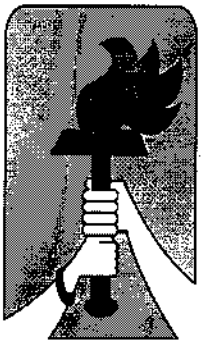
HINDUSTHAN
EDUCATIONAL AND CHARITABLE TRUST



HICET

HINDUSTHAN
COLLEGE OF ENGINEERING ANDTECHNOLOGY

(An Autonomous Institution)

Coimbatore– 641032

DEPARTMENT OF ELECTRONICS AND COMMUNICATION

CURRICULUM & SYLLABUS

AY-2023-2024

Batch: 2022-2026

REGULATIONS 2022

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 CREDITS	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 CREDITS				**17**	**1**	**12**	**22**	**29**	**630**	**370**	**1000**	

SEMESTER III											
S.NO	**COURSECODE**	**COURSETITLE**	**COURSECATEGORY**	**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
TOTAL CREDITS				**17**	**1**	**8**	**24**	**27**	**610**	**390**	**1000**

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	4	50	50	100
7	22EC4253	DATA COMMUNICATION AND NETWORKS	PCC	2	0	2	3	4	50	50	100
PRACTICAL											

8	22EC4001	LINEAR INTEGRATED CIRCUITS LAB	PCC	0	0	3	1.5	4	60	40	100
9	22EC4002	ANALOG COMMUNICATION LAB	PCC	0	0	3	1.5	4	60	40	100
EEC COURSES (SE/AE)											
10	22HE4071	SOFT SKILLS -3	SEC	1	0	0	1	1	100	0	100
TOTAL CREDITS				**19**	**0**	**10**	**24**	**31**	**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 CREDITS				**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 CREDITS				**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 CREDITS				**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 CREDITS				**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.
2. NCC course level 1 & Level 2 will be added in the list of open elective subjects in the appropriate semester. Further, the 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.

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

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 CONTACTP ERIODS	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	IoTConceptsandApplications	OEC	2	0	2	4	3
5	22IT6401	DataScienceand Analytics	OEC	2	0	2	4	3
6	22BM6401	AugmentedandVirtualReality	OEC	2	0	2	4	3

OPEN ELECTIVE I AND II

Tobeofferedfor 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 CONTACTPERIODS	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	COURSE	COURSE TITLE	CATEGORY	PERIODS PERWEEK	TOTAL	CREDITS

3.	22EC5303	Medical Informatics	PEC3	3	0	0	3	3
4.	22EC6301	Medical Image Processing	PEC4	3	0	0	3	3
5.	22EC6302	Artificial Intelligence	PEC5	3	0	0	3	3
6.	22EC7301	Human Computer Interface	PEC6	3	0	0	3	3

VERTICAL2:VLSI Design

S No.	Course Code	Course Title	Category	Periods Per week			Total Contact Periods	Credits
				L	T	P		
1.	22EC5304	PCB Design	PEC1	3	0	0	3	3
2.	22EC5305	Advanced Processors	PEC2	3	0	0	3	3
3.	22EC5306	ASIC Design	PEC3	3	0	0	3	3
4.	22EC6303	Embedded Controllers	PEC4	3	0	0	3	3
5.	22EC6304	Low Power VLSI	PEC5	3	0	0	3	3
6.	22EC7302	Industrial Automation	PEC6	3	0	0	3	3

VERTICAL3:Communication systems

S No.	Course Code	Course Title	Category	Periods Per week			Total Contact Periods	Credits
				L	T	P		
1.	22EC5307	Fiber Optic Communication	PEC1	3	0	0	3	3
2.	22EC5308	Cellular and Mobile Communication	PEC2	3	0	0	3	3
3.	22EC5309	Satellite Communication	PEC3	3	0	0	3	3
4.	22EC6305	Global Positioning Systems	PEC4	3	0	0	3	3
5.	22EC6306	RF System Design	PEC5	3	0	0	3	3
6.	22EC7303	Software Defined Radio	PEC6	3	0	0	3	3

VERTICAL4:Wireless Communication

S No.	Course Code	Course Title	Category	Periods Per week			Total Contact Periods	Credits
				L	T	P		
1.	22EC5310	Network Security	PEC1	3	0	0	3	3
2.	22EC5311	High Speed Networks	PEC2	3	0	0	3	3
3.	22EC5312	Cloud Computing	PEC3	3	0	0	3	3
4.	22EC6307	Wireless Sensors and Networks	PEC4	3	0	0	3	3
5.	22EC6308	Wireless Broadband Communications	PEC5	3	0	0	3	3
6.	22EC7304	Cyber Forensics	PEC6	3	0	0	3	3

VERTICAL5:Business and Management

S No.	Course Code	Course Title	Category	Periods Per week			Total Contact Periods	Credits
				L	T	P		
1.	22EC5311	Total Quality Management	PEC1	3	0	0	3	3
2.	22EC5312	Principles of Management	PEC2	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	22MB5231	Financial Management	MDC	3	0	0	3	3
2	22MB6231	Fundamentals of Investment	MDC	3	0	0	3	3
3	22MB6232	Banking, Financial Services andInsurance	MDC	3	0	0	3	3
4	22MB7231	Introduction to Blockchain and its Applications	MDC	3	0	0	3	3
5	22MB7232	Fintech Personal Finance and Payments	MDC	3	0	0	3	3
6	22MB8231	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	22MB5232	Foundations of Entrepreneurship	MDC	3	0	0	3	3
2	22MB6233	Team Building & Leadership Management for Business	MDC	3	0	0	3	3
3	22MB6234	Creativity & Innovation in Entrepreneurship	MDC	3	0	0	3	3
4	22MB7233	Principles of Marketing Management For Business	MDC	3	0	0	3	3
5	22MB72334	Human Resource Management for Entrepreneurs	MDC	3	0	0	3	3
6	22MB8232	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	22CE5232	Sustainable infrastructure Development	MDC	3	0	0	3	3
2	22AG6233	Sustainable Agriculture and Environmental Management	MDC	3	0	0	3	3
3	22BM6233	Sustainable Bio Materials	MDC	3	0	0	3	3
4	22ME7233	Materials for Energy Sustainability	MDC	3	0	0	3	3
5	22CE7233	Green Technology	MDC	3	0	0	3	3
6	22CE8232	Environmental Quality Monitoring and Analysis	MDC	3	0	0	3	3

4.	22EC7205/ 22EC7206	Wearable Devices / Long term Evolution Technologies	PEC4	3	0	0	3	3
5.	22EC7207	Industrial IoT	PEC5	3	0	0	3	3
6.	22EC8202	IoT based System Design	PEC6	3	0	0	3	3

B E (Hons) Electronics and Communication Engineering with Specialization in Semiconductor Chip Design and Testing - TSSOLVE Semiconductors

VERTICAL 3: Semiconductor Chip Design and Testing - TSSOLVE Semiconductors

S No.	Course Code	Course Title	Category	Periods Per week			Total Contact Periods	Credits
				L	T	P		
1.	22EC5206	Digital System Design	PEC1	3	0	0	3	3
2.	22EC6208	CMOS VLSI Design	PEC2	3	0	0	3	3
3.	22EC6209	Low Power VLSI Design	PEC3	3	0	0	3	3
4.	22EC7208	ASIC Design	PEC4	3	0	0	3	3
5.	22EC7209	System Verilog	PEC5	3	0	0	3	3
6.	22EC8203	VLSI Testing and Design for Testability	PEC6	3	0	0	3	3

Chairman BoS

Chairman - BoS
ECE - HiCET

Dean Academics

Dean (Academics)
HiCET

Principal

PRINCIPAL
Hindusthan College Of Engineering & Technology
COIMBATORE - 641 032

HONOURS

S NO.	Vertical 1 Emerging Technologies in Communication Engineering	Vertical 2 Sensor Technologies and IoT	Vertical 3 Semiconductor Chip Design and Testing - TSOLVE Semiconductors
1	Tele Communication Switching and Networks	Real-Time Embedded Systems Design	Digital System Design
2	Optical Communication Networks	IOT Processors/ Advanced Processor Architectures	CMOS VLSI Design
3	Wireless Broadband Networks / Digital switching Systems	Computer Vision	Low Power VLSI Design
4	Software Defined Networks	Wearable Devices / Long term Evolution Technologies	ASIC Design
5	4G/5G Communication Networks/ Wireless systems and standards	Industrial IoT	System Verilog
6	Underwater Communication	IoT based System Design	VLSI Testing and Design for Testability

