S. No.	Vertical-I Sensor Technologies and IoT	Vertical II Advanced Communication Systems	Vertical III Semiconductor Chip Design and Testing
1	Realtime Embedded Systems	Cognitive Radio Networks	Wide Bandgap Devices
2	Sensor for IoT applications	Remote Sensing	Validation and Testing Technology
3	Advanced Processor Architectures	Rocketry and Space Mechanics	Low Power VLSI
4	IOT Processors	Underwater Navigation Systems	VLSI Testing and Design for Testability
5	Wearable Devices	Massive MIMO Networks	Mixed Signal IC Design Testing
6	Industrial IoT and Industry 4.0	Advanced Wireless Communication Techniques	Analog IC Design

Vertical-I
Sensor Technologies and IoT

S No.	Course Code	Course Title	Category	L	T	P	C	CIA	ESE	TOTAL
1	22EC5305	Realtime Embedded Systems	HDC	3	0	0	3	40	60	100

2	22EC6305	Sensor for IoT applications	HDC	3	0	0	3	40	60	100
3	22EC6306	Advanced Processor Architectures	HDC	3	0	0	3	40	60	100
4	22EC7304	IOT Processors	HDC	3	0	0	3	40	60	100
5	22EC7305	Wearable Devices	HDC	3	0	0	3	40	60	100
6	22EC8301	Industrial IoT and Industry 4.0	HDC	3	0	0	3	40	60	100

Vertical-II
Advanced Communication Systems

S No.	Course Code	Course Title	Category	L	T	P	C	CIA	ESE	TOTAL
1	22EC5306	Cognitive Radio Networks	HDC	3	0	0	3	40	60	100
2	22EC6307	Remote Sensing	HDC	3	0	0	3	40	60	100
3	22EC6308	Rocketry and Space Mechanics	HDC	3	0	0	3	40	60	100
4	22EC7306	Underwater Navigation Systems	HDC	3	0	0	3	40	60	100
5	22EC7307	Massive MIMO Networks	HDC	3	0	0	3	40	60	100
6	22EC8203	Advanced Wireless Communication Techniques	HDC	3	0	0	3	40	60	100

Vertical-III
Semiconductor Chip Design and Testing

S No.	Course Code	Course Title	Category	L	T	P	C	CIA	ESE	TOTAL
1	22EC5307	Wide Bandgap Devices	HDC	3	0	0	3	40	60	100
2	22EC6309	Validation and Testing Technology	HDC	3	0	0	3	40	60	100
3	22EC6310	Low Power VLSI	HDC	3	0	0	3	40	60	100
4	22EC7308	VLSI Testing and Design for Testability	HDC	3	0	0	3	40	60	100
5	22EC7309	Mixed Signal IC Design Testing	HDC	3	0	0	3	40	60	100
6	22EC8202	Analog IC Design	HDC	3	0	0	3	40	60	100

MINOR DEGREE VERTICAL COURSES
Embedded and IoT

S No.	Course Code	Course Title	Category	Periods Per week			Total Contact Periods	Credits
				L	T	P		
1	22EC5601	Electronics for Embedded Systems	MDC	3	0	0	3	3
2	22EC6601	Microcontroller and its Applications	MDC	3	0	0	3	3
3	22EC6602	Sensor and Embedded Systems	MDC	3	0	0	3	3
4	22EC7601	Fundamentals of IoT	MDC	3	0	0	3	3

5	22EC7602	Industrial IoT and Industry 4.0	MDC	3	0	0	3	3
6	22EC8601	IoT for Smart Systems	MDC	3	0	0	3	3

Vertical II
Fintech and Block Chain

S No.	Course Code	Course Title	Category	Periods Per week			Total Contact Periods	Credits
				L	T	P		
1	21CS5602	Financial Management	MDC	3	0	0	3	3
2	21MB6231	Fundamentals of Investment	MDC	3	0	0	3	3
3	21MB6232	Banking, Financial Services andInsurance	MDC	3	0	0	3	3
4	21MB7231	Introduction to Blockchain and its Applications	MDC	3	0	0	3	3
5	21MB7232	Fintech Personal Finance and Payments	MDC	3	0	0	3	3
6	21MB8231	Introduction to Fintech	MDC	3	0	0	3	3

Vertical III
Entrepreneurship

S No.	Course Code	Course Title	Category	Periods Per week			Total Contact Periods	Credits
				L	T	P		
1	21BA5601	Foundation of Entrepreneurship	MDC	3	0	0	3	3
2	21BA6601	Introduction to Business Venture	MDC	3	0	0	3	3
3	21BA6602	Team Building & Leadership Management for Business	MDC	3	0	0	3	3
4	21BA7601	Creativity & Innovation in Entrepreneurship	MDC	3	0	0	3	3
5	21BA7602	Principles of Marketing Management for Business	MDC	3	0	0	3	3
6	21BA8601	Human Resource Management for Entrepreneurs	MDC	3	0	0	3	3
7	21BA8602	Financing New Business Ventures	MDC	3	0	0	3	3

Vertical IV
Environment and Sustainability

S No.	Course Code	Course Title	Category	Periods Per week			Total Contact Periods	Credits
				L	T	P		
1	21CEXXXX	Sustainable Infrastructure Development	MDC	3	0	0	3	3
2	21AG6233	Sustainable Agriculture and Environmental Management	MDC	3	0	0	3	3
3	21BM6233	Sustainable Bio Materials	MDC	3	0	0	3	3

4	21ME7233	Materials for Energy Sustainability	MDC	3	0	0	3	3
5	21CE7233	Green Technology	MDC	3	0	0	3	3
6	21CE8232	Environmental Quality Monitoring and Analysis	MDC	3	0	0	3	3

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SYLLABUS
I SEMESTER

Programme/ Sem	Course Code	Name of the Course	L	T	P	C
B.E./B.Tech/I	22MA1101	**MATRICES AND CALCULUS (Common to all Branches)**	3	1	0	4

Course Objective	**The learner should be able to** 1. Construct the characteristic polynomial of a matrix and use it to identify eigenvalues and Eigenvectors 2. Impart the knowledge of sequences and series. 3. Analyseanddiscussthemaximaandminimaofthefunctionsofseveralvariables. 4. Evaluate the multiple integrals and apply in solving problems. 5. Apply vector differential operator for vector function and theorems to solve engineering problems.

Unit	Description	Instructional Hours
I	**Matrices** Eigen values and Eigen vectors – Properties of Eigen values and Eigen vectors (without proof) -Cayley - Hamilton Theorem (excluding proof) - Reduction of a quadratic form to canonical form by orthogonal transformation.	12
II	**Single Variate Calculus** Rolle's Theorem–Lagrange's Mean Value Theorem-Maxima and Minima–Taylor's and Maclaurin's Series.	12
III	**Functions of Several Variables** Partial derivatives-Total derivative, Jacobian, Maxima, minima and saddle points; Method of Lagrange multipliers **.Gradient, divergence and curl and derivatives**	12
IV	**Integral Calculus** Double integrals in Cartesian coordinates–Area enclosed by plane curves (excluding surface area)– Triple integrals in Cartesian co-ordinates – Volume of solids (Sphere, Ellipsoid , Tetrahedron) using Cartesian co-ordinates.	12
V	**Vector Calculus** Gradient, divergence and curl; Green's theorem, Stoke's and Gauss divergence theorem (statement only) for cubes only.	12
	Total Instructional Hours	**60**

Course Outcome	At the end of the course, the learner will be able to CO1: Compute Eigen values and Eigen vectors of the given matrix and transform given quadratic form into canonical form. CO2: Apply the concept of differentiation to identify the maximum and minimum values of curve. CO3: Compute partial derivatives of function of several variables and write Taylor's series for functions with two variables. CO4: Evaluate multiple integral and its applications in finding area, volume. CO5: Apply the concept of vector calculus in two and three dimensional spaces.

TEXTBOOKS:

T1:G.B.ThomasandR.L.Finney,"CalculusandAnalyticalGeometry",9thEditionAddisonWesleyPublishing Company,2016.
T2:ErwinKreyszig,"AdvancedEngineeringMathematics",JohnWiley&Sons,2019.
T3:K.P.UmaandS.Padma,"EngineeringMathematicsI(MatricesandCalculus) ",PearsonLtd,2022.

REFERENCEBOOKS:

R1-JerroldE.Marsden,AnthonyTromba,"VectorCalculus",W.H.Freeman,2003
R2-StraussM.J,G.L.BradleyandK.J.Smith,"Multivariablecalculus",PrenticeHall,2002.
R3-VeerarajanT,"EngineeringMathematics",McGrawHillEducation(India)PvtLtd,NewDelhi,2016.

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO-1	PSO-2
CO1	3	3	3	3	3	2	2	-	-	1	2	2	3	2
CO2	3	3	3	3	2	2	2	-	-	1	2	2	2	2
CO3	3	3	3	3	2	2	2	-	-	1	2	2	2	2
CO4	3	3	3	3	2	2	2	-	-	1	2	2	2	2
CO5	3	3	3	3	2	2	2	-	-	1	2	2	3	3
AVG	3	3	3	3	2.2	2	2	-	-	1	2	2	2.4	2.2

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Programme /Sem	Course Code	Name of the Course	L	T	P	C
B.E/B.Tech/ I	**22CY1151**	**Chemistry for Circuit Engineering (ECE, EEE, EIE, BME,CSE, IT, AIML)**	2	0	2	3

Course Objective

The learner should be able to

1. Acquire knowledge on the concepts of chemistry involved in day today life.
2. Identify the water related problems and water treatment techniques.
3. Enhance the fundamental knowledge on electrochemistry and the mechanism of corrosion and its control.
4. Gain knowledge on the nuclear energy source and batteries.
5. Extend the knowledge on the concepts of spectroscopy and its applications.

Unit	Description	Instructional Hours
I	**CHEMISTRY IN EVERYDAY LIFE** Chemicals in food – Food colors – Artificial sweeteners – Food preservatives. Soaps and Detergents – Soaps – Types of Soap – Detergents – Types of detergents. Drugs – Classification of drugs - Therapeutic Action of Different Classes of Drugs. Chemicals in Cosmetics – Creams – Talcum powders- Deodorants – Perfumes. Plastics – Thermoplastics- Preparation, properties and uses of PVC, Teflon and Thermosetting plastics - Preparation, properties and uses of Polyester and Polyurethane.	6
II	**WATER TECHNOLOGY** Impurities in Water, Hardness of Water, Boiler feed Water – Boiler troubles -Sludge and scale formation, Caustic embrittlement, priming and foaming, boiler corrosion- -Softening Methods (Zeolite & Ion-Exchange Methods)- Desalination of Brackish Water - Reverse Osmosis, Potable water and treatment. **Estimation of total, permanent and temporary hardness of water by EDTA. Determination of Dissolved Oxygen in sewage water by Winkler's method. Estimation of alkalinity of water sample by indicator method.**	6+9
III	**ELECTROCHEMISTRY AND CORROSION** Electrochemical cells – reversible and irreversible cells - EMF- Single electrode potential – Nernst equation (derivation only) – Conductometric titrations. Chemical corrosion – Pilling – Bedworth rule – electrochemical corrosion – different types –galvanic corrosion – differential aeration corrosion – corrosion control – sacrificial anode and impressed cathodic current methods. **Conductometric titration of strong acid vs strong base (HClvsNaOH). Estimation of Ferrous iron by Potentiometry.**	6+6
IV	**ENERGY SOURCES AND STORAGE DEVICES** Introduction- nuclear energy- nuclear fission- controlled nuclear fission- nuclear fusion differences between nuclear fission and fusion- nuclear chain reactions- nuclear reactor power generator- classification of nuclear reactor- light water reactor- breeder reactor. Batteries and fuel cells: Types of batteries- alkaline battery- lead storage battery- lithium ion battery- fuel cell H_2 -O_2 fuel cell applications.	6
V	**SPECTROSCOPY** Beer-Lambert's law – UV-visible spectroscopy and IR spectroscopy – principles – instrumentation (block diagram only) - applications – flame photometry – principle – instrumentation (block diagram only) – estimation of sodium by flame photometry – atomic absorption spectroscopy – principles – instrumentation (block diagram only) – Estimation of nickel by atomic absorption spectroscopy.	6
	Total Instructional Hours	**45**

Course Outcome

At the end of the course, the learner will be able to

CO1: List out the chemicals used in food, soaps and detergents, drugs, cosmetics and plastics

CO2: Differentiate hard and soft water and solve the related problems on water purification in domestic as well as in industries.

CO3: Develop knowledge on the basic principles of electrochemistry and understand the causes of corrosion, its consequences to minimize corrosion to improve industrial design

CO4: Develop knowledge about the renewable energy resources and batteries along with the need of new materials to improve energy storage capabilities

CO5: List out the applications of spectroscopic techniques in various engineering fields.

TEXT BOOKS

T1 - P.C.Jain& Monica Jain, "Engineering Chemistry" DhanpatRai Pub, Co., New Delhi (2018).

T2 -O.G.Palanna, "Engineering chemistry" McGraw Hill Education India (2017).

REFERENCES

R1 - ShikhaAgarwal "Engineering Chemistry -Fundamentals and Applications, Cambridge University Press, Delhi, 2019

R2 - S.S.Dara "A Text book of Engineering Chemistry" S.Chand& Co. Ltd., New Delhi (2018).

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO-1	PSO-2
CO1	**3**	**2**	**2**	**-**	**2**	**1**	**1**		**1**		**1**	**1**	**1**	**1**
CO2	3	2	2	-	2	1	1		1		1	1	1	1
CO3	3	2	2	-	2	1	1		1		1	1	1	1
CO4	3	2	2	2	2	1	1		1		2	1	1	1
CO5	3	2	2	-	2	1	1		1		1	1	1	1
AVG	3	2	2	2	2	1	1	-	1	-	1.2	1	1	1

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Programme/ Sem	Course Code	Name of the Course	L	T	P	C
B.E./B.Tech / I	**22HE1151**	**ENGLISH FOR ENGINEERS (Common to all Branches)**	2	0	2	3

Course Objective	**The student should be able** 1. To improve the communicative proficiency of learners.To help learners use language effectively in professional writing. 2. To advance the skills of maintaining the suitable one of communication. 3. To introduce the professional life skills. 4. To impart official communication etiquette.

Unit	Description	Instructional Hours
I	**Language Proficiency:** Types of Sentences, Functional Units, Framing question. **Writing:** process description, Writing Checklist.**Vocabulary** – words on environment. **Practical Component: Listening-** Watching short videos and answer the questions, **Speaking-** Self introduction ,formal & semi-formal	7+ 2
II	**Language Proficiency**: Tenses, Adjectives and adverbs. **Writing:** Formal letters (letters conveying positive and negative news), Formal and informal email writing (using emoticons, abbreviations& acronyms), reading comprehension. **Vocabulary**– words on entertainment. **Practical Component: Listening**-Comprehensions based on TED talks**Speaking-** Narrating a short story or an event happened in their life	7+ 2
III	**Language Proficiency:** Prepositions, phrasal verbs. **Writing:** Formal thanks giving, Congratulating, warning and apologizing letters, cloze test. **Vocabulary** – words on, tools.**PracticalComponent:Listening**-Listentosongsandanswerthequestions**Speaking-** Justaminute	5+ 4
IV	**Language Proficiency:** Subject verb concord, Prefixes & suffixes. **Writing:**Preparing agenda &minutes, writing an event report. **Vocabulary**– words on engineering process. **Practical Component: Listening-** Comprehensions based on Talk of orators or interview shows **Speaking-**Presentation on a general topic with ppt.	5+ 4
V	**Language Proficiency:** Modal Auxiliaries, Active & passive voice, **Writing:** Project report (proposal & progress) ,sequencing of sentences **Vocabulary** –words on engineering material **Practical Component: Listening-** Listening- Comprehensions based on Nat Geo/Discovery channel videos **Speaking-** Preparing posters and presenting as a team.	6+ 3
	Total Instructional Hours	**45**

Course Outcome	After completion of the course the learner will be able CO1:Tocommunicateinaprofessional forum CO2:Tospeakorwriteacontentintheproficientlanguage CO3: To maintain and use appropriate one of the communication.\ CO4:To read ,write and present in a professional way. CO5:To follow the etiquettes in formal communication.

TEXTBOOKS:

T1- Norman Whitby, "Business Benchmark-Pre-intermediate to Intermediate", Cambridge University Press,2016.T2- Raymond Murphy, "Essential English Grammar", Cambridge UniversityPress,2019.

REFERENCEBOOKS:

R1- Meenakshi Raman and Sangeetha Sharma. "Technical Communication- Principles and Practice", Oxford University Press, 2009.

R2-RaymondMurphy, "English GrammarinUse"-4thedition CambridgeUniversityPress,2004.

R3-KamaleshSadanan"AFoundationCoursefortheSpeakersofTamil-Part-I&II",Orient Blackswan,2010.

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO-1	PSO-2
CO1	1	1	1	2	1	1	2	1	2	3	1	3	3	2
CO2	1	2	1	1	2	2	1	1	1	3	1	3	2	3
CO3	1	2	1	1	1	2	1	1	2	3	1	2	2	2
CO4	1	1	1	1	2	1	1	1	2	3	1	2	3	3
CO5	1	2	1	1	1	1	1	2	2	3	1	2	2	2
AVG	1	1.6	1	1.2	1.4	1.4	1.2	1.2	1.8	3	1	2.4	2.4	2.4

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Programme/ Sem	CourseCode	NameoftheCourse	L	T	P	C
B.E./B.Tech/ I	22EC1151	ELECTRON DEVICES (ECE)	2	0	2	3

CourseObjectives	**The student should be able to** 1. Acquire elementary knowledge on PN junction and Zener diode sand their applications 2. Familiarize the BJT Operation, Characteristics and Configurations. 3. Explore the Operation and Characteristic so fJFET and MOSFET 4. Be exposed to the basic operation of special semi conductor devices. 5. Learn the functionality of power and display devices.

Unit	Description	Instructional Hours
I	**SEMICONDUCTORDIODES** TheoryofPNJunctionDiode-ForwardandReverseBiasCharacteristics-DiodeCurrentEquations,Rectifiers:Half-wave Rectifiers,Full Wave Rectifiers and Bridge Rectifiers. Zener Diode:Characteristics-Breakdown in diodes-Zener breakdown and Avalanche Breakdown.Characteristics of PN junction and Zener diode.	6+3
II	**BIPOLARJUNCTIONTRANSISTORS** BJT Construction- NPN and PNP – Transistor Operation-Early Effect, Configurations of BJT:Input and Output Characteristics of CE,CBand CC Configurations, Limits of Operation, Transistor Amplifying Action..Input,Output and Transfer characteristics of CE Amplifier	6+3
III	**FIELDEFFECTTRANSISTOS** JFET- Construction and Operation – Drain and Transfer Characteristics -Comparison of JFET and BJT- MOSFET: Depletion Type MOSFET, Enhancement Type MOSFET - Comparison of JFET and MOSFET.Transfer characteristics ofJ FET.	6+3
IV	**SPECIALSEMICONDUCTORDEVICES** Schottky Barrier Diodes-Varactor Diodes–Power Diodes-Tunnel Diodes-Photo Diodes-PhotoconductiveCells-IREmitters-Light-EmittingDiodes,Liquid-Crystal Displays-Solar cells-Thermistors.Characteristics of Photo Diode.	6+3
V	**POWERDEVICESANDDISPLAYDEVICES** Silicon-Controlled Rectifier-Construction,Operation and Characteristics, Applications-DISC- TRIAC- Unijunction Transistors-Photo Transistors.Characteristics of SCR	6+3
	TotalInstructionalHours	45

CourseOutcome	At the end of the course, the learner will be able to CO1: Explain the structure and working operation of PN junction and Zener diodes. CO2:Demonstratethecharacteristicsofdifferenttypesof BJTand compare CO3: Infer and compare the characteristics of JFET and MOSFET CO4:Understand and relatevariousspecialsemiconductordevices CO5:Interpret and associate the usage of different power and display devices

TEXTBOOKS:

T1.Robert Boylestad and Louis Nashelsky,"Electron Devices and Circuit Theory"Prentice Hall,10th edition,July2008.

REFERENCEBOOKS:

R1-R.S.Sedha,—A Text Book of AppliedElectronics S.Chand Publications,2006.

R2-JMillman,C CHalkias,SatyabrataJit,"Electronic Devices & Circuits",Tata McGrawHill,2010.

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO 10	PO 11	PO 12	PSO1	PSO2
CO1	3	3	3	2	2	1	1	-	-	-	1	2	3	3
CO2	3	3	2	2	2	1	1	-	-	-	1	2	3	2
CO3	3	2	3	2	2	1	1	-	-	-	1	2	2	2
CO4	3	3	3	2	2	1	1	-	-	-	1	2	3	2
CO5	3	3	3	2	2	1	1	-	-	-	1	2	3	2

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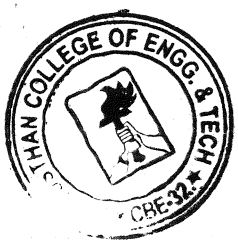

Programme/ Sem	Course Code	Name of the Course	L	T	P	C
B.E./B.Tech/ I	22IT1151	PYTHON PROGRAMMING AND PRACTICES AGRI, CHEM,FT,AERO, AUTO, CIVIL,MECH, MECT,ECE,BME)	2	0	2	3

Course Objective	**The learner should be able** 1. To know the basics of algorithmic problem solving 2. To read and write simple Python programs 3. To develop Python programs with conditionals and loops and to define Python functions and call them 4. To use Python data structures -- lists, tuples, dictionaries 5. To do input/output with files in Python

Unit	Description	Instructional Hours
I	**ALGORITHMIC PROBLEM SOLVING** Algorithms, building blocks of algorithms (statements, state, control flow, functions), notation (pseudo code, flow chart, programming language), algorithmic problem solving, simple strategies for developing algorithms (iteration, recursion). **Illustrative problems: To find the Greatest Common Divisor (GCD)oftwo numbers, Fahrenheit to Celsius, Perform Matrix addition.**	5+4
II	**DATA, STATEMENTS,CONTROL FLOW** Data Types, Operators and precedence of operators, expressions, statements, comments; Conditionals: Boolean values and operators, conditional (if), alternative (if -else), chained conditional (if –elif-else); Iteration: state, while, for, break, continue, pass; **Simple algorithms and programs: Area of the circle, check the given year is Leap year or not, Factorial of a Number.**	5+4
III	**FUNCTIONS, STRINGS** Functions, parameters and arguments; Fruitful functions: return values, local and global scope, function composition, recursive functions. Strings: string slices, immutability, string functions and methods, string module. **Illustrative programs: Perform Linear Search, Selection sort, Sum of all elements in a List, Pattern Programs**	5+4
IV	**LISTS, TUPLES, DICTIONARIES** Lists: list operations, list slices, list methods, list loop, mutability, aliasing, cloning lists, listparameters; Tuples: tuple assignment, tuple as return value; Dictionaries: operations andmethods; advanced list processing - list comprehension. **Illustrative programs: List Manipulation, Finding Maximum in a List, String processing.**	5+4
V	**FILES, MODULES, PACKAGES** Files and exception: text files, reading and writing files, errors and exceptions, handling exceptions, modules, packages **Illustrative programs: Reading writing in a file, word count, Handling Exceptions**	9
	Total Instructional Hours	45

Course Outcome	At the end of the course, the learner will be able to CO1: Develop algorithmic solutions to simple computational problems CO2: Read, write, execute by hand simple Python programs CO3: Structure simple Python programs for solving problems and Decompose a Python program into functions CO4: Represent compound data using Python lists, tuples, dictionaries CO5: Read and write data from/to files in Python Programs.

TEXT BOOKS:

T1: Guido van Rossum and Fred L. Drake Jr, An Introduction to Python – Revised and updated for Python 3.6.2, Shroff Publishers, First edition (2017).

T2:S. Annadurai, S.Shankar, I.Jasmine, M.Revathi, Fundamentals of Python Programming, Mc-Graw Hill Education (India) Private Ltd, 2019.

REFERENCE BOOKS:

R1:CharlesDierbach, —Introduction to Computer Science using Python: A Computational Problem- Solving Focus, Wiley India Edition,2013.
R2:Timothy A. Budd, —Exploring Pythonl, Mc-Graw Hill Education (India) Private Ltd., 2015
R3:Robert Sedgewick, Kevin Wayne, Robert Dondero, —Introduction to Programming in Python: An Inter-disciplinary Approach, Pearson India Education Services Pvt. Ltd., 2016

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO 10	PO 11	PO 12	PSO1	PSO2
CO1	3	3	3	3	-	-	-	-	2	-	-	2	3	2
CO2	3	3	3	-	-	-	-	-	2	-	-	2	3	2
CO3	3	3	3	2	-	-	-	-	2	-	-	2	3	2
CO4	3	3	3	3	-	-	-	-	2	-	-	2	3	2
CO5	3	3	3	3	-	-	-	-	2	-	-	2	3	2

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Programme/ Sem	Course Code	Name of the Course	L	T	P	C
B.E./B.Tech/ I	22CS1152	**OBJECT ORIENTED PROGRAMMING USING PYTHON** **(CSE, IT, ECE & AIML)**	2	0	2	3

Course Objective	**The learner should be able** 1. To read and write simple Python programs. 2. To develop Python programs with conditionals and loops. 3. To define Python functions and call them. 4. To understand OOP concepts and write programs using classes and objects. 5. To do input/output with files in Python.

Unit	Description	Instructional Hours
I	**INTRODUCTION TO PYTHON** What is Python - Advantages and Disadvantages, Benefits and Limitation- Downloading and Python-installation-Python Versions-Running Python Scripts, Executing scripts with python launcher-Using interpreter interactively- Using variables-String types: normal, raw and Unicode-String operations and functions- Math operator and functions.Illustrative program: find minimum in a list, insert acard in a list of sorted cards, guess an integer number in a range, Towers of Hanoi.	7+2
II	**DATA TYPES, STATEMENTS,CONTROL FLOW** Data Types(List,Tuple,string,dicionary,set)-Operators and precedence of operators, expressions, statements, comments; Conditionals: Boolean values and operators, conditional (if), alternative (if - else), chained conditional (if –elif-else); Iteration: state, while, for, break, continue, pass. Illustrative programs:Find the square root of a number, To find the given number is Prime or not, Write aPython program which accepts a sequence of comma-separated numbers from user, generate a list and find the sum and average of the numbers.	5+4
III	**PYTHON FUNCTIONS** Introduction to functions-Global and local variable in python-Decorators in python-Python lamda functions-Exception handling in python. Illustrative programs:Square root, GCD,exponentiation, linear search, binary search, Write a menu driven program to perform the following task:a) A function Sum_DigN( ) to find the s um of the digits of a given n umber, b) A recursive function Sum_DigR( ) to find the same.	5+4
IV	**PYTHON OOPS** Introduction to oops concept-Python class and objects-Constructor in python-Inheritance-Types of inheritance-Encapsulation in python-Polymorphism in python. Illustrative programs:Write a Python program using class for the calculation of telephone bill. Thecharges for the calls are fixed as follows: Unit Call Cost/unit Below 100 calls No Charge, only rental amount Rs. 250 100-150 calls Rs. 1.00 151-300 calls Rs. 2.50 301-600 calls Rs. 4.50 Above 600 Rs. 6.00	5+4
V	**FILES, PACKAGES** File handling in python-Open a file in python-How to read from a file in python-writing to file in. python-Python numpy-Python pandas. Illustrative programs: How to display the contents of text file in reverse order? Write the code for thesame, not exceeding 10 lines of code, Creating Modules and Packages for arithmetic Operations.	5+4
	Total Instructional Hours	**45**

Course Outcome	At the end of the course, the learner will be able to CO1: Understanding the basic concepts to read, write and execute simple python programs. CO2: Apply the conditional and looping concepts for solving problems. CO3: Apply functions to decompose larger complex programs. CO4: Understanding the OOPS concepts and writing programs using classes and objects CO5: Understand to read and write data from/to files in Python Programs.

TEXT BOOKS:

T1: Guido van Rossum and Fred L. Drake Jr, An Introduction to Python – Revised andupdated for Python 3.2, Network Theory Ltd., 2011.

REFERENCE BOOKS:

R1: Charles Dierbach, —Introduction to Computer Science using Python: A ComputationalProblem-Solving Focus, Wiley India Edition, 2013.

R2: Timothy A. Budd, —Exploring Pythonl, Mc-Graw Hill Education (India) Private Ltd., 2015.

R3: Robert Sedgewick, Kevin Wayne, Robert Dondero, —Introduction to Programming inPython: An Inter-disciplinary Approach, Pearson India Education Services Pvt. Ltd., 2016

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO 10	PO 11	PO 12	PSO1	PSO2
CO1	3	3	3	3	-	-	-	-	2	-	-	2	3	2
CO2	3	3	3	-	-	-	-	-	2	-	-	2	3	2
CO3	3	3	3	2	-	-	-	-	2	-	-	2	3	2
CO4	3	3	3	3	-	-	-	-	2	-	-	2	3	2
CO5	3	3	3	3	-	-	-	-	2	-	-	2	3	2

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Programme/ Sem	Course Code	Name of the Course	L	T	P	C
B.E./B.Tech/ I	22HE1071	UNIVERSAL HUMAN VALUES (COMMON TO ALL BRANCHES)	2	0	0	2

Course Objectives	**Thestudentshould bemade** 1. To help the students appreciate the essential complementarily between 'VALUES' and 'SKILLS' to ensure sustained happiness and prosperity which are the core aspirations of all human beings. 2. TofacilitatethedevelopmentofaHolisticperspectiveamongstudentstowardslifeandprofession as well as towards happiness and prosperity based on a correct understanding of the Human reality and the rest of existence. Such a holistic perspective forms the basis of Universal Human Values and movement towards value-based living in a natural way. 3. TohighlightplausibleimplicationsofsuchaHolisticunderstanding, Intermsofethicalhumanconduct, trustful and mutually fulfilling human behavior and mutually enriching interaction with Nature.

Unit	Description	Instructional Hours
I	**Introduction to Value Education** Right Understanding, Relationship and Physical Facility (Holistic Development and the Role of Education)-Understanding Value Education - Self-exploration as the Process for Value Education - Continuous Happiness and Prosperity – the Basic Human Aspirations - Happiness and Prosperity – Current Scenario - Method to Fulfill the Basic Human Aspirations	6
II	**Harmony in the Human Being and Harmony in the Family** Understanding Human being as the Co-existence of the Self and the Body - Distinguishing between the Needs of the Self and the Body - The Body as an Instrument of the Self - Understanding Harmony in the Self- Harmony of the Self with the Body - Programme to ensure self-regulation and Health	6
III	**Harmony in the Family and Society** Harmony in the Family – the Basic Unit of Human Interaction.Values in Human to Human Relationship'Trust' – the Foundational Value in Relationship Values in Human to Human Relationship'Respect' – as the RightEvaluation Understanding Harmony in the Society	6
IV	**Harmony in the Nature / Existence** Understanding Harmony in the Nature.Interconnectedness, self-regulation and Mutual Fulfillment among the Four Orders of Nature- Understanding Existence as Co-existence of mutually interacting units in all pervasivespace Realizing Existence as Co-existence at All Levels The Holistic Perception of Harmony in Existence. Vision for the Universal Human Order	6
V	**Implications of the Holistic 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 CaseStudiesStrategies for Transition towards Value-based Life and Profession	6
	Total Instructional Hours	**30**

Course Outcome	At the end of the course, the learner will be able CO1: To become more aware of holistic vision of life - themselves and their surroundings. CO2: To become more responsible in life, in the Society and in handling problems with sustainable Solutions. CO3: To sensitive towards their commitment towards what they understood towards environment and Socially responsible behavior. CO4: To able to apply what have learnt to their own self in different day-to-day settings in real life and In handling problems with sustainable solutions. CO5: To develop competence and capabilities for maintaining Health and Hygiene.

Reference Books:

R1. A Foundation Course in Human Values and Professional Ethics, R R Gaur, R Asthana, G P Bagaria, 2nd Revised Edition, Excel Books, New Delhi, 2019. ISBN 978-93-87034-47-1

R2. Teachers' Manual for A Foundation Course in Human Values and Professional Ethics, R R Gaur, R Asthana, G P Bagaria, 2nd Revised Edition, Excel Books, New Delhi, 2019. ISBN 978-93- 87034-53-2

R3. Jeevan Vidya: Ek Parichaya, A Nagaraj, Jeevan Vidya Prakashan, Amarkantak, 1999.

R4. Human Values, A.N. Tripathi, New Age Intl. Publishers, New Delhi, 2004.

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Programme / Sem	Course Code	Name of the Course	L	T	P	C
B.E./B.Tech/ I	22HE1072	ENTREPRENEURSHIP & INNOVATION (Common for all Branches)	1	0	0	1

Course Objectives	**The student should be made** 1. To acquire the knowledge and skills needed to manage the development of innovation. 2. To recognize and evaluate potential opportunities to monetize these innovations. 3. To plan specific and detailed method to exploit these opportunities. 4. To acquire the resources necessary to implement these plans. 5. To make students understand organizational performance and its importance.

Module	Description
1	**Entrepreneurial Thinking**
2	**Innovation Management**
3	**Design Thinking**
4	**Opportunity Spotting / Opportunity Evaluation**
5	**Industry and Market Research**
6	**Innovation Strategy and Business Models**
7	**Financial Forecasting**
8	**Business Plans/ Business Model Canvas**
9	**Entrepreneurial Finance**
10	**Pitching to Resources Providers / Pitch Deck**
11	**Negotiating Deals**
12	**New Venture Creation**
13	**Lean Start-ups**
14	**Entrepreneurial Ecosystem**
15	**Velocity Venture**
	TOTAL INSTRUCTIONAL HOURS 15

Course Outcome	**At the end of the course, the learner will be able to** CO1: Understandthenatureofbusinessopportunities,resources,andindustriesincriticalandcreative aspects. CO2: Understand the processes by which innovation is fostered, managed, and commercialized. CO3:Remember effectively and efficiently the potential of new business opportunities. CO4:Assess the market potential for a new venture, including customer need, competitors, and industry attractiveness.. CO5:Developabusiness model for a new venture, including revenue. Margins, operations, Working capital, and investment

TEXTBOOKS

T1:AryaKumar"Entrepreneurship–CreatingandleadinganEntrepreneurialOrganization",Pearson,SecondEdition(2012).
T2:EmrahYayici"DesignThinkingMethodology", Artbiztech,FirstEdition(2016).

REFERENCEBOOKS

R1: Christopher Golis "Enterprise & Venture Capital", Allen &Unwin Publication, Fourth Edition (2007).
R2: ThomasLockWood&EdgerPapke"InnovationbyDesign",Career Press.com,SecondEdition(2017).
R3: Jonathan Wilson "Essentials of Business Research", Sage Publication, FirstEdition(2010).

WEBRESOURCES

W1:https://blof.forgeforward.in/tagged/startup-lessons
W2:https://blof.forgeforward.in/tagged/entrepreurship
W3:https://blof.forgeforward.in/tagged/minimum-viable-product
W4:https://blof.forgeforward.in/tagged/minimum-viable-product
W5:https://blof.forgeforward.in/tagged/innovation

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Programme/ Sem	CourseCode	Name of the Course	L	T	P	C
B.E./B.Tech/ I	22MC1091	**INDIAN CONSTITUTION** (Common for all Branches)	2	0	0	0

Course Objectives	**The student should be made to** 1. Sensitization towards self, family (relationship),society and nature 2. Understanding (or developing clarity) of nature, society and larger systems, on the basis of human relationships and resolved individuals 3. Strengthening of self-reflection 4. Development of commitment and courage to act

Unit	Description	Instructional Hours
I	**BASIC FEATURES AND FUNDAMENTAL PRINCIPLES** Meaning of the constitution law and constitutionalism–Historical perspective of the constitution of India– salient features and characteristic of the constitution of India.	6
II	**FUNDAMENTAL RIGHTS** Scheme of the fundamental rights–fundamental duties and its legislative status–The directive principles of state policy–its importance and implementation-Federal structure and distribution Of legislative and financial powers between the union and states.	6
III	**PARLIAMENTARY FORM OF GOVERNMENT** The constitution powers and the status of the president in India.–Amendment of the constitutional Powers and procedures–The historical perspective of the constitutional amendment of India– Emergency provisions: National emergency, President rule, Financial emergency.	6
IV	**LOCALGOVERNANCE** Local self-government-Rural Local Government-Panchayath Raj, Elections of Panchayat-State Election Commission- Urban Local Government-Amendment Act, Urban Local Government Structures in India	6
V	**INDIANSOCIETY** ConstitutionalRemediesforcitizens–PoliticalPartiesandPressureGroups;Right of Women,Childrenand Scheduled Castes and Scheduled Tribes and other Weaker Sections.	6
	Total Instructional Hours	**30**

Course Outcome	At the end of the course, the learner will be able to CO1:Understand the functions of the Indian government. CO2:Understand and abide the rules of the Indian Constitution

TEXTBOOKS:

T1: DurgaDasBasu,"IntroductiontotheConstitutionofIndia",PrenticeHallofIndia,NewDelhi,1997.
T2: Agarwal R C.,"Indian Political System", S.Chand and Company, NewDelhi,1997.
T3: MaciverandPage,"Society:AnIntroductionAnalysis",MacMilanIndiaLtd.,NewDelhi.
T4: Sharma K L., "Social Stratification in India: Issues and Themes ",Jawaharlal NehruUniversity,NewDelhi,1997.

REFERENCEBOOKS:

R1-Sharma,Brij Kishore,"Introduction to the Constitution of India:, Prentice Hall of India, New Delhi.
R2-GahaiUR.,"IndianPoliticalSystem",NewAcademicPublishingHouse, Jalaendhar.
R3-Sharma R N., "Indian Social Problems",Media Promoters and Publishers Pvt. Ltd.

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SYLLABUS
II SEMESTER

Programme/Sem	Course Code	Name of the Course	L	T	P	C
B.E./II	22MA2102	DIFFERENTIAL EQUATIONS AND LAPLACE TRANSFORM (ECE, EEE &EIE)	3	1	0	4

Course Objective

The learner should be able to

1. Describe some methods to solve different types of first order differential equations.
2. Understand the various approach to find general solution of the ordinary differential equations
3. Evaluate the various types of Partial differential equations and methods to find solution.
4. Analyze the techniques of Laplace transform.
5. Analyze the techniques of Inverse Laplace transform.

Unit	Description	Instructional Hours
I	**ORDINARY DIFFERENTIAL EQUATIONS OF FIRST ORDER** Basic concepts, separable differential equations, exact differential equations, integrating factors, linear differential equations, Bernoulli equation.	12
II	**LINEAR DIFFERENTIAL EQUATIONS OF SECOND ORDER** Second order linear differential equations with constant with RHS of the form e^{ax} , x^n , sinax, cosax- – Cauchy's linear equations– Method of variation of parameters.	12
III	**PARTIAL DIFFERENTIAL EQUATIONS** Formation of partial differential equations by eliminating arbitrary constants and functions – Solution of first order partial differential equations of the form f(p,q)=0, Clairaut's equation – Lagrange's equation.	12
IV	**LAPLACE TRANSFORM** Laplace transform–Basic properties –Transforms of derivatives and integrals of functions-Periodicfunctions - Unit step function - Dirac delta function.	12
V	**INVERSE LAPLACE TRANSFORM** Inverse Laplace transform-Convolution theorem (with out proof) –Solution of linear ODE of second order with constant coefficients using Laplace transforms..	12
	Total Instructional Hours	**60**

Course Outcome

At the end of the course, the learner will be able to

CO1: Apply few methods to solve different types of first order differential equations.
CO2: Evaluate the solutions of higher order ordinary differential equations and its properties.
CO3: Compute the solution of first order partial differential equations.
CO4: Apply Laplace transform and its properties to solve periodic functions.
CO5: Solve certain linear differential equations using inverse Laplace Transform.

TEXT BOOKS:

T1 - Erwin Kreyszig, "Advanced Engineering Mathematics", 10th Edition, Wiley India Private Ltd., New Delhi, 2018
T2 - Bali. N.P and Manish Goyal & Watkins, "Advanced Engineering Mathematics", 7th Edition, Laxmi Publications Pvt Ltd, 2007

REFERENCE BOOKS :

R1- Thomas & Finney " Calculus and Analytic Geometry" , Sixth Edition,,Narosa Publishing House, New Delhi.
R2 - Weir,M.D and Joel Hass, ' Thomas Calculus" 12thEdition,Pearson India 2016.
R3 - Grewal B.S, "Higher Engineering Mathematics", 42nd Edition, Khanna Publications, Delhi, 2012.

PO&PSO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	3	3	3	2	2	1	1	-	-	1	1	2	2	2
CO2	3	3	3	2	2	1	1	-	-	1	1	2	2	2
CO3	3	3	3	3	3	1	1	-	-	1	1	2	2	2
CO4	3	3	3	2	2	1	1	-	-	1	1	2	2	2
CO5	3	3	3	3	3	1	1	-	-	1	-	2	2	2
AVG	3	3	3	2.4	2.4	1	1	-	-	1	1	2	2	2

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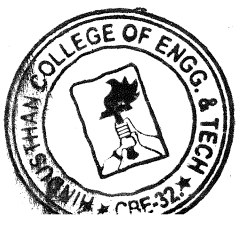

Programme/ Sem	Course Code	Name of the Course	L	T	P	C
B.E/ II	22CY2101	ENVIRONMENTAL STUDIES (common to all branches except CSE,IT & AIML)	3	0	0	2

Course Objective	**The learner should be able to** 1. Grasp the importance and issues related to ecosystem and biodiversity and their protection. 2. Acquire knowledge about environmental pollution – sources, effects and control measures of environmental pollution. 3. Identify the various natural resources, exploitation and its conservation 4. Gain knowledge on the scientific, technological, economic and political solutions to environmental problems. 5. Become aware on the national and international concern for environment and its protection

Unit	Description	Instructional Hours
I	**ENVIRONMENT, ECOSYSTEMS AND BIODIVERSITY** Main objectives and scope of environmental studies-Importance of environment – need for public awareness - concept of an ecosystem – structure and function of an ecosystem – food chain, food web and ecological pyramids - energy flow in the ecosystem – ecological succession processes - Introduction, types, characteristic features, structure and function of the forest and ponds ecosystem – Introduction to biodiversity definition: types and value of biodiversity – hot-spots of biodiversity – threats to biodiversity– endangered and endemic species of India – conservation of biodiversity: In-situ and ex-situ conservation of biodiversity.	9
II	**NATURAL RESOURCES** Renewable and Non renewable resources - Forest resources: Use and over-exploitation, deforestation, timber extraction, mining, dams and their effects on forests and tribal people - Food resources: World food problems, changes caused by agriculture and overgrazing, effects of modern agriculture – Energy resources: Renewable and non renewable energy sources – Solar energy and wind energy - role of an individual in conservation of natural resources.	9
III	**ENVIRONMENTAL POLLUTION** Definition – causes, effects and control measures of: Air pollution- Water pollution – Water quality parameters- Soil pollution - Noise pollution- Nuclear hazards – role of an individual in prevention of pollution.	9
IV	**SOCIAL ISSUES AND THE ENVIRONMENT** From unsustainable to sustainable development – urban problems related to energy- environmental ethics: Issues and possible solutions – 12 Principles of green chemistry- Municipal solid waste management. Global issues – Climatic change, acid rain, greenhouse effect and ozone layer depletion – Disaster Management – Tsunami and cyclones.	9
V	**HUMAN POPULATION AND THE ENVIRONMENT** Population growth, variation among nations – population explosion – family welfare programme – environment and human health – effect of heavy metals – human rights – value education – HIV / AIDS – women and child welfare – Environmental impact analysis (EIA)- GIS-remote sensing-role of information technology in environment and human health.	9
	Total Instructional Hours	45

Course Outcome	**At the end of the course, the learner will be able to** CO1: Discuss the importance of ecosystem and biodiversity for maintaining ecological balance. CO2: Identify the causes of environmental pollution and hazards due to manmade activities. CO3: Develop an understanding of different natural resources including renewable resources. CO4: Demonstrate an appreciation for need for sustainable development and understand the various social issues and solutions to solve the issues. CO5: Describe about the importance of women and child education, existing technology to protect environment.

TEXT BOOKS:

T1 – S.Annadurai and P.N. Magudeswaran, "Environmental studies", Cengage Learning India Pvt.Ltd, Delhi, 2020
T2 - Anubha Kaushik and C. P. Kaushik, "Perspectives in Environmental studies", Sixth edition, New Age International Publishers, New Delhi, 2019.

REFERENCE BOOKS:

R1 - Erach Bharucha, "Textbook of environmental studies" University Press (I) Pvt.ltd, Hyderabad, 2015
R2 - G.Tyler Miller, Jr and Scott E. Spoolman"Environmental Science" Thirteenth Edition, Cengage Learning, 2010.
R3 – Gilbert M. Masters and Wendell P. Ela "Introduction to Environmental Engineering and Science", 3rd edition, Pearson Education, 2013.

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Program me/ Sem	Course Code	Name of the Course	L	T	P	C
BE/B.Tech II	22PH2101	BASICS OF MATERIAL SCIENCE (Common to all branches except MCT)	2	0	0	2

Course Objective	**The student should be able to** 1.Gain knowledge about Crystal systems and crystal structures 2. Understand the knowledge about electrical properties of materials 3. Enhance the fundamental knowledge in semiconducting materials. 4. Gain knowledge about magnetic materials 5. Acquire fundamental knowledge new engineering materials which is related to the engineering program

Unit	Description	Instructional Hours
I	**CRYSTAL PHYSICS** Crystal systems - Bravais lattice - Lattice planes - Miller indices – Inter planar spacing in cubic lattice - Atomic radius, Coordination number and Packing factor for SC, BCC and FCC crystal structures.	6
II	**ELECTRICAL PROPERTIES OF MATERIALS** Classical free electron theory - Expression for electrical conductivity – Thermal conductivity, expression – Widemann - Franz law – Success and failures -– Fermi- Dirac statistics – Density of energy states .	6
III	**SEMICONDUCTING MATERIALS** Introduction – Compound and elemental semiconductor - direct and indirect band gap of semiconductors. Intrinsic semiconductor — electrical conductivity – band gap determination. - Extrinsic semiconductor – n type and p type semiconductor –Light Emitting Diode.	6
IV	**MAGNETIC MATERIALS** Origin of magnetic moment – Bohr magnetron – comparison of Dia, Para and Ferro magnetism – Domain theory – Hysteresis – soft and hard magnetic materials – anti ferromagnetic materials – Ferrites and its applications.	6
V	**NEW ENGINEERING MATERIALS** Metallic glasses: melt spinning process, Preparation and applications - shape memory alloys: phases, shape memory effect - Characteristics of SMA : Pseudoelastic effect, Super elasticity and Hystersis. Applications of SMA. Nanomaterials preparation (bottom up and top down approaches) – various techniques - pulsed laser deposition - Chemical vapor deposition	6
	Total Instructional Hours	30

Course Outcome	**After completion of the course the learner will be able to** CO1: Understand the Crystal systems and crystal structures in the field of Engineering CO2: Illustrate the fundamental of electrical properties of materials CO3: Discuss concept of acceptor or donor levels and the band gap of a semiconducting materials CO4: Develop the technology of the magnetic materials and its applications in engineering field CO5: Understand the advanced technology of new engineering materials in the field of Engineering

TEXT BOOKS:

T1 - Rajendran V, "Materials Science", Tata McGraw Hill Publishing Company Limited, New Delhi, 2017.

T2- M.N Avadhanulu and PG Kshirsagar "A Text Book of Engineering physics" S. Chand and Company ltd., New Delhi 2022

REFERENCE BOOKS:

R1 – Charles Kittel "Introduction to Solid State Physics". Wiley., New Delhi 2017

R2 - Dr. M.Arumugam "Materials Science " Anuradha publications., 2019

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO-1	PSO-2
CO1	3	2	2	-	2	1	1					1	1	1
CO2	3	2	2	-	2	1	-					1	-	1
CO3	3	2	2	-	2	1	1					1	1	1
CO4	3	2	2	2	2	1	-					1	-	1
CO5	3	2	2	-	2	1	1					1	1	2
AVG	3	2	2	2	2	1	1	-	-	-	-	1	1	1.2

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Program me/ Sem	Course Code	Name of the Course	L	T	P	C
BE/B.Tech/ II	22PH2151	PHYSICS FOR CIRCUIT ENGINEERING PROGRAMME (AIML,CSE,ECE,EEE,EIE,IT & BME)	2	0	2	3

Course Objective	**The student should be able to** 1. Gain knowledge about laser, their applications , become conversant with principles of optical fiber and its applications 2. Enhance his fundamental knowledge about properties of matter 3. Understand the concept of wave optics 4. Gain knowledge about quantum mechanics to explore the behavior of sub atomic particles 5. Acquire fundamental knowledge of Ultrasonics and their applications.

Unit	Description	Instructional Theory Hours
I	**LASER AND FIBER OPTICS** Spontaneous emission and stimulated emission –Type of lasers – Nd:YAG laser - Laser Applications – Holography – Construction and reconstruction of images. Principle and propagation of light through optical fibers – Derivation of numerical aperture and acceptance angle – Classification of optical fibers (based on refractive index and modes) – Fiber optical communication link. **Determination of Wavelength and particle size using Laser**	6
II	**PROPERTIES OF MATTER** Elasticity – Hooke's law – Poisson's ratio – Bending moment – Depression of a cantilever – Determination of Young's modulus of the material of the beam by Uniform bending theory and experiment. Twisting couple - torsion pendulum: theory and experiment **Determination of Young's modulus by uniform bending method** **Determination of Rigidity modulus – Torsion pendulum**	6
III	**WAVE OPTICS** Interference of light – air wedge –Thickness of thin paper(Testing of thickness of surface) -Michelson interferometer - Diffraction of light –Fraunhofer diffraction at single slit – Diffraction grating - Plane Diffraction grating – Rayleigh's criterion of resolution power - resolving power of grating. **Determination of wavelength of mercury spectrum – spectrometer grating** **Determination of thickness of a thin wire – Air wedge method**	6
IV	**QUANTUM PHYSICS** Black body radiation –Compton effect: theory and experimental verification – wave particle duality –concept of wave function and its physical significance – Schrödinger's wave equation – time independent and time dependent equations – particle in a one-dimensional rigid box .	6
V	**ULTRASONICS** Production – Piezoelectric generator – Properties of Ultrasonic waves. Determination of velocity using acoustic grating – Cavitation. Industrial applications – Drilling and welding – Non destructive testing (pulse echo system). Medical applications – Ultrasound Scanner – A – mode – B- mode and C –mode.	6
	Total Instructional Hours	30
	Total Lab Instructional Hours	30

Course Outcome	**After completion of the course the learner will be able to** CO1: Understand the advanced technology of LASER and optical communication in the field of engineering CO2: Illustrate the fundamental properties of matter CO3: Discuss the Oscillatory motions of particles CO4: Understand the dual nature of matter and the Necessity of quantum mechanics. CO5: Develop the Ultrasonics technology and its applications in NDT.

PO&	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	2	1	1	1	1		-	1	-	2	3	2	1
CO2	3	3	1	1	2	-	-	-	1	-	2	2	2	2
CO3	3	2	1	2	2	-	-	-	1	-	1	2	2	3
CO4	3	3	1	2	2	1	-	-	1	-	1	2	2	2
CO5	3	2	2	3	2	1	2	-	1	-	2	2	2	3
AVG	3	2.4	1.2	1.8	1.8	1	2	-	1	-	1.6	2.2	2	2.2

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PROGRAMME	COURSE CODE	NAME OF THE COURSE	L	T	P	C
B.E/B.Tech	22CS2255	Programming Using C	2	0	2	3

Course Objective	1. To develop simple algorithms for arithmetic and logical problems. 2. To understand and implement the fundamental concepts in a program. 3. To enable how to implement conditional branching, iteration and recursion. 4. To understand how to decompose a problem into functions and synthesize a complete program and to enable them to use arrays, pointers, strings and structures in solving problems. 5. To understand the use files to perform read and write operations

Unit	Description	Instructional Hours
I	**BasicsofCProgramming** StructureofCprogram-Cprogramming:DataTypes–Keywords–Variables - Operators:PrecedenceandAssociativity-Expressions–Input/Outputstatements Decision making statements - Looping statements – Pre-processordirectives -Compilation process	5+4(P)
II	**Arrays andStrings** IntroductiontoArrays: Declaration,Initialization–One dimensionalarray–Twodimensional arrays– Stringoperationsand Stringfunctions	5+4(P)
III	**FunctionsandPointers** Introductiontofunctions:Functionprototype,function definition,functioncall - Parameter passing: Pass by value, Pass by reference – Recursion – Pointers –Pointeroperators– Pointerarithmetic–Arraysandpointers	5+4(P)
IV	**StructuresandUnions** Structure - Nested structures– Array of structures –Self-referential structures – Dynamic memory allocation – Typedef-Unions –Unionof Structures	7+2(P)
V	**FileProcessing** Files–Typesoffileprocessing:Sequentialaccess,Randomaccess–Sequential accessfile-Randomaccessfile – Command linearguments	7+2(P)
	TOTAL INSTRUCTIONAL HOURS	45

S.No	List of Experiments
1	Programs using I/O statements and expressions
2	Write a program to find whether the given year is leap year or Not
3	Design a calculator to perform the operations, namely, addition, subtraction, multiplication and division
4	Write a program to findSum of Digits of two number
5	Check whether a given number is Armstrong number or not
6	Write a program to find addition of two Matrix.
7	Write a program for compute transpose of a matrix.
8	Write a program to find Palindrome of a given String
9	Find a factorial of a number using recursion
10	Sort the list of numbers using pass by reference
11	Compute internal marks of students for five different subjects using structures
12	Generate salary slip of employees
13	Write a program to copy the content of file to another file
14	Find the total number of characters, words and lines in given file.
15	Write a program to swap operation using command line arguments for input
Course Outcome	At the end of the course, the learner will be able to CO1: Develop simple algorithms for arithmetic and logical problems. CO2: Test and execute the programs and correct syntax and logical errors. CO3: Implement conditional branching, iteration and recursion. CO4: Decompose a problem into functions and synthesize a complete program and use arrays, pointers, strings and structures to formulate algorithms and programs. CO5: Use files to perform read and write operations.

TEXT BOOKS:

T1 - Rajendran V, Applied Physics, Tata McGraw Hill Publishing Company Limited, New Delhi, 2017.

T2- Gaur R.K. and Gupta S.L., Engineering Physics, 8th edition, Dhanpat Rai Publications (P) Ltd., New Delhi, 2015.

REFERENCE BOOKS:

R1 - M.N Avadhanulu and PG Kshirsagar"A Text Book of Engineering physics"S.Chand and Company ltd., NewDelhi 2016

R2 - Dr. G. Senthilkumar "Engineering Physics – I" VRB publishers Pvt Ltd., 2021

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	3	3	2	1	1	1	1	-	1	-	2	3	2	1
CO2	3	2	1	1	2	1	1	-	1	-	2	2	3	3
CO3	3	2	1	2	2	1	1	-	1	-	1	2	3	3
CO4	3	2	3	2	3	1	1	-	1	-	1	2	2	2
CO5	3	2	3	2	2	2	1	-	1	-	1	2	2	3
AVG	3	2.2	2	1.6	2	1.2	1	-	1	-	1.4	2.2	2.4	2.4

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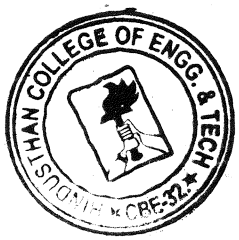

TEXT BOOKS:

T1:Balagurusamy, "Programming in ANSI C", Tata McGraw, 7th Edition, 2001. ISBN 13:9789339219666

T2: Behrouz A. Forouzan, Richard F. Gilberg, J. Jaya, S. Shankar, I. Jasmine SelvakumariJeya, M. Ramya Devi, "Computer Programming in C", Cengage Learning, 2022.

T3: Byron Gottfried, "Programming with C", Schaum's Outlines Series, McGraw Hill Education, 3rd edition, 2017.

REFERENCE BOOKS:

R1: Schildt Herbert, "C: The Complete Reference", Tata McGraw Hill Education, 4th edition, 2014.

R2: R. S. Bichkar, "Programming with C", Universities Press, 2nd edition 2012.

R3: YashvantKanetkar, "Exploring C", BPB Publishers, 2nd edition, 2003.

R4: W. Kernighan Brian, Dennis M. Ritchie, "The C Programming Language", PHI Learning, 2nd edition, 1988

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Programme/ Sem	Course Code	Name of the Course	L	T	P	C
B.E. / II	22CS2253	JAVA FUNDAMENTALS (AI&ML & FOR OTHER IBM STUDENTS)	2	0	2	3

Course Objective	**The student should be able** 1. To Understand the Basics of java Programming. 2. To discuss the packages and interfaces in java programming 3. To learn IO streams and multithreading in java 4. To learn generics and collections framework in java 5. To understand event handling and swing in java

Unit	Description	Instructional Hours
I	**INTRODUCTION TO JAVA** JAVA-History of JAVA-Features of JAVA-Hello worlds java program-Setting path-JDK, JRV and JVM-JAVA variables-JAVA data types-Keywords-Operators. *Illustrative Programs: Java program to swap two numbers using bitwise operator, Java program to find the smallest three numbers using ternary operator.*	5+2(P)
II	**CONTROL STATEMENTS** Introduction to control statements in programming-If-else-switch-for loop-while loop-do while loop-Break-continue-JAVA comments. *Illustrative programs: Find the square root of a number ,To determine leap year or not, Java program to find the factorial of number using recursion,Create Generic number calculator using Java.*	5+6(P)
III	**JAVA POLYMORPHISM** Introduction to polymorphism concepts-Method overloading-Method overriding-Covariant return type-Super keyword-Instance Initializer block-final keyword-Runtime polymorphism-Dynamic binding-Instance of operator-Abstract class-interface-abstract Vs interface.*Illustrative programs: Method overriding, Abstract classes.*	7+2(P)
IV	**ENCAPSUALATION, ARRAY** Java encapsulation-package-access modifier-Encapsulation-Object cloning- call by value-Java array concepts-Single dimension array-Multi dimension array.*Illustrative programs:Java program to check the whether the input character is vowels or not*	7+2(P)
V	**FILES, PACKAGES** File handling in python-Open a file in JAVA-How to read from a file in JAVA-writing to file in JAVA-Exception handling-Java swing-java applet-Java AWT and events-Java collection. *Illustrative programs:Find the most frequent words in a text read from a file, Linked List implementation using collections, Program that handles all mouse events, Program using swing.*	5+4(P)
	TOTAL INSTRUCTIONAL HOURS	**45**

Course Outcome	At the end of the course, the learner will be able to CO1: Understanding the OOPS and basic concepts of Java. CO2: Understand how to program using user defined packages and interfaces. CO3: Apply multithreading concepts based on appropriate problems. CO4: Understand generics and collections framework in java CO5: Apply event handling classes and swing concepts to create different applications in java

TEXT BOOKS:

T1 - Herbert Schildt, "The complete reference java 2", 11th edition, McGraw – Hill 2019.
T2 - "Core Java 2",Vol 2,Advanced Features, Cay.S.Horstmann and Gary Cornell, Seventh Edition, Pearson Education

REFERENCE BOOKS:

R1 - E.Balagurusamy,"Programming with java A Primer", fifth edition, McGraw – Hill 2014.
R2 - H.M.Deitel, P.J.Deitel, "Java: how to program", Eleventh edition, Prentice Hall of India private limited, 2017.

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO-1	PSO-2
CO1	3	3	3	3	-	-	-	-	-	-	-	2	3	2
CO2	3	3	-	-	-	-	-	-	2	-	-	2	3	2
CO3	3	3	3	2	-	-	-	-	2	-	-	2	3	2
CO4	3	3	3	3	-	-	-	-	2	-	-	2	3	2
CO5	3	3	3	3	-	-	-	-	2	-	-	2	3	2
AVG	3	3	3	2.75	-	-	-	-	2	-	-	2	3	2

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Programme	Course Code	Name of the Course	L	T	P	C
B.E/B.Tech	22ME2001	**Engineering Practices (Common to all branches)**	0	0	4	2

Course Objective	To provide exposure to the students with hands on experience on various basic engineering practices in Civil, Mechanical and Electrical Engineering.

Unit	Description of the Experiments
	GROUP A (CIVIL AND MECHANICAL)
1	Preparation of Single pipe line and Double pipe line connection by using valves, taps, couplings, unions, reducers and elbows.
2	Arrangement of bricks using English Bond for one brick thick wall for right angle corner junction and T- junction
3	Arrangement of bricks using English Bond for one and a half brick thick wall for right angle corner and T- junction
4	Preparation of arc welding of Butt joints, Lap joints and Tee joints.
5	Practice on sheet metal Models– Trays and funnels
6	Hands-on-exercise in wood work, joints by sawing, planning and cutting.
7	Practice on simple step turning, taper turning and drilling.
8	Demonstration on Smithy operation.
9	Demonstration on Foundry operation.
10	Demonstration on Power tools.
	GROUP B (ELECTRICAL ENGINEERING)
1	Residential house wiring using switches, fuse, indicator, lamp and energy meter.
2	Fluorescent lamp wiring.
3	Stair case wiring.
4	Measurement of Electrical quantities – voltage, current, power & power factor in single phase circuits.
5	Measurement of energy using single phase energy meter.
6	Soldering practice using general purpose PCB.
7	Measurement of Time, Frequency and Peak Value of an Alternating Quantity using CRO and Function Generator.
8	Study of Energy Efficient Equipment's and Measuring Instruments.
	Total Instructional Hours 45

Course Outcome	• Fabricate wooden components and pipe connections including plumbing works. • Fabricate simple weld joints. • Fabricate different electrical wiring circuits and understand the AC Circuits.

Programme	Course Code	Name of the Course	L	T	P	C
B.E/B.Tech	22ME2001	**Engineering Practices (Common to all branches)**	0	0	4	2

Course Objective	To provide exposure to the students with hands on experience on various basic engineering practices in Civil, Mechanical and Electrical Engineering.

Unit	Description of the Experiments
	GROUP A (CIVIL AND MECHANICAL)
1	Preparation of Single pipe line and Double pipe line connection by using valves, taps, couplings, unions, reducers and elbows.
2	Arrangement of bricks using English Bond for one brick thick wall for right angle corner junction and T- junction
3	Arrangement of bricks using English Bond for one and a half brick thick wall for right angle corner and T- junction
4	Preparation of arc welding of Butt joints, Lap joints and Tee joints.
5	Practice on sheet metal Models– Trays and funnels
6	Hands-on-exercise in wood work, joints by sawing, planning and cutting.
7	Practice on simple step turning, taper turning and drilling.
8	Demonstration on Smithy operation.
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10	Demonstration on Power tools.
GROUP B (ELECTRICAL ENGINEERING)	
1	Residential house wiring using switches, fuse, indicator, lamp and energy meter.
2	Fluorescent lamp wiring.
3	Stair case wiring.
4	Measurement of Electrical quantities – voltage, current, power & power factor in single phase circuits.
5	Measurement of energy using single phase energy meter.
6	Soldering practice using general purpose PCB.
7	Measurement of Time, Frequency and Peak Value of an Alternating Quantity using CRO and Function Generator.
8	Study of Energy Efficient Equipment's and Measuring Instruments.
	Total Instructional Hours **45**
Course Outcome	• Fabricate wooden components and pipe connections including plumbing works. • Fabricate simple weld joints. • Fabricate different electrical wiring circuits and understand the AC Circuits.

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Programme/ Sem	Course Code	Name of the Course	L	T	P	C
BE/B.TECH II	22HE2071	**DESIGN THINKING**	2	0	0	2

Course Objective	**The student should be able to** 1. To expose students to the design process 2. To develop and test innovative ideas through a rapid iteration cycle. 3. To provide an authentic opportunity for students to develop teamwork and leadership skills

Unit	Description	Instructional Hours
I	**DESIGN ABILITY** Asking Designers about what they Do – Deconstructing what Designers Do – Watching what Designers Do – Thinking about what Designers Do – The Natural Intelligence of Design Sources	6
II	**DESIGNING TO WIN** Formula One Designing – Radical Innovations – City Car Design – Learning From Failures – Design Process and Working Methods	5
III	**DESIGN TO PLEASE AND DESIGNING TOGETHER** Background – Product Innovations – Teamwork versus Individual work – Roles and Responsibilities – Avoiding and Resolving Conflicts.	6
IV	**DESIGN EXPERTISE** Design Process – Creative Design - Design Intelligence – Development of Expertise – Novice to Expert. Critical Thinking – Case studies: Brief history of Albert Einstein, Isaac Newton and Nikola Tesla	6
V	**DESIGN THINKING TOOLS AND METHODS** Purposeful Use of Tools and Alignment with Process - Journey Mapping - Value Chain Analysis - Mind Mapping – Brainstorming - Design Thinking Application: Design Thinking Applied to Product Development	7
	Total Instructional Hours	**30**

Course Outcome	**After completion of the course the learner will be able to** CO1: Develop a strong understanding of the Design Process CO2: Learn to develop and test innovative ideas through a rapid iteration cycle. CO3: Develop teamwork and leadership skills

TEXT BOOKS:

T1 - 1. Nigel Cross, "Design Thinking", Kindle Edition.

REFERENCE BOOKS:

R1 - Tom Kelley, "Creative Confidence", 2013.

R2 - 3. Tim Brown, "Change by Design", 2009.

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Programme/ Sem	Course Code	Name of the Course	L	T	P	C
BE/B.TECH II	22HE2072	SOFT SKILLS AND APPTITUDE I	0	0	0	1

Course Objective	**The student should be able to** 1. To develop and nurture the soft skills of the students through instruction, knowledge acquisition, demonstration and practice. 2. To enhance the students ability to deal with numerical and quantitative skills. 3. To identify the core skills associated with critical thinking. 4. To develop and integrate the use of English language skills

Unit	Description	Instructional Hours
I	**Lessons on excellence** Skill introspection, Skill acquisition, consistent practice	2
II	**Logical Reasoning** Problem Solving - Critical Thinking- Lateral Thinking - Coding and Decoding – Series – Analogy - Odd Man Out - Visual Reasoning - Sudoku puzzles - Attention to detail	11
III	**Quantitative Aptitude** Addition and Subtraction of bigger numbers - Square and square roots - Cubes and cube roots - Vedic maths techniques - Multiplication Shortcuts - Multiplication of 3 and higher digit numbers – Simplifications - Comparing fractions - Shortcuts to find HCF and LCM - Divisibility tests shortcuts - Algebra and functions	11
IV	**Recruitment Essentials** Resume Building - Impression Management	4
V	**Verbal Ability** Nouns and Pronouns – Verbs - Subject-Verb Agreement - Pronoun-Antecedent – Agreement - Punctuations	4
	Total Instructional Hours	30

Course Outcome	**After completion of the course the learner will be able to** CO1: Students will analyze interpersonal communication skills. public speaking skills. CO2: Students will exemplify tautology, contradiction and contingency by logical thinking. CO3: Students will be able to develop an appropriate integral form to solve all sorts of quantitative problems. CO4:Students can produce a resume that describes their education, skills, experiences and measurable achievements with proper grammar, format and brevity CO5: Students will be developed to acquire the ability to use English language with an error while making optimum use of grammar

REFERENCE BOOKS:

R1 - Quantitative Aptitude – Dr. R S Agarwal
R2 -Speed Mathematics: Secret Skills for Quick Calculation - Bill Handley
R3 -Verbal and Non – Verbal Reasoning – Dr. R S Agarwal
R4- Objective General English – S.P.Bakshi

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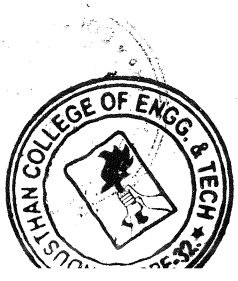

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Programme/ Sem	Course Code	Name of the Course	L	T	P	C
B.E./B.Tech/I	22MC2092	**HERITAGE OF TAMIL**	2	0	0	0

Course Objective	**The learner should be able to** 1. Introduce students to the great History of Tamil literature. 2. Establish the heritage of various forms of Rock art and Sculpture art. 3. To study and understand the various folk and Martial arts of Tamil culture 4. Introduce students to Ancient Tamil concepts to understand the richness of Tamil literature. 5. To learn about the various influences or impacts of Tamil language in Indian culture.

Unit	Description	Instructional Hours
I	**Language and Literature** Language families in India – Dravidian Languages – Tamil as a classical language – Classical Literature in Tamil- Secular nature of Sangam Literature – Distributive justice in Sangam Literature – Management principles in Thirukural – Tamil epics and impacts of Buddhism & Jainism in Tamil and Bakthi literature of Azhwars and Nayanmars – Forms of minor poetry _ Development of Modern literature in Tamil – Contribution of Bharathiyar and Bharathidasan.	6
II	**Heritage _ Rock Art Paintings to Modern Art – Sculpture** Hero Stone to Modern Sculpture – Bronze icons – Tribes and their handcrafts - Art of temple car making – Massive Terracotta sculptures, Village deities, Thiruvalluvar statue at Kanyakumari, Making of musical instruments – Mridangam, Parai, Yazh and Nadhaswaram - Role of Temples in social and economic life of Tamils.	6
III	**Folk and Martial Arts** Therukoothu, Karagattem, Villupattu, Kaniyan koothu, Oyilattam, Leather puppertry, Silambattam., Valari Tiger dance – Sports and Games of Tamils.	6
IV	**Thinai Concept of Tamils** Flora and Fauna of Tamils – Aham and Puram Concept from Tholkappiyam and Sangam Literature – Aram concept of Tamils – Education and Literacy during Sangam Age - Ancient cities and ports of Sangam age – Exporot and Import during Sangam age – Overseas conquest of Cholas.	6
V	**Contribution of Tamils to Indian National Movement and Indian Culture** Contribution of Tamils to Indian freedom struggle – The cultural influence of Tamils over the other parts of India – Self respect movement – Role of Siddha Medicine in indigenous systems of Medicine – Inscriptions & Manuscripts – Print History of Tamil books.	6
	Total Instructional Hours	30

Course Outcome	**At the end of the course, the learner will be able to** CO1: Learn about the works pertaining to Sangam age CO2: Aware of our Heritage in art from Stone sculpture to Modern Sculpture. CO3Appreciate the role of Folk arts in preserving, sustaining and evolution of Tamil culture. CO4: Appreciate the intricacies of Tamil literature that had existed in the past. CO5: Understand the contribution of Tamil Literature to Indian Culture

TEXTBOOKS:

T1: Social Life of Tamils (Dr.K.K.Pillay) A joint publication of TNTB & ESC and RMRL – (in print)

T2: Social Life of the Tamils - The Classical Period (Dr.S.Singaravelu) (Published by: International Institute of Tamil Studies.

T3: Historical Heritage of the Tamils (Dr.S.V.Subatamanian, Dr.K.D. Thirunavukkarasu)(Published by: International Institute of Tamil Studies).

REFERENCEBOOKS:

R1-The Contributions of the Tamils to Indian Culture (Dr.M.Valarmathi) (Published by: International Institute of Tamil Studies)

R2- Porunai Civilization (Jointly Published by: Department of Archaeology & Tamil Nadu Text Bookand Educational Services Corporation, Tamil Nadu)

R3-Journey of Civilization Indus to Vaigai (R.Balakrishnan) (Published by: RMRL) – Reference Book.

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Programme	Course Code	Course Title	L	T	P	C
BE/BTECH	22MC2093	SOCIAL SERVICES AND COMMUNITY DEVELOPMENT	1	0	0	1

Course Objectives:

The student should be able to

1. Acquire the knowledge and active participate in social service and community development activities.
2. Understand the concept of disaster management and role of NCC cadets in disaster management..
3. Understand the concept thinking and reasoning process..
4. Understand about maps and use of bearing and service protector
5. Know about the principles of flight and Aero foil structure and ATC procedures.