PROFESSIONAL ELECTIVE COURSES: VERTICALS

B E (Hons) Electronics and Communication Engineering with Specialization in Emerging Technologies in Communication Engineering

VERTICAL1: Emerging Technologies in Communication Engineering

S No.	Course Code	Course Title	Category	Periods Per week			Total Contact Periods	Credits
				L	T	P		
1.	22EC5204	Tele Communication Switching and Networks	PEC1	3	0	0	3	3
2.	22EC6202	Optical Communication Networks	PEC2	3	0	0	3	3
3.	22EC6203/ 22EC6204	Wireless Broadband Networks / Digital switching Systems	PEC3	3	0	0	3	3
4.	22EC7202	Software Defined Networks	PEC4	3	0	0	3	3
5.	22EC7203/ 22EC7204	4G/5G Communication Networks/ Wireless systems and standards	PEC5	3	0	0	3	3
6.	22EC8201	Underwater Communication	PEC6	3	0	0	3	3

B E (Hons) Electronics and Communication Engineering with Specialization in Sensor Technologies and IoT

VERTICAL 2: Sensor Technologies and IoT

S No.	Course Code	Course Title	Category	Periods Per week			Total Contact Periods	Credits
				L	T	P		
1.	22EC5205	Real-Time Embedded Systems Design	PEC1	3	0	0	3	3
2.	22EC6205/ 22EC6206	IOT Processors/ Advanced Processor Architectures	PEC2	3	0	0	3	3
3.	22EC6207	Computer Vision	PEC3	3	0	0	3	3

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

The learner should be able to

Course Objective

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	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**

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

Course Outcome

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.

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

The learner should be able to

Course Objective

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)- Desalinatfon 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).

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B.E./B.Tech/ I	22HE1151	ENGLISH FOR ENGINEERS (Common to all Branches)	L2	T0	P2	C3

The student should be able

Course Objective

1. To improve the communicative proficiency of learners.
2. To help learners use language effectively in professional writing.
3. To advance the skills of maintaining the suitable one of communication.
4. To introduce the professional life skills.
5. 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,**Reading-** Purpose of Reading - Churning & Assimilation, Interpreting Ideas - Interpreting Graphs in Technical Writing.	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 **Reading** - Skimming – Scanning – Reading: Scientific Texts – Literary Texts	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-**Listen to songs and answer the questions**Speaking-** Justaminute**Reading-** Reading feature articles (from newspapers and magazines) -Reading to identify point of view and perspective (opinion pieces, editorials etc.)	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. **Reading-** Reading Comprehension - Techniques for Good Comprehension - - Sequencing of Sentences.	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.**Reading-** Biographies,travelogues,technical blogs.	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"-4theditionCambridgeUniversityPress,2004.

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

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B.E./B.Tech	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

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

The learner should be able

Course Objective

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 Python‖, 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

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

Course Objective	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. TofacilitatethedevelopmentofaHolisticperspectiveamongstudentstowardslifean dprofession 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. TohighlightplausibleimplicationsofsuchaHolisticunderstandingintermsofethica lhumanconduct, 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 Right Evaluation-Understanding Harmony in the Society	6
IV	**Harmony in the Nature / Existence** Understanding Harmony in the Nature.Interconnectedness, self-regulation and Mutual Fulfilment among the Four Orders of Nature- Understanding Existence as Co-existence of mutually interacting units in allpervasivespaceRealizing Existence as Co-existence at All LevelsThe 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 ValuesDefinitiveness 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	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

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	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*, RR 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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rogramme	Course Code	Name of the Course	L	T	P	C
B.E./B.Tech	22HE1072	**ENTREPRENEURSHIP & INNOVATION**	1	0	0	1

(Common for all Branches)

The student should be made

Course Objectives

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**

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

Course Outcome

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	Course Code	Name of the Course	L	T	P	C
B.E	22MA3102	COMPLEX ANALYSIS AND TRANSFORMS (EEE, EIE, ECE)	3	1	0	4

Course Objective

The learner should be able to

1. Introduction to analytic functions and its properties.
2. Understand Cauchy's theorem and its applications in evaluation of integral.
3. Analyze Fourier series which is central to many applications in engineering
4. Apply Fourier transform techniques in various situations.
5. Analyze Z transform techniques for discrete time systems

Unit	Description	Instructional Hours
I	**COMPLEX DIFFERENTIATION** Functions of complex variables – Analytic functions – Cauchy's – Riemann equations and sufficient conditions (excluding proof) – Construction of analytic functions – Milne –Thomson's method – Conformal mapping w = A+z , Az, 1/z and bilinear transformations.	12
II	**COMPLEX INTEGRATION** Cauchy's integral theorem – Cauchy's integral formula –Taylor's and Laurent's series (statement only) –Residues - Cauchy's Residue theorem - Contour Integration with unit circle only.	12
III	**FOURIER SERIES** Dirichlet's conditions- General Fourier Series – Odd and Even Functions – Change of Interval - Parseval's Identity - Half Range Sine and Cosine Series.- Harmonic analysis	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

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

CO1: Understand the concept of analytic functions and discuss its properties.

CO2: Evaluate various integrals by using Cauchy's residue theorem and classify singularities and derive Laurent series expansion

CO3: Understand the principles of Fourier series which helps them to solve physical problems of Engineering

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, John Wiley & Sons, 2019.

T2 - Veerarajan T, "Engineering Mathematics", McGraw Hill Education (India) Pvt Ltd, New Delhi, 2016.

REFERENCE BOOKS:

R1 - James Ward Brown, Ruel Vance Churchill, Complex Variables and Applications, McGraw-Hill Higher Education, 2004

R2 - Dennis Zill, Warren S. Wright, Michael R. Cullen, Advanced Engineering Mathematics, Jones & Bartlett Learning, 2011

R3 - Ian N. Sneddon, Elements of Partial Differential Equations, Courier Corporation, 2013

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Programme	Course Code	Name of the Course	L	T	P	C
BE	22EC3202	Signals and Systems	3	1	0	3

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. Sampling: Nyquist theorem, Representation of CT signals by samples, Reconstruction of CT signal from samples Mathematical operation on signals, classification of signals and system -analog and discrete.	12
II	**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	**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, impulse response, 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: Understand signal spectrum and apply Fourier series to continuous signal spectrum.
CO3: Apply Fourier and Laplace transform in LTI system analysis.
CO4: Apply DTFT to understand the properties of discrete time signals.
CO5: Apply 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.

REFERENCE BOOKS:

R1 - M.J.Roberts, "Signals & Systems Analysis using Transform Methods & MATLAB", McGraw Hill, 2017.
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 - NagoorKani, "Signals and Systems,Simplified", McGrawHill Publication, 2018.

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Programme	Course Code	Name of the Course	L	T	P	C
BE	22EC3201	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** BJT– Need for biasing, DC Load Line and Bias Point – Various biasing methods of BJT – Thermal stability – Stability factors – Bias compensation techniques using Diode, thermistor and sensistor – Biasing BJT Switching Circuits- JFET – DC Load Line and Bias Point – Various biasing methods of JFET – MOSFET Biasing – Biasing FET Switching Circuit.	9
II	**SMALL SIGNAL AMPLIFIERS** h-parameter small-signal equivalent circuit –Midband analysis of single stage, CE 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- Astable multivibrator–Monostable multivibrator and Bistable multivibrator.	9
	Total Instructional Hours	**45**

Course Outcome

CO1: Understand various biasing circuit for BJT and JFET amplifiers and apply in solvingthe problems
CO2: Understand the low frequency and high frequency response of BJT amplifiers usingsmall signal equivalent circuit.
CO3: Understand the operation of various types of large signal amplifiers and linearwave shaping circuits
CO4: Understand the different types of feedback amplifiers with examples
CO5: Understand 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)
T2- Donald .A. Neamen, "Electronic Circuit Analysis and Design" ,3 rd edition, Tata McGraw Hill, 2010(Unit IV)

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

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Programme	Course Code	Name of the Course	L	T	P	C
BE	22EC3203	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	**DIGITAL FUNDAMENTALS** 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	**COMBINATIONAL CIRCUIT DESIGN** 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	**MEMORY DEVICES AND DIGITAL INTEGRATED CIRCUITS** Classification of memories, Read/write operations- Memory decoding and expansion, Static and Dynamic RAM- PLDs- Architecture and implementation - Digital logic families -Characteristics - TTL, ECL and CMOS logic.	9
	Total Instructional Hours	**45**

Course Outcome

CO1: Able to apply the concepts of Boolean theorem to simplify Boolean expressions
CO2: Able to understand the working of various combinational circuits.
CO3: Able to apply the concepts to in various synchronous sequential circuits.
CO4: Able to apply the concepts to in various asynchronous sequential circuits.
CO5: Understand the organization of memories and PLDs.