Unit	Description	Instructional Hours
I	**SOCIAL SERVICES AND COMMUNITY DEVELOPMENT** Basics of social services and its need - Rural development programs - Contribution of youth towards social welfare - NGOs in social services Swach bharath Abhiyan - Social evils - Mission Indra danush - Beti bacho Beti pado - Digital awareness - Constitution day.	3
II	**DISASTER MANAGEMENT** Organization of Disaster management -Types of emergencies - Natural and manmade disasters - fire service and fire fighting - prevention of fire.	3
III	**PERSONALITY DEVELOPMENT** Introduction to personality development - public speaking Intra and Inter personal skills -self awareness - critical thinking - Decision making and problem solving.	3
IV	**MAP READING** Types of maps - conventional signs - scales and Grid system - relief and contour gradient - cardinal points - Types of North - types of bearing and use of service protector - Prismatic compass and its uses - setting of map - finding North and own position.	3
V	**PRINCIPLES OF FLIGHT AND AIRMANSHIP** Introduction to principle of flight - Forces acting on the aircraft - Angle of attack - Angle of incidence - Newton's - law of motion - Bernauli's theorem and Venturi effect - Aerofoil - Airfield layout - ATC (Air Traffic Control) - circuit procedures - Aviation medicine.	3
	Total Instructional Hours	15

Course Outcome:

After completion of the course the learner will be able to

CO1:Perform the social services on various occasions for better community and social life
CO2:Appreciate the need and requirement for disaster management and NCC role in disaster management activities.
CO3: Define thinking, reasoning, critical thinking and creative thinking
CO4:Use of bearing and service protector and locate the places and objects on the ground.
CO5:Understand the principles of flight and Aerofoil structure

Reference:

1. UGC and AICTE circulated syllabus.

Text Books :

1. NCC cadet Guide (SD/SW) Army
2. NCC cadet Guide (SD/SW) Airforce.
3. ANOs Guide (SD/SW) by DG NCC, Ministry of Defence, New Delhi
4. Digital Forum App 1.0 & 2.0, by DG NCC DG NCC, Ministry of Defence, New Delhi

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Programme/sem	Course Code	Name of the Course	L	T	P	C
BE/B.TECH/III	**21MA3102**	**FOURIER ANALYSIS AND TRANSFORMS (COMMON TO EEE, ECE, EIE, AGRI, BM & FT)**	3	1	0	4

Course Objective	1. Analyze Fourier series which is central to many applications in engineering. 2. Apply the effective tools for the solutions of one-dimensional boundary value problems. 3. Apply the effective tools for the solutions of two-dimensional heat equations. 4. Apply Fourier transform techniques in various situations. **5.** Analyze Z transform techniques for discrete time systems

Unit	Description	Instructional Hours
I	**FOURIER SERIES** Dirichlet's conditions- General Fourier Series – Odd and Even Functions – Half range sine and cosine series – Change of Interval - Parseval's Identity - Harmonic analysis.	12
II	**BOUNDARY VALUE PROBLEMS** Classification of PDE - Solutions of one-dimensional wave equation - One dimensional equation of heat conduction (excluding insulated edges).	12
III	**TWO-DIMENSIONAL HEAT EQUATIONS** Steady state solution of two-dimensional equation of heat conduction in infinite plate and semicircular plate.	12
IV	**FOURIER TRANSFORMS** Fourier Transform Pairs - Fourier sine and cosine transforms – Properties - Transforms of Simple functions – Convolution Theorem (Statement only) – Parseval's identity(Statement only).	12
V	**Z - TRANSFORMS AND DIFFERENCE EQUATIONS** Z- Transforms - Elementary properties – Inverse Z - transform (using partial fraction and residues) – Convolution theorem (excluding proof)– Solution of difference equations using Z – transform.	12
	Total Instructional Hours	**60**

Course Outcome	CO1-Understand the principles of Fourier series which helps them to solve physical problems of engineering. CO2-Employ Fourier series in solving the boundary value problems. CO3-Understand Fourier series in solving the two-dimensional heat equations. CO4-Apply Fourier transform techniques which extend its applications. CO5-Illustrate the Z- transforms for analyzing discrete-time signals and systems

TEXT BOOKS:

T1 - Erwin Kreyszig, "Advanced Engineering Mathematics", 10th Edition, Wiley India Private Ltd., New Delhi, 2018

T2 - Bali. N.P and Manish Goyal & Watkins, "Advanced Engineering Mathematics", 7th Edition, Laxmi Publications Pvt Ltd, 2007

REFERENCE BOOKS :

R1 - Veerarajan. T.,"Transforms and Partial Differential Equations", Tata McGraw Hill Education Pvt. Ltd., Second reprint, New Delhi, 2012.

R2 - Grewal B.S., "Higher Engineering Mathematics", 44th Edition, Khanna Publishers, Delhi.2018.

R3 -Ramana. B.V., "Higher Engineering Mathematics", Tata McGraw Hill Publishing Company Limited, New Delhi, 2018.

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	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3	3	3	-	-	-	-	-	-	-	2	2	1
CO2	3	3	3	3	-	-	-	-	-	-	-	2	1	2
CO3	3	3	3	3	-	-	-	-	-	-	-	3	2	3
CO4	3	3	3	3	3	-	-	-	-	-	-	2	1	2
CO5	3	3	3	3	-	-	-	-	-	-	-	2	2	1
AVG	3	3	3	3	3	-	-	-	-	-	-	2.2	1.6	1.8

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Programme	Course Code	Name of the Course	L	T	P	C
BE	21EC3201	Digital Electronics	3	0	0	3

Course Objective

1. To impart knowledge on different methods used for the simplification of Boolean functions
2. To explain the working of various combinational circuits
3. To gain knowledge about synchronous sequential circuits.
4. To gain knowledge about asynchronous sequential circuits.
5. To impart knowledge on different types of memories.

Unit	Description	Instructional Hours
I	**BOOLEAN ALGEBRA AND LOGIC SIMPLIFICATIONS** Boolean operation and expressions- Laws and rules of Boolean algebra -Simplification using Boolean algebra - Sum of Products (SOP) - Product of Sums (POS)- Karnaugh map Minimization- Quine - McCluskey method of minimization- Logic Gates- NAND–NOR implementations.	9
II	**ANALYSIS AND DESIGN OF COMBINATIONAL CIRCUITS** Analysis and design of combinational circuits - Circuits for arithmetic operations: adder, subtractor, Carry look ahead adder-BCD adder-Magnitude comparator-Encoders and Decoders-Multiplexers and Demultiplexers, Parity checker and generators.	9
III	**SYNCHRONOUS SEQUENTIAL CIRCUITS** Latches- Flip-flops- SR, JK, D, T, and Master-Slave - Edge triggering - Level Triggering-Analysis and design of synchronous sequential circuits: State diagram - State table – State minimization - State assignment, Synchronous Up/Down counters, mod n counters, Shift registers, Universal shift registers.	9
IV	**ASYNCHRONOUS SEQUENTIAL CIRCUITS** Analysis and design of asynchronous sequential circuits - Reduction of state and flow tables – Race-free state assignment – Hazards.	9
V	**MEMORIES and PROGRAMMABLE LOGIC DEVICES** Classification of memories-RAM- RAM organization- Static RAM Cell- Dynamic RAM Cell-ROM-ROM organization-PROM-EPROM-Flash memories-PAL,PLA,FPGA,CPLD.	9
	Total Instructional Hours	**45**

Course Outcome

CO1-Interpretants and implement the Boolean function with universal gates them with universal gates.
CO2-Design and analyze various combinational circuits.
CO3-Illustrate synchronous sequential circuits.
CO4-Contrast and compare various synchronous sequential circuits.
CO5-Discuss the working principle of different types of memories.

TEXT BOOKS:

T1-Thomas L. Floyd, "Digital Fundamentals", 10th Edition, Pearson Education Inc, 2011.

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REFERENCE BOOKS:

R1- A.Anandkumar, "Fundamentals of Digital Electronics", fourth edition ,PHI Learning Pvt. Ltd,2016.

R2- S.Salivahanan and S.Arivazhagan, "Digital Circuits and Design" ,Vikas publishing House Pvt. Ltd ,2013

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3	3	2	2	-	-	-	-	-	1	1	3	2
CO2	3	3	2	2	2	-	-	-	-	-	1	1	3	2
CO3	3	2	3	2	2	-	-	-	-	-	1	1	3	3
CO4	3	3	3	2	2	-	-	-	-	-	1	1	3	3
CO5	3	3	3	2	2	-	-	-	-	-	1	1	3	3
AVG	3	3	3	2	2	-	-	-	-	-	1	1	3	2.6

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Programme	Course Code	Name of the Course	L	T	P	C
BE	21EC3202	Signals and Systems	3	1	0	4

Course Objective	1. To understand the basic signals and their properties. 2. To learn the mathematical tool of Fourier series and transforms. 3. To understand the concept of system analysis using Laplace transforms. 4. To understand the discrete signal analysis using transforms. 5. To know discrete system analysis using Z –transform.

Unit	Description	Instructional Hours
I	**SIGNALS AND SYSTEM REPRESENTATION & CLASSIFICATION** Standard signal representation –continuous and discrete domain. Properties of impulse signal. Mathematical operation on signals, classification of signals and system -analog and discrete.	12
II	**ANALYSIS OF CONTINUOUS TIME (CT) SIGNALS** Fourier series analysis-Trigonometric form, spectrum of continuous time (CT) signals- Fourier and Laplace transform of standard signals-Region of Convergence (ROC).Inverse Fourier and Laplace transform–partial fraction method, Properties.	12
III	**LINEAR TIME INVARIANT- CONTINUOUS TIME (CT) SYSTEMS** Block diagram representation of system- Direct form I & II. Applying Fourier and Laplace transform : Transfer function ,impulse response and Frequency response of CT system , Convolution integrals-Integral & Graphical method.	12
IV	**ANALYSIS OF DISCRETE TIME SIGNALS** DTFT and Inverse DTFT – properties of DTFT - z transform and Inverse z-transform – Region of Convergence, properties of z transform.Convolution sum-Graphical and Matrix method.	12
V	**LINEAR TIME INVARIANT-DISCRETE TIME SYSTEMS** Block diagram representation of system- Direct form I & II structure.DTFT and Z transform analysis of systems: Transfer function, impulseresponse, system response and Frequency response, Convolution and de-convolution	12
	Total Instructional Hours	60

Course Outcome	CO1-Understand the signal and system classification and properties CO2-Interpret signal spectrum and apply Fourier series to continuous signal CO3-Apply Fourier and Laplace transform in LTI system analysis. CO4-Apply DTFT to understand the properties of discrete time signals. CO5-Evaluate Z-transform for discrete system analysis

TEXT BOOKS:

T1 - AllanV.Oppenheim, S.Wilsky and S.H.Nawab, "Signals and Systems", Pearson, 2007.

T2 - P Ramakrishna Rao, "Signals and System", Tata McGraw-Hill Education.2010.

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REFERENCE BOOKS:

R2 - B. P. Lathi, "Principles of Linear Systems and Signals", Second Edition, Oxford, 2009.

R3 - RameshBabu.P and Anandanatarajan, "Signals and Systems",Fifthedition,Scitech publications,2017.

R4 - A.NagoorKani, "Signals and Systems,Simplified", McGrawHill Publication, 2018.

R4 - A.NagoorKani, "Signals and Systems,Simplified", McGrawHill Publication, 2018.

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3	3	3	-		-	-	-	-	-	3	3	2
CO2	3	3	3	3	-		-	-	-	-	-	3	3	2
CO3	3	3	3	3	-		-	-	-	-	-	3	3	2
CO4	3	3	3	3	-		-	-	-	-	-	3	3	2
CO5	3	3	3	3	-		-	-	-	-	-	3	3	2
AVG	3	3	3	3	-		-	-	-	-	-	3	3	2

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Programme	Course Code	Name of the Course	L	T	P	C
BE	21EC3203	Electronic Circuits	3	0	0	3

Course Objective

1. To learn about biasing of BJT and JFET circuits.
2. To study the behavior of small signal amplifiers using BJT.
3. To provide an insight on the large signal amplifiers and linear wave shaping circuits.
4. To impart knowledge on feedback amplifiers.
5. To discuss the operating principles of oscillators and multivibrators.

Unit	Description	Instructional Hours
I	**BIASING OF BJT AND FET** Need for biasing – Stability factor - Load line and quiescent point.-Variation of quiescent point - BJT biasing circuits – Bias compensation for BJT – FET andMOSFET Biasing circuits.	9
II	**SMALL SIGNAL AMPLIFIERS** h-parameter small-signal equivalent circuit –Midband analysis of single stageCE amplifiers - Low frequency response of CE amplifiers - High frequency π model -High frequency response of CE amplifiers, Multistage amplifiers -Darlington Amplifier.	9
III	**LARGE SIGNAL AMPLIFIERS AND LINEAR WAVE SHAPING CIRCUITS** Classification of large signal amplifiers –Class A , Class B amplifier – Cross over Distortion - Push-Pull amplifier – complementary symmetry push-pull amplifier, Tuned amplifiers -Class C tuned amplifier -Integrator- Differentiator- Clippers- Clampers- Diode comparator .	9
IV	**FEEDBACK AMPLIFIERS** Block diagram, Loop gain, Gain with feedback, Effects of negative feedback. Sensitivity and desensitivity of gain, Cut-off frequencies, distortion, noise, input impedance and output impedance with feedback. Four types of negative feedback connections - voltage series feedback, voltage shunt feedback, current series feedback and current shunt feedback.	9
V	**OSCILLATORS AND MULTIVIBRATORS** Classification of oscillator, Barkhausen Criterion - Mechanism for start of oscillation and stabilization of amplitude. General form of an Oscillator, Analysis of Hartley, Colpitt's, RC phase shift and Wien bridge Oscillator- Astablemultivibrator– Monostablemultivibrator and Bistablemultivibrator.	9
	Total Instructional Hours	45

Course Outcome

CO1-Assess various biasing circuit for BJT and JFET amplifiers and apply in solving the problems
CO2-Design the low frequency and high frequency response of BJT amplifiers using small signal equivalent circuit.
CO3-Design various types of large signal amplifiers and linear wave shaping circuits
CO4-Understand & design the different types of feedback amplifiers with examples
CO5-Create various types of oscillators and multivibrators and their applications

TEXT BOOKS:

T1- S.Salivahanan, N.Suresh Kumar and A.Vallavaraj, "Electronic Devices and Circuits", 3rd Edition,2012, McGraw Hill.(All units)

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REFERENCE BOOKS:
R1-Robert L.Boylestad, Louis Nasheisky, "Electronic Devices and Circuit Theory", 9th Edition, 2007.
R2- Jacob Millman,Christos C.Halkias,"Electronic Devices and Circuits" McGraw Hill , Edition 1991.
R3- D.Schilling and C.Belove, "Electronic Circuits", 3rd Edition, McGraw Hill, 1989.
R4- David A. Bell, "Electronic Devices and Circuits", fifth edition,Oxford Higher education

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3	3	2	-		-	-	-	-	-	3	3	2
CO2	3	3	3	2	-		-	-	-	-	-	3	3	2
CO3	3	2	3	2	-		-	-	-	-	-	3	3	2
CO4	3	2	3	2	-		-	-	-	-	-	3	3	2
CO5	3	2	3	2	-		-	-	-	-	-	3	3	2
AVG	3	2.4	3	2	-		-	-	-	-	-	3	3	2

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Programme	Course Code	Name of the Course	L	T	P	C
BE	21CS3252	OOPS using Java	2	0	2	3

Course Objective	1. Learn the basics of java programming language 2. Discuss he inheritance, interfaces and exception handling in java 3. Learn packages and multithreading in java 4. Learn I/O streams and collections framework in java 5. Learn Applets,frames and windows in java and its applications.

Unit	Description	Instructional Hours
I	**OVERVIEW OF JAVA PROGRAMMING** Review of Object oriented programming-Introduction to java programming-Features of Java Language, JVM -The Java Environment-Primitive Data types-variables-arrays-control statements- classes and objects-access specifier-methods-constructor-string. **Programs:** 1. Arrange the given character array in ascending order by getting the user input. 2. method overriding 3. add two complex numbers using constructors	7+2(P)
II	**BASIC JAVA FEATURES** Inheritance – class hierarchy – polymorphism – dynamic binding – final keyword Defining an interface-implementing an interface-applying interface-variables in interface-extended interface - Exception Handling-exception types-uncaught exception-multiple catch - nested try – throw and finally - built-in exceptions. **Programs:** 1. Bank Details using Multi-Level Inheritance 2. Student's internal and external Mark statements using Interface with exception handling	7+2(P)
III	**PACKAGES AND MULTITHREAD** Packages-defining package-access protection-importing packages -Multithreaded programming -java thread model-thread priorities-synchronization- thread class and runnable interface-creating multiple threads. **Programs:** 1. Calculate simple interest and compound interest using packages and exception handling. 2. Program to illustrate multi threads.	7+2(P)
IV	**I/O STREAMS AND COLLECTIONS FRAMEWORK** I/O basics- Streams, Byte streams, Character streams, reading console input-writing console output-reading and writing files. Collections overview –interfaces (Collection, List, Set, SortedSet, NavigableSet)-classes(ArrayList, LinkedList, HashSet, LinkedHashSet, TreeSet)-an iterator. **Programs:** 1. Convert uppercase into lowercase using file I/O. 2. Linked List implementation using collections.	7+2(P)
V	**FRAMES AND WINDOWS** Applet fundamentals-Applet Basics-An Applet Skeleton-Simple Applet Display Methods-The HTML APPLET Tag-Passing Parameters to Applets. Window Fundamentals- Working withFrame Windows-Creating a Frame Window in an Applet-Displaying Information Within a Window-Working with Graphics-Drawing Lines-Drawing Rectangles-Drawing Ellipses and Circles-Working with Color-Working with Fonts. **Programs:** 1. Create simple banner using applet 2. Create an applet using shapes, color and fonts.	7+2(P)

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Total Instructional Hours	**35+10**
Course Outcome	CO1-Understand the Basics of Java Programming CO2-Design program using inheritance, interfaces and exception handling. CO3-Develop applications using packages and multithreading in java CO4-Implement I/O streams classes and collections in real time applications. CO5-Design real time applications using Applet, frames and windows

TEXT BOOKS:

T1-Herbert Schildt, "The complete reference java 2",seventh edition, McGraw – Hill 2007.

T2-"Core Java 2",Vol 2,Advanced Features, Cay.S.Horstmann and Gary Cornell, Seventh Edition, Pearson Education

REFERENCES BOOKS:

R1-E.Balagurusamy, "Programming with java A Primer", fifth edition, McGraw – Hill 2014

R2-H.M.Deitel, P.J.Deitel, "Java : how to program", Fifth edition, Prentice Hall of India private limited,2003

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3	2	3	3		-	-	3	-	-	2	3	1
CO2	3	2	3	3	3		-	-		-	-	3	3	3
CO3	3	3	3	3	2		-	-	3	2	-	2	3	3
CO4	3	2	2	3	3		-	-			-	3	3	2
CO5	3	3	3	3	2		-	-	3	2	-	2	3	2
AVG	3	3	3	3	2		-	-	3	2	-	2	3	2

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Programme	Course Code	Name of the Course	L	P	T	C
BE	21EC3001	Electronic Circuits Lab	0	0	3	1.5

Course Objective	1. To introduce methods of biasing transistors. 2. To design and analysis transistor as amplifiers. 3. To analyze and design wave shaping circuits and signal generator. 4. To simulate various electronic circuits using multisim.
Exp.No.	**Description of the Experiments**
1	Design, construct and test the following biasing circuits and find the transient analysis and frequency response of Single BJT and FET. a) Fixed bias b) Self bias
2	Current series Feedback Amplifiers
3	RC Phase shift oscillator
4	Hartley Oscillator
5	Class C tuned Amplifier
6	Astablemultivibrator
	Simulation Experiments
7	Darlington Amplifier
8	Colpitt's Oscillator
9	Integrator, Differentiator, Clipper and Clamper circuits.
10	Monostable multivibrator
	Total Practical Hours 45
Course Outcome	CO1-Design and analyze the biasing circuits for various amplifier configurations CO2-Construct and analyze the performance of signal generators for a specified frequency. CO3-Analyze the performance of electronic circuits using PSPICE. CO4-Design & construct negative feedback amplifiers CO5-Design and construct oscillators for various frequency ranges

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	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	2	3	3	3		-	-	2	2	-	3	3	3
CO2	3	2	3	3	3		-	-	2	2	-	3	3	3
CO3	3	2	3	3	3		-	-	2	2	-	3	3	3
CO4	3	2	3	3	3		-	-	2	2	-	3	3	3
CO5	3	2	3	3	3		-	-	2	2	-	3	3	3
AVG	3	2	3	3	3		-	-	2	2	-	3	3	3

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Programme	Course Code	Name of the Course	L	P	T	C
B.E. / B.Tech	21MC3191	Indian Constitution	2	0	0	0

Course Objective	1. Sensitization of student towards self, family (relationship), society and nature. 2. Understanding (or developing clarity) of nature, society and larger systems, on the basis of human relationships and resolved individuals. 3. Strengthening of self reflection. 4. Development of commitment and courage to act.

Unit	Description	Instructional Hours
I	**BASIC FEATURES AND FUNDAMENTAL PRINCIPLES** Meaning of the constitution law and constitutionalism – Historical perspective of the constitution of India – salient features and characteristics of the constitution of India.	4
II	**FUNDAMENTAL RIGHTS** Scheme of the fundamental rights – fundamental duties and its legislative status – The directive principles of state policy – its importance and implementation - Federal structure and distribution of legislative and financial powers between the union and states.	4
III	**PARLIAMENTARY FORM OF GOVERNMENT** The constitution powers and the status of the president in India. – Amendment of the constitutional powers and procedures – The historical perspective of the constitutional amendment of India – Emergency provisions: National emergency, President rule, Financial emergency.	4
IV	**LOCAL GOVERNANCE** Local self government -constitutional scheme of India – Scheme of fundamental right to equality – scheme of fundamental right to certain freedom under article19 – scope of the right to life and personal liberty under article 21.	4
V	**INDIAN SOCIETY** Constitutional Remedies for citizens – Political Parties and Pressure Groups; Right of Women, Children and Scheduled Castes and Scheduled Tribes and other Weaker Sections	4
	Total Instructional Hours	45

Course Outcome	CO1: Understand the functions of the Indian government CO2: Understand and abide the rules of the Indian constitution.

TEXT BOOKS:

T1-Durga Das Basu, "Introduction to the Constitution of India ", Prentice Hall of India, New Delhi.

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Programme	Course Code	Name of the Course	L	P	T	C
BE	21EC3002	Digital Electronics Lab	0	0	3	1.5

Course Objective	1. Demonstrate the formal procedures for the analysis and design of combinational circuits 2. Use appropriate design technique to design the different sequential circuits. 3. Apply the concepts of Hardware Description Language for designing digital circuits.
Exp.No.	**Description of the Experiments**
	Design, implement and test the following digital circuits,
1	4-bit binary Adder / Subtractor using IC 7483.
2	BCD adder using IC 7483.
3	Multiplexer and De-multiplexer using logic gates.
4	Encoder and Decoder using logic gates.
5	Parity checker and generator.
6	4 – bit binary ripple counter.
7	3-bit synchronous up / down counter.
8	4 – bit shift register using Flip – flops.
9	Basic combinational digital circuits programs using HDL
10	Basic sequential digital circuits programs using HDL.
	Total Practical Hours 45
Course Outcome	CO1-Analyze the performance of various combinational circuits. CO2-Design and develop various synchronous logic circuits. CO3-Formulate the design procedure of combinational digital circuits using Hardware Description Language CO4-Formulate the design procedure of sequential digital circuits using Hardware Description Language CO5-Understand & Simulate VHDL programming

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO 1	3	2	3	3	3		-	-	2	2	-	3	3	3
CO 2	3	2	3	3	3		-	-	2	2	-	3	3	3
CO 3	3	2	3	3	3		-	-	2	2	-	3	3	3
CO 4	3	2	3	3	3		-	-	2	2	-	3	3	3
CO 5	3	2	3	3	3		-	-	2	2	-	3	3	3
AVG	3	2	3	3	3		-	-	2	2	-	3	3	3

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Programme/sem	Course Code	Name of the Course	L	T	P	C
BE/B.TECH/IV	21MA4104	PROBABILITY AND RANDOM PROCESSES (ECE)	3	1	0	4

Course Objective	1. Construct a well-defined knowledge of random variables. 2. Describe the concept of standard distributions and their applications. 3. Explain the concept of two-dimensional random variables and determine covariance. 4. Discuss the concept of stationary process and correlation functions. 5. Describe the autocorrelation function and the power spectral density for an LTI system

Unit	Description	Instructional Hours
I	**PROBABILITY AND RANDOM VARIABLE** Random variable –Discrete and continuous random variables – Probability mass function - Probability density function – Cumulative distribution functions - Moment generating functions.	12
II	**STANDARD DISTRIBUTION** Discrete Distributions - Binomial, Poisson, Geometric distributions - Continuous Distributions -Uniform, Exponential and Normal distributions.	12
III	**TWO DIMENSIONAL RANDOM VARIABLES** Joint distributions – discrete and continuous random variables – marginal and conditional probability distributions – covariance – correlation.	12
IV	**RANDOM PROCESSES** Classification of Random Processes – Stationary process – Auto correlation functions – Cross correlation functions – Properties - Markov process - Poisson Process.	12
V	**SPECTRAL DENSITIES AND LINEAR SYSTEMS WITH RANDOM INPUTS** Power spectral density – Cross spectral density – Properties- Linear time invariant system – System transfer function – Linear systems with random inputs.	12
	Total Instructional Hours	**60**

Course Outcome	CO1-Understand the concepts of random variables. CO2-Distinguish various discrete and continuous distribution functions. CO3-Express the phenomenon of two-dimensional random variables. CO4-Apply the fundamental knowledge of the Markov and Poisson processes. CO5-Apply the concept of Fourier Transform to analyze the response of random inputs to LTI system

TEXT BOOKS:

T1 - Saeed Ghahramani, "Fundamentals of probability with stochastic processes", Prentice Hall New Jersy, 2016

T2 –Douglas C.Montgomery and George C Runger,"Applied statistics and probability for Engineers",Wiley,Delhi, 2014.

REFERENCE BOOKS :

R1 – Ibe. O.C., "Fundamentals of Applied Probability and Random Processes", Elsevier, 1st Indian Reprint, 2010

R2 - Veerarajan, T., "Probability, Statistics and Random Processes", Tata McGraw-Hill,2nd Edition, New Delhi, 2010.

R3 - Miller. S.L. and Childers. D.G., "Probability and Random Processes with Applications to Signal Processing and Communications", Academic Press, 2nd Edition, 2014

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T2-R.C.Agarwal, (1997) "Indian Political System", S.Chand and Company, New Delhi.
T3-Maciver and Page, " Society: An Introduction Analysis ", Mac Milan India Ltd., New Delhi.
T4-K.L.Sharma, (1997) "Social Stratification in India: Issues and Themes", Jawaharlal Nehru University, NewDelhi.
REFERENCE BOOKS:
R1. Sharma, Brij Kishore, " Introduction to the Constitution of India:, Prentice Hall of India, New Delhi.
R2. U.R.Gahai, "Indian Political System ", New Academic Publishing House, Jalaendhar.
R3. R.N. Sharma, "Indian Social Problems ", Media Promoters and Publishers Pvt. Ltd.

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3	1	1	2	3	2	2	2	3	-	3	2	3
CO2	3	3	1	1	2	3	2	2	2	3	-	3	2	3
CO3	3	3	1	1	2	3	2	2	2	3	-	3	2	3
CO4	3	3	1	1	2	3	2	2	2	3	-	3	2	3
CO5	3	3	1	1	2	3	2	2	2	3	-	3	2	3
AVG	3	3	1	1	2	3	2	2	2	3	-	3	2	3

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Programme	Course Code	Name of the Course	L	T	P	C
BE	21EC4201	Electro Magnetic Fields and Waves	3	1	0	4

Course Objective

1. To learn the field and potentials due to static charges.
2. To learn the basics of static magnetic field.
3. To understand how materials affect electric and magnetic fields.
4. To be familiar with the relations between the fields under time varying situations.
5. To provide knowledge on basic characteristics of guided waves.

Unit	Description	Instructional Hours
I	**STATIC ELECTRIC FIELD** Vector Algebra, Coordinate Systems, Vector differential operator, Gradient, Divergence, Curl,Divergence theorem, Stokes theorem, Coulombs law, Electric field intensity, Point, Line,Surface and Volume charge distributions, Electric flux density, Gauss law, Absolute Electric potential, Potential difference, Calculation of potential differences for different configurations.Electric dipole, Electrostatic Energy and Energy density	12
II	**STATIC MAGNETIC FIELD** The Biot-Savart Law in vector form – Magnetic Field intensity due to a finite and infinite wire carrying a current I – Magnetic field intensity on the axis of a circular loop carrying a current I – Ampere's circuital law. Magnetic flux density – Force on a moving charge – Force on a differential current element – Torque on a closed circuit – Magnetic moment – Magnetic Potentials.	12
III	**ELECTRIC AND MAGNETIC FIELDS IN MATERIALS** Poisson's and Laplace's equation – Electric Polarization- Definition of Capacitance – Capacitance of various geometries - Boundary conditions for electric fields –point form of ohm's law – continuity equation for current. Definition of Inductance – Inductance of solenoid and Toroid – Definition of mutual inductance. Energy density in magnetic fields –Magnetic boundary conditions.	12
IV	**TIME VARYING ELECTRIC AND MAGNETIC FIELDS** Faraday's law – Displacement current – Maxwell's equations in point form and integral form.Poynting Vector and the flow of power –Instantaneous Average and Complex Poynting vector.	12
V	**WAVEGUIDES** Waves between parallel planes, TE Waves, TM Waves, Characteristics of TE and TM waves, TEM waves, Velocities of propagation, Rectangular Wave Guides: General Solution, TM and TE Waves in Rectangular Guides, Impossibility of TEM waves in waveguides	12
	Total Instructional Hours	**60**

Course Outcome

CO1-Analyze fields and potentials resulting from static charges competently
CO2-Demonstrate proficiency in evaluating static magnetic fields
CO3-Articulate the influence of materials on electric and magnetic fields
CO4-Relate the fields under time varying situations
CO5-Understand radio wave propagations in guided systems.

TEXT BOOKS:

T1-W H.Hayt& J A Buck : "Engineering Electromagnetics" McGraw-Hill, 8th Edition 2011.

T2-E.C. Jordan & K.G. Balmain "Electromagnetic Waves and Radiating Systems." Pearson Education/PHI,4th Edition

REFERENCE BOOKS:

R1-Mathew.N.O.Sadiku."Elements of Electromagnetics", Sixth edition ,Oxford University Press. 2015

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	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3	3	3	-		-	-	-	-	-	3	3	1
CO2	3	3	3	3	-		-	-	-	-	-	3	3	1
CO3	3	3	3	3	-		-	-	-	-	-	3	3	1
CO4	3	3	3	3	-		-	-	-	-	-	3	3	1
CO5	3	3	3	3	-		-	-	-	-	-	3	3	1
AVG	3	3	3	3	-		-	-	-	-	-	3	3	1

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Programme	Course Code	Name of the Course	L	T	P	C
BE	21EC4202	Analog Communication	3	1	0	4

Course Objective

1. To introduce the concept of Amplitude Modulation and methods to generate and detect AM waves.
2. To introduce the concept of Angle Modulation and methods to generate and detect AM waves.
3. To impart knowledge on different types of Radio Transmitters.
4. To give an insight about various communication receivers.
5. To impart knowledge on the impact of noises in communication systems.

Unit	Description	Instructional Hours
I	**AMPLITUDE MODULATION SYSTEMS:** Communication system model - Need for modulation -Amplitude Modulation – Modulation index, frequency spectrum, Average power- DSBSC, SSB, VSB– Amplitude modulator circuits- collector modulator, Balanced modulator, Ring modulator–SSB generation- Amplitude Demodulator circuits –Envelope detectors.	12
II	**ANGLE MODULATION SYSTEMS:** Angle modulation –FM and PM –Narrow band, Wideband FM -Spectral analysis of modulated signal – Bandwidth requirements- Carson's Rule - Pre emphasis, De-emphasis - Generation and demodulation of FM waves -Indirect and Direct FM generation, Balanced Frequency Discriminator and PLL demodulator.	12
III	**TRANSMITTERS:** Classification of transmitters - Block diagram of AM broadcasting transmitters- Low Level and High Level transmitters - Pilot carrier SSB Transmitter- FM transmitters- Armstrong FM systems.	12
IV	**RECEIVERS:** Classifications of receivers –Receiver characteristics – Mixer-Tuned radio frequency receiver - Super heterodyne receiver -. FM receiver -Automatic frequency control - Limiters - Diversity reception techniques - TDM and FDM.	12
V	**NOISE IN COMMUNICATION SYSTEMS:** Shot Noise - Thermal noise - White Noise- Equivalent Noise Bandwidth - Noise Figure - Effective Noise Temperature - Noise in CW Modulation systems- Noise in Linear Receiver using coherent detection, Noise in AM receivers using envelope Detection - Noise in FM receivers.	12
	Total Instructional Hours	**60**

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R2-Narayana Rao, N : "Elements of Engineering Electromagnetics" 6th edition,Pearson Education, 2006.

R3-Ramo, Whinnery and Van Duzer: "Fields and Waves in Communications Electronics" ,John Wiley & Sons, 3rd edition 2003

R4-David K.Cheng: "Field and Wave Electromagnetics - Second revised Edition-Pearson,2013.

R5-RG.S.N. Raju, Electromagnetic Field Theory & Transmission Lines, Pearson Education, 2006.

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	2	2	3	-		-	-	-	-	-	2	3	2
CO2	3	3	3	3	-		-	-	-	-	-	2	3	2
CO3	3	2	2	3	-		-	-	-	-	-	2	3	3
CO4	3	3	3	2	-		-	-	-	-	-	2	3	2
CO5	3	2	2	2	-		-	-	-	-	-	2	3	2
AVG	3	2.4	2.4	2.6	-		-	-	-	-	-	2	3	2.2

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Course Outcome	CO1-Apply the concepts in selecting suitable amplitude modulation techniques for various applications. CO2-Apply the concepts in selecting appropriate angle modulation techniques for a message signal. CO3-Understand the principle and working of different transmitters. CO4-Understand the principle and operation of different receivers. CO5-Understand the impact of noise on communication systems

TEXT BOOKS:

T1- Dennis Roddy, John Coolen ,"Electronic Communications", 4th edition, Pearson Education, 2012(Unit I,II,III,IV)

T2- Simon Haykin, "Communication Systems", John Wiley & Sons; 5th Edition, New Delhi, 2011. (Unit V)

REFERENCE BOOKS:

R1-Wayne Tomasi ," Electronic Communications Systems –Fundamentals through advanced",5th edition, Pearson Education 2009

R2-Lathi B P, "Introduction to Communication Systems", BS publications, New Delhi, 2001.

R3-Kennedy G, "Electronic Communication systems", Tata McGraw Hill, New Delhi,5th edition, 2011.

R4-Carlson A B, "Communication systems: An Introduction to signals and noise in electrical communication", McGraw Hill, New Delhi, 2002.

R5-Taub and Schilling, "Principles of Communication Systems", McGraw Hill, New Delhi, 1996.

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	2	2	-	-		-	-	-	-	-	2	3	2
CO2	3	3	3	2	-		-	-	-	-	-	1	3	2
CO3	3	3	3	2	-		-	-	-	-	-	1	2	2
CO4	3	3	3	3	-		-	-	-	-	-	2	2	3
CO5	2	1	2	1	-			-	-	-	-	2	2	2
AVG	2.8	2.2	2.6	2	-		-	-	-	-	-	1.6	2.4	2.2

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Program me	Course Code	Name of the Course	L	T	P	C
BE	21EC4203	Linear Integrated Circuits	3	0	0	3

Course Objective

1. To study the basic concepts of OPAMP.
2. To impart knowledge on various applications of OPAMP.
3. To know the working of comparators and waveform generators.
4. To impart the design concepts of ADC and DAC.
5. To study the working of PLL and voltage regulators.

Unit	Description	Instructional Hours
I	**BASICS OF OPERATIONAL AMPLIFIERS** Basic information about op-amps – Ideal Operational Amplifier - General operational amplifier stages,DC and AC performance characteristics, slew rate, Open and closed loop configurations.	9
II	**APPLICATIONS OF OPERATIONAL AMPLIFIERS** Sign Changer, Scale Changer, Phase Shift Circuits, Voltage Follower, V-to-I and I-to-V converters, adder, subtractor, Instrumentation amplifier, Integrator, Differentiator, Precision rectifier, clipper and clamper, Low-pass, high-pass and band-pass Butterworth filters.	9
III	**COMPARATORS AND WAVEFORM GENERATORS** Comparators, Schmitt trigger, Sine-wave generators, Multivibrators , Multivibrators using IC 555, Frequency to Voltage and Voltage to Frequency converters.	9
IV	**ANALOG TO DIGITAL AND DIGITAL TO ANALOG CONVERTERS** D/A converter – specifications - weighted resistor type, R-2R Ladder type, Voltage Mode and Current-Mode -R - 2RLadder types - switches for D/A converters, A/D Converters – specifications - Flash type - Successive Approximation type - Single Slope type – Dual Slope type.	9
V	**PLL AND VOLTAGE REGULATORS** Operation of the basic PLL, Voltage controlled oscillator, Application of PLL for AM detection, FM detection, IC Voltage regulators – Three terminal fixed and adjustable voltage regulators.	9
	Total Instructional Hours	45

Course Outcome

CO1-Analyze the characteristics of Opamp.
CO2-Design various applications of Opamp.
CO3-Design various wave generating and shaping circuits.
CO4-Develop ADC and DAC for various applications.
CO5-Analyze the PLL and voltage regulators for various applications

TEXT BOOKS:

T1-D.Roy Choudhry, Shail Jain, "Linear Integrated Circuits", Wiley Eastern, New Delhi, 2014. (All Units)

T2-Ramakant A. Gayakwad, "OP-AMP and Linear ICs", 4th Edition, Pearson Education, 2015 .(Refer Unit II & IV)

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REFERENCE BOOKS:

R1-S.Salivahanan& V.S. Kanchana Bhaskaran, "Linear Integrated Circuits", 2nd edition McGraw Hill, 2014.

R2-Sergio Franco, "Design with Operational Amplifiers and Analog Integrated Circuits", 3rd Edition, Tata McGraw-Hill, 2007.

R3-Robert F.Coughlin, Frederick F.Driscoll, "Operational Amplifiers and Linear Integrated Circuits", Sixth Edition, PHI, 2001.

R4-B.S.Sonde, "System design using Integrated Circuits" , 2nd Edition, New Age Pub, 2001.

R5-Gray and Meyer, "Analysis and Design of Analog Integrated Circuits", Wiley International, 2005.

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	2	3	2	-		-	-	-		-	2	2	2
CO2	3	3	3	3	-			-	-	-	-	2	2	2
CO3	3	3	3	2	-		-	-	-	-	-	2	2	2
CO4	3	3	3	3	-		-	-	-	-	-	2	2	2
CO5	3	3	3	3	-		-	-	-	-	-	2	2	2
AVG	3	2.8	3	2.6	-		-	-	-	-	-	2	2	2

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Programme	Course Code	Name of the Course	L	T	P	C
BE	21EC4251	Control Systems	2	0	2	3

Course Objective

1. To know the concept of modeling of control systems.
2. To gain adequate knowledge in the time response analysis of first and second order systems.
3. To examine the various frequency response plots.
4. To enumerate the concept of different stability analysis techniques.
5. To describe the concept of state variable analysis.

Unit	Description	Instructional Hours
I	**MATHEMATICAL MODELING OF CONTROL SYSTEMS** Basic components of Control System – Open loop and Closed loop systems – Introduction to Differential equation -Transfer function- Modeling of Electrical and Mechanical systems- Block diagram reduction methods - Signal flow graph. **Experimental study- Digital simulation of linear systems.**	6+3
II	**TIME RESPONSE ANALYSIS** Time response - Order and Type of the Systems – Standard test signals-Unit step Response analysis of first and second order systems – Time domain specifications-Steady state errors – Introduction to P, PI, PD and PID controllers. **Experimental study- Response of Proportional controllers.**	6+3
III	**FREQUENCY RESPONSE ANALYSIS** Frequency Response - Frequency Domain specifications -Bode Plot, Polar Plot – Constant M and N Circles –Introduction to Lead, Lag, and Lead Lag Compensators. **Experimental study- Frequency response analysis of bode plot.**	6+3
IV	**STABILITY ANALYSIS** BIBO Stability, Routh-Hurwitz Criterion, Root Locus Technique, Construction of Root Locus, Application of Root Locus Diagram - Nyquist Stability Criterion. **Experimental study- Stability analysis of linear system using root locus.**	6+3
V	**STATE VARIABLE ANALYSIS** State space representation of Continuous Time systems – State equations – Physical, Phase and Canonical variable forms-Transfer function from State Variable Representation- Concepts of Controllability and Observability. **Experimental study- State space representation of Continuous Time systems.**	6+3
	Total Instructional Hours	**30+15**

Course Outcome

CO1-Analyze different control systems mathematically and understood the concept of Transfer Function.
CO2-Derive different time domain specifications and analyze the steady state error concept.
CO3-Design and analyze the polar, bode and Nichols frequency response plots.
CO4-Analyze the stability of closed loop system using different techniques.
CO5-Understand the concept of state space modeling of continuous time systems and controllability and observability.

TEXT BOOKS:

T1- J.Nagrath and M.Gopal, "Control System Engineering", New Age International Publishers, 6th Edition, 2018.
T2- Benjamin.C.Kuo, "Automatic control systems", Wiley,9th Edition,2014.

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REFERENCE BOOKS:

R1- KatsushikoOgata,"Modern control engineering",Pearson education,5th Edition, 2010.

R2- Schaum's Outline Series, "Feed back and Control Systems" ,Tata McGraw-Hill, 2nd Edition,2013.

R3- A.Nagoorkani,"Control Systems Engineering",RBA publications, First edition,2014.

R4- John J.DAzzo&Constantine H.Houpis, "Linear Control System Analysis and Design", TMH, 1995.

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	2	2	3	3		-	-	-	-	-	-	3	3
CO2	3	3	3	3	3		-	-	-	-	-	-	3	2
CO3	3	2	2	3	3		-	-	-	-	-	-	3	2
CO4	3	3	3	2	3		-	-	-	-	-	-	3	3
CO5	3	2	2	2	3		-	-	-	-	-	-	3	2
AVG	3	2.4	2.4	2.6	3		-	-	-	-	-	-	3	2.4

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Programme	Course Code	Name of the Course	L	P	T	C
BE	21EC4001	Linear Integrated Circuits Lab	0	0	3	1.5

Course Objective	1. To apply operational amplifier in linear applications. 2. To apply operational amplifiers in nonlinear applications 3. To use SPICE software for circuit design.
Exp.No.	**Description of the Experiments**
	Design and Test the following experiments
1	Voltage Follower, Inverting & Non inverting amplifiers using 741 op-amp.
2	Active low-pass, High-pass and band-pass filters using 741 op-amp.
3	Astablemultivibrator, Monostable multivibrator and Schmitt Trigger using 741 op-amp.
4	Phase shift and Wien bridge oscillators using 741 op-amp.
5	Astable and Mono stable multivibrators using NE555 Timer.
6	Function Generator using ICL8038.
	Simulate the following experiments
7	Integrator, Differentiator and Instrumentation Amplifier using SPICE.
8	Astable& Monostable multivibrators with NE555 Timer using SPICE.
9	Phase shift and Wien bridge oscillators with op-amp using SPICE.
10	D/A and A/D converters using SPICE.
	Total Practical Hours 45

Course Outcome	CO1-Interpret about the basic concepts for the circuit configuration for the design of linear integrated circuits and CO2-Develop skills to design simple circuits using OP-AMP CO3-Develop skills to design simple filter circuits and various amplifiers and solve problems CO4-Analyze various multiplier circuits. CO5-Design various modulators and demodulators

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	2	3	3	3		-		3	3	-	3	3	2
CO2	3	2	3	3	3		-		3	3	-	3	3	2
CO3	3	2	3	3	3		-		3	3	-	3	3	2
CO4	3	2	3	3	3		-		3	3	-	3	3	2
CO5	3	2	3	3	3		-		3	3	-	3	3	2
AVG	3	2	3	3	3		-		3	3	-	3	3	2

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Programme	Course Code	Name of the Course	L	P	T	C
B.E	21EC4002	Analog Communication Lab	0	0	4	2

Course Objective	1. To understand different modulation and demodulation schemes. 2. To analyze spectral characteristics of modulated signals 3. To understand the concept of multiplexing of signals.
Exp.No.	**Description of the Experiments**
1	Design and testing of Amplitude Modulation and Demodulation
2	Design and testing of Frequency Modulation and Demodulation.
3	Design and testing of Pre Emphasis - De Emphasis Circuits
4	Design and testing of Mixer Circuit
5	Design and testing of Phase locked loop
6	Pulse Amplitude Width Modulation
7	Time Division Multiplexing.
	Simulation Experiments
8	DSB SC Modulation and Demodulation.
9	Pulse Width and Pulse Position modulation
10	Spectral Characteristics of AM & FM
	Total Practical Hours 45
Course Outcome	CO1-Analyze the performance of various modulation and demodulation methods CO2-Interpret the spectral characteristics of the modulated signals CO3-Analyze multiplexing techniques in signal reception CO4-Evaluate Spectral Characteristics of AM CO5-Assess Spectral Characteristics of FM

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3	3	3	3		-		3	2	-	3	3	3
CO2	3	3	3	3	3		-		3	2	-	3	3	3
CO3	3	3	3	3	3		-		3	2	-	3	3	3
CO4	3	3	3	3	3		-		3	2	-	3	3	3
CO5	3	3	3	3	3		-		3	2	-	3	3	3
AVG	3	3	3	3	3		-		3	2	-	3	3	3

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Program me	Course Code	Name of the Course	L	T	P	C
BE	21MC4191	ESSENCE OF INDIANTRADITIONALKNOWLEDGE	2	0	0	0

Course Objective

1. To facilitate the students with the concepts of Indian traditional knowledge and to make themunderstand the Importance of roots of knowledge system
2. Tomakethestudentsunderstandthetraditionalknowledgeandanalyzeit and apply it to their day to daylife
3. Toimpartbasicprinciplesofthoughtprocess,ItihasandDharmaShastraand connecting society andnature
4. TounderstandtheconceptofIntellectualandintellectualpropertyrightswith specialreference.
5. TofocusonintroductiontoIndianKnowledgeSystem,Indianperspectiveof modern scientific world-view and basic principles of Yoga and Indianphilosopy

Unit	Description	Instructional Hours
I	**Introduction to traditional knowledge** Define traditional knowledge, nature and characteristics, scope and importance, kinds of traditional knowledge, IndigenousKnowledge(IK), characteristics, traditional knowledge vs indigenous knowledge, traditional knowledge vs western knowledge.	6
II	Protection of traditional knowledge The need for protecting traditional knowledge Significance of TK Protection, value of TK in global economy, Role of Governmenttoharness	6
III	Itihas and Dharma-Shastra **Itihas:** The Mahabharata - The Puranas -TheRamayana. Dharma-Shastra: Manu Needhi- The Tirukkural – Thiruarutpa	6
IV	Traditional knowledge and intellectual propertySystems of traditional knowledge protection, Legal concepts for the protection of traditional knowledge, Patents andtraditionalknowledge, Strategies to increase protection of traditional knowledge	6
V	Indian philosophy Jain–Buddhist –Charvaka– Samkhya-Yoga-Nyaya–Vaisheshika-Saiva Siddhanta	6
	Total Instructional Hours	45

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Course Outcome	CO1: Identify the concept of Traditional knowledge and its importance CO2: Explain the need and importance of protecting traditional knowledge. CO3: Explain the need and importance of Itihas and Dharma Shastra. CO4: Interpret the concepts of Intellectual property to protect the traditional knowledge. CO5: Interpret the concepts of indian philosophy to protect the traditional knowledge

REFERENCE BOOKS:

1. Traditional Knowledge System in India, by Amit Jha,2009.
2. Traditional Knowledge System in India by Amit Jha Atlantic publishers,2002.
3. "Knowledge Traditions and Practices of India" Kapil Kapoor1, MichelDanino2.
4. V. Sivaramakrishna (Ed.), Cultural Heritage of India-Course Material, BharatiyaVidya Bhavan, Mumbai, 5th Edition,2014.
5. VNJha(Eng.Trans,), TarkasangrahaofAnnamBhatta,InernationalChinmayFoundation, Velliarnad,Amaku,am.

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3	1	1	2	3	2	2	2	3	-	3	2	3
CO2	3	3	1	1	2	3	2	2	2	3	-	3	2	3
CO3	3	3	1	1	2	3	2	2	2	3	-	3	2	3
CO4	3	3	1	1	2	3	2	2	2	3	-	3	2	3
CO5	3	3	1	1	2	3	2	2	2	3	-	3	2	3
AVG	3	3	1	1	2	3	2	2	2	3	-	3	2	3

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Programme	Course Code	Name of the Course	L	T	P	C
BE	19EC5201	MICROPROCESSOR AND MICRO CONTROLLER	3	0	0	3

Course Objective	1. Study the Architecture of 8085 and 8086 microprocessor. 2. Learn the design aspects of I/O and Memory Interfacing circuits. 3. Study about communication and bus interfacing. 4. Study the Architecture of 8051 microcontroller 5. Study the concepts of microcontroller interfacing

Unit	Description	Instructional Hours
I	**THE 8085 AND 8086 MICROPROCESSO** Introduction to 8085 – Microprocessor architecture – Addressing modes - Instruction set -Introduction to 8086 – Microprocessor architecture – Addressing modes - Instruction set- Assembly language programming – Modular Programming - Interrupts and interrupt service routines.	9
II	**8086 SYSTEM BUS STRUCTURE** 8086 signals – Basic configurations – System bus timing –System design using 8086 – Introduction to Multiprogramming – Multiprocessor configurations – Coprocessor, Closely coupled and loosely Coupled configurations – Introduction to advanced processors	9
III	**I/O INTERFACING** Parallel communication interface – Serial communication interface – D/A and A/D Interface – Timer Interface – Keyboard /display controller – Interrupt controller – DMA controller – Programming and applications Case studies: Traffic Light control, LED display, LCD display.	9
IV	**MICROCONTROLLER AND INTERFACING MICROCONTROLLER** Architecture of 8051 – Special Function Registers (SFRs) - I/O Pins Ports and Circuits – Instruction set - Addressing modes - Assembly language programming. Programming 8051 Timers - Serial Port Programming - Interrupts Programming – LCD & Keyboard Interfacing - ADC, DAC & Sensor Interfacing - Stepper Motor	9
V	**ARM PROCESSOR 9** Arcon RISC Machine – Architectural Inheritance – Core & Architectures - Registers – Pipeline - Interrupts – ARM organization - ARM processor family – Co-processors - ARM instruction set- Thumb Instruction set - Instruction cycle timings - The ARM Programmer"s model- ARM Assembly Language Programming	9
	Total Instructional Hours	45

Course Outcome	CO1-Understand 8086 microprocessor and execute the assembly Language programs using 8086 microprocessor CO2-Interpret System Bus Structure and implement the Multiprocessor Configuration. CO3-Assess the various peripheral devices interfacing with 8086 microprocessors. CO4-Analyze 8051 microcontroller and execute the assembly Language programs using 8051 microcontroller CO5-Design 8051 microcontroller for interfacing various peripheral devices and construct the water level indicator and Zigbee interfacing

TEXT BOOKS:

T1-Ramesh S. Goankar, "Microprocessor Architecture, Programming and Applications with 8085", 5th Edition, Prentice Hall

T2- Yu-Cheng Liu, Glenn A.Gibson, "Microcomputer Systems: The 8086 / 8088 Family - Architecture, Programming and Design", Prentice Hall of India, 2011.

T3- Mohamed Ali Mazidi, Janice Gillispie Mazidi, Rolin McKinlay, "The 8051 Microcontroller and Embedded Systems: Using Assembly and C", Second Edition, Pearson education, 2011

REFERENCE BOOKS:

R1 - Doughlas V.Hall, "Microprocessors and Interfacing, Programming and Hardware",TMH,2012

R2- Krishna Kant , "Microprocessors and microcontrollers architecture programming and system design 8085 8086 8051 8096 PHI Learning Private Limited", 2014

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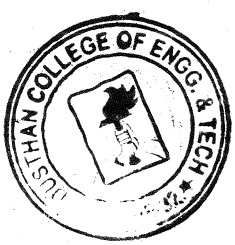

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3	2	2	-	-	-	-	-	-	-	2	3	3
CO2	3	3	3	3	-	-	-	-	3	-	-	2	3	3
CO3	3	2	2	2	-	-	-	-	2	-	-	3	3	3
CO4	3	3	3	2	-	-	-	-	3	-	-	3	3	3
CO5	3	3	2	3	-	-	-	-	3	-	-	3	3	3
AVG	3	2.8	2.4	2.4	-	-	-	-	2.8	-	-	2.6	3	3

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Programme	Course Code	Name of the Course	L	T	P	C
BE	19EC5202	Transmission Lines and Wave Guides	3	0	0	3

Course Objective	1.To teach general theory on transmission lines and its characteristics 2. To give thorough understanding about high frequency line, power and impedance measurements 3 .To impart technical knowledge in impedance matching using smith chart 4. To study the behavior of guided waves between parallel planes 5. To provide an insight on the characteristics of guided waves in in rectangular and circular waveguides	
Unit	**Description**	**Instructional Hours**
I	**TRANSMISSION LINE THEORY** General theory of Transmission lines - the transmission line - general solution - The infinite line - Wavelength, velocity of propagation - Waveform distortion – Distortion less line - Loading and different methods of loading - Line not terminated in Z_0 - Reflection coefficient - calculation of current, voltage, power delivered and efficiency of transmission - Input and transfer impedance - Open and short circuited lines - reflection factor and reflection loss	12
II	**HIGH FREQUENCY TRANSMISSION LINES** Transmission line equations at radio frequencies - Line of Zero dissipation - Voltage and current on the dissipation-less line, Standing Waves, Nodes, Standing Wave Ratio - Input impedance of the dissipation-less line - Open and short circuited lines - Power and impedance measurement on lines - Reflection losses - Measurement of VSWR and wavelength.	12
III	**IMPEDANCE MATCHING IN HIGH FREQUENCY LINES** Impedance matching: Quarter wave transformer - Impedance matching by stubs - Single stub and double stub matching - Smith chart - Solutions of problems using Smith chart - Single and double stub matching using Smith chart.	12
IV	**GUIDED WAVES** Waves between parallel planes-Transverse Electric Waves-Transverse Magnetic Waves-Characteristics of TE and TM waves-Transverse Electromagnetic waves- Velocity of propagation-Attenuation in parallel plane guides- Wave Impedances	12
V	**WAVEGUIDES** Rectangular Waveguides - TM Waves in Rectangular guides -TE Waves in Rectangular Waveguides - Impossibility of TEM waves in waveguides -Bessel functions -TM and TE waves in Circular waveguides -Wave Impedance and Characteristic Impedances.	12
	Total Instructional Hours	**60**

Course Outcome	After completion of the course the learner will be able to CO1-Understand the characteristics of transmission lines and its losses CO2-Analyze the standing wave ratio and input impedance in high frequency transmission lines CO3-Analyze impedance matching for high frequency lines using smith charts CO4-Interpret the behavior of guided waves between parallel planes CO5-Assess the Characteristics of guided waves in rectangular and circular waveguides

TEXT BOOKS:

T1-John D Ryder, "Networks, Lines and Fields", 2nd Edition, Prentice Hall India, 2015.

T2-E.C.Jordan and K.G. Balmain, "Electromagnetic Waves and Radiating Systems"2nd Edition, Prentice Hall of India, 2006.

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REFERENCE BOOKS:

R1-Reinhold Ludwig and Powel Bretchko,‖ RF Circuit Design – Theory and Applications‖, Pearson Education Asia, First Edition,2001.

R2 - D. K. Misra, —Radio Frequency and Microwave Communication Circuits- Analysis and Design‖, John Wiley & Sons, 2004.

R3 - Mathew M. Radmanesh, —Radio Frequency &Microwave Electronics‖, Pearson Education Asia, Second Edition,2002.

R4 - G.S.N Raju, "Electromagnetic Field Theory and Transmission Lines Pearson Education, First edition 2005.

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3	3	2	2	-	-	-	-	-	-	3	3	3
CO2	2	2	2	2	3	-	-	-	-	-	-	3	3	2
CO3	3	3	2	2	2	-	-	-	-	-	-	3	3	2
CO4	3	3	2	2	3	-	-	-	-	-	-	3	2	2
CO5	3	3	1	2	1	-	-	-	-	-	-	3	2	1
AVG	2.8	2.8	2	2	2.2	-	-	-	-	-	-	3	2.6	2

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Programme	Course Code	Name of the Course	L	T	P	C
BE	19EC5203	VLSI Design	3	0	0	3

Course Objective	To learn the fundamentals of CMOS and MOS design To understand silicon processing To familiarize with VLSI combinational logic and sequential logic circuits design To learn high speed processing material and data path To learn hardware description language – Verilog for digital system design

Unit	Description	Instructional Hours
I	**INTRODUCTION TO CMOS CIRCUITS AND MOS TRANSISTOR THEORY** MOS transistors – CMOS logic – Circuits and System Representation – An example – Introduction to nMOS, pMOS enhancement transistor – MOS device design equation – Basic DC equation, second order effects – Complementary CMOS inverter – DC characteristics	9
II	**CMOS PROCESSING, CIRCUIT CHARACTERIZATION AND PERFORMANCE ESTIMATION** Silicon semiconductor technology: An overview – Basic CMOS technology –CMOS process enhancement –Reistance estimation – Capicatence estimation – Switching characteristics – Analytical delay models, Gate delays – Power dissipation.	9
III	**CMOS CIRCUITS AND LOGIC DESIGN** CMOS logic gate design –physical design of simple logic gates – INVERTER, NAND and NOR gates, Complex logic gateslayout, CMOS standard cell design – CMOS logic structures – Pseudo nMOS logic, Dynamic CMOS logic, Clocked CMOS logic, Pass transistor logic – Clocking strategies – Clocked system, latches and registers, system timing, setup and hold time, single phase memory structure PLL clock technique, two phase clocking	9
IV	**INTRODUCTION TO GaAs TECHNOLOGY &ARITHMETIC BUILDING BLOC** Ultra-fast systems – Gallium arsenide crystal structure – Technology development – Architectures for ripple carry adders, carry look ahead adders, High speed adders, accumulators, Multipliers	9
V	**VERILOG PROGRAMMING INTRODUCTION** Hierarchical modelling concepts – Basic concepts – Modules and ports – Gate level modelling – Behavioural modelling – Data flow modelling: An introduction.	9
	Total Instructional Hours	**45**

Course Outcome	After completion of the course the learner will be able to CO1-Understand the basics of to analyze CMOS and MOS transistors CO2-Analyze passive components required for physical design. CO3-Analyze timing issues of sequential logic CO4-Understand advanced semiconductor processing materials and data processing architecture CO5-Acquire knowledge on the programming concepts of Verilog HDL language

TEXT BOOKS:

T1-- Neil H E Weste and Kamran Eshranghian, "Principles of CMOS VLSI Design: A system Perspective", Second edition, Pearson education Asia.

T2- Douglas A Pucknell and Kamran Eshranghian, "Basic VLSI Design", Third edition, Prentice Hall of India.

REFERENCE BOOKS:

R1- -Samir Palnitkar, "Verilog HDL – A guide top Digital Design and Synthesis", Second edition, Pearson education.

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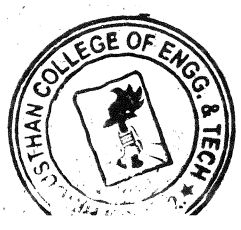

R2 - Neil H E Weste and David money Haris, "CMOS VLSI Design: A circuits and systems Perspective", Addison Wesley, New Delhi, 2010.

R3 - Sung-Mo Kanga and Yusuf Leblebici, "CMOS Digital Integrated Circuits- Analysis and Design", Tata McGraw Hill, New Delhi, 2004.

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3	2	3	2	-	-	-	-	3	-	2	3	2
CO2	3	3	2	3	2	-	-	-	-	2	-	2	3	2
CO3	3	2	3	3	2	-	-	-	-	2	-	2	3	2
CO4	3	2	3	2	2	-	-	-	-	2	-	2	3	2
CO5	3	2	3	3	2	-	-	-	-	2	-	2	3	3
AVG	3	2	3	3	2	-	-	-	-	2	-	2	3	3

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Programme	Course Code	Name of the Course	L	T	P	C
BE	19EC5251	Data Communication and Networks	2	0	2	3

Course Objective	1. To understand the state-of-the-art in network models 2. To analyze the flow control and error control algorithms in a network. 3. To familiarize the various aspects of routing algorithms. 4. Be exposed to the required functionality of each network application. 5. To familiarize with various wide area network.	
Unit	**Description**	**Instructional Hours**
I	**PHYSICAL LAYER** OSI reference model, TCP/IP Protocol suite. Line Configuration, Encoding and Decoding, Multiplexing-transmission media - Circuit Switching, Packet Switching, Message Switching. **Simulation of Network Topology – Star, Bus and Ring**	6+5
II	**LINK LAYER ALGORITHMS AND PROTOCOLS** Flow control and error control, stop and wait, Sliding windows ,Local Area Networks - IEEE 802 standards, LLC, MAC layer protocols – CSMA/CD Ethernet, Token Ring, FDDI. **Study And Compare the performance of Stop And Wait Protocol,Study And Compare the performance of Selective Repeat Protocol,Go Back N Protocol**	6+5
III	**ROUTING ALGORITHMS AND PROTOCOLS** Routing Algorithms- RIP, OSPF, BGP, multicast routing (DVMRP, PIM)- IPv4 -IPv6. UDP-TCP-congestion Control Algorithms. **Simulation of Distance Vector Routing Algorithm, Link State Routing Algorithm, Study of Network Simulator (Ns), Simulation of Congestion Control Algorithms Using Ns.**	6+5
IV	**APPLICATION LAYER** Domain Name system – Remote logging, Electronic Mail, File Transfer - WWW and HTTP- Simple Network Management Protocol – Data Security.	6
V	**WIDE AREA NETWORKS** Integrated Services Digital Network (ISDN), *B-ISDN*, Frame delay and Asynchronous Transfer Mode (ATM) Protocol	6
Total Instructional Hours		**30+15=45**

Course Outcome	After completion of the course the learner will be able to CO1-Demonstrating the network layer Strategies CO2-Identify the technical issues related to networking technologies. CO3-Discriminate various routing techniques. CO4-Discuss the various application layer protocols for web applications CO5-Elaborate and compare various wide area networks

TEXT BOOKS:

T1 - Behrouz A Forouzan , "Data Communication and Networking", McGraw-Hill, New Delhi, 2012.

T2 - Larry L. Peterson, Bruce S. Davie, "Computer Networks: A Systems Approach", Fifth Edition, Morgan Kaufmann Publishers, 2011

REFERENCE BOOKS:

R1 - Andrew S Tanenbaum, "Computer networks", Prentice Hall of India, New Delhi, 2010.

R2 - William Stallings, "Data and Computer Communication", Prentice Hall of India, New Delhi, 2007

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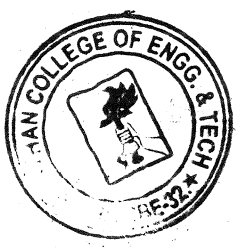

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3	3	3	3		-	-		3	-	3	3	2
CO2	3	3	3	3	3		-	-	-	3	-	3	3	3
CO3	3	3	3	3	3		-	-	-	-	-	3	3	3
CO4	3	3	3	3	3		-		3	-	-	3	3	3
CO5	3	3	3	3	3		-	-	3	3	-	3	3	2
AVG	3	3	3	3	3		-	-	3	3	-	3	3	2.6

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Programme	Course code	Name of the course	L	T	P	C
BE	19EC5202	Digital Signal Processing	2	0	2	3

Course Objective

1. To learn discrete Fourier transform and its properties.
2. To know the characteristics of IIR filters.
3. To learn the design of Finite Impulse Response filters.
4. To understand Finite word length effects.
5. To study the concept of Multirate Signal Processing.

Unit	Description	Instructional Hours
I	**DISCRETE FOURIER TRANSFORM** Introduction to DFT–FFT Algorithms –Radix 2 FFT algorithms, Decimation in time Algorithms, Decimation in frequency Algorithms, Inverse DFT using FFT	7
II	**IIR FILTER DESIGN** IIR filter design: Butterworth approximation using Impulse Invariance Transform and Bilinear transformation, Chebyshev approximation using Impulse Invariance Transform and Bilinear transformation .(LPF)	7
III	**FIR FILTER DESIGN** Linear phase realization of FIR filters-Design of linear phase FIR filters using Windows (Rectangular Window, Hamming Window, Hanning Window)- FIR filter Design using Frequency sampling method.	7
IV	**FINITE WORDLENGTH EFFECTS** Quantization by Truncation and Rounding – Quantization of filter coefficients – Product quantization error - Limit cycle oscillations in recursive systems: Zero input limit cycle oscillation, Overflow limit cycle oscillation – Scaling to prevent Overflow.	7
V	**MULTI RATE DIGITAL SIGNAL PROCESSING** Decimation, Interpolation, Sampling rate conversion by a rational factor, Applications of Multirate Signal Processing:Subband Coding of Speech signals.	7
	List of Experiments	
	1. Spectral analysis using FFT algorithms. 2. Filtering very long sequence using sectioned convolution. 3. Design of FIR filters using Rectangular, Hamming and Hanning windows. 4. Design of Digital IIR filters using Bilinear and Impulse Invariant Transforms. 5. Analysis of limit cycle oscillations in recursive digital filters due to quantization.	10
	Total Instructional Hours	45

Course Outcome

On the completion of the course the students could able to:

CO1-Apply DFT for the analysis of digital signals & systems
CO2-Design IIR Butterworth and Chebyshev filters
CO3-Design FIR filters and apply them in real time applications of information processing
CO4-Illustrate finite word length effects on filters
CO5-Design and implement Multirate filters

TEXT BOOKS

1. John G. Proakis & Dimitris G.Manolakis, "Digital Signal Processing – Principles, Algorithms & Applications", Fourth Edition, Pearson Education / Prentice Hall, 2007. (Unit I, II, III,IV)
2. A .Nagoor Kani, "Digital Signal Processing", 2010 Edition,Mc Graw Hill Education (India) Pvt. Ltd (Unit V)

REFERENCE BOOK

1. Emmanuel C.Ifeachor, & Barrie.W.Jervis, "Digital Signal Processing", Second Edition, Pearson Education, Prentice Hall, 2002
2. Sanjit K. Mitra, "Digital Signal Processing – A Computer Based Approach", Mc Graw Hill, 2007
3. Andreas Antoniou, "Digital Signal Processing", Mc Graw Hill, 2006
4. A.V.Oppenheim, R.W. Schafer and J.R. Buck, "Discrete-Time Signal Processing", 8th Indian Reprint, Pearson,2004

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	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3	3	2	3	-	-	-	-	-	-	3	2	3
CO2	3	2	2	3	3	-	-	-	-	-	-	3	3	3
CO3	2	3	3	2	3	-	-	-	-	-	-	3	3	3
CO4	3	3	3	2	2	-	-	-	-	-	-	3	3	3
CO5	3	3	3	3	2	-	-	-	-	-	-	3	2	3
AVG	2.8	2.8	2.8	2.6	2.6	-	-	-	-	-	-	3	2.6	3

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PRINCIPAL

Programme	Course code	Name of the course	L	T	P	C
BE	19EC5001	VLSI Design Lab	0	0	3	1.5

Course Objective	1. To learn Hardware Descriptive Language (Verilog). 2. To learn fusing of logical modules on FPGAs. 3. To learn the fundamental principles of VLSI circuit design in digital and analog domain.
Expt.No.	**Description of the Experiments**
1	Write Verilog Code for the following circuits and their Test Bench for verification, do the initial timing verification and observe the waveform. 1. Basic logical gates. 2.Half and full adder 3.8-bit adder. 4.Flip flop -RS, D and JK 5.4 bit up/down counter 6.Multiplier minimum 4 bit
2	Synthesize and implement 8 bit adder, 4 bit up/down counter and multiplier (minimum 4 bit) in a FPGA.
3	Design an Inverter using CMOS and complete the design flow mentioned below: i. Draw the schematic and verify the DC Analysis and Transient Analysis ii.Draw the Layout and verify the Design Rule Check and ERC iii. Check for Layout verses schematic iv. Extract RC and back annotate the same and verify the Design v. Verify for Time, Power and Area.
	Total Instructional Hours 45
Course Outcome	CO1-Write HDL code for basic as well as advanced digital integrated circuits. CO2-Import the logic modules into FPGA Boards and Synthesize digital logics on FPGA CO3-Design the layouts of Analog IC Blocks using EDA tools. CO4-Simulate the layouts of Analog IC Blocks using EDA tools. CO5-Extract the layouts of Analog IC Blocks using EDA tools.

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3	3	3	3	-	-	-	3	2	-	3	3	3
CO2	3	3	3	3	3	-	-	-	3	2	-	3	3	3
CO3	3	3	3	3	3	-	-	-	3	2	-	3	3	3
CO4	3	3	3	3	3	-	-	-	3	2	-	3	3	3
CO5	3	3	3	3	3	-	-	-	3	2	-	3	3	3
AVG	3	3	3	3	3	-	-	-	3	2	-	3	3	3

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PRINCIPAL

Programme	Course Code	Course Title	L	T	P	C
BE/BTECH	19HE5071	Soft Skills - I	1	0	0	1

Course Objectives:

1. To employ soft skills to enhance employability and ensure workplace and career success.
2. To enrich students' numerical ability of an individual and is available in technical flavor.
3. To interpret things objectively, to be able to perceive and interpret trends to make generalizations and be able to analyze assumptions behind an argument/statement.

Unit	Description	Instructional Hours
I	**Introduction to Soft Skills:** Introduction- Objective -Hard vs Soft Skills - Measuring Soft Skills- Structure of the Soft Skills -Self Management-Critical Thinking-Reflective thinking and writing- p2p Interaction	3
II	**Art of Communication:** Verbal Communication - Effective Communication - Active listening – Paraphrasing - Feedback - Non-Verbal Communication – Roles-Types- How nonverbal communication can go wrong- How to Improve nonverbal Communication - Importance of feelings in communication - dealing with feelings in communication.	4
III	**World of Teams:** Self Enhancement - importance of developing assertive skills- developing self-confidence – developing emotional intelligence - Importance of Team work – Team vs. Group - Attributes of a successful team – Barriers involved - Working with Groups – Dealing with People- Group Decision Making.	3
IV	**Quantitative Aptitude:** Averages - Profit and loss - Partnerships - Time and work - Time, Speed and Distance - Problems based on trains - Problems based on boats and streams	3
V	**Logical Reasoning:** Clocks - Calendars - Direction Sense - Data Interpretation: Tables, Pie Chart, Bar Graph - Data Sufficiency	2

Course Outcome:

CO1:	Students will have clarity on their career exploration process and to match their skills and interests with a chosen career path.
CO2:	Students will develop knowledge, skills, and judgment around human communication that facilitate their ability to work collaboratively with others
CO3:	Students will understand how teamwork can support leadership skills
CO4:	Students will be able to make sense of problems, develop strategies to find solutions, and persevere in solving them.
CO5:	Students will demonstrate an enhanced ability to draw logical conclusions and implications to solve logical problems.

REFERENCE BOOKS:

R1: Soft Skills Training: A Workbook to Develop Skills for Employment - Frederick H. Wentz

R2: How to prepare for data interpretation for CAT by Arun Sharma.

R3: How to Crack TEST OF REASONING in all competitive examinations by Jaikishan and Premkishan.