TEXT BOOKS:

T1- M. Morris Mano and Michael D. Ciletti, "Digital Design", 5th Edition, Pearson, 2013.(Unit I,Unit 2,Unit3,Unit 4, Unit 5)
T2-Thomas L. Floyd, "Digital Fundamentals", 10th Edition, Pearson Education Inc, 2011.

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

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Programme	Course code	Name of the course	L	T	P	C
B.E.	22EC3251	OBJECT ORIENTED PROGRAMMING USING JAVA	2	0	2	3

Course Objective

The student should be able

1. To understand the concepts of Object Oriented Programming
2. To impart the fundamental concepts of core JAVA.
3. To enable the students to gain programming skills in JAVA.
4. To know how to handle exceptions.
5. To understand multithread programming logic

Unit	Description	Instructional Hours
I	**INTRODUCTIONTOOBJECTORIENTEDPROGRAMMING** Object oriented programming concepts – objects-classes- methods and messages-abstraction and encapsulation-inheritance- abstract classes- polymorphism-Benefits of OOP, Application of OOP-Java Evolution-Features of Java-Difference of Java from C and C++.	15
II	**OVERVIEW OF JAVA LANGUAGE** Basics of Java programming, Data types, constants -Variables and Arrays, Operators and expressions , Decision making and branching –looping –Classes, Objects and Methods- access specifiers – static members –Constructors-this keyword-finalize method	15
III	**PACKAGES AND INTERFACES** Java API Packages –Naming conventions-creating, accessing, using Packages-Inheritance– Method Overriding- Abstract class Interfaces: Multiple inheritance-defining, extending, implementing interfaces- -final keyword	15
IV	**EXCEPTION HANDLING** Fundamentals-Exception types –Uncaught exceptions-Using try and catch-Multiple Catch-Nested try-Throws-Finally-Built in Exceptions-Throwing own exceptions	15
V	**MULTITHREAD PROGRAMMING** Creating Threads- Extending thread class-Stopping and Blocking Thread-Life cycle –Using Thread-Thread Exceptions-Thread priority-Synchronization-Runnable Interface-Inter thread communication	15
	Total Instructional Hours	**60**

S.No	List of Experiments
1	Ramu went to a restaurant to had his meals. He is charged with Rs. 70.50. The tax should be8% of the meal cost. The tip should be 10% of the total after adding the tax. Write a java program to display the mealcost,taxamount, tip amount, and total billon the screen.
2	Rhea Pandey's teacher has asked her to prepare well for the lesson on seasons. When her teacher tells a month, she needs to say the season corresponding to that month. Write a java program to solve the above task. Spring – March to May, Summer – June to August, Autumn – September to November and, Winter – December to February. Month should be in the range 1 to 12. If not the output should be "Invalid month"
3	Write a Java program to find the eligibility of admission for a professional course based on the following criteria: Eligibility Criteria: Marks in Maths>=65 and Marks in Phy>=55 and Marks in Chem>=50 and Total in all three subject >=190 or Total in Maths and Physics >=140 Input the marks obtained in Physics :65 Input the marks obtained in Chemistry :51 Input the marks obtained in Mathematics :72 Total marks of Maths, Physics and Chemistry: 188 Total marks of Maths and Physics: 137

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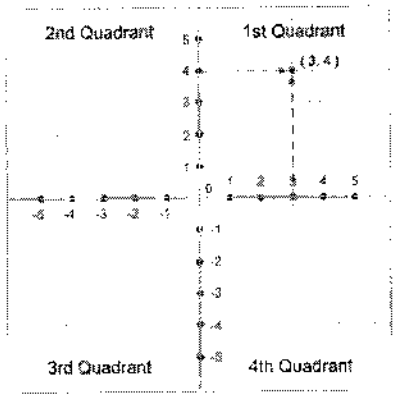
The candidate is not eligible.

4 Write a Java program to accept a coordinate point in a XY coordinate system and determine in which quadrant the coordinate pointlies.



5 XYZ Technologies is in the process of increment the salary of the employees. This increment is done based on their salary and their performance appraisal rating.
If the appraisal rating is between 1 and 3, the increment is 10% of the salary.
If the appraisal rating is between 3.1 and 4, the increment is 25% of the salary.
If the appraisal rating is between 4.1 and 5, the increment is 30% of the salary.
Help them to do this, by writing a Java program that displays the incremented salary.
Note: If either the salary is 0 or negative (or) if the appraisal rating is not in the range 1 to 5 (inclusive), then the output should be "Invalid Input". XYZ TECHNOLOGIES

6 Draft a java Program to Calculate Average of' n' Numbers Using Arrays

7 Suppose you have a Piggie Bank with an initial amount of $50 and you have to add some more amount to it. Create a class 'Add Amount' with a data member named 'amount' with an initial value of $50. Now make two constructors of this class as follows:
1 - without any paramcter - no amount will be added to the Piggie Bank
2 - having a parameter which is the amount that will be added to the Piggie Bank
Create an object of the 'AddAmount' class and display the final amount in the Piggie Bank.

8 Write a java program for multilevel inheritance

9 Write a java program to create an abstract class named Shape that contains an empty method named number Of Sides( ).Provide three classes named Trapezoid, Triangle and Hexagon such that each one of the classes extends the class Shape. Each one of the classes contains only the method number Of Sides( ) that shows the number of sides in the given geometrical figures

10 Write a java program in which you will declare two interface sum and sub inherits these interfaces through class A1 and display their content.

11 Write a java program for multiple exception handling.

12 Write a java program to implement multithreading

Course Outcome

CO1	Understand the concepts of OOPs
CO2	Design the syntax, semantics and classes in Java language
CO3	Design program using User Defined packages and interfaces
CO4	Develop applications using Exception handling in java
CO5	Implement the use of multithread programming.

TEXT BOOK:

T1 Herbert Schild, "Java The Complete Reference", Eighth Edition, McGraw Hill, 2011

T2 E Balagurusamy, "Programming with JAVA", Fifth Edition, McGraw Hill, 2015.

REFERENCES:

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.

R3 Cay S. Horstmann, "Core Java Fundamentals", Volume 1, 11 th Edition, Prentice Hall, 2018

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Programme	Course Code	Name of the Course	L	P	T	C
BE	22EC3002	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.
	Software Experiments
1	Adder / Subtractor Circuits and BCD adder using Verilog code
2	Magnitude Comparator and ALU using Verilog code
3	Synchronous Counters using Verilog code
4	Asynchronous counters using Verilog code
5	Sequence Detector using Verilog code for digital lab

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 and sequential digital circuits using Hardware Description Language

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Programme	Course Code	Name of the Course	L	P	T	C
BE	22EC3001	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	Class B and
7	Class AB Amplifiers
8	Common Collector Amplifier
9	Astable multivibrator
	Simulation Experiments
10	Darlington Amplifier
11	Colpitt's Oscillator
12	Integrator, Differentiator, Clipper and Clamper circuits.
13	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.

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Programme	Course Code	Name of the Course	L	T	P	C
B.E-ECE/I	22EC3204	Circuits and Networks	2	0	0	2

Course Objectives

CO1:To teach the fundamental concepts and introduce mesh and nodal analysis techniques for DC and AC Circuits
CO2:To introduce various network reduction techniques and different network theorems used for circuit analysis
CO3:To introduce the phenomenon of resonance in coupled circuits
CO4:To impart knowledge on transient response of the electric circuits
CO5:To study two port networks and their characterization

Unit	Description	Instructional Hours
I	**BASIC CONCEPTS OF DC AND AC CIRCUITS** Introduction to Basic Circuit Elements, Ohm's Law – Kirchhoff's Voltage law – Kirchhoff's Current law–Resistors in series and parallel Combinations, A.C Circuits –Complex Impedance, Mesh and Nodal analysis for D.C and A.C. circuits	9
II	**NETWORK REDUCTION AND THEOREMS** Network Reduction: Voltage and Current Division, Source Transformation, T & π Networks- Star-Delta conversion. Network theorems: Superposition theorem, Thevenin's theorem, Norton's theorem, Reciprocity theorem, Millman's theorem, and Maximum power transfer theorem, Application of Network theorems to DC and AC Circuits.	9
III	RESONANCE AND COUPLED CIRCUITS Resonance – Series and Parallel resonance – Variation of impedance with frequency -Variation in current through and voltage across L and C with frequency – Bandwidth – Q factor -Selectivity. Self-inductance – Mutual inductance – Dot rule – Coefficient of coupling –Series, Parallel connection of coupled inductors – Single tuned and double tuned coupled circuits	9
IV	TRANSIENT ANALYSIS Natural response-Forced response – Transient response of RC, RL and RLC circuits to excitation by Step Signal, Impulse Signal and exponential sources – Complete response of RC, RL and RLC Circuits to sinusoidal excitation.	9
V	**TWO PORT NETWORKS** Two port networks, Z parameters, Y parameters, Transmission (ABCD) parameters, Hybrid(H) Parameters, Interconnection of Two Port Networks (Series, Parallel And Cascade)	9
	Total Instructional Hours	45

Course Outcome

After completing this course, the students will be able to:
CO1: Explain the circuit's behaviour using circuit laws and apply mesh analysis/ nodal analysis to determine behaviour of the given DC and AC circuit
CO2: Apply network reduction techniques/network theorems and determine behaviour of the given DC and AC circuit
CO3: Understand and compute the transient response of RC, RL and RLC Circuits
CO4: Understand the frequency response of series and parallel RLC circuits and explain the behavior of coupled circuits
CO5: Understand the characterization of two-port networks and apply for interconnection of two port networks

TEXTBOOKS:

T1- William H. Hayt, Jr. Jack E. Kemmerly and Steven M. Durbin, —Engineering Circuit Analysisl , McGraw Hill Science Engineering, Eighth Edition, 11th Reprint 2016.
T2- Joseph Edminister and Mahmood Nahvi, —Electric Circuitsl, Schaum's Outline Series, Tata McGraw Hill Publishing Company, New Delhi, Fifth Edition Reprint 2016.

REFERENCEBOOKS:

R1- Hayt and Kemmerly, "Engineering Circuit Analysis", McGraw Hill Education, New Delhi, 8th Ed, 2013.
R2-Van Valkenberg, "Network Analysis", Prentice Hall India Learning Pvt. Ltd., 3rd Edition, 1980.
R3-K. S. Suresh Kumar, "Electric Circuit Analysis", Pearson Publications, 2013.
R4-Chakrabarti, "Circuit Theory Analysis and Synthesis", Dhanpat Rai& Co., Seventh - Revised edition, 2018
R5-R. Gupta, "Network Analysis and Synthesis", S. Chand & Company Ltd, 2010.

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PROGRAMME	COURSE CODE	NAME OF THE COURSE	L	T	P	C
B.Tech	22IT2252	Relational Database Management System	2	0	2	3

Course Objective	1. List and explain the fundamental concepts of a relational database system. 2. Utilize a wide range of features available in a DBMS package. 3. Develop the logical design of the database using data modeling concepts such as entity relationship diagrams. 4. Manipulate a database using SQL. 5. Assess the quality and ease of use of data modeling and diagramming tools.

Unit	Description	Instructional Hours
I	**UNDERSTANDING DATABASE CONCEPTS** Introduction-tables-Primary keys-Foreign keys-Installation of SQLite-Installation of DB2 data database-Database storage introduction-Database normalization-Indexes and how they are used in databases-Configure non-clustered indexes-Configure clustered indexes	9
II	**ENTITIES AND RELATIONSHIPS** Introduction to Entities and Relationships-Entities and Their Attributes-Domains-Basic Data Relationships-Documenting Relationships-Dealing with Many-to-Many Relationships Relationships and Business Rules-Data Modeling Versus Data Flow-Schemas	3+6(P)
III	**RELATIONAL DATABASE DESIGN THEORY** Introduction to The Relational Data Model-Understanding Relations-Primary Keys Representing Data Relationships-Views-The Data Dictionary-Normalization-Translating an ER Diagram into Relations-Normal Forms-Types of Normal Forms- Database Design and Performance Tuning introduction-Indexing-Clustering-Partitioning-Understand data definition language (DDL)	5+4(P)
IV	**USING INTERACTIVE SQL AND MANIPULATE A RELATIONAL DATABASE** Introduction to manipulating data-Understand data manipulation language (DML)-JDBC As The Fundamental Java API - JDBC basics-JPA as the JAVA ORM API-From JDBC to JPA	5+4(P)
V	**DATABASE IMPLEMENTATION ISSUES** Database Security Introduction-Sources of External Security Threats-Sources of Internal Threats-External Remedies-Internal Solutions-Understanding Database Backup and Restore-Understand different types of backups-Define a backup and recovery strategy-Test your knowledge	5+4(P)
	TOTAL INSTRUCTIONAL HOURS	**45**

S.No	List of Experiments
1	Creating indexes
2	Create Tables
3	Create Stored Procedures and Functions
4	Read data using SELECT statements
5	Query Multiple tables with join statements
6	Create database and connecting to table using Java API
7	CRUD Operation using JPA

8	Set permissions on database
9	Restore a database
Course Outcome	CO1: Describe the fundamental elements of relational database management systems CO2: Explain the basic concepts of relational data model, entity-relationship model, relational CO3: Improve the database design by normalization. CO4: Design ER-models to represent simple database application scenarios CO5: Convert the ER-model to relational tables, populate relational database and formulate SQL queries on data.
TEXT BOOKS: T1: IBM Course Ware	
REFERENCE BOOKS: R1: Database Design and Relational Theor-Normal Forms and All That Jazz.,2019 R2: Pro SQL Server Relational Database Design and Implementation-Louis Davidson, Jessica Moss.,2016 R3: Relational Theory for Computer Professionals-C.J. Date.,2013	

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Coimbatore – 641032

DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

Curriculum and Syllabus for the Batch 2021-2025

2019 REGULATIONS

DETAILS OF CHANGES CARRIED OUT IN CURRICULUM & SYLLABUS

CBCS PATTERN

UNDERGRADUATE PROGRAMMES

B.E ELECTRONICS AND COMMUNICATION ENGINEERING (UG)

REGULATION-2019 (Revised on July 2023)

(For the students admitted during the academic year 2021-2025 and onwards)

SEMESTER I

S.No.	Course Code	Course Title	Category	L	T	P	C	CIA	ESE	TOTAL
THEORY										
1	21HE1101	Technical English	HS	2	1	0	3	40	60	100
2	21MA1103	Calculus and Differential Equations	BS	3	1	0	4	40	60	100
THEORY WITH LAB COMPONENT										
3	21PH1151	Applied Physics	BS	2	0	2	3	50	50	100
4	21CY1151	Chemistry for Engineers	BS	2	0	2	3	50	50	100
5	21CS1151/ 21CS1152	Python Programming and Practices/ Object Oriented Programming using Python(IBM)	ES	2	0	2	3	50	50	100
6	21EC1153	Electron devices and Electric Circuits	ES	2	0	2	3	50	50	100
PRACTICAL										
7	21HE1001	Language Competency Enhancement Course-I	HS	0	0	2	1	0	100	100
MANDATORY COURSES										
8	21HE1072	**Career Guidance Level – I** Personality, Aptitude and Career Development	EEC	2	0	0	0	100	0	100
			Total	**15**	**2**	**10**	**20**	**350**	**450**	**800**

As Per AICTE Norms 3 Weeks Induction Programme is Added in The First Semester as an Audit Course