R4: A New Approach To Reasoning Verbal & Non-Verbal By B.S. Sijwali

R5: Quantitative Aptitude for Competitive Examinations - Dr. R.S. Aggarwal, S. Chand

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3	1	1	2	3	2	2	2	3	-	3	2	3
CO2	3	3	1	1	2	3	2	2	2	3	-	3	2	3
CO3	3	3	1	1	2	3	2	2	2	3	-	3	2	3
CO4	3	3	1	1	2	3	2	2	2	3	-	3	2	3
CO5	3	3	1	1	2	3	2	2	2	3	-	3	2	3
AVG	3	3	1	1	2	3	2	2	2	3	-	3	2	3

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Programme	Course code	Name of the course	L	T	P	C
BE	19EC5002	Microprocessor and Micro Controller Lab	0	0	3	1.5

Course Objective	1.Introduce ALP concepts and features 2. Write ALP for arithmetic and logical operations in 8086 and 8051 3. Differentiate Serial and Parallel Interface 4. Interface different I/Os with Microprocessors 5. Be familiar with MASM
Expt.No.	**Description of the Experiments**
	Using 8086 Micro processor and MASM software
1.	Basic arithmetic and Logical operations.
2.	Code conversion and decimal arithmetic
3.	Matrix operations
4.	Searching
5.	Sorting
	Using 8086 Micro processor and Interfacing
6.	Parallel interface
7.	Key board and Display interface
8.	Serial interface
9.	A/D and D/A interface
	Using 8051 Micro controller
10.	Basic arithmetic and Logical operations
11.	Square and Cube program, Find 2's complement of a number
12.	Stepper motor control interface
	Total Instructional Hours 45
Course Outcome	CO1- Understand and implement programs on 8086 microprocessors. CO2-Design I/O circuits. CO3-Assess Memory Interfacing circuits. CO4-Interpret and implement 8051 microcontroller-based systems. CO5-Develop various interfacing and its programming methodologies

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	**3**	3	2	2	**3**	-	-	-	-	-	-	**2**	3	**3**
CO2	**3**	3	3	3	**3**	-	-	-	**3**	-	-	**2**	2	**3**
CO3	**3**	2	2	2	**3**	-	-	-	**2**	-	-	-	3	**3**
CO4	**3**	3	3	2	**3**	-	-	-	**3**	-	-	**3**	2	**3**
CO5	**3**	3	2	3	**3**	-	-	-	**3**	-	-	**3**	3	**3**
AVG	**3**	2.8	2.4	2.4	**3**	-	-	-	**2.8**	-	-	**2.5**	2.6	**3**

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Programme	Course Code	Name of the Course	L	T	P	C
B.E./B.Tech.	19HE5072	DESIGN THINKING	1	0	0	1

Course Objective	OBJECTIVES: 1.To expose students to the design process 2.To develop and test innovative ideas through a rapid iteration cycle. 3.To provide an authentic opportunity for students to develop teamwork and leadership skills

Unit	Description	Instructional Hours
I	**DESIGN ABILITY** Asking Designers about what they Do – Deconstructing what Designers Do – Watching what Designers Do – Thinking about what Designers Do – The Natural Intelligence of Design Sources	4
II	**DESIGNING TO WIN** Formula One Designing – Radical Innovations – City Car Design – Learning From Failures – Design Process and Working Methods	4
III	**DESIGN TO PLEASE AND DESIGNING TOGETHER** Background – Product Innovations – Teamwork versus Individual work – Roles and Responsibilities – Avoiding and Resolving Conflicts.	4
IV	**DESIGN EXPERTISE** Design Process – Creative Design - Design Intelligence – Development of Expertise – Novice to Expert. Critical Thinking – Case studies: Brief history of Albert Einstein, Isaac Newton and Nikola Tesla	3
	Total Instructional Hours	**15**

Course Outcome	Upon completion of the course, students will be able to CO1: Develop a strong understanding of the Design Process CO2: Learn to develop and test innovative ideas through a rapid iteration cycle. CO3: Develop teamwork and leadership skills CO4: understanding of design processes and methodologies.

TEXT BOOKS:

T1 -Nigel Cross, "Design Thinking", Kindle Edition.

REFERENCE BOOKS:

R1 - Tom Kelley, "Creative Confidence", 2013.

R2 - Tim Brown, "Change by Design", 2009.

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Programme	Course Code	Name of the Course	L	T	P	C
BE	19EC6202	Antenna and Wave Propagation	3	1	0	4

Course Objective	1. To provide an insight of the radiation phenomena and the antenna parameters 2. To teach the radiation characteristics of different types of aperture and slot antennas 3. To study the radiation mechanism of array antennas 4. To impart knowledge on special antennas and antenna measurements 5. To understand the propagation of radio waves and various types of wave propagation

Unit	Description	Instructional Hours
I	**FUNDAMENTALS OF RADIATION:** Definition of antenna parameters – Gain, Directivity, Effective aperture, Radiation Resistance, Band width, Beam width, Input Impedance. Matching – Baluns, Polarization mismatch, Antenna noise temperature, Radiation from Oscillating dipole, Half-wave dipole, Folded dipole, Yagi array	12
II	**APERTURE AND SLOT ANTENNAS:** Radiation from rectangular apertures, Uniform and Tapered aperture, Horn antenna, Reflector antenna, Aperture blockage, Feeding structures, Slot antennas, Microstrip antennas – Radiation mechanism – Applications	12
III	**ANTENNA ARRAYS:** Point Source, Array of Two-point sources, N -Element Uniform Linear Array, Broad-Side array, End-Fire Array, Pattern multiplication, Concept of Phased arrays, Adaptive array, Antenna synthesis-Binomial array.	12
IV	**SPECIAL ANTENNAS:** Frequency independent antennas –Spiral antenna, Helical antenna, Log periodic Antenna. Modern antennas- Reconfigurable antenna, Active antenna, Dielectric antennas, Electronic band gap structure and applications, Antenna Measurements-Test Ranges, Measurement of Gain, Radiation pattern, Polarization, VSWR	12
V	**PROPAGATION OF RADIO WAVES:** Modes of propagation , Structure of atmosphere , Ground wave propagation, Tropospheric propagation , Duct propagation, Troposcatter propagation , Flat earth and Curved earth concept, Sky wave propagation – Virtual height, critical frequency, Maximum usable frequency – Skip distance, Fading , Multi hop propagation	12
	Total Instructional Hours	**60**

Course Outcome	After completion of the course the learner will be able to CO1-Understand the radiation phenomena and the antenna parameters CO2-Interpret the radiation characteristics of different types of aperture and slot antennas CO3-Discriminate the radiation mechanism of various types of array antennas. CO4-Analyze the purpose on special antennas and some of the basic antenna measurements CO5-Understand the characteristics of different types of radio wave propagation at different frequencies

TEXT BOOKS:

T1- John D Kraus, Ronald J Marhefka, Ahmad S Khan "Antennas and Wave Propagation", Fifth Edition, Mc Graw Hill Education (India) Private Limited, Special Edition 2012. Unit-I-IV

T2 - K.D.Prasad, "Antenna and Wave propagation", Satya Prakashan Publishers, Third Reprint Edition, 2016 Unit-I-V

REFERENCE BOOKS:

R1- Constantine.A.Balanis "Antenna Theory Analysis and Design", Third Edition, Wiley India Pvt.Ltd., Reprint 2016- Unit-I,III&IV

R2 - Edward.C.Jordan and Keith G.Balmain, "Electromagnetic Waves and Radiating Systems", Second Edition, PHI Learning Private Limited, 2011. Unit-V

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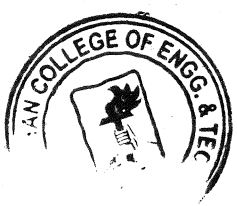

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3	3	3	-	-	-	-	-	-	-	3	3	2
CO2	3	3	3	3	-	-	-	-	-	-	-	3	3	2
CO3	3	3	3	3	-	-	-	-	-	-	-	3	3	2
CO4	3	3	3	3	-	-	-	-	-	-	-	3	3	2
CO5	3	3	3	3	-	-	-	-	-	-	-	3	3	2
AVG	3	3	3	3	-	-	-	-	-	-	-	3	3	2

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Programme	Course Code	Name of the Course	L	T	P	C
BE	19EC6181	Principles of Management	3	0	0	3

Course Objective

The student should be able to
1. Acquire fundamental knowledge on management and organization
2. Extend the knowledge about the planning strategies.
3. Understand the nature of organizing and organization
4. Gain knowledge about the role of communication and types of leadership
5. Understand the system and process of controlling.

Unit	Description	Instructional Hours
I	**OVERVIEW OF MANAGEMENT AND ORGANIZATION** Definition of Management – Science or Art – Manager Vs Entrepreneur – types of managers -managerial roles and skills – Evolution of Management – Scientific, human relations , system and contingency approaches – Types of Business organization – Sole proprietorship, partnership, company-public and private sector enterprises – Organization culture and Environment – Current trends and issues in Management.	9
II	**PLANNING** Nature and purpose of planning – planning process – types of planning – objectives – setting objectives – policies – Planning premises – Strategic Management – Planning Tools and Techniques – Decision making steps and process.	9
III	**ORGANIZING** Nature and purpose – Formal and informal organization – organization chart – organization structure – types – Line and staff authority – departmentalization – delegation of authority –centralization and decentralization – Job Design – Human Resource Management – HR Planning, Recruitment, selection, Training and Development, Performance Management , Career planning and management	9
IV	**DIRECTING** Foundations of individual and group behaviour – motivation – motivation theories – motivational techniques – job satisfaction – job enrichment – leadership – types and theories of leadership –communication – process of communication – barrier in communication – effective communication – communication and IT.	9
V	**CONTROLLING** System and process of controlling – budgetary and non-budgetary control techniques – use of computers and IT in Management control – Productivity problems and management – control and performance – direct and preventive control – reporting.	9
	Total Instructional Hours	45

Course Outcome

After completion of the course the learner will be able to
CO1-Analyze strategies to handle the given issues in management
CO2-Discuss the nature of decision-making process
CO3-Analyze the types of organization structure and departmentation.
CO4-Evaluate the theories of leadership.
CO5-Understand the techniques of budgetary and non – budgetary control.

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TEXT BOOKS:

T1-Harold Koontz & Heinz Weihrich , A.RamachandraAryasri , "Principles of management" ,2 Edition, Tata Mc Graw Hill, 2016 - UNIT (1to 5)

T2- Tripathy PC & Reddy PN, "Principles of Management", Tata McGraw Hill, 5th Edition UNIT (1to 5)

REFERENCE BOOKS:

R1- Stephen A. Robbins & David A. Decenzo& Mary Coulter, "Fundamentals of Management" 7th Edition, Pearson Education, 2011

R2 - Robert Kreitner&MamataMohapatra, "Management", Biztantra, 2008.

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	2	-	-	-	-	-	-	-	2	2	2	3	2	1
CO2	1	-	-	-	-	-	-	-	-	1	2	3	2	1
CO3	2	-	-	-	-	-	-	-	3	1	2	3	2	2
CO4	-	-	-	-	-	-	-	-	3	3	2	3	1	3
CO5	1	-	-	-	-	-	-	-	2	3	2	3	1	3
AVG	1.5	-	-	-	-	-	-	-	2.5	2	2	3	1.6	2.2

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PRINCIPAL

Programme	Course Code	Name of the Course	L	T	P	C
BE	19EC6251	Embedded Systems and IoT	2	0	3	3.5

Course Objective	The student should be able to 1. Learn the internal architecture and interfaces of an embedded system. 2. Understand the concepts of real-time operating systems. 3. Build a small low-cost embedded and IoT system using Raspberry Pi/open platform. 4. Get an idea where the application areas are available for the Internet of Things. 5. Survey successful IoT products and solutions to analyze their architecture and technologies.

Unit	Description	Instructional Hours
I	**INTRODUCTION TO EMBEDDED SYSTEMS** Introduction to Embedded Systems – Classification – Major Applications – General purpose and Domain specific processors – Sensors and Actuators – Communication Interfaces.	7
II	**REAL TIME OPERATING SYSTEMS** OS Basics – Types – Tasks – Process and Threads – Multiprocessor and Multitasking – VxWorks – MicroC/OS-II.	6
III	**GETTING STARTED WITH RASPBERRY PI** About the Board – Linux on Raspberry Pi - Interfaces - Programming Raspberry Pi with python – Examples.	5
IV	**OVERVIEW OF IoT UNDERSTANDING** Introduction – Physical and Logical design of IoT – IoT Enabling Technologies – IoT levels and deployment templates.	6
V	**APPLICATION DEVELOPMENT** Home Automation – Cities – **Environment**: Weather monitoring system – Forest Fire detection – Agriculture – Productivity Applications.	6
	Practicals- IoT 1. Study of ARM Processor 2. LED blinking using ARM 3. ADC and temperature sensor interfacing with ARM 4. Installation of OS in Raspberry Pi 5. GPIO Control over Web Browser 6. Communicating data using on-board module 15 7. Home automation using Pi 8. Node-RED, MQTT Protocol 9. Using Node-RED Visual Editor on Rpi 10. IoT Applications based on Pi	15
	Total Instructional Hours	45

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Course Outcome	After completion of the course the learner will be able to CO1-Design and development of embedded systems applications. CO2-Analyze the real time operating system concepts and scheduling of the process. CO3-Apply the concepts of RTOS using Raspberry Pi /open platform. CO4-Understand the IoT fundamentals using IoT enabling Technologies. CO5-Explore deployment platforms for IoT applications and automation

TEXT BOOKS:

T1-Introduction to Embedded System, Shibu.K.V, McGraw and Hill Education, 13th Edition, 2014. (Unit 1&2).

T2- Internet of Things: An hands on approach, ArshdeepBahga, Vijay Madisetti, University Press, 2014. (Unit 3, 4, 5).

REFERENCE BOOKS:

R1 - Raspberry Pi cookbook: Software and hardware problems and solutions, Monk, Simon. O'Reilly Media, Inc., 2016.
R2- The Internet of Things: Applications to the Smart Grid and Building Automation by – Olivier Hersent, Omar Elloumi and David Boswarthick – Wiley Publications -2012.
R3- Robert Barton, Patrick Grossetete, David Hanes, Jerome Henry, Gonzalo Salgueiro,"IoT Fundamentals: Networking Technologies, Protocols, and Use Cases for theInternet of Things", CISCO Press, 2017.
R4- Wayne Wolf, "Computers as Components: Principles of Embedded ComputerSystem Design", Elsevier, 2006.
R5-Andrew N Sloss, D. Symes, C. Wright, "Arm System Developers Guide", MorganKauffman/ Elsevier, 2006.
R6- IOT (Internet of Things) Programming: A Simple and Fast Way of Learning,IoT Kindle Edition.

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3	3	3	-	-	-	-	3	3	-	3	3	2
CO2	3	3	3	3	3	-	-	-	-	3	-	3	3	3
CO3	3	3	3	3	3	-	-	-	-	-	-	3	3	3
CO4	3	3	3	3	-	-	-	-	3	-	-	-	3	3
CO5	3	3	3	3	3	-	-	-	3	3	-	3	3	2
AVG	3	3	3	3	3	-	-	-	3	3	-	3	3	2

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PRINCIPAL

Programme	Course Code	Name of the Course	L	T	P	C
BE	19EC6001	Digital Communication Lab	0	0	3	1.5

S.NO	LIST OF EXPERIMENTS
1.	Signal Sampling and TDM.
2.	Pulse Amplitude Modulation.
3.	Pulse Code Modulation and Demodulation.
4.	Line Coding Schemes.
5.	Pulse Width and Pulse Time Modulation
	SIMULATION EXPERIMENTS
6.	Generation and Detection of Delta modulation Scheme.
7.	ASK Modulator and Demodulator.
8.	Simulation of FSK schemes.
9.	Signal constellations of BPSK and QPSK .
10.	Simulation of Communication Channel(AWGN).
	TOTAL PRACTICAL HOURS 45
Course Outcome	CO1-Design sampling and reconstruction for given signal CO2-Interpret multiplex signals without aliasing effect. CO3-Analyze the performance of various Pulse Modulations and Demodulation. CO4-Understand & Implement the various bandpass modulation/demodulation schemes CO5-Design a communication channel

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	2	2	3	2	3	-	-	-	3	2	3	3	3	3
CO2	3	2	3	2	3	-	-	-	3	2	3	3	3	3
CO3	2	3	3	2	3	-	-	-	3	2	3	3	3	3
CO4	3	3	3	2	3	-	-	-	3	3	3	3	3	3
CO5	3	3	3	2	3	-	-	-	3	-	2	3	3	3
AVG	2.6	2.6	3	2	3	-	-	-	3	2.2	2.8	3	3	3

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PRINCIPAL

Programme	Course Code	Name of the Course	L	T	P	C
BE	19EC6701	Internship	0	0	0	1

Course Objective	1. To provide students with opportunities to make connections between the theory and practice of academic study and the practical application of that study in a professional work environment. 2. Gain insight into a possible career path of interest while learning about the industry in which the organization resides, organizational structure, and roles and responsibilities within that structure 3. Develop professional connections and identify a strategy for maintaining those connections.
S.NO.	**Description**
1.	Conduct an informational interview with an individual at your organization other than your site supervisor to explore a profession of interest and summarize your findings.
2.	Analyze your internship experience, reflecting on lessons learned and how your liberal arts education prepared you for the internship.
3.	Add details about your experience including new skills developed and results obtained during the internship.
Course Outcome	CO1-Ability to articulate what was learned and how it will be apply to your professional goals CO2-Identify about of professions that may be of interest as a result of this experiences CO3-Develop additional skills that will need to be developed to ensure CO4-Create a new technology, career readiness include learning a new technology..

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	**3**	3	3	3	**3**	3	2	3	3	2	3	**3**	3	**3**
CO2	**3**	3	3	3	**3**	3	2	3	3	3	3	**3**	3	**3**
CO3	**3**	3	3	3	**3**	3	2	3	3	**2**	3	**3**	3	**3**
CO4	**3**	3	3	3	**3**	3	2	3	3	3	3	**3**	3	**3**
AVG	**3**	3	3	3	**3**	3	2	3	3	2.5	3	**3**	3	**3**

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PRINCIPAL

Programme	Course Code	Course Title	L	T	P	C
BE/BTECH	19HE6071	Soft Skill-II	1	0	0	1

Course Objectives:

1. To make the students aware of the importance, the role and the content of soft skills through instruction, knowledge acquisition, demonstration and practice.
2. To learn everything from equations to probability with a completely different approach.
3. To make the students learn on an increased ability to explain the problem comprehensively.

Unit	Description	Instructional Hours
I	**Group Discussion & Presentation Skills:** GD skills – Understanding the objective and skills tested in a GD – General types of GDs – Roles in a GD – Do's & Don'ts – Mock GD & Feedback. - Presentation Skills – Stages involved in an effective presentation – selection of topic, content, aids – Engaging the audience – Time management – Mock Presentations & Feedback	4
II	**Interview Skills and Personality Skills:** Interview handling Skills – Self preparation checklist – Grooming tips: do's & don'ts – mock interview & feedback - Interpersonal skills-creative thinking-problem solving-analytical skills	3
III	**Business Etiquette & Ethics:** Etiquette – Telephone & E-mail etiquette – Dining etiquette – do's & Don'ts in a formal setting – how to impress. Ethics – Importance of Ethics and Values – Choices and Dilemmas faced – Discussions from news headlines.	3
IV	**Quantitative Aptitude:** Permutation, Combination - Probability - Logarithm - Quadratic Equations - Algebra - Progression - Geometry - Mensuration.	3
V	**Logical Reasoning:** Logical Connectives - Syllogisms - Venn Diagrams – Cubes - Coded inequalities - Conditions and Grouping	2

Course Outcome:

CO1:	Students will have learnt to keep going according to plan, coping with the unfamiliar, managing disappointment and dealing with conflict.
CO2:	Students will Actively participate meetings, Group Discussions / interviews and prepare & deliver presentations
CO3:	Students will define professional behavior and suggest standards for appearance, actions and attitude in a Business environment
CO4:	Students will be able to apply quantitative reasoning and mathematical analysis methodologies to understand and solve problems.
CO5:	Students will excel in complex reasoning.

REFERENCE BOOKS

R1:	Bridging the Soft Skills Gap: How to Teach the Missing Basics to Todays Young Talent- Bruce Tulgan
R2:	Quantitative Aptitude for Competitive Examinations (5th Edition) - Abhjit Guha
R3:	How to crack test of Reasoning - Jaikishan and Premkishan
R4:	The hand on guide to Analytical Reasoning and Logical Reasoning - Peeyush Bhardwaj

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Programme	Course Code	Course Title	L	T	P	C
BE/BTECH	19HE6072	Intellectual Property Rights (IPR)	1	0	0	1

Course Objectives:

1. To introduce fundamental aspects of Intellectual property Rights to students who are going to play a major role in development and management of innovative projects in industries.
2. To disseminate knowledge on patents, patent regime in India and abroad and registration aspects.
3. To disseminate knowledge on copyrights and its related rights and registration aspects.
4. To disseminate knowledge on trademarks and registration aspects.
5. To disseminate knowledge on Design, Geographical Indication (GI) and their registration aspects.

Unit	Description	Instructional Hours
I	**INTRODUCTION TO INTELLECTUAL PROPERTY** Introduction, Types of Intellectual Property, International Organizations, Agencies and Treaties, Importance of Intellectual Property Rights.	3
II	**PATENTS** Patents -Elements of Patentability: Novelty, Non-Obviousness (Inventive Steps), Industrial Application -Non -Patentable Subject Matter -Registration Procedure, Rights and Duties of Patentee, Assignment and license.	3
III	**COPYRIGHTS** Purpose And Function Of Trade Marks, Acquisition Of Trade Mark Rights, Protectable Matter, Selecting And Evaluating Trade Mark, Trade Mark Registration Processes.	3
IV	**TRADEMARKS** Concept of Trademarks -Different kinds of marks (brand names, logos, signatures, symbols, well known marks, certification marks and service marks) -Non-Registrable Trademarks - Registration of Trademarks.	3
V	**DESIGN AND GEOGRAPHICAL INDICATION** Design: meaning and concept of novel and original -Procedure for registration. Geographical indication: meaning, and difference between GI and trademarks -Procedure for registration.	3

Course Outcome:

CO1:	Identify different types of Intellectual Properties (IPs), the right of ownership, scope of protection as well as the ways to create and to extract value from IP.
CO2:	Recognize the crucial role of IP in organizations of different industrial sectors for the purposes of product and technology development.
CO3:	Identify, apply and assess ownership rights and marketing protection under intellectual property law as applicable to information, ideas, new products and product marketing.
CO4:	Identify different types of trademarks and procedure for registration
CO5:	Recognize the concept of design, geographical indication and procedure for registration

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3	1	1	2	3	2	2	2	3	-	3	2	3
CO2	3	3	1	1	2	3	2	2	2	3	-	3	2	3
CO3	3	3	1	1	2	3	2	2	2	3	-	3	2	3
CO4	3	3	1	1	2	3	2	2	2	3	-	3	2	3
CO5	3	3	1	1	2	3	2	2	2	3	-	3	2	3
AVG	3	3	1	1	2	3	2	2	2	3	-	3	2	3

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PRINCIPAL

Programme	Course Code	Name of the Course	L	T	P	C
BE	19EC5301	Measurements and Instrumentation	3	0	0	3

Course Objective	The student should be able to 1. Know the concept of measurements and learn the use of DC & AC bridges. 2. Understand the working principle of electronic instruments. 3. Learn the use of different types of signal generators and analyzers. 4. Understand the use of different types of transducers. 5. Learn the principle of working and applications of digital data acquisition system and fiber optic measurements.

Unit	Description	Instructional Hours
I	**INTRODUCTION TO MEASUREMENT SYSTEMS & INDICATING EQUIPMENTS** Introduction to Instruments & their Representation, Static & Dynamic characteristics of Instruments, Types Of Errors-Error Analysis. PMMC, DC Ammeters & Voltmeters, Multimeter or VOM, Calibration of DC Instruments Bridge Measurements: Wheatstone, Kelvin, Maxwell, Schering and Wien Bridge.	9
II	**ELECTRONIC INSTRUMENTS FOR MEASURING & RECORDING** AC Voltmeter using Rectifier, True RMS-Responding voltmeters, Electronic Multimeter Digital Voltmeter, Q meter, Cathode Ray Oscilloscope (CRO), Recorders: Galvanometric, Servo type Potentiometric, Magnetic type & Digital Recorder.	9
III	**SIGNAL GENERATION & SIGNAL ANALYSIS** Sine wave generator, Frequency synthesized signal generator, Sweep frequency generators Function generators-Audio frequency signal generation. Wave analyzers -Harmonic distortion analyzer -spectrum analysis.	9
IV	**TRANSDUCERS** Classification of Transducers-Selecting a Transducer -Strain Gages-Displacement Transducers- Pressure Measurements, Temperature Measurements- Non-Electrical , Electrical & radiation methods. Flow Measurements.	9
V	**DATA ACQUISITION SYSTEMS AND FIBER OPTIC MEASUREMENTS** Elements of a Digital Data Acquisition System - Interfacing Transducers to Electronic Control & Measuring Systems - Multiplexing - Computer Controlled Test Systems: Testing of Audio Amplifier & Radio Receiver, - IEEE 488 Bus & Electrical interface - Fiber Optic Measurements: Power Measurement and System Loss - Optical Time Domains Reflectometer.	9
Total Instructional Hours		**45**

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PRINCIPAL

Course Outcome	After completion of the course the learner will be able to CO1: Understand the measurements concept and usage of AC/DC bridges. CO2: Explore knowledge on Electronic Instruments. CO3: Explain the different types of Signal generators and CRO. CO4: Identify various types of transducers and their working. CO5: Learn the various process of computer controlled instrumentation.

TEXT BOOKS:

T1- Albert D.Helfrick and William D.Cooper, Modern Electronic Instrumentation and Measurement Techniques, I, 2003.

T2- Ernest O.Doebelin, Measurements System-Application & Design, McGraw-Hill,1990,Fourth Edition.

REFERENCE BOOKS:

R1 - B.C.Nakara, K.K.Chaudhry, Instrumentation Measurement and Analysis , McGraw - Hill , 2004. .

R2 - J.B.Gupta, "A Course In Electronics And Electrical Measurements And Instrumentation", S.K.Kataria and sons,2013

R3 - A.K.Sawhney, "A Course In Electrical And Electronic Measurement And Instrumentation" ,Dhanpat Raj and Sons,2005

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	**3**	3	2	2	**2**	-	-	-	-	-	-	**2**	3	**3**
CO2	**3**	3	3	3	**3**	-	-	-	-	-	-	**2**	2	**3**
CO3	**3**	2	2	2	**2**	-	-	-	-	-	-	-	3	**3**
CO4	**3**	3	3	2	**2**	-	-	-	-	-	-	**3**	2	**3**
CO5	**3**	3	2	3	**3**	-	-	-	-	-	-	**3**	3	**3**
AVG	**3**	2.8	2.4	2.4	**2.4**	-	-	-	-	-	-	**2.5**	2.6	**3**

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Programme	Course Code	Name of the Course	L	T	P	C
BE	19EC5302	PCB Design	3	0	0	3

Course Objective

1. To describe the basics, layout planning and design in the field of Printed Circuit boards.
2. To design the PCB deals with the various considerations for special circuits.
3. To learn the Image Transfer, Plating and Etching techniques.
4. To know the different technology involves in the Printed Circuit Boards.
5. To summarize the PCB Technology trends.

Unit	Description	Instructional Hours
I	**BASICS OF PRINTER CIRCUIT BOARDS** Component of a PCB – Classification of PCB - Manufacturing of Basic PCB – Layout planning: General PCB considerations – Electrical Design Considerations –Layout Design: Layout Scale – Layout Sketch / Design – Layout considerations.	9
II	**DESIGN CONSIDERATIONS FOR SPECIAL CIRCUITS** Design Rules for Analog Circuits: Components and Placement – Signal Conductors – Supply and Ground Connectors – General Rules for design of Analog PCBs. Design Rules for Digital Circuits: Transmission Lines. Design rules for PCBs for High frequency circuits, Fast Pulse Circuits, Microwave Circuits and Power Electronic Circuits.	9
III	**IMAGE TRANSFER, PLATING AND ETCHING TECHNIQUES** Image Transfer Techniques: Laminates Surface Preparation – Screen Printing – Pattern Transferring Techniques – Printing Inks – Printing Process - Photo Painting - Laser Diode Imaging(LDI) - Plating Process : need for Plating – Plating Techniques - Special plating Techniques - Etching Techniques : Etching Parameters – Equipment and Techniques - Optimizing Etchant Economy	9
IV	**TECHNOLOGY OF PRINTED CIRCUIT BOARDS** Film Master Production: Emulsion Parameters – Film Emulsions – Dimensional Stability of Film Masters – Reprographic Cameras – Film Processing - Film Registration - Photo printing: Basic processes for Double sided PCBs – Wet Film resists and Dry Film resists.	9
V	**PCB TECHNOLOGY TRENDS** Fine–line Conductors with Ultra Thin copper Foil - Multilayer Boards - Multiwire Boards – Subtractive - Semi-Additive Processes – Additive Processes – Flexible Printed Circuit Boards – Metal Core Circuit Boards – Mechanical Milling of PCBs.	9
Total Instructional Hours		**45**

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Course Outcome	After completion of the course the learner will be able to CO1: Explain the basics PCB and layout design considerations. CO2: Enumerate PCB Design considerations in Special circuits. CO3: Enhance the knowledge in image transfer, plating and Etching techniques in PCBs. CO4: Recognize the various Technologies in Printed Circuit boards. CO5: Summarize the PCB technology trends.

TEXT BOOKS:

T1-R.S. Khandpur, "Printed Circuit Boards Design, Fabrication, Assemble and Testing", TMH, 2005. (Unit 1,2 & 3)

T2 - Walter C Bosshart , "Printed Circuits Boards Design and Technology" - Tata McGraw- Hill , 2008. (Unit 4 & 5)

REFERENCE BOOKS:

R1 - ChristoperT.Robertson, "PCB Designers Reference: Basics", Prentice Hall, First edition, 2003.

R2 - C.F.Coombs, "Printed Circuits Handbook", McGraw-Hill, 2001.

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3	2	2	2	-	-	-	-	-	-	2	3	3
CO2	3	3	3	3	3	-	-	-	-	-	-	2	2	3
CO3	3	2	2	2	2	-	-	-	-	-	-	-	3	3
CO4	3	3	3	2	2	-	-	-	-	-	-	3	2	3
CO5	3	3	2	3	3	-	-	-	-	-	-	3	3	3
AVG	3	2.8	2.4	2.4	2.4	-	-	-	-	-	-	2.5	2.6	3

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PRINCIPAL

Programme	Course Code	Name of the Course	L	T	P	C
BE	19EC5303	RF System Design	3	0	0	3

Course Objective	The student should be able to 1.To learn the various passive and active components for radio frequency circuits 2. To gain knowledge on microstrip line filters 3. To understand the working principle of active RF components for various applications. 4. To design biasing circuits for RF amplifiers 5. To learn various RF oscillators, Mixers, power dividers and couplers

Unit	Description	Instructional Hours
I	**INTRODUCTION TO RF DESIGN** Importance of RF design, Electromagnetic Spectrum, RF behavior of passive Components, Chip components and Circuit Board considerations, Scattering Parameters, Smith Chart and applications.	9
II	**RF FILTER DESIGN** Overview, Basic resonator and filter configuration, Special Filter Realizations, Filter Implementations, Unit element, Kurodas Identity , Coupled Filters.	9
III	**ACTIVE RF COMPONENTS & APPLICATIONS** RF Diodes, BJT, RF FETs, High electron mobility transistors; Matching and Biasing Networks – Impedance matching using discrete components, Microstrip line matching networks, Amplifier classes of operation and biasing networks.	9
IV	**RF AMPLIFIER DESIGN** Characteristics, Amplifier Power relations, Stability Considerations, Constant gain circles, Constant VSWR circles, Broadband, Low power,High power and multistage amplifiers.	9
V	**OSCILLATORS, MIXERS & APPLICATIONS** Basic oscillator Model - high frequency oscillator configuration - Basic characteristics of mixers - RF couplers - Wilkinson divider - Detector and demodulator circuits.	9
Total Instructional Hours		**45**

Course Outcome	After completion of the course the learner will be able to CO1: Describe the various passive and active components for radio frequency circuits CO2: Design and analyze microstrip line filters CO3: Design matching networks using Smith chart CO4: Design biasing circuits for RF amplifiers CO5: Describe various RF oscillators, Mixers, power dividers and couplers.

TEXT BOOKS:

T1 - Reinhold Ludwig and Powel Bretchko, —RF Circuit Design – Theory and Applications‖, Pearson Education Asia, First Edition, 2011

T2- Joseph. J.Carr, —Secrets of RF Circuit Design‖, McGraw Hill Publishers, Third Edition, 2000

REFERENCE BOOKS:

R1 -Matthew M.Radmanesh, — Radio frequency and Microwave Electronics ‖, Pearson Education Asia, 2nd Edition ,2002.

R2- Ulrich L. Rohde and David P. NewKirk, —RF/ microwave Circuit Design‖, John Wiley & Sons USA, 2000

R3-Roland E. Best, —Phase –Locked loops: Design, simulation and Applications‖, McGraw Hill Publishers , 5th Edition,2003

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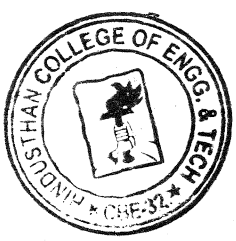

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3	2	2	2	-	-	-	-	-	-	2	3	3
CO2	3	3	3	3	3	-	-	-	-	-	-	2	2	3
CO3	3	2	2	2	2	-	-	-	-	-	-	-	3	3
CO4	3	3	3	2	2	-	-	-	-	-	-	3	2	3
CO5	3	3	2	3	3	-	-	-	-	-	-	3	3	3
AVG	3	2.8	2.4	2.4	2.4	-	-	-	-	-	-	2.5	2.6	3

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PRINCIPAL

Programme	Course Code	Name of the Course	L	T	P	C
BE	19EC5304	Network Security	3	0	0	3

Course Objective

1. To impart knowledge on the Network security services, attacks and mechanisms.
2. To introduce the principles of block ciphers and stream ciphers
3. To enlighten the concepts of public key cryptography and the authentication techniques.
4. To give a clear idea on various Data Integrity algorithms and the methods used for key distribution
5. To understand the security services provided to internet.

Unit	Description	Instructional Hours
I	**INTRODUCTION TO RF DESIGN** OSI security architecture –Security Services, Mechanisms and attacks-Network security model-Symmetric cipher model- substitution techniques, transposition techniques, steganography.	9
II	**SYMMETRIC CIPHERS** Block cipher principles- Data Encryption Standard(DES)-Advanced Encryption Standard (AES)-Multiple Encryption-Triple DES- modes of block cipher-stream ciphers-RC5 algorithm.	9
III	**ASYMMETRIC CIPHERS** Principles of public key cryptosystems-RSA algorithm-Key management – Diffie Hellman Key exchange- EI Gamal cryptography-Elliptic curve arithmetic-Elliptic curve cryptography.	9
IV	**MUTUAL TRUST , AUTHENTICATION AND DATA INTEGRITY** Mutual trust, Symmetric key distribution using symmetric encryption-symmetric key distribution using asymmetric encryption-distribution of public keys-X.509 Authentication services-Remote user- Authentication principles-Kerberos, Data integrity : Security of hash function and MAC – SHA - HMAC –DSS.	9
V	**INTERNET SECURITY:** Security Services for E-mail-Pretty Good Privacy-S/MIME. Overview of IP Security – IP security policy-Encapsulation Security Payload (ESP)-SSL/TLS Basic Protocol-combining security associations-Internet key exchange.	9
Total Instructional Hours		**45**

Course Outcome

After completion of the course the learner will be able to

CO1:Analyze and apply the appropriate Cryptographic technique to overcome the security attacks.
CO2:Categorize Symmetric and asymmetric ciphers.
CO3:Develop Symmetric and asymmetric ciphers.
CO4:Develop a secured system with authentication and integrity services.
CO5:Apply the necessary internet security algorithm for various applications.