SEMESTER II

S.No.	Course Code	Course Title	Category	L	T	P	C	CIA	ESE	TOTAL
THEORY										
1	21HE2101	Business English for Engineers	HS	2	1	0	3	40	60	100
2	21MA2103	Linear Algebra, Numerical Methods and Transform Calculus	BS	3	1	0	4	40	60	100
THEORY WITH LAB COMPONENT										
3	21PH2151	Material Science	BS	2	0	2	3	50	50	100
4	21CY2151	Environmental Studies	BS	2	0	2	3	50	50	100
5	212CS2152 /21CS2153	Essentials of C&C++Programming/ Java Fundamentals(IBM)	ES	2	0	2	3	50	50	100
6	21ME2154	Engineering Graphics	ES	1	0	4	3	50	50	100
PRACTICAL										
7	21ME2001	Engineering Practices	ES	0	0	4	2	50	50	100
8	21HE2001	Language Competency Enhancement Course-II	HS	0	0	2	1	0	100	100
MANDATORY COURSES										
9	21HE2072	**Career Guidance Level – II** Personality, Aptitude and Career Development	EEC	2	0	0	0	100	0	100
10	21HE2073	Entrepreneurship & Innovation	EEC	1	0	0	0	100	0	100
			Total	**15**	**2**	**16**	**22**	**500**	**500**	**1000**

SEMESTER III

S.No	Course Code	Course Title	Category	L	T	P	C	CIA	ESE	TOTAL
THEORY										
1	21MA3102	Fourier analysis and transforms	BS	3	1	0	4	40	60	100
2	21EC3201	Digital Electronics	PC	3	0	0	3	40	60	100
3	21EC3202	Signals and Systems	PC	3	1	0	4	40	60	100
4	21EC3203	Electronic Circuits	PC	3	0	0	3	40	60	100
THEORY WITH LAB COMPONENT										
5	21CS3252/ 21IT3252	Oops using Java/ Relational Database Management System(IBM)	PC	2	0	2	3	50	50	100
PRACTICAL										
6	21EC3001	Electronic circuits lab	PC	0	0	3	1.5	50	50	100
7	21EC3002	Digital Electronics Lab	PC	0	0	3	1.5	50	50	100
MANDATORY COURSES										
8	21MC3191	Indian Constitution	MC	2	0	0	0	100	0	100
9	21HE3072	**Career Guidance Level – III** Personality, Aptitude and Career Development	EEC	2	0	0	0	100	0	100
10	21HE3073	Leadership Management Skills	EEC	1	0	0	0	100	0	100
			Total	**19**	**2**	**8**	**20**	**550**	**450**	**1000**

SEMESTER IV

S.No	Course Code	Course Title	Category	L	T	P	C	CIA	ESE	TOTAL
THEORY										
1	21MA4104	Probability and Random Processes	BS	3	1	0	4	40	60	100
2	21EC4201	Electro Magnetic Fields and waves	PC	3	1	0	4	40	60	100
3	21EC4202	Analog Communication	PC	3	1	0	4	40	60	100
4	21EC4203	Linear Integrated Circuits	PC	3	0	0	3	40	60	100
THEORY WITH LAB COMPONENT										
5	21EC4251/ 21EC4252	Control Systems/ Design Thinking-An Introduction(IBM)	PC	2	0	2	3	50	50	100
PRACTICAL										
6	21EC4001	Linear Integrated Circuits Lab	PC	0	0	3	1.5	50	50	100
7	21EC4002	Analog communication Lab	PC	0	0	3	1.5	50	50	100
MANDATORY COURSES										
8	21MC4191	Essence of Indian tradition knowledge/Value Education	MC	2	0	0	0	100	0	100
9	21HE4072	**Career Guidance Level – IV** Personality, Aptitude and Career Development	EEC	2	0	0	0	100	0	100
10	21HE4073	Ideation Skills	EEC	2	0	0	0	100	0	100
			Total	**20**	**3**	**8**	**21**	**550**	**450**	**1000**

SEMESTER V

S.No.	Course Code	Course Title	Category	L	T	P	C	CIA	ESE	TOTAL
THEORY										
1	21EC5201	Microprocessor and Microcontroller	PC	3	0	0	3	40	60	100
2	21EC5202	Transmission lines and WaveGuides	PC	3	1	0	4	40	60	100
3	21EC5203	VLSI Design	PC	3	0	0	3	40	60	100
4	21EC53XX	**Professional Elective –I**	PE	3	0	0	3	40	60	100
THEORY WITH LAB COMPONENT										
5	21EC5251	Data Communication and Networks	PC	2	0	2	3	50	50	100
6	21EC5252	Digital Signal Processing	PC	2	0	2	3	50	50	100
7	21CS5331	Angular JS(for IBM students)	PC	2	0	2	3	50	50	100
PRACTICALS										
8	21EC5001	VLSI Design Lab	PC	0	0	3	1.5	50	50	100
9	21EC5002	Microprocessors and Microcontrollers Lab	PC	0	0	3	1.5	50	50	100
MANDATORY COURSES										
10	21HE5071	Soft Skills - I	EEC	1	0	0	1	100	0	100
11	21HE5072	Design Thinking	EEC	1	0	0	1	100	0	100
			Total	**18**	**1**	**10**	**24**	**500**	**500**	**1000**

SEMESTER VI

S.No.	Course Code	Course Title	Category	L	T	P	C	CIA	ESE	TOTAL
THEORY										
1	21EC6202	Antenna and Wave Propagation	PC	3	1	0	4	40	60	100
2	21EC6181	Principles of Management	HS	3	0	0	3	40	60	100
3	21EC63XX /21CS6351	**Professional Elective – II/Node JS and Microservices(IBM)**	PE	3	0	0	3	40	60	100
4	21XX64XX	**Open Elective– I**	OE	3	0	0	3	40	60	100
THEORY WITH LAB COMPONENTS										
5	21EC6251/ 21CS6255	**Embedded Systems and IOT/IOT and Spring Framework(IBM)**	PC	2	0	3	3.5	50	50	100
6	21EC6253	Digital Communication	PC	2	0	3	3.5	50	50	100
PRACTICALS										
7		Project Based Learning	PC	0	0	3	1.5	50	50	100
MANDATORY COURSES										
8	21EC6701	Internship	EEC	-	-	-	1	100	0	100
9	21HE6071	Soft Skills - II	EEC	1	0	0	1	100	0	100
10	21HE6072	Intellectual Property Rights (IPR)	EEC	1	0	0	1	100	0	100
			Total	**19**	**1**	**6**	**24**	**550**	**450**	**1000**

SEMESTER VII

S.No.	Course Code	Course Title	Category	L	T	P	C	CIA	ESE	TOTAL
THEORY										
1	21EC7201	Digital Image Processing	PC	3	0	0	3	40	60	100
2	21EC7202	Optical and Microwave Engineering	PC	3	0	0	3	40	60	100
3	21EC73XX/ 21EC7331	**Professional Elective-III/Block Chain(IBM)**	PE	3	0	0	3	40	60	100
4	21XX74XX	**Open Elective – II**	OE	3	0	0	3	40	60	100
THEORY WITH LAB COMPONENTS										
5	21EC7251	Wireless Communication	PC	2	0	2	3	50	50	100
PRACTICALS										
6	21EC7001	Digital Image processing Lab	PC	0	0	3	1.5	50	50	100
7	21EC7002	Optical Communication and Microwave Lab	PC	0	0	3	1.5	50	50	100
PROJECT WORK										
8	21EC7901	Project Work – Phase I	EEC	0	0	4	2	50	50	100
			Total	**14**	**0**	**12**	**20**	**300**	**500**	**800**

SEMESTER VIII

S.No.	Course Code	Course Title	Category	L	T	P	C	CIA	ESE	TOTAL
THEORY										
1	21EC83XX	**Professional Elective –IV**	PE	3	0	0	3	40	60	100
2	21EC83XX	**Professional Elective- V**	PE	3	0	0	3	40	60	100

PROJECT WORK										
3	21CH8901	Project Work – Phase II	EEC	0	0	16	8	100	100	200
			Total	**6**	**0**	**16**	**14**	**150**	**250**	**400**

TOTAL NO OF CREDITS: 165

LIST OF PROFESSIONAL ELECTIVES

S.No.	Course Code	Course Title	Category	L	T	P	C	CIA	ESE	TOTAL
PROFESSIONAL ELECTIVE I										
1	21EC5301	Measurements and Instrumentation	PE	3	0	0	3	40	60	100
2	21EC5302	PCB Design	PE	3	0	0	3	40	60	100
3	21EC5303	RF System Design	PE	3	0	0	3	40	60	100
4	21EC5304	Network Security	PE	3	0	0	3	40	60	100
5	21EC5181	Total Quality Management	PE	3	0	0	3	40	60	100
PROFESSIONAL ELECTIVE II										
1	21EC6301	Medical Electronics	PE	3	0	0	3	40	60	100
2	21EC6302	Industrial Automation	PE	3	0	0	3	40	60	100
3	21EC6303	Mobile Communication	PE	3	0	0	3	40	60	100
4	21EC6304	High Speed Networks	PE	3	0	0	3	40	60	100
5	21EC6182	E-Commerce Technology	PE	3	0	0	3	40	60	100
6	21EC6305	Virtual Reality and Augmented Reality	PE	3	0	0	3	40	60	100
PROFESSIONAL ELECTIVE III										
1	21EC7301	Robotics	PE	3	0	0	3	40	60	100
2	21EC7302	ASIC Design	PE	3	0	0	3	40	60	100
3	21EC7303	Global Positioning Systems	PE	3	0	0	3	40	60	100
4	21EC7181	Entrepreneurship Development	PE	3	0	0	3	40	60	100
5	21EC7305	Cyber Forensics	PE	3	0	0	3	40	60	100
6	21EC7306	Embedded Controllers	PE	3	0	0	3	40	60	100
PROFESSIONAL ELECTIVE IV										
1	21EC8301	Neural networks and Deep learning	PE	3	0	0	3	40	60	100
2	21EC8303	Satellite Communication	PE	3	0	0	3	40	60	100
3	21EC8304	Wireless Sensors and Networks	PE	3	0	0	3	40	60	100
4	21EC8181	Foundation Skills in Integrated Product Development	PE	3	0	0	3	40	60	100
5	21EC8305	Medical Image Processing	PE	3	0	0	3	40	60	100

6	21EC8311	Computer Communication and Internet Protocol	PE	3	0	0	3	40	60	100
7	21EC8312	Cloud Computing	PE	3	0	0	3	40	60	100
PROFESSIONAL ELECTIVE V										
1	21EC8306	Artificial Intelligence	PE	3	0	0	3	40	60	100
2	21EC8307	Low Power VLSI	PE	3	0	0	3	40	60	100
3	21EC8308	Software Defined Radio	PE	3	0	0	3	40	60	100
4	21EC8309	Photonic Networks	PE	3	0	0	3	40	60	100
5	21EC8182	Intellectual Property Rights and Innovations	PE	3	0	0	3	40	60	100
6	21EC8310	Fundamentals of Nano Science	PE	3	0	0	3	40	60	100

LIST OF INDUSTRIAL CORE COURSES

S.No.	CODE	Courses	CAT	L	T	P	C	CIA	ESE	TOTAL
1	21CS1152	Object Oriented Programming using Python	IC	2	0	2	3	50	50	100
2	21CS2153	Java Fundamentals	IC	2	0	2	3	50	50	100
3	21IT3252	Relational Database Management System	IC	2	0	2	3	50	50	100
4	21EC4252	Design Thinking-An Introduction	IC	2	0	2	3	50	50	100
5	21CS5331	Angular JS	IC	2	0	2	3	50	50	100
6	21CS6351	Node JS and Micro services	IC	2	0	2	3	50	50	100
7	21CS6255	IoT and Spring Framework	IC	2	0	2	3	50	50	100
8	21EC7331	Blockchain	IC	2	0	2	3	50	50	100

LIST OF OPEN ELECTIVES

ELECTRONICS AND COMMUNICATION ENGINEERING										
S.No.	Course Code	Course Title	Category	L	T	P	C	CIA	ESE	TOTAL
1	21EC6401	Consumer Electronics	OE	3	0	0	3	40	60	100
2	21EC7401	Introduction to IOT	OE	3	0	0	3	40	60	100
LIFE SKILL COURSES										
3	21LSZ401	General Studies for Competitive Examinations	OE	3	0	0	3	40	60	100
4	21LSZ402	Human Rights, Women's	OE	3	0	0	3	40	60	100

		Rights and Gender Equality								
5	21LSZ403	Indian Ethos and Human Values	OE	3	0	0	3	40	60	100
6	21LSZ404	Indian Constitution and Political System	OE	3	0	0	3	40	60	100
7	21LSZ405	Yoga for Human Excellence	OE	3	0	0	3	40	60	100
NCC COURSES (Only forthe students' who have opted NCC subjects in Semester I, II, III & IV are eligible)										
8	21HEZ401	NCC course level 1	OE	3	0	0	3	40	60	100
9	21HEZ402	NCC course level 2	OE	3	0	0	3	40	60	100

(Note: Z Stands for semester, students can't choose twice the course)

MINOR Verticals

Internet of Things

S No.	Course Code	Course Title	Category	Periods Per week			Total Contact Periods	Credits
				L	T	P		
1	21EC5231	Microprocessors and Microcontrollers	MDC	3	0	0	3	3
2	21EC6231	Introduction to Internet of Things	MDC	3	0	0	3	3
3	21EC6232	Introduction to Security of Cyber Physical Systems	MDC	3	0	0	3	3
4	21EC7231	Ubiquitous Sensing, Computing and Communication	MDC	3	0	0	3	3
5	21EC7232	Embedded Systems for IoT	MDC	3	0	0	3	3
6	21EC8231	IoT with Arduino, ESP, and Raspberry Pi	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

S NO.	Vertical 1 Emerging Technologies in Communication Engineering	Vertical 2 Sensor Technologies and IoT	Vertical 3 Semiconductor Chip Design and Testing - TESSOLVE Semiconductors
1	Tele Communication Switching and Networks	Real-Time Embedded Systems Design	Digital System Design
	Optical Communication Networks	IOT Processors/ Advanced Processor Architectures	CMOS VLSI Design
3	Wireless Broadband Networks / Digital switching Systems	Computer Vision	Low Power VLSI Design
4	Software Defined Networks	Wearable Devices / Long term Evolution Technologies	ASIC Design
5	4G/5G Communication Networks/ Wireless systems and standards	Industrial IoT	System Verilog
6	Underwater Communication	IoT based System Design	VLSI Testing and Design for Testability

PROFESSIONAL ELECTIVE COURSES: VERTICALS

B E (Hons) Electronics and Communication Engineering with Specialization in Emerging Technologies in Communication Engineering

VERTICAL1: Emerging Technologies in Communication Engineering

S No.	Course Code	Course Title	Category	Periods Per week			Total Contact Periods	Credits
				L	T	P		
1.	21EC5204	Tele Communication Switching and Networks	PEC1	3	0	0	3	3
2.	21EC6202	Optical Communication Networks	PEC2	3	0	0	3	3
3.	21EC6203/ 21EC6204	Wireless Broadband Networks / Digital switching Systems	PEC3	3	0	0	3	3
4.	21EC7202	Software Defined Networks	PEC4	3	0	0	3	3
5.	21EC7203/ 21EC7204	4G/5G Communication Networks/ Wireless systems and standards	PEC5	3	0	0	3	3
6.	21EC8201	Underwater Communication	PEC6	3	0	0	3	3

B E (Hons) Electronics and Communication Engineering with Specialization in Sensor Technologies and IoT

VERTICAL 2: Sensor Technologies and IoT

S No.	Course Code	Course Title	Category	Periods Per week			Total Contact Periods	Credits
				L	T	P		
1.	21EC5205	Real-Time Embedded Systems Design	PEC1	3	0	0	3	3
2.	21EC6205/ 21EC6206	IOT Processors/ Advanced Processor Architectures	PEC2	3	0	0	3	3
3.	21EC6207	Computer Vision	PEC3	3	0	0	3	3
4.	21EC7205/ 21EC7206	Wearable Devices / Long term Evolution Technologies	PEC4	3	0	0	3	3
5.	21EC7207	Industrial IoT	PEC5	3	0	0	3	3
6.	21EC8202	IoT based System Design	PEC6	3	0	0	3	3