TEXT BOOKS:

T1 - William Stallings, Cryptography and Network Security, 6th Edition, Pearson Education, March 2013

T2- Behrouz A. Ferouzan, "Cryptography & Network Security", 3rd Edition, Tata Mc Graw Hill, 2007

REFERENCE BOOKS:

R1 -Charlie Kaufman, Radia Perlman and Mike Speciner, "Network Security", 2nd Edition, Prentice Hall of India, 2002.

R2- Bruce Schneier and Neils Ferguson, "Practical Cryptography", First Edition, Wiley Dream tech India Pvt Ltd, 2003.

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	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3	2	2	2	-	-	-	-	-	-	2	3	3
CO2	3	3	3	3	3	-	-	-	-	-	-	2	2	3
CO3	3	2	2	2	2	-	-	-	-	-	-	-	3	3
CO4	3	3	3	2	2	-	-	-	-	-	-	3	2	3
CO5	3	3	2	3	3	-	-	-	-	-	-	3	3	3
AVG	3	2.8	2.4	2.4	2.4	-	-	-	-	-	-	2.5	2.6	3

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HINDUSTHAN COLLEGE OF ENGG. & TECH ★ CBE-32 ★

PRINCIPAL

Programme	Course Code	Name of the Course	L	T	P	C
BE	19EC5181	Total Quality Management	3	0	0	3

Course Objective	The student should be able to 1. To learn the quality philosophies and tools in the managerial perspective. 2. To learn the quality philosophies 3. To learn the various tools of TQM 4.To apply the statistical techniques in quality management 5. To make the students aware about the quality loss and its role in economy

Unit	Description	Instructional Hours
I	**UNIT I INTRODUCTION** Introduction - Need for quality - Evolution of quality - Definitions of quality - Dimensions of product and service quality - Basic concepts of TQM - TQM Framework - Contributions of Deming, Juran 95 and Crosby - Barriers to TQM - Customer focus - Customer orientation, Customer satisfaction, Customer complaints, Customer retention.	9
II	**TQM PRINCIPLES** Leadership - Quality Statements, Strategic quality planning, Quality Councils - Employee involvement - Motivation, Empowerment, Team and Teamwork, Recognition and Reward, Performance appraisal - Continuous process improvement - PDCA cycle, 5S, Kaizen - Supplier partnership - Partnering, Supplier selection, Supplier Rating.	9
III	**TQM TOOLS AND TECHNIQUES I** The seven traditional tools of quality - New management tools - Six sigma: Concepts, Methodology, applications to manufacturing, service sector including IT - Bench marking - Reason to bench mark, Bench marking process - FMEA - Stages, Types.	9
IV	**TQM TOOLS AND TECHNIQUES II** Quality Circles - Cost of Quality - Quality Function Deployment (QFD) - Taguchi quality loss function - TPM - Concepts, improvement needs - Performance measures.	9
V	**QUALITY MANAGEMENT SYSTEM** Introduction—Benefits of ISO Registration—ISO 9000 Series of Standards—Sector-Specific Standards—AS 9100, TS16949 and TL 9000-- ISO 9001 Requirements—Implementation—Documentation—Internal Audits—Registration- ENVIRONMENTAL MANAGEMENT SYSTEM: Introduction—ISO 14000 Series Standards—Concepts of ISO 14001—Requirements of ISO 14001—Benefits of EMS.	9
	Total Instructional Hours	**45**

Course Outcome	After completion of the course the learner will be able to CO1: To make the students clear about the quality concepts. CO2: The different contributions of quality experts CO3: To apply the quality philosophies and tools CO4: To facilitate continuous improvement practices and ensure customer delight CO5: To make them understand the importance of quality awards as a competitive advantage.

TEXT BOOKS:

T1 - Dale H.Besterfield et al, Total Quality Management, Third edition, Pearson Education (First Indian Reprints 2004).

T2 - SubburajRamasamy, Total Quality Management, Sixth edition, Tata McGraw Hill Education(India) Pvt Ltd, Reprint 2015.

REFERENCE BOOKS:

R1- James R. Evans and William M. Lindsay, "The Management and Control of Quality", 8 th Edition, First Indian Edition, Cengage Learning, 2012.

R2- Janakiraman. B and Gopal .R.K., "Total Quality Management - Text and Cases", Prentice Hall (India) Pvt. Ltd., 2006..

R3- Suganthi.L and Anand Samuel, "Total Quality Management", Prentice Hall (India) Pvt. Ltd., 2006.

R4- ISO9001-2015 standards

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	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	**3**	3	2	2	**2**	-	-	-	-	-	-	**2**	3	**3**
CO2	**3**	3	3	3	**3**	-	-	-	-	-	-	**2**	2	**3**
CO3	**3**	2	2	2	**2**	-	-	-	-	-	-	-	3	**3**
CO4	**3**	3	3	2	**2**	-	-	-	-	-	-	**3**	2	**3**
CO5	**3**	3	2	3	**3**	-	-	-	-	-	-	**3**	3	**3**
AVG	**3**	2.8	2.4	2.4	**2.4**	-	-	-	-	-	-	**2.5**	2.6	**3**

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PRINCIPAL

Programme	Course Code	Name of the Course	L	T	P	C
BE	19EC6301	Medical Electronics	3	0	0	3

Course Objective	The student should be able to 1. Gain knowledge about the various physiological parameters both electrical and nonelectrical and the methods of recording and also the method of transmitting these parameters. 2. Understand the measurement concepts of various bio-chemical and non electrical Parameters. 3. Study about the various assist devices used in the hospitals. 4. Acquire fundamental knowledge about equipment used for physical medicine and bio telemetry. 5. Explore the various recently developed diagnostic and therapeutic techniques.

Unit	Description	Instructional Hours
I	**ELECTRO-PHYSIOLOGYAND BIO-POTENTIALRECORDING** The origin of Bio- potentials; biopotential electrodes, biological amplifiers, ECG, EEG,EMG,PCG,leadsystemsandrecording methods, typical waveformsandsignal characteristics.	9
II	**BIO-CHEMICALAND NON ELECTRICAL PARAMETER MEASUREMENT** pH, PO_2, PCO_2, colorimeter, Auto analyzer, Blood flow meter, cardiac output, respiratory measurement, Blood pressure, temperature, pulse, BloodCellCounters..	9
III	**ASSIST DEVICES** Cardiac pacemakers,DCDefibrillator, Dialyser, Ventilators, Magnetic Resonance Imaging Systems, Ultrasonic Imaging Systems, Heartlungmachine.	9
IV	**PHYSICAL MEDICINEAND BIOTELEMETRY** Diathermies- Shortwave,ultrasonicandmicrowavetypeandtheirapplications,SurgicalDiathermy- Telemetryprinciples,biotelemetry	9
V	**RECENTTRENDS IN MEDICAL INSTRUMENTATION** Thermograph,endoscopyunit,Laserinmedicine, Introductiontotelemedicine, Insulin Pumps, Radio pill, Brain machine interface, Lab on a chip.	9
Total Instructional Hours		45

Course Outcome	After completion of the course the learner will be able to CO1: Know the human body electro- physiological parameters and recording of bio-potentials CO2:Comprehend the non-electrical physiological parameters and their measurement – body temperature, blood pressure, pulse, blood cell count, blood flow meter etc. CO3: Interpret the various assist devices used in the hospitals viz. pacemakers, defibrillators, dialyzers and ventilators CO4: Understand the physical medicine methods eg. ultrasonic, shortwave, microwave surgical diathermies , and bio-telemetry principles and methods CO5: Discuss about recent trends in medical instrumentation

TEXT BOOKS:

T1- LeslieCromwell,"BiomedicalInstrumentationandMeasurement",PrenticeHallofIndia,New Delhi,2007. (Unit I to V).

REFERENCE BOOKS:

R1 - JohnG.Webster,"MedicalInstrumentationApplicationandDesign",3rd Edition,WileyIndiaEdition,2007.

R2 - Khandpur,R.S.,"HandbookofBiomedicalInstrumentation",TATAMcGraw-Hill,NewDelhi,2003.

R3 - JosephJ.CarrandJohnM.Brown,"IntroductiontoBiomedicalEquipmentTechnology",JohnWileyand Sons, NewYork, 2004

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	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3	3	2	2	-	-	-	-	-	1	2	3	3
CO2	3	3	2	2	2	-	-	-	-	-	1	2	3	2
CO3	3	2	3	2	2	-	-	-	-	-	1	2	2	2
CO4	3	3	3	2	2	-	-	-	-	-	1	2	3	2
CO5	3	3	3	2	2	-	-	-	-	-	1	2	3	3
AVG	3	3	3	2	2	-	-	-	-	-	1	2	3	2.6

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PRINCIPAL

Programme	Course Code	Name of the Course	L	T	P	C
BE	19EC6303	Mobile Communications	3	0	0	3

Course Objective	The student should be able to 1. To understand the design aspects of a cellular system 2. To illustrate the behavior of the wireless channel and its impact on system design 3. To interpret the mathematical modelsof propagation in wireless communications. 4. To understand the wireless systems and standards in wireless communication. 5. To understand the relevance of multiple layers and their functionalities.

Unit	Description	Instructional Hours
I	**Introduction to Wireless Communication Systems** Evolution and Fundamentals, Examples of Wireless Communication Systems, Cellular Telephone Systems, Trends in Cellular Radio and Personal Communication Systems	9
II	**Cellular Concepts** Frequency for Radio Transmission, Frequency Reuse, Channel Assignment Strategies, Handoff Strategies, Interference and System Capacity, Improving the Coverage and Capacity of Cellular Systems.Multiple Access System , TDMA, FDMA, CDMA	9
III	**Medium Access Control** Hidden and Exposed, Far and Near Problem, Protocol for MAC . **Mobile Radio Propagation**: Large Scale Path Loss, Free Space Propagation Model, Ground Reflection Model, Diffraction, Scattering, Practical Link Budget Design using Path Loss Models, Outdoor Propagation Models, Indoor Propagation Models, Signal Penetration through Buildings. Small Scale Fading and Multipath Propagation, Impulse Response Model, Multipath Measurements, Parameters of Multipath Measurements, Types of Small Scale Fading: Time Delay Spread, Doppler Spread; Raleigh and Ricean Distributions.	9
IV	**Wireless Systems and Standards** AMPS, ETACS, USDC, GSM – System Architecture, Radio Subsystem, Channel Types, Frame Structure, Signal Processing in GSM; GPRS, CDMA Digital Cellular Standards, PACS ,Wireless LANs ,Future advancement in Mobile Network	9
V	Mobile Network Layer , Mobile Transport Layer, Mobile Application Layer	9
Total Instructional Hours		**45**

Course Outcome	After completion of the course the learner will be able to CO1: Describe the cellular concept of wireless communication system. CO2: Illustrate the behavior of the wireless channel and its impact on system design CO3: Interpret the mathematical modelsof propagation in wireless communications. CO4: Understand the wireless systems and standards in wireless communication. CO5: Explore relevance of multiple layers and their functionalities

TEXT BOOKS:

T1-Rappaport,T.S., "Wireless communications", Second Edition, Pearson Education, 2010.

T2-Kamilo Feher, Wireless Digital Communications, Modulation and Spread Spectrum Applications, Eastern Economy Edition.

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REFERENCE BOOKS:

R1-Lee, Mobile Communications Engineering: Theory and applications, Second Edition,,McGraw- Hill International, 1998.

R2 Jochen H Schiller, Mobile Communication,2e, Addison-WesleyPublishers,2003.

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3	3	2	2	-	-	-	-	-	1	2	3	3
CO2	3	3	2	2	2	-	-	-	-	-	1	2	3	2
CO3	3	2	3	2	2	-	-	-	-	-	1	2	2	2
CO4	3	3	3	2	2	-	-	-	-	-	1	2	3	2
CO5	3	3	3	2	2	-	-	-	-	-	1	2	3	3
AVG	3	3	3	2	2	-	-	-	-	-	1	2	3	2.6

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PRINCIPAL

Programme	Course Code	Name of the Course	L	T	P	C
BE	19EC6304	High Speed Networks	3	0	0	3

Course Objective

1. To impart knowledge on Frame relay networks and ATM networks
2. To understand the concepts of congestion and traffic management
3. To gain knowledge on Graph Theory and Internet Routing
4. To know more about Quality of Service in IP Networks
5. To study the importance of Compression in High Speed Networks

Unit	Description	Instructional Hours
I	**HIGH SPEED NETWORKS** Protocols and TCP/IP Suite-TCP and IP-Frame Relay –Asynchronous Transfer Mode-High Speed LANs	9
II	**CONGESTION AND TRAFFIC MANAGEMENT** Congestion Control in Data Networks and Internets- Link-level Flow and Error Control-TCP Traffic Control-Traffic and Congestion Controls in ATM Networks	9
III	**INTERNET ROUTING** Overview of Graph Theory and Least-Cost Paths-Internet Routing Protocols-Exterior Routing Protocols and Multicast	9
IV	QOS IN IP NETWORKS Integrated and Differentiated Services-Protocols for QoS Support: Resource Reservation RSVP- Multiprotocol Label Switching - Real Time Transport Protocol	9
V	**COMPRESSION** Overview of Information Theory: Information and Entropy, Coding-Lossless Compression-Lossy Compression	9
	Total Instructional Hours	**45**

Course Outcome

CO1: Interpret ATM and Frame relay networks
CO2: Describe the concepts of congestion and traffic management
CO3: Analyze the Quality of service in IP Networks.
CO4: Infer the Principle of wireless network operation and compression
CO5: Summarize the Network management and application

TEXT BOOKS:

T1- William Stallings, "High-Speed Networks and Internets: Performance and Quality of Service", Pearson Education, Second Edition, 2002

T2- Jean Warland and Pravin Varaiya, "High Performance Communication Networksl", Jean Harcourt Asia Pvt. Ltd., Second Edition, 2001

REFERENCE BOOKS:

R1-Behrouz A. Forouzan, "Data Communication and Computer Networking", Fourth Edition

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	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3	3	2	2	-	-	-	-	-	1	2	3	3
CO2	3	3	2	2	2	-	-	-	-	-	1	2	3	2
CO3	3	2	3	2	2	-	-	-	-	-	1	2	2	2
CO4	3	3	3	2	2	-	-	-	-	-	1	2	3	2
CO5	3	3	3	2	2	-	-	-	-	-	1	2	3	3
AVG	3	3	3	2	2	-	-	-	-	-	1	2	3	2.6

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PRINCIPAL

Programme	Course Code	Name of the Course	L	T	P	C
BE	19EC6182	E-Commerce Technology	3	0	0	3

Course Objective	The student should be conversant with 1. Discuss fundamentals of e-commerce, types and applications. 2. Understand and apply relevant problem-solving methodologies 3. Identify components, systems and/or processes to meet required specifications 4. Understand the concept of Marketing and advertising 5. Identify research skills

Unit	Description	Instructional Hours
I	UNIT – I INTODUCTION Electronic Commerce-Frame work, the anatomy of E-Commerce applications, E-Commerce Consumer applications, E-Commerce organization applications. Consumer Oriented Electronic commerce – Mercantile Process models.	9
II	UNIT – II ELECTRONIC PAYMENT SYSTEMS & INTERORGANIZATIONAL COMMERCE Electronic payment systems – Digital Token-Based, Smart Cards, Credit Cards, Risks in Electronic Payment systems. Inter-Organizational Commerce – EDI, EDI Implementation, Value-added networks.	9
III	UNIT – III INTRA ORGANIZATIONAL COMMERCE Intra Organizational Commerce – work Flow, Automation Customization and internal Commerce, Supply chain Management.	9
IV	UNIT – IV THE CORPORATE DIGITAL LIBRARY Corporate Digital Library – Document Library, digital Document types, corporate Data Warehouses. Advertising and Marketing – Information based marketing, Advertising on Internet, on-line marketing process, market research	9
V	UNIT – V CONSUMER SEARCH AND RESOURCE DISCOVERY AND MULTIMEDIA AND DIGITAL VIDEO Consumer Search and Resource Discovery – Information search and Retrieval, Commerce Catalogues, Information Filtering. **Multimedia** – key multimedia concepts, Digital Video and electronic Commerce, Desktop video processing, Desktop video conferencing.	9
Total Instructional Hours		**45**

Course Outcome	After the completion of the course, the learner will be able to CO1: Understand the basic concepts and technologies used in the field of management information systems CO2: Identify and apply relevant problem-solving methodologies CO3: Design components, systems and/or processes to meet required specifications CO4: Evaluate the Internet marketing Strategies CO5: Demonstrate research skills

TEXT BOOKS:

T1- Ravi Kalakota, Andrew Winston, "Frontiers of Electronic Commerce", Addison Wesley.

T2 – Pete Lohsin , John Vacca "Electronic Commerce", New Age International

REFERENCE BOOKS:

R1 – Goel, Ritendra "E-commerce", New Age International

R2-Laudon, "E-Commerce: Business, Technology, Society", Pearson Education

R3-Bajaj and Nag, "E-Commerce the cutting edge of Business", TMH

R4-Turban, "Electronic Commerce 2004: A Managerial Perspective", Pearson Education

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	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3	3	2	2	-	-	-	-	-	1	2	3	3
CO2	3	3	2	2	2	-	-	-	-	-	1	2	3	2
CO3	3	2	3	2	2	-	-	-	-	-	1	2	2	2
CO4	3	3	3	2	2	-	-	-	-	-	1	2	3	2
CO5	3	3	3	2	2	-	-	-	-	-	1	2	3	3
AVG	3	3	3	2	2	-	-	-	-	-	1	2	3	2.6

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PRINCIPAL

Programme	Course Code	Name of the Course	L	T	P	C
BE	19EC7201	Digital Image Processing	3	0	0	3

Course Objective

1. To study the formation of an image and its acquisition.
2. To know about image enhancement in both time and frequency domains.
3. To be familiar with and restoration and segmentation techniques.
4. To know the widely used image compression algorithms.
5. To understand the image recognition concepts and image representation in the form of features.

Unit	Description	Instructional Hours
I	**DIGITAL IMAGE FUNDAMENTALS** Introduction – Fundamental Steps in Digital Image Processing –Components of an Image Processing System, Elements of Visual Perception – Image Sensing and Acquisition – Image Sampling and Quantization – RGB and HSI color models.	9
II	**IMAGE ENHANCEMENT** **Spatial Domain**: Gray level transformations – Histogram processing: Histogram equalization – Basics of Spatial Filtering –Smoothing and Sharpening Spatial Filtering -Homomorphic filtering, Color image enhancement **Frequency Domain**: Smoothing and Sharpening frequency domain filters – Ideal, Butterworth and Gaussian filters.	9
III	**IMAGE RESTORATION AND SEGMENTATION** **Restoration** :Image Restoration degradation model– Mean Filters – Inverse Filtering – Wiener filtering- Geometric transformations-spatial transformations. **Segmentation** : point, line,edge detection-Edge Linking via Hough transformation – Region based segmentation: Region Growing, Region splitting and merging - Practical applications – process an image using various segmentation techniques.	9
IV	**MORPHOLOGICAL PROCESSING AND IMAGE COMPRESSION** **Morphological processing**- Dilation and Erosion-Segmentation by morphological watersheds.**Compression**: Fundamentals – Error Free Compression – Variable Length Coding: Huffman coding, Arithmetic Coding – Compression Standards: JPEG and MPEG.	9
V	**PATTERN CLASSIFICATION** Feature extraction-Boundary representation – Chain Code ,Signature, skeleton –boundary descriptor-shape number- Patterns classification methods- supervised and unsupervised neural networks in Pattern recognition.	9
	Total Instructional Hours	**45**

Course Outcome

After completion of the course the learner will be able to
CO1-Explain and relate the concepts of digital image fundamentals.
CO2-Choose appropriate technique for image enhancement both in spatial and frequency domains.
CO3-Restore good quality images from the degraded one and Segment different aspects of the image
CO4-Categorize various compression techniques and interpret image compression standards.
CO5-Represent the image with various features and recognize an image from its features.

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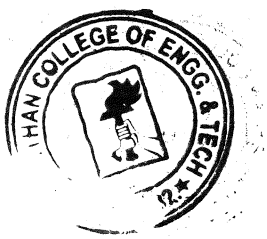

TEXT BOOKS:

T1- Rafael C Gonzalez, Richard E Woods, "Digital Image Processing", Pearson Education Inc, Fourth Edition, 2018.

T2- Anil K- Jain, "Fundamentals of Digital Image Processing", Pearson/Prentice Hall of India,2002.

REFERENCE BOOKS:

R1- Annadurai and Shanmughalakshmi, "Fundamentals of Digital Image Processing',Pearson India,2006.

R2 - S.Jayaraman, S.Esakkirajan, T.Veerakumar, "Digital Image Processing", TMH New Delhi ,2009

R3 - Kenneth R. Castleman, "Digital Image Processing", Pearson, 2006

R4- Rafael C. Gonzalez, Richard E. Woods, Steven Eddins, "Digital Image Processing using MATLAB ", Pearson Education, Inc., 2004.

R5- William K. Pratt, "Digital Image Processing", John Wiley, New York, 2002.

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	-	2	2	3	-	-	-	2	-	-	2	3	2
CO2	3	3	2	2	3	-	-	-	2	-	-	2	3	2
CO3	3	2	2	2	3	-	-	-	2	-	-	2	3	2
CO4	3	3	2	2	3	-	-	-	2	-	-	2	3	2
CO5	3	2	2	2	3	-	-	-	2	-	-	2	3	2
AVG	3	2.5	2	2	3	-	-	-	2	-	-	2	3	2

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Programme	Course Code	Name of the Course	L	T	P	C
BE	19EC7202	Optical and Microwave Engineering	3	0	0	3

Course Objective	The student should be able to 1. To facilitate the knowledge about optical fiber sources and transmission techniques 2. To understand the concepts of signal degradation in optical fibers. 3. To inculcate understanding of the fiber optical sources, receivers and coupling. 4. To understand the functional behavior of microwave semiconductor devices and microwave tubes 5. To enhance the knowledge in various Measurements of Microwave network

Unit	Description	Instructional Hours
I	**INTRODUCTION TO OPTICAL FIBERS** Elements of an Optical fiber communication system- Optical laws and definitions- optical modes and configurations -mode analysis for optical propagation through fibers modes in planar wave guide-modes in cylindrical optical fiber - Fiber materials--single mode fiber – multimode fiber-graded index fiber.	9
II	**TRANSMISSION CHARACTERISTIC OF OPTICAL FIBER** Attenuation-absorption --scattering losses-bending losses-core and cladding losses-signal dispersion –Inter symbol interference and bandwidth-Intra model dispersion-Material dispersion- Waveguide dispersion-Polarization mode dispersion-Intermodal dispersion-Dispersion optimization of single mode fiber-characteristics of single mode fiber-R-I Profile-cutoff wave length-dispersion calculation-mode field diameter.	9
III	**OPTICAL SOURCES, DETECTORS,RECEIVER AND COUPLING** Sources: - surface emitting LED-Edge emitting LED-quantum efficiency and power-modulation of LED –LASER diodes -modes and threshold conditions-Rate equations-external quantum efficiency- Detectors: PIN photo detector-Avalanche photo diodes- noise-SNR-detector response time-Avalanche multiplication noise-temperature effects - preamplifiers-digital receiver performance-probability of error and receiver sensitivity-quantum limit. -Lensing Schemes for Coupling Management- -LED Coupling to Single Mode Fibers	9
IV	**MICROWAVE PASSIVE COMPONENTS AND SEMICONDUCTOR DEVICES** Microwave Passive components: Directional Coupler, Power Divider, Magic Tee, attenuator, resonator, Principles of Microwave Semiconductor Devices: Gunn Diodes, IMPATT diodes, Schottky Barrier diodes, PIN diodes, Microwave tubes: Klystron, TWT, Magnetron.	9
V	**MICROWAVE MEASUREMENTS** Measuring Instruments – VSWR meter, Power meter, Spectrum Analyser, Network Analyser – Principles; Measurement of Impedance, Frequency, Power, VSWR, Q factor, Dielectric Constant, S Parameter- Hazards of microwaves	9
Total Instructional Hours		**45**

Course Outcome	After completion of the course the learner will be able to CO1-Realize basic elements in optical fibers, different modes and configurations CO2-Analyze the transmission characteristics associated with dispersion and polarization techniques. CO3-Design optical sources, detectors and coupling techniques with their use in optical communication system CO4-Analyze various microwave semiconductor devices. CO5-Analyze various waveguide components and performance of microwave tubes and Measurements

TEXT BOOKS:

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T1. GerdKeiser,"OpticalFiber Communicationl, McGraw Hill Education (India) Private Limited. Fifth Edition, Reprint 2013.
T2 - Annapurna Das and Sisir K Das, "Microwave Engineering", Mc Graw Hill Inc., 2004.
REFERENCE BOOKS:
R1. John M.Senior, —Optical fiber communication, Pearson Education, second edition.2007.
R2 - D.M.Pozar, "Microwave Engineering.", John Wiley & sons, Inc., 2006. .
R3- Samuel Y Liao, "Microwave Devices & Circuits", Prentice Hall of India, 2006.

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3	3	3	-	-	-	-	3	3	-	3	3	2
CO2	3	3	3	3	3	-	-	-	-	3	-	3	3	3
CO3	3	3	3	3	3	-	-	-	-	-	-	3	3	3
CO4	3	3	3	3	-	-	-	-	3	-	-	-	3	3
CO5	3	3	3	3	3	-	-	-	3	3	-	3	3	2
AVG	3	3	3	3	3	-	-	-	3	3	-	3	3	2.6

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Programme	Course Code	Name of the course	L	T	P	C
BE	19EC7251	Wireless Communication	2	0	2	3

Course Objective	1. To impart knowledge on Wireless communication. 2. To understand the performance of digital Modulation over wireless channel. 3. To interpret the various challenges in multi carrier modulation and design issues. 4. To provide an outline on cellular concepts and system design fundamentals. 5. To Study various Multiple Access techniques for wireless channels.	
Unit	Description	Instructional Hours
I	**Introduction to Wireless Communications** Overview of wireless systems –Wireless Spectrum –Path Loss and Shadowing –Radio wave propagation –Transmit and Receive signal Models –Free-Space path loss- ray tracing- Empirical Path Loss model path loss models- Shadow fading.	6
II	**Performance of Digital Modulation over Wireless Channel and Diversity** AWGN Channels--Fading– Outage Probability– Average Probability of Error — Combined Outage and Average Error Probability – Doppler Spread – Inter symbol Interference. Realization of Independent Fading Paths – Receiver Diversity – Selection and Threshold Combining–Transmitter Diversity – Channel known at Transmitter – Channel unknown at Transmitter – The Alamouti Scheme	6
III	**Multicarrier Modulation** Challenges in Multicarrier Systems-Data transmission using multiple carrier-Multicarrier modulation with Overlapping subchannels-Mitigation of subcarrier Fading- Discrete Implementation of Multicarrier Modulation-OFDM	6
IV	**Cellular Architecture-System Design Fundamentals** Cellular concepts, Frequency reuse, channel assignment strategies, handoff strategies, interference and system capacity, improving coverage and capacity in cellular systems.	6
V	**Multiple Access Techniques for Wireless Communication** Introduction to Multiple Access- Frequency Division Multiple Access (FDMA)-Time Division Multiple Access(TDMA)-Spread Spectrum Multiple Access-Code division Multiple Access (CDMA)-Space Division Multiple Access (SDMA)	6
	Total Hours	30
1.	**List of Experiments** **Study of wireless Communications using Communication Trainer Kits** To study the FHSS Modulation and Demodulation Techniques	

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2.	To study the DS spread spectrum Modulation and Demodulation Technique	
3.	To study the Code Division Multiple Access (CDMA) with Multiuser	
4.	To study Baseband Communication	
5.	To study and implement Adaptive Linear Equalizer	
	Wireless Path loss Computations - Study of Propagation Path loss Models (Using Mat lab Programming)	
6.	Free Space Propagation – Path Loss Model	
7.	Link Budget Equation for Satellite Communication	
	Total Instructional Hours	**15**
	Total Hours	**30+15=45**

Course Outcome	CO1-Demonstrate the signal propagation over wireless radio channel. CO2-Illustrate the performance of digital modulation technique over AWGN channels CO3-Infer the idea of multicarrier modulation in wireless system. Describe the cellular concepts for solving spectral congestion and user capacity. CO5-Summarize various Multiple Access Techniques for wireless channel.

TEXT BOOKS

T1. Andrea Goldmith, "Wireless Communication", Cambridge University Press, 2005.(Unit I ,II and III)

T2. T.S. Rappaport, "Wireless Communication, Principles and Practice", Pearson Education, Second Edition, 2002 (UNIT IV and UNIT V)

REFERENCE BOOKS:

R1. David Tse and Pramod Viswanath, "Fundamentals of Wireless Communication", Cambridge University Press, 2005.

R2. William C Y Lee, "Wireless and Cellular Communications", Tata McGraw Hill Publishing Company Limited, Third Edition, 2006..

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	2	3	2	-	-	-	-	-	-	-	3	3	2
CO2	3	2	3	2	-	-	-	-	-	-	-	3	3	2
CO3	3	2	3	2	-	-	-	-	-	-	-	3	3	2
CO4	3	2	3	2	-	-	-	-	-	-	-	3	3	2
CO5	3	2	3	2	-	-	-	-	-	-	-	3	3	2
AVG	3	2	3	2	-	-	-	-	-	-	-	3	3	2

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Programme	Course Code	Name of the Course	L	T	P	C
BE	19EC7001	Digital Image Processing Lab	0	0	3	1.5

Course Objective	1. To manipulate the image parameters 2. To improve the quality of an image 3. To detect and segment the boundary in an image. 4. To compress image using coding techniques. 5. To classify different pattern classes.
S.NO	LIST OF EXPERIMENTS
Simulation using MATLAB / EQUIVALENT SOFTWARE PACKAGE	
1.	Program for extraction of color components from RGB color image.
2.	Program for an image enhancement using pixel operation.
3.	Program for image enhancement using histogram equalization.
4.	Program to filter an image using averaging low pass filter in spatial domain and median filter.
5.	Program to sharpen an image using 2-D laplacian high pass filter in spatial domain.
6.	Program to smooth an image using low pass filter and high pass filter in frequency domain (Butterworth LPF and HPF)
7.	Program for morphological image operations-erosion, dilation, opening & closing
8.	Program for image segmentations using region based segmentation technique
9.	Program for image compression using Huffman coding
10.	Program for Pattern classification methods.
Course Outcome	TOTAL HOURS 45 CO1-Analyze color image processing CO2-Enhance the visual quality of an image CO3-Detect the edges and boundary in an image CO4-Demonstrate the applications of segmentation algorithms CO5-Classify different pattern classes.

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	2	2	3	2	3	-	-	-	3	2	-	3	3	3
CO2	3	2	3	2	3	-	-	-	3	2	-	3	3	3
CO3	2	3	3	2	3	-	-	-	3	2	-	3	3	3
CO4	3	3	3	2	3	-	-	-	3	3	-	3	3	3
CO5	3	3	3	2	3	-	-	-	3	3	-	3	3	3
AVG	2.8	2.6	3	2	3	-	-	-	3	2.4	-	3	3	3

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PRINCIPAL

Programme	Course Code	Name of the Course	L	T	P	C
BE	19EC7002	Optical Communication and Microwave Lab	0	0	3	1.5

S.NO	LIST OF EXPERIMENTS
OPTICAL EXPERIMENTS	
1.	DC Characteristics of LED and PIN Photo diode
2.	Coupling and bending losses of Fibers
3.	Fiber optic Analog and Digital Link
4.	Numerical Aperture determination for Fibers
5.	Attenuation Measurement in Fibers
MICROWAVE EXPERIMENTS	
6.	Characteristics of Gunn diode
7.	Characteristics of Reflex Klystron
8.	Directional Coupler Characteristics.
9.	S-parameter Measurement of the following microwave components (Isolator, Circulator, E plane Tee, H Plane Tee, Magic Tee)
10.	Radiation Pattern of Horn Antenna.
	TOTAL HOURS 45

Course Outcome	CO1-Analyze the performance of various microwave links. CO2-Evaluate the performance of various optical links. CO3-Interpret test microwave components CO4-Analyze the radiation of pattern of antenna. CO5-Understand & implement test optical components

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3	3	3	-	-	-	-	3	3	2	3	3	2
CO2	3	3	3	3	-	-	-	-	3	3	2	3	3	2
CO3	3	3	3	3	-	-	-	-	3	3	2	3	3	2
CO4	3	3	3	3	-	-	-	-	3	3	2	3	3	2
CO5	3	3	3	3	-	-	-	-	3	3	2	3	3	2
AVG	3	3	3	3	-	-	-	-	3	3	2	3	3	2

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PRINCIPAL

Programme	Course Code	Name of the Course	L	T	P	C
BE	19EC7901	Project Work –Phase I	0	0	4	2

Course Objective

The student should be able to

1. Work in teams to propose, formulate, and solve a challenging open-ended design problem of significant scope, depth, and breadth.
2. Understand and incorporate engineering standards and multiple realistic constraints, within realistic design time, budget, and performance objectives.
3. Develop a prototype of the proposed design and demonstrate the prototype in accordance with the specifications.
4. Effectively communicate information relating to all aspects of the design process in written, oral, and graphical form.

S.No Guidelines

1. Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
2. Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.
3. Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.
4. Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.
5. Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modelling to complex engineering activities with an understanding of the limitations.
6. Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.
7. Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.
8. Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.
9. Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.
10. Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.
11. Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.
12. Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

Course Outcome

CO1-Understand a real-world problem, identify the requirement and develop the design solutions.
CO2-Identify technical ideas, strategies and methodologies.
CO3-Develop solutions using new tools & techniques, test and validate the results for betterment of mankind
CO4-Prepare report and present the oral demonstrations.
CO5-Identify the requirement and develop the design solutions.

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3	3	3	3	3	3	3	3	3	3	3	3	3
CO2	3	3	3	3	3	3	3	3	3	3	3	3	3	3
CO3	3	3	3	3	3	3	3	3	3	3	3	3	3	3
CO4	3	3	3	3	3	3	3	3	3	3	3	3	3	3
CO5	3	3	3	3	3	3	3	3	3	3	3	3	3	3
AVG	3	3	3	3	3	3	3	3	3	3	3	3	3	3

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PRINCIPAL

Programme	Course Code	Name of the Course	L	T	P	C
BE	19EC8901	Project Work –Phase II	0	0	24	12

Course Objective

The student should be able to

1. Work in teams to propose, formulate, and solve a challenging open-ended design problem of significant scope, depth, and breadth.
2. Understand and incorporate engineering standards and multiple realistic constraints, within realistic design time, budget, and performance objectives.
3. Develop a extended prototype of the proposed design and demonstrate the prototype in accordance with the specifications.
4. Effectively communicate information relating to all aspects of the design process in written, oral,and graphical form.

S.No	Guidelines

1. Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
2. Identify, formulate, review research literature, and analyse complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.
3. Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.
4. Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.
5. Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modelling to complex engineering activities with an understanding of the limitations.
6. Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.
7. Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.
8. Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.
9. Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.
10. Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.
11. Demonstrate knowledge and understanding of the engineering and management principles and apply these to ones own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.
12. Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

Course Outcome

CO1-Understand a real-world problem, identify the requirement and develop the design solutions.
CO2-Identify technical ideas, strategies and methodologies.
CO3-Develop solutions using new tools & techniques, test and validate the results for betterment of mankind
CO4-Prepare report and present the oral demonstrations.
CO5-Identify the requirement and develop the design solutions.

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3	1	1	2	3	2	2	2	3	-	3	2	3
CO2	3	3	1	1	2	3	2	2	2	3	-	3	2	3
CO3	3	3	1	1	2	3	2	2	2	3	-	3	2	3
CO4	3	3	1	1	2	3	2	2	2	3	-	3	2	3
CO5	3	3	1	1	2	3	2	2	2	3	-	3	2	3
AVG	3	3	1	1	2	3	2	2	2	3	-	3	2	3

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PRINCIPAL

Programme	Course Code	Name of the Course	L	T	P	C
BE	19EC7301	Robotics	3	0	0	3

Course Objective	The student should be able to 1. To introduce the relevance of this course to the existing technology through demonstrations, case studies, simulations, contributions of scientist, national/international policies with a futuristic vision along with socio-economic impact and issues. 2. To introduce the electronics and software aspects in the design of robots. 3. To bring out the different languages for programming robot. 4. To specify robot requirements in the industry. 5. To introduce latest state of the art robots.