B E (Hons) Electronics and Communication Engineering with Specialization in Semiconductor Chip Design and Testing - TSSOLVE Semiconductors

VERTICAL 3: Semiconductor Chip Design and Testing - TESSOLVE Semiconductors

S No.	Course Code	Course Title	Category	Periods Per week			Total Contact Periods	Credits
				L	T	P		
1.	21EC5206	Digital System Design	PEC1	3	0	0	3	3
2.	21EC6208	CMOS VLSI Design	PEC2	3	0	0	3	3
3.	21EC6209	Low Power VLSI Design	PEC3	3	0	0	3	3
4.	21EC7208	ASIC Design	PEC4	3	0	0	3	3
5.	21EC7209	System Verilog	PEC5	3	0	0	3	3
6.	21EC8203	VLSI Testing and Design for Testability	PEC6	3	0	0	3	3

HONOURS

B E (Hons) Electronics and Communication Engineering with Specialization in Advanced Communication Systems

S No.	Course Code	Course Title	Category	Periods Per week			Total Contact Periods	Credits
				L	T	P		
1	21EC5204	Information Theory and Coding	PC	3	0	0	3	3
2	21EC6203	Cognitive Radio Network	PC	3	0	0	3	3
3	21EC6204	Advanced Wireless Broadband Communications	PC	3	0	0	3	3
4	21EC7203	Mobile and Vehicular Communication	PC	3	0	0	3	3
5	21EC7204	5G Technology	PC	3	0	0	3	3
6	21EC8201	Massive MIMO and mmWave Systems	PC	3	0	0	3	3

B E (Hons) Electronics and Communication Engineering with Specialization in Micro electronics and VLSI

S No.	Course Code	Course Title	Category	Periods Per week			Total Contact Periods	Credits
				L	T	P		
1	21EC5205	Analog VLSI Design	PC	3	0	0	3	3
2	21EC6205	Signal and Image Processing	PC	3	0	0	3	3
3	21EC6206	VLSI Signal Processing	PC	3	0	0	3	3
4	21EC7205	Reconfigurable Computing	PC	3	0	0	3	3
5	21EC7206	Evolvable Hardware	PC	3	0	0	3	3
6	21EC8202	Solar Power Electronics	PC	3	0	0	3	3

B E (Hons) Electronics and Communication Engineering with Specialization in Wireless technology

S No.	Course Code	Course Title	Category	Periods Per week			Total Contact Periods	Credits
				L	T	P		
1	21EC5206	Wireless Broadband Netwroks	PC	3	0	0	3	3
2	21EC6207	Wireless Communication Techniques	PC	3	0	0	3	3
3	21EC6208	Wireless Sensor Network Design	PC	3	0	0	3	3
4	21EC7207	Access Technologies	PC	3	0	0	3	3
5	21EC7208	Free Space Optical Communication	PC	3	0	0	3	3
6	21EC8203	Antenna Design and Testing	PC	3	0	0	3	3

CREDIT DISTRIBUTION

Semester	I	II	III	IV	V	VI	VII	VIII	Total
Credits	20	22	20	21	24	24	20	14	165

*** Student can earn extra credit 35 over and above the total credits**

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COIMBATORE - 641 032.

Programme	Course Code	Name of the Course	L	T	P	C
BE	21EC5201	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 MICROPROCESSORS** 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** 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: Design and implement programs on 8086 microprocessors.
CO2: Design I/O circuits.
CO3: Design Memory Interfacing circuits.
CO4: Design and implement 8051 microcontroller-based systems.
CO5: Design various interfacing and its programming methodologies

TEXT BOOKS:

T1-Ramesh S. Goankar, "Microprocessor Architecture, Programming and Applications with 8085", 5th Edition, Prentice Hall (Unit 1)
T2- Yu-Cheng Liu, Glenn A.Gibson, "Microcomputer Systems: The 8086 / 8088 Family - Architecture,

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Programming and Design", Prentice Hall of India, 2011. (Unit 1, 2, 3)
T3- Mohamed Ali Mazidi, Janice Gillispie Mazidi, Rolin McKinlay, "The 8051 Microcontroller and Embedded
Systems: Using Assembly and C", Second Edition, Pearson education, 2011 (Unit 4, 5)

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

Programme	Course Code	Name of the Course	L	T	P	C
BE	21EC5202	Transmission Lines and Wave Guides	3	1	0	4

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

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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: Understand the standing wave ratio and input impedance in high frequency transmission lines
CO3: Understand impedance matching for high frequency lines using smith charts
CO4: Understand the behavior of guided waves between parallel planes
CO5: Understand 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. (UNIT I to III)
T2-E.C. Jordan and K.G. Balmain, "Electromagnetic Waves and Radiating Systems"2nd Edition, Prentice Hall of India, 2006. (UNIT IV & V)

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.

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Programme	Course Code	Name of the Course	L	T	P	C
BE	21EC5203	VLSI Design	3	0	0	3

Course Objective

1.To learn the fundamentals of CMOS and MOS design
2.To understand silicon processing
3.To familiarize with VLSI combinational logic and sequential logic circuits design
4.To learn high speed processing material and data path
5. 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 –Resistance estimation – Capacitance 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 gates layout, 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 – Behavioral 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: Ability to analyze CMOS and MOS transistors.
CO2: Ability to analyze passive components required for physical design.
CO3: Ability to analyze timing issues of sequential logic
CO4: Ability to understand advanced semiconductor processing materials and data processing architecture
CO5: Ability to write a program using an efficient model for digital circuits.

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

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Wesley, New Delhi, 2010.

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

Programme	Course Code	Name of the Course	L	T	P	C
BE	21EC5251	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: Demonstrate the networking strategies.
CO2: Identify the technical issues related to networking technologies.
CO3: Discriminate various routing techniques.
CO4: Illustrate the web applications
CO5: Implement various network algorithms and protocols

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, MorganKaufmann 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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Programme	Course code	Name of the course	L	T	P	C
BE	21EC5202	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 MultirateSignal 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

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

Course Outcome

CO1: Apply DFT for the analysis of digital signals & systems.
CO2: Design IIR Butterworth and Chebyshev filters
CO3: Design FIR filters.
CO4: Illustrate Finite word length effect on filters.
CO5: Design and Implement Multirate Filters.

TEXT BOOKS

T1 - John G. Proakis& Dimitris G.Manolakis, "Digital Signal Processing – Principles, Algorithms & Applications", Fourth Edition, Pearson Education / Prentice Hall, 2007. (Unit I, II, III,IV)
T2 - A .NagoorKani, "Digital Signal Processing", 2010 Edition Mc Graw Hill Education (India) Pvt. Ltd (Unit V)

REFERENCE BOOK

R1- Emmanuel C Ifeachor, &Barrie.W.Jervis, "Digital Signal Processing", Second Edition, Pearson Education, Prentice Hall, 2002

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R2- Sanjit K. Mitra, "Digital Signal Processing – A Computer Based Approach", Mc Graw Hill, 2007

R3- Andreas Antoniou, "Digital Signal Processing", Mc Graw Hill, 2006

R4-. Oppenheim, R.W. Schafer and J.R. Buck, "Discrete-Time Signal Processing", 8th Indian Reprint, Pearson,2004

Programme	Course code	Name of the course	L	T	P	C
BE	21EC5001	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.