Unit	Description	Instructional Hours
I	**SCOPE OF ROBOTS** The scope of industrial Robots - Definition of an industrial robot - Need for industrial robots – Economic and Social Issues- applications.	9
II	**ROBOT COMPONENTS** Fundamentals of Robot Technology - Automation and Robotics - Robot anatomy - Work volume - Precision of movement - End effectors - Sensors.	9
III	**ROBOT PROGRAMMING** Robot Programming - Methods - interlocks textual languages. Characteristics of Robot level languages, characteristic of task level languages.	9
IV	**ROBOT WORK CELL** Robot Cell Design and Control - Remote Center compliance - Safety in Robotics.	9
V	**FUTURE TRENDS** Telepresence robot, Autonomous mobile robots, Walker Robots, Solar-ball Robot, Underwater bots, Aerobots, Advanced robotics in Space - Specific features of space robotics systems – long term technical developments, Next generation robots.	9
Total Instructional Hours		**45**

Course Outcome	After completion of the course the learner will be able to CO1: Ability to comprehend and appreciate the significance and role of this course in the present contemporary world. CO2: Ability to design and develop robotic based systems. CO3: Ability to develop system for industrial automation CO4: Ability to provide automatic solution for replacing humans in life threatening area. CO5: Ability to develop system for medical applications.

TEXT BOOKS:

T1 - Barry Leatham - Jones, "Elements of industrial Robotics", Pitman Publishing, 1987.

T2 - J. M. Selig, "Introductory Robotics", Prentice Hall, 1992.

REFERENCE BOOKS:

R1 - John Iovine, "Robots, Android and Animatronics", 2nd Edition, McGraw-Hill, 2012.

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	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3	3	3	3	3	2	3	3	3	3	3	3	3
CO2	3	3	3	3	3	3	3	3	3	3	3	3	3	3
CO3	3	3	3	3	3	3	3	3	3	3	3	3	3	3
CO4	3	3	3	3	3	3	2	3	3	3	3	3	3	3
CO5	3	3	3	3	3	3	2	3	3	3	3	3	3	3
AVG	3	3	3	3	3	3	2.4	3	3	3	3	3	3	3

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PRINCIPAL

Programme	Course Code	Name of the Course	L	T	P	C
BE	19EC7302	ASIC Design	3	0	0	3

Course Objective

1. To learn the fundamentals of ASIC and CMOS logic design
2. To familiarize with the various principles of programmable ASIC design
3. To impart knowledge on ASIC architecture and various logic synthesis techniques
4. To provide an insight on the concepts of delay models and logic simulation.
5. To familiarize with the concepts of floor planning and system partitioning

Unit	Description	Instructional Hours
I	**ASIC AND CMOS LOGIC DESIGN** Types of ASICs - Design flow - CMOS transistors - Combinational Logic Cell – Sequential logic cell - Data path logic cell - Transistors as Resistors - Transistor Parasitic Capacitance.	9
II	**PROGRAMMABLE ASIC** Anti fuse - static RAM - EPROM and EEPROM technology - Actel ACT - Xilinx LCA – Altera FLEX - Altera MAX DC & AC inputs and outputs - Clock & Power inputs - Xilinx I/O blocks.	9
III	**ASIC ARCHITECUTRE AND LOGIC SYNTHESIS** Architecture and configuration of Spartan and Virtex FPGAs- Logic Synthesis with an example-Finite State Machine Synthesis - Memory Synthesis.	9
IV	**LOGIC SIMULATION** Simulation-Logic Systems - Cell Models - Delay Models - StaticTimingAnalysis - Formal verification - Switch level and Transistor level simulation.	9
V	**ASIC CONSTRUCTION** System Partitioning – FPGA Partitioning, Partitioning Methods- Kernighan-Lin algorithm. Floor Planning - Placement-min cut & Eigen value algorithm - Routing-Global & Detailed routing.	9
	Total Instructional Hours	45

Course Outcome

After completion of the course, the student will be able to
CO1: Understand the basic ASIC and CMOS logic design.
CO2: Understand various types of Programmable ASICs.
CO3: Understand the ASIC architecture and logic synthesis.
CO4: Understand the various techniquesused in the logic simulation and delay models.
CO5: Understand the various methods system floor planning and partitioning.

TEXT BOOKS:

T1- M.J.S.Smith, " Application - Specific Integrated Circuits", Pearson, 2003. -UNIT I,II,III,IV,V

REFERENCE BOOKS:

R1.Steve Kilts, "Advanced FPGA Design," Wiley Inter-Science.

R2. Roger Woods, John McAllister, Dr. Ying Yi, Gaye Lightbod, "FPGA-based Implementation of Signal Processing Systems", Wiley, 2008.

R3. Mohammed Ismail and Terri Fiez, "Analog VLSI Signal and Information Processing ", McGraw Hill, 1994

R4. Douglas J. Smith, HDL Chip Design, Madison, AL, USA: Do one Publications, 1996.

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	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3	3	3	3	3	2	3	3	3	3	3	3	3
CO2	3	3	3	3	3	3	3	3	3	3	3	3	3	3
CO3	3	3	3	3	3	3	3	3	3	3	3	3	3	3
CO4	3	3	3	3	3	3	2	3	3	3	3	3	3	3
CO5	3	3	3	3	3	3	2	3	3	3	3	3	3	3
AVG	3	3	3	3	3	3	2.4	3	3	3	3	3	3	3

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Programme	Course Code	Name of the Course	L	T	P	C
BE	19EC7303	GLOBAL POSITIONING SYSTEM	3	0	0	3

Course Objective	The student should be able to 1. Acquire fundamental knowledge of GPS architectures 2. Extend the knowledge about GPS signal characteristics 3. Understand the receiver architecture and errors 4. Gain knowledge about Differential GPS 5. Study the applications of GPS

Unit	Description	Instructional Hours
I	**Introduction:** Basic concept, system architecture, GPS and GLONASS Overview, Satellite Navigation, Time and GPS, User position and velocity calculations, GPS, Satellite Constellation, Operation Segment, User receiving Equipment, Space Segment Phased development, GPS aided Geo augmented navigation (GAGAN) architecture.	6+6
II	**Signal Characteristics:** GPS signal components, purpose, properties and power level, signal acquisition and tracking, Navigation information extraction, pseud orange estimation, frequency estimation, GPS satellite position calculation, Signal structure, anti-spoofing (AS), selective availability, Difference between GPS and GALILEO satellite construction.	6+3
III	**GPS Receivers & Data Errors:** Receiver Architecture, receiver design options, Antenna design, GPS error sources, SA errors, propagation errors, ionospheric error, tropospheric error, multipath, ionospheric error, estimation using dual frequency GPS receiver, Methods of multipath mitigation, Ephemeris data errors, clock errors.	6
IV	**Differential GPS:** Introduction, LADGPS, WADGPS, Wide Area Augmentation systems, GEO Uplink subsystem, GEO downlink systems, Geo Orbit determination, Geometric analysis, covariance analysis, GPS /INS Integration Architectures	6
V	**GPS Applications:** GPS in surveying, Mapping and Geographical Information System, Precision approach Aircraft landing system, Military and Space application, intelligent transportation system. GPS orbital parameters, description of receiver independent exchange format (RINEX), Observation data and navigation message data parameters, GPS position determination, least squares method	6+6
	Total Instructional Hours	**30+15**

Course Outcome	After completion of the course the learner will be able to CO1: Understand the architecture of positioning systems CO2: Evaluate the position calculations CO3: Interpret the errors in GPS receiver data CO4: Illustrate the types of Differential GPS system CO5: understands the applications of GPS

TEXT BOOKS:

T1-Mohinder S.Grewal, Lawrence R.Weill, Angus P.Andrews, "Global positioning systems, Inertial Navigation and Integration", Wiley 2007.

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T2-B.Parkinson, J.Spilker, Jr.(Eds), "GPS: Theory and Applications", Vol.I&Vol.II, AIAA, 370 L'Enfant Promenade SW, Washington, DC 20024, 1996.

REFERENCE BOOKS:

R1 E.D.Kaplan, Christopher J. Hegarty, "Understanding GPS Principles and Applications", Artech House Boston 2005.

R2 - Ahmed El-Rabbany " Introduction to GPS:The Global Positioning System" Artech House BOSTON., 2002

R3 - A.Leick, "GPS Satellites Surveying", 2nd edition, John Wiley& Sons,NewYork,1995

R4 -B.Hoffman - Wellenhof, H.Lichtenegger and J.Collins, "GPS: Theory and Practice", 4th revised edition, Springer, Wein, New york, 1997.

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3	3	3	3	3	2	3	3	3	3	3	3	3
CO2	3	3	3	3	3	3	3	3	3	3	3	3	3	3
CO3	3	3	3	3	3	3	3	3	3	3	3	3	3	3
CO4	3	3	3	3	3	3	2	3	3	3	3	3	3	3
CO5	3	3	3	3	3	3	2	3	3	3	3	3	3	3
AVG	3	3	3	3	3	3	2.4	3	3	3	3	3	3	3

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PRINCIPAL

Programme	Course Code	Name of the Course	L	T	P	C
BE	19EC7304	Cloud Computing	3	0	0	3

Course Objective	• To understand the concept of cloud computing along with definition of organizational roles. • To Interpret the evolution of cloud from the existing technologies. • To understand the fundamental building block of cloud environment. • To have knowledge on foundational cloud architectural models • To be familiar with the security threats in cloud.

Unit	Description	Instructional Hours
I	**INTRODUCTION TO CLOUD COMPUTING** Understanding Cloud Computing- Cloud concepts and Terminology-Goals and Benefits –Risks and Challenges Cloud Characteristics-Cloud Delivery Models –Cloud deployment Models.	9
II	**CLOUD ENALBLING TECHNOLOGY** Broadband Networks and Internet Architecture-ISPs-Technical and Business consideration Data Centre Technology-Virtualization Technology - Operating System Based Virtualization-Hardware Based Virtualization -Virtualization Management- Web and Service Technology-Web Services-REST Services-Service Agents and Middle ware.	9
III	**CLOUD COMPUTING AND SPECIALIZED MECHANISM** Logical Network Perimeter-Virtual Server –cloud storage Device-Cloud Usage Monitor –Automated scaling Listener-Load balancer-SLA Monitor-Hypervisor-Resource cluster-Multi Device Broker	9
IV	**CLOUD COMPUTING ARCHITECTURE** Fundamental cloud Architecture-Elastic Resource Capacity Architecture-Service load Balancing Architecture-Cloud Bursting Architecture –Advanced Cloud architecture-Hypervisor clustering Architecture –Cloud Balancing Architecture-specialized cloud Architecture- Direct I/O Access Architecture-Elastic Network Capacity Architecture.	9
V	**CLOUD MANAGEMENT AND SECURITY MECHANISM** Resource Management system-SLA Management system-Billing management system-Identity and Access Management(IAM) –Single Sign-On(SSO)-Cloud Based Security Groups	9
Total Instructional Hours		**45**

Course Outcome	CO1: Infer the concepts and Terminology of Cloud Computing CO2: Contrast the Cloud Technology with existing Technology CO3:Summrize the various Cloud Computing Mechanism CO4:Outline the Cloud Computing Architecture CO5: Demonstrate the threats and security issues

TEXT BOOKS

T1-Cloud Computing Concepts ,Technology and Architecture (UNIT I,UNIT II, UNIT III,UNIT IVAND UNIT5)

T2-Distributed and Cloud Computing. Kal Hwang. GeoffeiyC.Fox. Jack J.Dongarra. Elsevier. 2012.(UNIT III and UNITV)

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REFERENCE BOOKS:

R1-Cloud Computing: A Practical Approach. Anthony T.Velte. Toby J.VeFte, Robert Elsenpeter. Tata McGraw Hill. rp20ll.

R2-Enterprise Cloud Computing GautamShroif, Cambridge University Press. 2010.

R3-Cloud Computing: Implementation, Management and Security, John W. Rittinouse, James F Ransome. CRC Press, rp2012

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3	3	3	3	3	2	3	3	3	3	3	3	3
CO2	3	3	3	3	3	3	3	3	3	3	3	3	3	3
CO3	3	3	3	3	3	3	3	3	3	3	3	3	3	3
CO4	3	3	3	3	3	3	2	3	3	3	3	3	3	3
CO5	3	3	3	3	3	3	2	3	3	3	3	3	3	3
AVG	3	3	3	3	3	3	2.4	3	3	3	3	3	3	3

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PRINCIPAL

Programme	Course Code	Name of the Course	L	T	P	C
BE	19EC7181	Entrepreneurship Development	3	0	0	3

Course Objective	The student should be able to 1. 1. To understand the concept of entrepreneurship. 2. To know the motivation factors for the entrepreneurs. 3. To analyze the business concepts and projects. 4. To impart knowledge about accounting and various taxes. 5. To understand the government policies towards partnerships.

Unit	Description	Instructional Hours
I	**ENTREPRENEURSHIP** Entrepreneur – Types of Entrepreneurs – Difference between Entrepreneur and Intrapreneur Entrepreneurship in Economic Growth, Factors Affecting Entrepreneurial Growth.	9
II	**MOTIVATION** Major Motives Influencing an Entrepreneur – Achievement Motivation Training, Self Rating, Business Games, Thematic Apperception Test – Stress Management, Entrepreneurship Development Programs – Need, Objectives.	9
III	**BUSINESS** Small Enterprises – Definition, Classification – Characteristics, Ownership Structures – Project Formulation – Steps involved in setting up a Business – identifying, selecting a Good Business opportunity, Market Survey and Research, Techno Economic Feasibility Assessment – Preparation of Preliminary Project Reports – Project Appraisal – Sources of Information – Classification of Needs and Agencies.	9
IV	**FINANCING AND ACCOUNTING** Need – Sources of Finance, Term Loans, Capital Structure, Financial Institution, Management of working Capital, Costing, Break Even Analysis, Taxation – Income Tax, Excise Duty – Sales Tax.	9
V	**SUPPORT TO ENTREPRENEURS** Sickness in small Business – Concept, Magnitude, Causes and Consequences, Corrective Measures - Business Incubators – Government Policy for Small Scale Enterprises – Growth Strategies in small industry – Expansion, Diversification, Joint Venture, Merger and Sub Contracting.	9
Total Instructional Hours		45

Course Outcome	After completion of the course the learner will be able to CO1 : Choose the entrepreneurial career. CO2 : Defend the motivation factors for the entrepreneurship. CO3 : Evaluate the effectiveness of a business plan and model. CO4 : Assess the taxes and the finance of a concern. CO5 : Relate the supports and partnerships with respect the given scenario.

TEXT BOOKS:

T1-S.S.Khanka, "Entrepreneurial Development" S.Chand& Co. Ltd., Ram Nagar, New Delhi, 2013

T2- Donald F Kuratko, " Entreprenuership – Theory, Process and Practice", 9th edition, Cengage Learning 2014.

REFERENCE BOOKS:

R1 - Mathew J Manimala, "Entrepreneurship Theory at Cross Roads: paradigms and Praxis", 2nd Edition Dream Tech, 2005.

R2 - Hisrich R D, Peters M P, "Entrepreneurship" 8th Edition, Tata McGraw-Hill, 2013.

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	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3	3	3	3	3	2	3	3	3	3	3	3	3
CO2	3	3	3	3	3	3	3	3	3	3	3	3	3	3
CO3	3	3	3	3	3	3	3	3	3	3	3	3	3	3
CO4	3	3	3	3	3	3	2	3	3	3	3	3	3	3
CO5	3	3	3	3	3	3	2	3	3	3	3	3	3	3
AVG	3	3	3	3	3	3	2.4	3	3	3	3	3	3	3

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PRINCIPAL

Programme	Course code	Name of the course	L	T	P	C
BE	19EC8301	Neural networks and Deep learning	3	0	0	3

Course Objective	1. To study the fundamental concepts neural networks and learning algorithms 2. To present the mathematical, statistical and computational challenges of building neural networks 3. To introduce radial basis function networks along with applications. 4. To enable the students to know deep learning techniques to support real-time applications 5. To examine the case studies of neural networks and deep learning.

Unit	Description	Instructional Hours
I	**BASIC LEARNING ALGORITHMS** Biological Neuron – Models of a Neuron – Network Architectures : Feed Forward and Feedback – Learning Process – Supervised and Unsupervised Learning - Learning Tasks - Pattern Recognition and Classification .	9
II	**PERCEPTRONS AND MULTILAYER PERCEPTRONS** Learning Algorithms - Perceptron Learning Algorithm–Perceptron Convergence Theorem – Perceptron learning and non separable sets – Multilayer Network Architectures.	9
III	**RADIAL BASIS FUNCTION NETWORKS** Cover's Theorem on the Separability of Patterns – The Interpolation problem –Generalized Radial Basis Function Networks –Hybrid Learning procedure for Radial Basis Function Networks – Computer Experiment: Pattern Classification	9
IV	**ATTRACTOR NEURAL NETWORKS** Associative Learning – Attractor Neural Network Associative Memory – Linear Associative Memory – Hopfield Network – Content Addressable Memory – Boltzmann Machine – Bidirectional Associative Memory – BAM Stability Analysis – Error Correction in BAMs.	9
V	**DEEP NETWORKS** Convolutional Neural Networks – Basic Structure: Padding, Strides, ReLU, Pooling, Fully Connected Layers, Interleaving, Local Response Normalization. Case studies :Alexnet, ZFNet, VGG, GoogleNet, ResNet.	9
Total Instructional Hours		45

Course Outcome	CO1: Understand basics of Neural Networks CO2: Implement various Neural Network models CO3: Realign high dimensional data using reduction techniques in NN CO4: Analyze optimization and generalization in NN CO5: Explore the deep learning applications

TEXT BOOKS:

T1:Simon Haykin, "Neural Networks and Learning machines". Pearson Education/PHI, 3rd Edition. 2009.
T2:Satish Kumar, "Neural Networks: A classroom approach". TMH education, 2nd Edition, 2013.
T3:Charu C Aggarwal, Neural Networks and Deep Learning, Springer, 2015

REFERENCES BOOKS:

R1 –James A. Freeman and David M. Skapura, "Neural Networks Algorithms, Applications and Programming Techniques", Pearson Education, 2003.
R2 - Martin T.Hagan, Howard B. Demuth and Mark Beale, "Neural Network Design", Thomson Learning, 2003.
R3 - Michael Nielsen, Neural Networks and Deep Learning, Determination Press, 2015.
R4 - Ian Goodfellow, Yoshua Bengio, Aaron Courville, "Deep Learning", MIT Press, 2016.

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	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	2	2	3	-	-	-	-	-	-	-	2	3	3
CO2	3	3	3	3	-	-	-	-	-	-	-	3	3	3
CO3	3	3	3	2	-	-	-	-	-	-	-	2	3	2
CO4	3	3	3	3	-	-	-	-	-	-	-	2	2	3
CO5	2	2	2	2	-	-	-	-	-	-	-	3	2	2
AVG	2.8	2.6	2.6	2.6	-	-	-	-	-	-	-	2.4	2.6	2.6

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PRINCIPAL

Programme	Course Code	Name of the Course	L	T	P	C
BE	19EC8302	Embedded Controllers	3	0	0	3

Course Objective	The student should be able to 1. Introduce the concept of RISC and CISC microcontrollers. 2. Study the architecture of PIC and RL 78 family microcontrollers. 3. Gain knowledge about multi tasking and the real time operating system. 4. Learn the features and architecture of MSP430 microcontroller. 5. Understand the programming and peripheral interface using MSP430 microcontroller families.

Unit	Description	Instructional Hours
I	**RISC PROCESSORS** RISC Vs CISC, RISC properties and evolution, Advanced RISC microcontrollers, PIC18xx microcontroller family, Architecture, Instruction set, ROM, RAM, Timer programming, Serial port programming, Interrupt programming, ADC and DAC interfacing, CCP module and programming.	9
II	**CISC PROCESSORS** RL78 16 BIT Microcontroller architecture, addressing modes, on-Chip memory, ADC, interrupts, MAC unit, Barrel shifter, internal and external clock generation, memory CRC, on chip debug function and self programming.	9
III	**MULTITASKING AND THE REAL-TIME OPERATING SYSTEM** The challenge of multitasking and real time, multitasking with sequential programming, State machines, Real time operating system, RTOS services, synchronization and messaging tools, CCS PIC C Compiler RTOS. Design example: Voltmeter with RS232 serial output.	9
IV	**MSP430 16 - BIT MICROCONTROLLER** The MSP430 Architecture, CPU Registers, Instruction Set, addressing modes, the MSP430 family viz. MSP430x2x, MSP430x4x, MSP430x5x. Low power aspects of MSP430 : low power modes, active Vs standby current consumption, FRAM Vs Flash for low power and reliability.	9
V	**PROGRAMMING AND PERIPHERAL INTERFACE USING MSP430 FAMILIES** Memory mapped peripherals, I/O pin multiplexing, Timers, RTC, watchdog timer, PWM control, Analog interfacing and data acquisition, DMA, programming with above internal peripherals using optimal power consumption. Case study: Remote control of air conditioner and home appliances.	9
Total Instructional Hours		45

Course Outcome	After completion of the course the learner will be able to CO1: Discriminate RISC and CISC processors, and work with PIC microcontrollers. CO2: Work with the 16 bit microcontroller RL78 and design microcontroller based systems for a Real world application. CO3: Apply the concept of multitasking and RTOS in embedded system design. CO4: Gaining design knowledge and concepts on MSP430 family of Microcontroller. CO5: Ability to design and develop microcontroller based smart electronic system and home appliances.

TEXT BOOKS:

T1- Muhammad Ali Mazidi, Rolind D. Mckinlay and Danny Causey. "PIC Microcontroller and Embedded Systems", Pearson Education, 2008. (Unit I and III).
T2-John H. Davies, "MSP 430 Micro controller basics", Elsevier, 2008. (Unit IV and V).

REFERENCE BOOKS:

R1 - Alaxander G, James M. Conard, " Creating fast, Responsive and energy efficient Embedded systems using the Renesas RL78 microcontroller", Micrium press, USA, Reprinted by S.P Printers, 2011. (Unit II).

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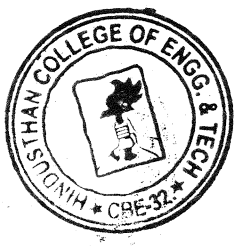

R2 - David. E. Simon, "An Embedded Software Primer", Addison-Wesley, Reprint 2015.

R3 - Tim Wilmshurst, "Designing Embedded Systems with PIC microcontrollers-Principles and Applications", Newnes Publications, 2007.

R4- Douglas V.Hall, "Microprocessor and Interfacing, Programming and Hardware", Tata Mc Graw Hill Revised, 2nd Edition 2016, 11th Reprint 2011.

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	2	2	3	-	-	-	-	-	-	-	2	3	3
CO2	3	3	3	3	-	-	-	-	-	-	-	3	3	3
CO3	3	3	3	2	-	-	-	-	-	-	-	2	3	2
CO4	3	3	3	3	-	-	-	-	-	-	-	2	2	3
CO5	2	2	2	2	-	-	-	-	-	-	-	3	2	2
AVG	2.8	2.6	2.6	2.6	-	-	-	-	-	-	-	2.4	2.6	2.6

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PRINCIPAL

Programme	Course Code	Name of the Course	L	T	P	C
BE/B.Tech	19EC8303	Satellite Communication	3	0	0	3

Course Objective

The student should be conversant with

1. Basics of satellite communications and different satellite communication orbits
2. The effect of radio wave propagation in satellites
3. Understand the satellite segment and earth segment
4. In-depth treatment of satellite communication systems operation and planning, Link budgets & planning
5. The various methods of satellite access To understand various applications of satellite communications

Unit	Description	Instructional Hours
I	**INTRODUCTION TO SATELLITE COMMUNICATION** Historical background, Basic concepts of Satellite Communications, Communication Networks and Services, Comparison of Network Transmission technologies, Orbital and Spacecraft problems, Growth of Satellite communications. **Orbits and Launching Methods:** Introduction, Kepler's First Law, Kepler's Second Law, Kepler's Third Law, Definitions of Terms for Earth-Orbiting Satellites, Orbital Elements, Apogee and Perigee Heights, Orbit Per turbations, Effects of a non spherical earth, Atmospheric drag.	9
II	**RADIO WAVE PROPAGATION AND POLARIZATON** **Radio wave Propagation:** Introduction, Atmospheric Losses, Ionospheric Effects, Rain Attenuation, Other Propagation Impairments. **Polarization:** Introduction, Antenna Polarization, Polarization of Satellite Signals, Cross Polarization, Discrimination, Ionospheric Depolarization, Rain Depolarization, Ice Depolarization.	9
III	**THE SPACE SEGMENT AND THE EARTH SEGMENT** **The space segment:** Introduction, The Power Supply, Attitude Control, Spinning satellite stabilization, Momentum wheel stabilization, Station Keeping, Thermal Control, TT&C Subsystem, Transponders, The wideband receiver, The input demultiplexer, The power amplifier, The Antenna Subsystem **The Earth Segment:** Introduction, Receive-Only Home TV Systems, The outdoor unit, The indoor unit for analog (FM) TV, Master Antenna TV System, Community Antenna TV System, Transmit-Receive Earth Stations.	9
IV	**THE SPACE LINK** Introduction, Equivalent Isotropic Radiated Power, Transmission Losses, Free-space transmission, Feeder losses, Antenna misalignment losses, Fixed atmospheric and ionospheric losses, The Link-Power Budget Equation, System Noise, Carrier-to-Noise Ratio, The Uplink, Saturation flux density, Input backoff, Downlink, Output back-off, Combined Uplink and Downlink C/N Ratio	9
V	**SATELLITE ACCESS AND SPECIALIZED SERVICES** Introduction, Single Access, Preassigned FDMA, Demand-Assigned FDMA, Spade System, TDMA, Preassigned TDMA, Demand-assigned TDMA, Satellite-Switched TDMA, Code-Division Multiple Access **Satellite Mobile and Specialized Services:** Introduction, Satellite Mobile Services, VSATs, Radarsat, Global Positioning Satellite System (GPS), Orbcomm, Iridium.	9
	Total Instructional Hours	45

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PRINCIPAL

Course Outcome	After the completion of the course, the learner will be able to CO1: Understand principle, working and operation of various sub systems of satellite as well as the earth station. CO2: Understand Effects of radio propagation in satellites CO3: Apply various communication techniques for satellite applications CO4: Analyze and design satellite communication link CO5: Learn advanced techniques and regulatory aspects of satellite communication and Understand role of satellite in various applications

TEXT BOOKS:

T1- Satellite Communications, by Dennis Roddy (Fourth edition),McGraw Hill

T2 – Satellite Communication Systems Engineering, by Wilbur L. Pritchard, Henri G. Suyderhoud, Robert A. Nelson (Second Edition), Pearson

REFERENCE BOOKS:

R1 – Satellite Communication, by Timothy Pratt, Charles Bostian, Jeremy Allnutt(Second Edition), John Wiley & Sons.

R2-Satellite Technology, Principles and Applications, by Anil K. Maini, VarshaAgarwal(Second Edition), Wiley.

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	**3**	**2**	**2**	**3**	-	-	-	-	-	-	-	**2**	**3**	**3**
CO2	**3**	3	3	3	-	-	-	-	-	-	-	**3**	3	**3**
CO3	**3**	3	3	2	-	-	-	-	-	-	-	**2**	3	**2**
CO4	**3**	3	3	3	-	-	-	-	-	-	-	**2**	2	**3**
CO5	**2**	2	2	2	-	-	-	-	-	-	-	**3**	2	**2**
AVG	**2.8**	2.6	2.6	2.6	-	-	-	-	-	-	-	**2.4**	2.6	**2.6**

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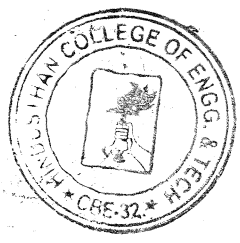

PRINCIPAL

Programme	Course Code	Name of the Course	L	T	P	C
BE	19EC8304	Wireless Sensor and Networks	3	0	0	3

Course Objective

1. To provide an outline on the characteristics and challenges of Wireless Sensor Networks
2. To discuss the network architecture of Wireless Sensor Networks
3. To understand various medium access control protocols for WSNs
4. To describe various time synchronization and topology control mechanisms for WSNs
5. To study various routing protocols and discuss the applications of WSNs

Unit	Description	Instructional Hours
I	**OVERVIEW OF WIRELESS SENSOR NETWORKS** Challenges for Wireless Sensor Networks-Characteristic Requirements, Required Mechanisms-Difference between MANETs and WSNs- Applications of WSN.	9
II	**ARCHITECTURES** Single-Node Architecture - Hardware Components-Energy Consumption of Sensor Nodes - Operating Systems and Execution Environments-Example of sensor Nodes. Network Architecture -Sensor Network Scenarios- Optimization Goals and Figures of Merit, Gateway Concepts.	9
III	**MEDIUM ACCESS CONTROL PROTOCOLS** Fundamentals of MAC protocols - Low duty cycle protocols and wakeup concepts -Contention-based protocols - Schedule-based protocols - SMAC - Traffic-adaptive medium access protocol (TRAMA) - The IEEE 802.15.4 MAC protocol. Naming and addressing: Fundamentals-Address and Name Management, Assignment of MAC Addresses.	9
IV	**TIME SYNCHRONIZATION AND TOPOLOGY CONTROL** Introduction to time synchronization problem-Protocols based on sender/receiver synchronization-localization and positioning-possible approaches-single – hop localization positioning in multi-hop environments- Topology control -Motivation and basic ideas controlling topology in flat network-hierarchal networks by dominating sets-hierarchal networks by clustering-combining hierarchal topologies and power control.	9
V	**ROUTING PROTOCOLS AND APPLICATIONS** Gossiping and agent-based unicast forwarding-Energy-efficient unicast-Broadcast and Multicast-Geographic routing -Mobile nodes, Application-Target detection and tracking-edge detection-Field sampling	9
Total Instructional Hours		45

Course Outcome

CO1: Outline the characteristics and challenges of Wireless Sensor Networks
CO2: Demonstrate the WSN network architecture and its operation
CO3: Summarize various medium access protocols used for WSN.
CO4: Illustrate the various mechanism for time synchronization and topology control in WSN
CO5: Infer the routing techniques used in WSN

TEXT BOOKS:

T1-Holger Karl & Andreas Willig, "Protocols and Architectures for Wireless Sensor Networks", John Wiley, 2005.

T2- Feng Zhao & Leonidas J. Guibas, "Wireless Sensor Networks- An Information Processing Approach", Morgan Khaufmann Publishers'

REFERENCE BOOKS:

R1- KazemSohraby, Daniel Minoli, &TaiebZnati, "Wireless Sensor Networks-Technology, Protocols, And Applications", John Wiley, 2007.

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R2-Anna Hac, "Wireless Sensor Network Designs", John Wiley, 2003.

R3-Edgar H.Callaway,Jr. and Edgar H.Callaway, "Wireless Sensor Networks :Architectures and Protocols", CRC Press, August 2003.

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	2	2	3	-	-	-	-	-	-	-	2	3	3
CO2	3	3	3	3	-	-	-	-	-	-	-	3	3	3
CO3	3	3	3	2	-	-	-	-	-	-	-	2	3	2
CO4	3	3	3	3	-	-	-	-	-	-	-	2	2	3
CO5	2	2	2	2	-	-	-	-	-	-	-	3	2	2
AVG	2.8	2.6	2.6	2.6	-	-	-	-	-	-	-	2.4	2.6	2.6

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PRINCIPAL

Programme	Course Code	Name of the Course	L	T	P	C
BE	19EC8181	Foundation Skills In Integrated Product Development	3	0	0	3

Course Objective	1. To introduce fundamental aspects of Integrated Product Development. 2. To understand the concept of selection and testing Methodologies. 3. To know the concepts of various layouts and architecture of product. 4. To study the various industrial process tool and design techniques. 5. To analyze estimation, planning and design for manufacturing and product development.

Unit	Description	Instructional Hours
I	**FUNDAMENTALS OF PRODUCT DEVELOPMENT** Global Trends Analysis and Product decision - Social Trends - Technical Trends- Economical Trends - Environmental Trends - Political/Policy Trends - Introduction to Product Development Methodologies and Management - Overview of Products and Services - Types of Product Development - Overview of Product Development methodologies - Product Life Cycle – Product Development Planning and Management.	9
II	**REQUIREMENTS AND SYSTEM DESIGN** Requirement Engineering - Types of Requirements - Requirement Engineering - traceability Matrix and Analysis - Requirement Management - System Design & Modeling - Introduction to System Modeling - System Optimization - System Specification - Sub-System Design - Interface Design.	9
III	**DESIGN AND TESTING Conceptualization** Industrial Design and User Interface Design - Introduction to Concept generation Techniques – Challenges in Integration of Engineering Disciplines - Concept Screening & Evaluation - Detailed Design - Component Design and Verification – Mechanical, Electronics and Software Subsystems - High Level Design/Low Level Design of S/W Program - Types of Prototypes, S/W Testing- Hardware Schematic, Component design, Layout and Hardware Testing – Prototyping - Introduction to Rapid Prototyping and Rapid Manufacturing - System Integration, Testing, Certification and Documentation	9
IV	**SUSTENANCE ENGINEERING AND END-OF-LIFE (EOL) SUPPORT** Introduction to Product verification processes and stages - Introduction to Product Validation processes and stages - Product Testing Standards and Certification - Product Documentation - **Sustenance** -Maintenance and Repair – Enhancements - **Product EoL** - Obsolescence Management – Configuration Management - EoL Disposal	9
V	**BUSINESS DYNAMICS – ENGINEERING SERVICES INDUSTRY The Industry –** Engineering Services Industry - Product Development in Industry versus Academia –**The IPD Essentials** - Introduction to Vertical Specific Product Development processes - Manufacturing/Purchase and Assembly of Systems - Integration of Mechanical, Embedded and Software Systems – Product Development Trade-offs - Intellectual Property Rights and Confidentiality – Security & Configuration	9
Total Instructional Hours		**45**

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Course Outcome	CO1: Define, formulate and analyze a problem CO2: Solve specific problems independently or as part of a team CO3: Gain knowledge of the Innovation & Product Development process in the Business Context CO4: Work independently as well as in teams CO5: Manage a project from start to finish

TEXT BOOKS:

T1-Product Design and Development, Karl T.Ulrich and Steven D.Eppinger, McGraw –Hill International Edns.1999

REFERENCE BOOKS:

R1-Concurrent Engg. /Integrated Product Development. Kemnneth Crow, DRM Associates, 6/3, ViaOlivera, Palos Verdes, CA 90274(310) 377-569, Workshop Book

R2-Effective Product Design and Development, Stephen Rosenthal, Business One Orwin, Homewood, 1992, ISBN,1-55623-603-4.

R3-Tool Design – Integrated Methods for successful Product Engineering, Stuart Pugh, Addison Wesley Publishing, mours, NY, 1991, ISBN 0-202-41639-5.

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	**3**	**2**	**2**	**3**	-	-	-	-	-	-	-	**2**	**3**	**3**
CO2	**3**	3	3	3	-	-	-	-	-	-	-	**3**	3	**3**
CO3	**3**	3	3	2	-	-	-	-	-	-	-	**2**	3	**2**
CO4	**3**	3	3	3	-	-	-	-	-	-	-	**2**	2	**3**
CO5	**2**	2	2	2	-	-	-	-	-	-	-	**3**	2	**2**
AVG	**2.8**	2.6	2.6	2.6	-	-	-	-	-	-	-	**2.4**	2.6	**2.6**

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Programme	Course Code	Name of the Course	L	T	P	C
BE	19EC8306	Artificial Intelligence	3	0	0	3

Course Objective

The student should be able to

1. Understand concept of AI & the various characteristics of Intelligent agents
2. Learn the different search strategies in AI
3. Learn to represent knowledge in solving AI problems
4. Understand the different ways of Learning
5. Know about the various applications of AI.

Unit	Description	Instructional Hours
I	**INTRODUCTION** AI–Definition – Foundation & History of Artificial Intelligence –Intelligent Agents– Agents & Environments, Concept of Rationality, Structure of Agents	9
II	**PROBLEM SOLVING METHODS** **Solving Problems by searching:** Uninformed – Informed (Heuristics) search strategies. **Beyond Classical search:** Local Search Algorithms and Optimization Problems - Searching with Partial Observations –**Adversarial Search**: Game Playing - Optimal Decisions in Games, Alpha - Beta Pruning - Stochastic Games. **Constraint Satisfaction Problems:** Constraint Propagation - Backtracking Search -	9
III	**KNOWLEDGE, REASONING & PLANNING** **First Order Logic**: Syntax and Semantics –Unification and Lifting – Forward Chaining-Backward Chaining – Resolution, **Classical Planning-** Algorithms, planning Graphs, Hierarchical & multi agent planning – **Knowledge Representation** - Ontological Engineering-Categories and Objects – Events - Mental Events and Mental Objects - Reasoning Systems for Categories - Reasoning with Default Information	9
IV	**LEARNING** Forms of Learning, Supervised Learning, Learning Decision trees, Artificial Neural networks, Support vector machines, Knowledge in Learning, Inductive Logic Programming, Statistical Learning, Active & passive Reinforcement Learning.	9
V	**AI APPLICATIONS** **Natural Language Processing**: – Language Models – Information Retrieval-Information Extraction – **Natural Language for communication**: Machine Translation – Speech Recognition – **Robotics:** Robot Hardware, Perception – Planning – Moving, Robotic software Architectures.	9
Total Instructional Hours		45

Course Outcome

After completion of the course the learner will be able to

CO1: Use appropriate search algorithms for any AI problem.

CO2:Represent a problem using first order and predicate logic Write Genetic Algorithm to solve the optimization problem

CO3:Provide the apt agent strategy to solve a given problem.

CO4:Use Learning methods for the different types of problem

CO5:Design applications for NLP that use Artificial Intelligence

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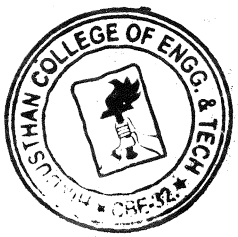

T1- S. Russell and P. Norvig, "Artificial Intelligence: A Modern Approach‖, Prentice Hall, Third Edition, 2009. (Unit I to V)
T2 - I. Bratko, —Prolog: Programming for Artificial Intelligence, Fourth edition, Addison-Wesley Educational Publishers Inc., 2011. (Unit I to V)

REFERENCE BOOKS:

R1-M. Tim Jones, —Artificial Intelligence: A Systems Approach(Computer Science)‖, Jones and Bartlett Publishers, Inc.; First Edition, 2008

R2-David L. Poole and Alan K. Mackworth, —Artificial Intelligence: Foundations of Computational Agents‖, Cambridge University Press, 2010.

R3-Gerhard Weiss, —Multi Agent Systems‖, Second Edition, MIT Press, 2013

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	**3**	3	3	3	-	-	-	-	-	-	-	**3**	3	2
CO2	**3**	3	3	2	-	-	-	-	-	-	-	**3**	3	2
CO3	**3**	3	3	2	-	-	-	-	-	-	-	**3**	3	**3**
CO4	**3**	3	3	1	-	-	-	-	-	-	-	**3**	3	**3**
CO5	**3**	**3**	**3**	**3**	-	-	-	-	-	-	-	**3**	**3**	**3**
AVG	**3**	**3**	**3**	**2.4**	-	-	-	-	-	-	-	**3**	**3**	**2.6**

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Programme	Course Code	Name of the Course	L	T	P	C
BE	19EC8307	Low Power VLSI	3	0	0	3

Course Objective	The student should be able to 1. To gain knowledge about sources of power. 2. To throw light on the power optimization techniques. 3. To learn about the design of low power CMOS circuits. 4. To identify suitable techniques to estimate the power dissipation. 5. To explore memory circuits with low power dissipation.

Unit	Description	Instructional Hours
I	**POWER DISSIPATION IN CMOS** Hierarchy of limits of power – Sources of power consumption – Physics of power dissipation in CMOS FET devices – Basic principle of low power design.	9
II	**POWER OPTIMIZATION** Logic level power optimization – Circuit level low power design – circuit techniques for reducing power consumption in adders and multipliers.	9
III	**DESIGN OF LOW POWER CMOS CIRCUITS** Computer arithmetic techniques for low power system – reducing power consumption in memories – low power clock, Inter connect and layout design – Advanced techniques – Special techniques.	9
IV	**POWER ESTIMATION** Power Estimation techniques – logic power estimation – Simulation power analysis – Probabilistic power analysis.	9
V	**SYNTHESIS AND SOFTWARE DESIGN FOR LOW POWER** Synthesis for low power – Behavioral level transform – software design for low power.	9
Total Instructional Hours		45

Course Outcome	After completion of the course the learner will be able to CO1:Gain the knowledge to differentiate the various sources of power CO2:Toanalyze the different techniques in low power design. CO3: To identify the power reduction techniques based on technology independent and technology dependent Power dissipation mechanism in various MOS logic style. CO4: To analyze suitable techniques to estimate the power dissipation. CO5: To design memory circuits with low power dissipation.

TEXT BOOKS:

T1.Kaushik Roy and S.C.Prasad, "Low power CMOS VLSI circuit design", Wiley, 2000.
T2.Dimitrios Soudris, ChirstianPignet, Costas Goutis, "Designing CMOS Circuits for Low Power", Kluwer, 2002.

REFERENCE BOOKS:

R1.J.B.Kulo and J.H Lou, "Low voltage CMOS VLSI Circuits", Wiley 1999.
R2. A.P.Chandrasekaran and R.W.Broadersen, "Low power digital CMOS design", Kluwer, 1995.
R3.Gary Yeap, "Practical low power digital VLSI design", Kluwer, 1998.
R4. AbdelatifBelaouar, Mohamed.I.Elmasry, "Low power digital VLSI design", Kluwer, 1995.

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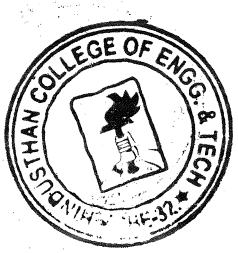

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3	3	3	-	-	-	-	-	-	-	3	3	2
CO2	3	3	3	2	-	-	-	-	-	-	-	3	3	2
CO3	3	3	3	2	-	-	-	-	-	-	-	3	3	3
CO4	3	3	3	1	-	-	-	-	-	-	-	3	3	3
CO5	3	3	3	3	-	-			-	-		3	3	3
AVG	3	3	3	2.4	-	-			-	-		3	3	2.6

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Programme	Course code	Name of the course	L	T	P	C
BE	19EC8308	Software Defined Radio	3	0	0	3

Course Objective	1. To study about comprehensive knowledge of most technical aspects of SDR. 2. To understand the operations and applications of SDR 3. To know about up-to-date treatment of the latest technologies. 4. To study the system design implementations. 5. To know more about smart radio for future.

Unit	Description	Instructional Hours
I	**INTRODUCTION TO SOFTWARE DEFINED RADIO** The Need for Software Defined Radios (SDR) - Definition, Characteristics and Benefits of a SDR- Architecture evolution of SDR – Foundations, technology tradeoffs and architecture implications - Antenna for Cognitive Radio - Design Principles of a Software Radio.	9
II	**FUNCTIONAL ARCHITECTURE OF SDR** Basics of SDR - Essential functions of SDR– Goals of architecture of SDR - Hardware and Software architecture of SDR - Computational properties of processing resources- Top level component topology- Interface topologies among plug and play modules - SDR as platform for cognitive radio.	9
III	**COGNITIVE RADIO** Introduction to Cognitive Radio - Motivation and Purpose - Marking radio self aware and cognitive techniques – Organization of Cognitive tasks - Enabling location and environment awareness in cognitive radios- Design Challenges associated with CR. - IEEE 802 Cognitive Radio related activities.	9
IV	**FUNCTIONAL ARCHITECTURE OF COGNITIVE RADIO** Cognitive Radio Capabilities-Cognitive Transceiver architecture - Radio Resource Allocation for Cognitive Radio - Spectrum Allocation in Cognitive Radio Networks -Spectrum Sensing – Spectrum Sharing – Spectrum Mobility – Spectrum Management – Regulatory issues – Emerging Cognitive Radio Applications in Cellular Networks.	9
V	**SMART RADIO FOR FUTURE** Dynamic Spectrum Access- Cognitive Cycle concept- Technologies supporting the Cognitive Radio concept-Spectrum Awareness- Radio Spectrum models- Spectrum measurement techniques – Concept and architecture of TV White Spaces.	9
TOTAL INSTRUCTIONAL HOURS		**45**

Course Outcome	After completion of the course the learner will be able to CO1: ToAnalyze technical aspects of SDR. CO2: To apply the concept of SDR. CO3:Toanalyze the latest technologies. CO4: To design architecture of cognitiveradio. CO5: To apply the smart radio concept.

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TEXT BOOKS:

T1- Andreas F. Molisch, "Wireless Communications", 2nd Edition, John Wiley & Sons Ltd, 2011.

T2- H. Venkataraman, G. Muntean (editores). Cognitive Radio and its Application for Next Generation Cellular and Wireless Networks. 2013. Spriger, ISBN 978-94-007-1826-5.

REFERENCE BOOKS:

R1- Markus Dillinger, "Software Defined Radio: Architectures, Systems and Functions", 2003.

R2- HuseyinArslan , "Cognitive Radio, Software Defined Radio and Adaptive wireless system,Springer, 1 edition ,September 24, 2007.

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	**3**	3	3	3	-	-	-	-	-	-	-	**3**	3	**2**
CO2	**3**	3	3	2	-	-	-	-	-	-	-	**3**	3	**2**
CO3	**3**	3	3	2	-	-	-	-	-	-	-	**3**	3	**3**
CO4	**3**	3	3	1	-	-	-	-	-	-	-	**3**	3	**3**
CO5	**3**	**3**	**3**	**3**	-	-	-	-	-	-	-	**3**	**3**	**3**
AVG	**3**	**3**	**3**	**2.4**	-	-	-	-	-	-	-	**3**	**3**	**2.6**

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Programme	Course Code	Name of the Course	L	T	P	C
BE	19EC8309	Photonic Networks	3	0	0	3

Course Objective

The student should be able

1. To understand the importance of the backbone infrastructure for our present and future communication needs.
2. To familiarize them with the architectures and the protocol stack in use.
3. To understand the differences in the design of data plane and the control plane and the routing, switching and the resource allocation methods and the network management and protection methods
4. To study the advances in networking and switching domains and the future trends.
5. To study the network management and protection methods.

Unit	Description	Instructional Hours
I	**OPTICAL SYSTEM COMPONENTS** Light Propagation in optical fibers – Loss & bandwidth, System limitations, Nonlinear effects; Solitons; Optical Network Components – Couplers, Isolators & Circulators, Multiplexers & Filters, Optical Amplifiers, Switches, Wavelength Converters..	9
II	**OPTICAL NETWORK ARCHITECTURES** Introduction to Optical Networks; SONET / SDH, Metropolitan-Area Networks, Layered Architecture; Broadcast and Select Networks – Topologies for Broadcast Networks, Media-Access Control Protocols, Wavelength Routing Architecture.	9
III	**WAVELENGTH ROUTING NETWORKS** The optical layer, Optical Network Nodes, Routing and wavelength assignment, Traffic Grooming in Optical Networks, Architectural variations- Linear Light wave networks.	9
IV	**PACKET SWITCHING AND ACCESS NETWORKS** Photonic Packet Switching – OTDM, Multiplexing and Demultiplexing, Synchronization, Broadcast OTDM networks, Switch-based networks, Contention Resolution Access Networks – Network Architecture overview, Optical Access Network Architectures and OTDM networks..	9
V	**NETWORK DESIGN AND MANAGEMENT** Transmission System Engineering – System model, Power penalty - transmitter, receiver, crosstalk, dispersion, Wavelength stabilization, Overall design considerations, Control and Management – Network management functions, Configuration management, Performance management, Fault management, Optical safety, Service interface.	9
Total Instructional Hours		45

Course Outcome

After completion of the course the learner will be able to

CO1: To gain knowledge on Photonic components in optical communication systems.
CO2:To know concept of Optical modulation and demodulation techniques.
CO3: To understand the basic aspects of routing networks .
CO4: To Analyze the architectures and the protocol stack.
CO5: To Compare the differences in the design of data plane, control plane, routing, switching, resource allocation methods, network management and protection methods.

TEXT BOOKS:

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T1- . Rajiv Ramaswami and Kumar N. Sivarajan, —Optical Networks: A Practical Perspectivel, Harcourt Asia Pte Ltd., Second Edition 2004.-UNIT 1 , UNIT II , UNIT III , UNIT IV , UNIT V

T2-C. Siva Ram Moorthy and Mohan Gurusamy, —WDM Optical Networks: Concept, Design and Algorithmsl, Prentice Hall of India, Ist Edition, 2002.. UNIT III

REFERENCE BOOKS:

R1 - Gerd Keiser – Optical Fiber : Third edition 2000

R2 - P.E. Green, Jr., —Fiber Optic Networksl, Prentice Hall, NJ, 1993.

R3 - Biswanath Mukherjee, —Optical WDM Networksl, Springer Series, 2006.

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3	3	3	-	-	-	-	-	-	-	3	3	2
CO2	3	3	3	2	-	-	-	-	-	-	-	3	3	2
CO3	3	3	3	2	-	-	-	-	-	-	-	3	3	3
CO4	3	3	3	1	-	-	-	-	-	-	-	3	3	3
CO5	3	3	3	3	-	-	-	-	-	-	-	3	3	3
AVG	3	3	3	2.4	-	-	-	-	-	-	-	3	3	2.6

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PRINCIPAL

Programme	Course Code	Name of the Course	L	T	P	C
BE	19EC8182	Intellectual Property Rights and Innovations	3	0	0	3

Course Objective

The student should be able

1. To introduce fundamental aspects of Intellectual property Rights
2. To understand the concept of Patents and copyrights.
3. To know the concepts of WIPO and GATT.
4. To study the Strategies and legislations of IPR.
5. To analyze Patents, Copyright and related rights by case studies

Unit	Description	Instructional Hours
I	**INTRODUCTION** Invention and Creativity – Intellectual Property (IP) – Importance –Protection of IPR – Basic types of property (i. Movable Property ii. Immovable Property and iii. Intellectual Property).	9
II	**PATENTS & COPYRIGHTS** IP – Patents – Copyrights and related rights – Trade Marks and rights arising from Trademark registration – Definitions – Industrial Designs and Integrated circuits – Protection of Geographical Indications at national and international levels – Application Procedures.	9
III	**INTRODUCTION TO WIPO & GATT** International convention relating to Intellectual Property – Establishment of WIPO –Mission and Activities – History – General Agreement on Trade and Tariff (GATT).	9
IV	**WTO AND STRATEGIES** Indian Position Vs WTO and Strategies – Indian IPR legislations – commitments to WTO-Patent Ordinance and the Bill – Draft of a national Intellectual Property Policy –Present against unfair competition.	9
V	**CASE STUDIES** Case Studies on – Patents (Basmati rice, turmeric, Neem, etc.) – Copyright and related rights – Trade Marks – Industrial design and Integrated circuits – Geographic indications – Protection against unfair competition	9
Total Instructional Hours		45

Course Outcome

After completion of the course the learner will be able to

CO1: To gain knowledge on IPR.
CO2:To know concept of Patents and copyrights.
CO3: To understand the concepts of WIPO and GATT.
CO4: To infer the Strategies and legislations of IPR
CO5: To analyze Patents, Copyright and related rights by various case studies.

TEXT BOOKS:

T1- WIPO Intellectual Property Handbook: Policy, Law and Use WIPO PUBLICATION NO. 489 (E) ISBN 92-805-1291-7 WIPO 2004 Second Edition

T2-. Intellectual Property Rights and Global Capitalism: The Political Economy of the Trips Agreement Donald G. Richards M E Sharpe Inc publisher , 2004 UNIT IV

REFERENCE BOOKS:

R1 - Intellectual Property Today : Volume 8, No. 5, May 2001, [www.iptoday.com].
- Using the Internet for non-patent prior art searches, Derwent IP Matters, July 2000.

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	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3	3	3	-	-	-	-	-	-	-	3	3	2
CO2	3	3	3	2	-	-	-	-	-	-	-	3	3	2
CO3	3	3	3	2	-	-	-	-	-	-	-	3	3	3
CO4	3	3	3	1	-	-	-	-	-	-	-	3	3	3
CO5	3	3	3	3	-	-	-	-	-	-	-	3	3	3
AVG	3	3	3	2.4	-	-	-	-	-	-	-	3	3	2.6

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PRINCIPAL

Programme	Course Code	Name of the Course	L	T	P	C
BE	19EC6401	Consumer Electronics	3	0	0	3

Course Objective	The student should be able to 1. Sketch and describe operating principles of different types of microphones. 2. Learn various components of video system and displays. 3. Describe working of Washing machine, Microwave ovens, Refrigerators. 4. Understand the working principles of power supplies. 5. Learn various standards in product compliances.

Unit	Description	Instructional Hours
I	**AUDIO SYSTEMS** Microphones, loudspeakers baffle and enclosure, Acoustics, mono, stereo, Quad, Amplifying System, Equalizers and Mixers, Synthesizers, Commercial Sound, Theater Sound System.	9
II	**VIDEO SYSTEMS AND DISPLAYS** Monochrome, Color TV standards, TFT, Plasma, HDTV, LCD, LED TV, Direct-To Home (DTH- Set Top Box), Video Telephone and Video Conferencing.	9
III	**DOMESTIC AND CONSUMER APPLIANCES** Washing machines, Microwave ovens, Air-conditioners and Refrigerators, Computers, office System, Telephone & Mobile Radio System.	9
IV	**POWER SUPPLIES** SMPS/UPS and Preventive Maintenance and others systems such as Remote controls, Bar codes, RFID.	9
V	**PRODUCT COMPLIANCE** Product safety and liability issues; standards related to electrical safety and fire hazards, EMI/EMC requirements, design techniques for ESD, RF interference and immunity, line current harmonics and mains voltage surge.	9
Total Instructional Hours		**45**

Course Outcome	After completion of the course the learner will be able to 1. Understand electronics engineering concepts used in audio systems. 2. Identify and explain working of various colour TV and Display blocks. 3. Understand the basic functions of various domestic and consumer electronic goods. 4. Understand various types of power supplies, Remote and RFID. 5. Use different product safety, compliance standards and techniques associated with electronic products.

TEXT BOOKS:

T1 - SP Bali, "Consumer Electronics", Pearson Education, 2008

T2 - J.S. Chitode, "Consumer Electronics", Technical Publications, 2007

REFERENCE BOOKS:

R1 - Jan Holler, VlasiosTsiatsis, Catherine Mulligan, Stefan Avesand, Stamatis Karnouskos, David Boyle, "From Machine-to-Machine to the Internet of Things: Introduction to a New Age of Intelligence", 1st Edition, Academic Press, 2014.

R2 - Marco Schwartz, "Internet of Things with the Arduino Yun", Packt Publishing, 2014.

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PRINCIPAL

Programme	Course Code	Name of the Course	L	T	P	C
BE	19EC7401	Introduction to IOT (Common to all Branches)	3	0	0	3

Course Objective	The student should be able to 1. To understand the fundamentals of Internet of Things. 2. To build a small low cost embedded system using Arduino / Raspberry Pi or equivalent boards. 3. To apply the concept of Internet of Things in the real world scenario 4. To model an IoT based system with specifications and requirements. 5. To construct a web based system using IoT

Unit	Description	Instructional Hours
I	**The Internet of Things: An Overview** Introduction-Characteristics-Physical design - Protocols – Logical design – Enabling technologies – IoT Levels – Domain Specific IoTs: Home Automation. IoT vs M2M.	9
II	**IoT Design Methodology** IoT systems management – IoT Platforms Design Methodology – Specifications - Integration and Application Development.	9
III	**IoT with Raspberry PI** Physical device – Raspberry Pi Interfaces – Programming – Other IoT Devices	9
IV	**Building IoT With Galileo/Arduino** Intel Galileo Gen2 - Exploring the Linux Console - Arduino IDE – Programming - The Arduino Language Reference and APIs – Servo API.	9
V	**Advanced Topics and Case Studies** IoT Physical Servers & Cloud Offerings: WAMP – Django – Amazon Web Services, Case Studies: Smart Lighting – Weather Monitoring System – Smart Irrigation - IoT Printer.	9
Total Instructional Hours		**45**

Course Outcome	After completion of the course the learner will be able to CO1:Describe IoT with various tools. CO2:Design a portable IoT using Arduino/ equivalent boards and relevant protocols. CO3:Develop web services to access/control IoT devices. CO4:Deploy an IoT application and connect to the cloud. CO5;Analyze applications of IoT in real time scenario

TEXT BOOKS:

T1- ArshdeepBahga, Vijay Madisetti, "Internet of Things – A hands-on approach", Universities Press, 2015. (Unit 1,2, 3 & 5)

T2- Manoel Carlos Ramon, "Intel® Galileo and Intel® Galileo Gen 2: API Features and Arduino Projects for Linux Programmers", Apress, 2014. (Unit 4).

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REFERENCE BOOKS:
R1 - Jan Holler, VlasiosTsiatsis, Catherine Mulligan, Stefan Avesand, Stamatis Karnouskos, David Boyle, "From Machine-to-Machine to the Internet of Things: Introduction to a New Age of Intelligence", 1st Edition, Academic Press, 2014.
R2 - Marco Schwartz, "Internet of Things with the Arduino Yun", Packt Publishing, 2014.

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PRINCIPAL

Programme	Course Code	Course Title	L	T	P	C
BE/BTECH	19LS6401	General Studies for Competitive Examinations	2	1	0	3

Course Objectives:

1. To provide awareness to the students about higher education entrance exams and various types of jobs offered both in the Central and State Government.(CAT, GMAT, GRE, IBPS, IELTS, UPSC, SSC, RRB, TNPSC, GATE, IES, TNEB, AFCAT, DRDO, ISRO, INCOME TAX,LIC...)
2. To help the students to choose the area where they are interested.
3. To develop competitive skills through various types of objective tests.
4. To train them by conducting aptitude test based on verbal and quantitative skills.

Unit	Description	Instructional Hours
I	**Numerical Ability** Simplification and Approximation – Algebra – Number System- Averages – Ratio and Proportion – Partnership – Allegation or Mixture – Problem on Ages - Percentages - Profit and Loss – Time and Work – Pipes and Cisterns – Time, Speed and Distance – Problems on Trains ,Boats and Streams - Permutation and Combination- Probability- Data Interpretation- Simple Interest and Compound Interest – Geometry , Trigonometry and Mensuration – Progressions.	18
II	**Reasoning Ability** Alphanumeric series - Reasoning Analogies – Coding-Decoding – Blood Relations - Directions – Calendars –Clocks – Data Sufficiency – Deductive Reasoning - Input-Output – Order & Ranking – Seating Arrangements –Visual Reasoning – Cubes and cuboids - Critical Reasoning – Syllogism – Venn Diagram – Puzzles	10
III	**Language Competency** Reading Comprehensions – Cloze Test – Sentence Completion – Match the Columns – Error Detection – Jumbled word/Paragraphs – Vocabulary & Grammar – One Word Substitution – Idioms and Phrases – Antonyms and Synonyms – Sentence Correction – Misfit/Out of Context sentence.	10
IV	**Computer Acquaintanceship** Internet – Memory – Keyboard Shortcuts – Computer Abbreviation – Microsoft Office – Computer Hardware – Computer Software – Operating System – Networking – Computer Fundamentals /Terminologies.	3
V	**General Awareness** Geography – Culture – History – Economic Science – Scientific Research – General Policy – Awards and Honours – Books and Authors – Static GK - Current Affairs.	4
	Total Instructional Hours	45

Course Outcomes

CO1:
Thinking critically and applying basic mathematics skills to interpret data, draw conclusions, and solve problems; developing proficiency in numerical reasoning;
Application of quantitative reasoning in aptitude tests.

CO2:
The ability to identify and define problems/issues, recognizing their complexity, and considering alternative viewpoints and solutions to use the critical skills of observation, analysis, evaluation.

CO3:

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	Understanding and reasoning using concepts framed in words; Critical verbal reasoning; Reading Comprehension; Application of verbal reasoning in aptitude tests.
	CO4: Students will possess the basic understanding of computer hardware and software, utilizing web technologies, basic understanding of network principles, Keyboard Shortcuts and various Operating System.
	CO5: Students will be updated with awareness and knowledge regarding the occurrences around the world.
R1:	Quantitative Aptitude for Competitive Examinations – Abhijith Guptha
R2:	The Pearson Guide to Quantitative Aptitude - Dinesh Khattar
R3:	Analytical Reasoning and Logical Reasoning- Peeyush Bharadwaj
R4:	A New Approach to Reasoning - B.S. Sijwali & S. Sijwali Arihant
R5:	Word Power made easy - Norman Lewis
R6:	Verbal Ability & Reading Comprehension for the CAT – Arun Sharma, Meenakshi Upadhyay - Mcgraw-hill Education
R7:	Computer Awareness - Arihant Publication
R8:	General Knowledge and General Awareness - Arihant Manhar Pandey

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PRINCIPAL

Programme	Course Code	Name of the Course	L	T	P	C
BE/BTech	19LS6402	Human rights, Women rights and Gender equality	3	0	0	3

COURSE OBJECTIVES

- To sensitize the Engineering students to various aspects of Human Rights
- To make them understand the world level perspective related to Human Rights
- To identify the constitutional rights of women
- To understand the various political rights and laws related to women
- To understand the gender equality concepts

Unit	Description	Instructional Hours
I	**Introduction** Human Rights – Evolution of the concept of Human Rights - Meaning, origin and Development. Notion and Classification of Rights – Natural, Moral and Legal Rights, Civil and Political rights. Economic, Social and Cultural Rights - Theories of Human Rights - Philosophical foundations of Human Rights	9
II	**Human Rights national and international perspective** Human Rights in India – Constitutional Provisions / Guarantees – Redressal Mechanisms at National and International levels – Constitutional Remedies and Directions of state policy - Geneva Convention of 1864. Universal declaration of Human Rights, 1948. UN agencies to monitor and compliance – UNHRC (United Nations Human Rights Commission)	9
III	**CONSTITUTIONAL RIGHTS OF WOMEN IN INDIA** Indian constitution relating to women - Fundamental rights - Directive principles of state policy - right to equality - rights against exploitation, the right to constitutional remedy - University Declaration of Human Rights - Enforcement of Human Rights for Women and Children - Role of Cells and Counseling Centers - Legal AID cells, Help line, State and National level Commission	9
IV	**POLITICAL RIGHTS OF WOMEN IN INDIA AND LAWS** Political Rights of Women in India - Electoral process - women as voters - candidates and leader - pressure group, Representation of women in local self government – women in Rural and urban local bodies – Reservation of women – Laws against violence & Sexual crimes: eve teasing – rape - indecent representation of women - immoral trafficking	9
V	**GENDER EQUALITY** Gender roles: Biological vs cultural determinism – Private vs public dichotomy – Gender division of labour and asymmetric role structure Gender role socialization and formation of identity –Occupational segregation and wage discrimination – Gender stereotyping in work place – Human development indicators and gender disparity	9
Course Outcome	After completion of the course the learner will be able to CO1:Describe IoT with various tools. CO2:Design a portable IoT using Arduino/ equivalent boards and relevant protocols. CO3:Develop web services to access/control IoT devices. CO4:Deploy an IoT application and connect to the cloud. CO5;Analyze applications of IoT in real time scenario	

TEXT BOOKS:

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Kapoor S.K, "Human Rights under International Law and Indian Laws", Central Agency, Allahabad 2014.
ArunaGoel. (2004). "Violence and Protective Measures for Women Development and Empowerment". Deep & Deep, New Delhi.

REFERENCES:

Chandra U "Human Rights" Allahabad Law Agency, Allahabad 2014.
Upandra Baxi "The Future of Human Rights, Oxford Univeristy Press, New Delhi.
Menonnivedita (2004). "Recovering Subversion: Feminist Politics beyond the Law". Permanent Black, Delhi.
Cornick, J.C. and Meyers, M.K. (2009) *Gender Equality: Transforming Family Divisions of Labor*. New York: Verso.

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PRINCIPAL

Programme	Course Code	Name of the Course	L	T	P	C
BE/BTech	19LS6404	Indian Ethos and Human Values	3	0	0	3

Course Objective	1. To learn about Indian ethos and its importance today 2. To know about business concepts and philosophies from various perspectives. 3. To know the Indian philosophical system of knowing oneself. 4. To understand values and its significance. 5. To know ethics from western and Indian perspective.

Unit	Description	Instructional Hours
I	**INDIAN ETHOS** Indian Ethos – Models of management in Indian socio-political environment. Indian work ethos and principles of Indian Management – Goals of Life- Teachings of important Indian Spiritual leaders..	9
II	**BUSINESS CONCEPTS AND PHILOSOPHIES** Economics of giving - Western economic system. Developing and implementing gross national happiness - Sabbath economics - Islamic economics and Banking	9
III	**INDIAN PHILOSOPHICAL SYSTEM** Indian Philosophical system - Nature of mind - Personality attributes based on Gunas - Human values and five sheaths - Bagavad Gita for human perfection	9
IV	**VALUES** Meaning - Significance - Formation of values- Science and values. – Application of values in Management - Values for managers - Chanakya neethi on leadership	9
V	**ETHICS** Introduction to Greek philosophers - Perspectives on ethics - Indian constitution and Unity in diversity - Thirukural on ethics	9
Total Instructional Hours		45

Course Outcome	CO1: To impart knowledge on Indian Ethos for inspirational life CO2: To apply Business concepts and philosophies for broader perspective in society CO3: To familiarize students about Indian philosophy system to handle life efficiently CO4: To apply values in day to day functioning for better standard of life. CO5: To conceptualize ethics from western and Indian perspective

TEXT BOOKS:

T1- Nandagopal.R and Ajith Sankar R.N. Indian Ethos and Values in Management, ISBN – 978-0-07-106779-9. Tata McGraw Hill Education Private Ltd, 2011.
T2-Khandelwal.N.M, Indian Ethos and Values for Managers, ISBN 978-93-5024-452-4, 3rd Edition, Himalaya Publishing House, 2011.

REFERENCE BOOKS:

R1-Management Thoughts in Thirukkural by K. Nagarajan – ANMOL Publications PVT Ltd 4374/4B Ansari Road, New Delhi 110 002. 2010.
R2-Dr. Radhakrishnan Pillai, Corporate Chanakya, ISBN 978-81-8495-133-2, Jaico Publishing House, 2016.
R3-Soham, LEEP (Life Empowerment and Enrichment Program), ISBN 9788175977259 Central Chinmaya Mission Trust, 2017.

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Programme	Course Code	Name of the Course	L	T	P	C
B.E./B.Tech.	19LS6403	INDIAN CONSTITUTION and POLITICAL SYSTEM	3	0	0	3

Course Objective	OBJECTIVES: 1.Teach history and philosophy of Political Science. 2.Describe the Indian Constitution and fundamental rights. 3.Summarize powers and functions and Emergency rule of Indian government. 4.Explain Local Governance. 5.Converse the challenges to Indian Democracy

Unit	Description	Instructional Hours
I	**INTRODUCTION** Meaning, Nature and Scope of Political Science – Significance of Political Science as a Discipline - Approaches to the study of Political Science – Key Concepts: State, Nation and Sovereignty - Political Science as a Science or an Art .	9
II	**CONSTITUTION OF INDIA &FUNDAMENTAL RIGHTS** Meaning of the constitution law and constitutionalism – Historical perspective of the constitution of India – salient features and characteristics of the constitution of India. Scheme of the fundamental rights – fundamental duties and its legislative status – The directive principles of state policy –Rights of women and Children -Constitutional Remedies for citizens	9
III	**PARLIAMENTARY FORM OF GOVERNMENT AND EMERGENCY PROVISIONS** The constitution powers and the status of the president in India. – Amendment of the constitutional powers and procedures – Emergency provisions: National emergency, President rule, Financial emergency.	9
IV	**LOCAL GOVERNANCE** Panchayati Raj and Municipal Government; Structure, Power & Functions; Significance of 73rd and 74th Amendments; Changes in Rural Power structure and empowerment of the marginalized groups such as SCs/STs and Women	9
V	**CHALLENGES TO INDIAN DEMOCRACY** Caste, class, ethnicity and gender in Indian politics; Criminalization and corruption, politics of regionalism, communalism, backward class and Dalit movements, Tribal people movements, struggle for gender justice	9
Total Instructional Hours		45

Course Outcome	Upon completion of the course, students will be able to CO1: Understand the history of Indian Constitution CO2: Understand fundamental rights and fundamental duties. CO3: Understand the Parliamentary form of Governmentand Challenges to Indian Demorcracy

TEXT BOOKS:

T1 - Durga Das Basu, "Introduction to the Constitution of India ", Prentice Hall of India, New Delhi, 1997.
T2 -Agarwal R C., "Indian Political System",S.Chand and Company, New Delhi, 1997.
T3 - Johari,J.C. Principles of Modern Political Science. New Delhi: Sterling, 1989.
T4 - Sharma K L., "Social Stratification in India: Issues and Themes", Jawaharlal Nehru University, New Delhi, 1997.

REFERENCE BOOKS:

R1 - Sharma, Brij Kishore, " Introduction to the Constitution of India:, Prentice Hall of India, New Delhi.
R2 - Gahai U R., "Indian Political System ", New Academic Publishing House, Jalaendhar.
R3 -Sharma R N., "Indian Social Problems ", Media Promoters and Publishers Pvt. Ltd.

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Programme	Course Code	Course Title	L	T	P	C
BE/BTECH	19LS6405	YOGA FOR HUMAN EXCELLENCE	2	0	1	3

Course Objectives:	Understanding of 1.Structure and functions of Human Body, 2.Importance of Physical Exercises and various Medical systems 3.Life- force and Philosophy of Kaya Kalpa 4. Mind and its functions and 5.Meditation Practices.

Unit	Description	Instructional Hours
I	**PHYSICAL STRUCTURE** Purpose of life - life — yoga — modern life style - importance of physical health,Physical structure—combination of five elements - three forms of body,Blood circulation system - Respiratory system. Nervous system - Digesting system	9
II	**FUNCTIONS OF PHYSICAL BODY** Three circulations - disease, pain and death - causes for disease, Limit and method in five aspects — food, work, sleep, sensual pleasure and thought, Importance of physical exercises - Simplified Physical Exercises - Rules and regulations, Food and Medicine — yogic food habits — natural food - naturopathy -Medical systems: Allopathy, Siddha, Ayurvedha,Unani and Homeopathy.	9
III	**REJUVENATION OF LIFE-FORCE** Philosophy of Kaya kalpa - Physical body - Sexual vital fluid - Life force- Bio-Magnetism - Mind,Anti-ageing and postponing death - Kayakalpa Practical - benefits,Sex and spirituality - value of sexual vital fluid - married life - chastity,Functional Relationships of body, life force and mind.	9
IV	MIND Bio-magnetic wave - Mind - imprinting and magnifying - Eight essential factors of living beings, Mental Frequency - functions of mind — five layers, Ten stages of mind Benefits of meditation -habitual imprints - understandable imprints, Importance of meditation - benefits of meditation.	9
V	**MEDITATION** Simplified Kundalini Yoga - greatness of guru - types of meditation,Agna meditation - explanation - benefits,Santhi meditation - explanation - benefits - clearance of spinal cord - benefits,Thuriam meditation - explanation - benefits - Thuriyatheetham meditation - explanation - benefits.	9
	Total Instructional Hours	45
Text Book:	1. Yogic Life- VISION, Vethathiri Publications.	
Reference Books:	1VethathiriMaharishi,YogaforModernage,2017,VethathiriPublications, Erode. 2Vethathiri Maharishi, Mind, 2017, Vethathiri Publications, Erode. 3Dr.Mathuram Sekar, Medicine and Health, NarmadhaPublications. 4Vethathiri Maharishi, Simplified Physical Exercises, 2013, Vethathiri Publications, Erode 5WCSC-VISION for Wisdom, Yogasanas, 2012, Vethathiri Publications, Erode.	

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