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Programme	Course code	Name of the course	L	T	P	C
BE	21EC5002	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: Write ALP Programmes for fixed and Floating Point and Arithmetic
CO2: Interface different I/Os with processor
CO3: Generate waveforms using Microprocessors
CO4: Execute Programs in 8051
CO5: Explain the difference between simulator and Emulator

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Programme	Course Code	Course Title	L	T	P	C
BE/BTECH	21HE5071	Soft Skills - I	1	0	0	1

Course Objectives:

1.To employ soft skills to enhance employability and ensure workplace and career success.
2.Toenrich 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

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Programme	Course code	Name of the course	L	T	P	C
BE	21EC5002	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: Write ALP Programmes for fixed and Floating Point and Arithmetic
CO2: Interface different I/Os with processor
CO3: Generate waveforms using Microprocessors
CO4: Execute Programs in 8051
CO5: Explain the difference between simulator and Emulator

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Programme	Course Code	Course Title	L	T	P	C
BE/BTECH	21HE5072	Design Thinking	1	0	0	1

Course Objective

- To expose students to the design process
- To develop and test innovative ideas through a rapid iteration cycle.
- 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

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	Course Code	Name of the Course	T	P	C
BE	21EC5301	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**

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, PHI, 2003. (Unit I to V)
T2- Ernest O.Doebelin, Measurements System-Application & Design, McGraw-Hill,1990,Fourth Edition.(Unit I to Unit V)

REFERENCE BOOKS:

R1 - B.C.Nakara, K.K.Chaudhry, Instrumentation Measurement and Analysis , McGraw - Hill , 2004. . (Unit I & IV)
R2 - J.B.Gupta, "A Course In Electronics And Electrical Measurements And Instrumentation" S.K.Kataria and sons,2013

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Programme	Course Code	Name of the Course	L	T	P	C
BE	21EC5302	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.

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Programme	Course Code	Name of the Course	L	T	P	C
BE	21EC5303	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 Applicationsl, Pearson Education Asia, First Edition, 2011

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

REFERENCE BOOKS:

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

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

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

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BE	21EC5304	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** 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- El 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

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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Programme	Course Code	Name of the Course	L	T	P	C
BE	21EC5181	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

CHAIRPERSON/BOS

Chairman - BoS
ECE - HiCET

DEAN/PRINCIPAL

Dean (Academics)
HiCET

Programme	Course Code	Name of the Course	L	T	P	C
B.E.	22CEXXXX	SUSTAINABLE INFRASTRUCTURE DEVELOPMENT	3	0	0	3

Course Objective

1. To gain knowledge on concepts and socio-economic policies of sustainable development.
2. To examine the strategies for implementing sustainable development programmes.
3. To learn the various sustainability and performance indicators, their assessment techniques and constraints
4. To explore the different approaches for resource management for a sustainable urban planning.
5. To understand the principles of urban planning and built-in environment.

Unit	Description	Instructional Hours
I	**INTRODUCTION TO SUSTAINABLE DEVELOPMENT** Definitions and principles of Sustainable Development - History and emergence of the conceptof Sustainable Development - Environment and Development linkages- Globalization andenvironment – Millennium Development Goals: Status (global and Indian) Impacts on approachto development policy and practice in India, future directions.	9
II	**ENVIRONMENTAL SUSTAINABILITY** Land, Water and Food production - Moving towards sustainability: Energy powering SustainableDevelopment - Financing the environment and Sustainable Development.	9
III	**SUSTAINABILITY INDICATORS** Sustainability indicators – Hurdlesto Sustainability-Operational Guidelines-Interconnected prerequisites for sustainabledevelopment - Science and Technology for sustainable development – Performanceindicators of sustainability and Assessment mechanism – Constraints and barriers forsustainable development.	9
IV	**URBAN PLANNING AND ENVIRONMENT** Environment and Resources, Sustainability Assessment, Future Scenarios, Form of Urban Region, Managing the change, Integrated Planning, Sustainable Development.	9
V	**THE BUILT-IN ENVIRONMENT** Urban Form, Land Use, Compact Development, Principles of street design- complete streets,Transport Integrated Urban land use Planning, Guidelines for Environmentally Sound Transportation.	9
	Total Instructional Hours	**45**

Course Outcome

The students will be able to:
CO1: Describe the concepts and socio-economic policies of sustainable development.
CO2: Recognize and identify the strategies for implementing sustainable development programmes.
CO3: Comprehend the various sustainability and performance indicators, their assessment techniques and constraints
CO4: Identify the different approaches for resource management for a sustainable urban planning
CO5: Illustrate the principles of urban planning and built-in environment.

REFERENCE BOOKS:

R1. GilgAWandYarwoodR," Rural Change and Sustainability-Agriculture, the Environment andCommunities",CABI Edited by SJEssex,September2005.
R2. GaneshaSomayaji and SakaramaSomayaji, "Environmental Concerns and Sustainabledevelopment: Some perspectives from India", Editors: publisher TERI Press, ISBN 8179932249.
R3. James H. Weaver, Michael T. Rock, Kenneth Kustere, "Achieving Broad-Based SustainableDevelopment: Governance, Environment, and Growth with Equity", Kumarian Press, WestHartford, CT. Publication Year,1997.
R4. Kirkby. J, O'Keefe P. and Timberlake, "Sustainable development" Earth Scan Publication,London,1996.
R5. Kerry Turner. R, "Sustainable Environmental Management", Principles and Practice Publisher:Belhaven Press,ISBN:1852930039.
R6. Munier N, "Introduction to Sustainability", Springer2005

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ECE - HiCET

Chairman

Dean - Academics

Dean (Academics)
HiCET

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HICET

HINDUSTHAN

COLLEGE OF ENGINEERING AND TECHNOLOGY

(An Autonomous Institution)

Coimbatore – 641032

DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

Revised Curriculum and Syllabus for the Batch 2020-2024

2019 REGULATIONS

HINDUSTHAN EDUCATIONAL AND CHARITABLE TRUST
HICET

HindusthanCollegeofEngineering andTechnology
(AnAutonomousInstitution, Affiliatedto AnnaUniversity,Chennai
ApprovedbyAICTE,NewDelhi&AccreditedbyNAACwith'A'Grade)
ValleyCampus,PollachiHighways,Coimbatore,Tamilnadu.

TÜVRheinland CERTIFIED

DETAILS OF CHANGES CARRIED OUT IN CURRICULUM & SYLLABUS

CBCS PATTERN

UNDERGRADUATE PROGRAMMES

B.E ELECTRONICS AND COMMUNICATION ENGINEERING (UG)

REGULATION-2019 (Revised on July 2021)

Amendments on June 2023
(For the students admitted during the academic year 2020-2024 and onwards)

SEMESTER I

S.No.	Course Code	Course Title	Category	L	T	P	C	CIA	ESE	TOTAL
THEORY										
1	19HE1101	Technical English	HS	2	1	0	3	25	75	100
2	19MA1103	Calculus and Differential Equations	BS	3	1	0	4	25	75	100
THEORY WITH LAB COMPONENT										
3	19PH1151	Applied Physics	BS	2	0	2	3	50	50	100
4	19CY1151	Chemistry for Engineers	BS	2	0	2	3	50	50	100
5	19CS1151	Python Programming and Practices	ES	2	0	2	3	50	50	100
6	19EC1153	Electron devices and Electric Circuits	ES	2	0	2	3	50	50	100
PRACTICAL										
7	19HE1071	Language Competency Enhancement Course-I	HS	0	0	2	1	0	100	100
MANDATORY COURSES										
8	19HE1072	**Career Guidance Level – I** Personality, Aptitude and Career Development	EEC	2	0	0	0	100	0	100
			Total :	**15**	**2**	**10**	**20**	**350**	**450**	**800**

As Per AICTE Norms 3 Weeks Induction Programme is Added in The First Semester as an Audit Course

SEMESTER II

S.No.	Course Code	Course Title	Category	L	T	P	C	CIA	ESE	TOTAL
THEORY										
1	19HE2101	Business English for Engineers	HS	2	1	0	3	25	75	100
2	19MA2103	Linear Algebra,Numerical Methodsand Transform Calculus	BS	3	1	0	4	25	75	100
THEORY WITH LAB COMPONENT										
3	19PH2151	Material Science	BS	2	0	2	3	50	50	100
4	19CY2151	Environmental Studies	BS	2	0	2	3	50	50	100
5	19CS2152	Essentials of C&C++Programming	ES	2	0	2	3	50	50	100
6	19ME2154	Engineering Graphics	ES	1	0	4	3	50	50	100
PRACTICAL										
7	19ME2001	Engineering Practices	ES	0	0	4	2	50	50	100
8	19HE2071	Language Competency Enhancement Course-II	HS	0	0	2	1	0	100	100
MANDATORY COURSES										
9	19HE2072	**Career Guidance Level – II** Personality, Aptitude and Career Development	EEC	2	0	0	0	100	0	100
10	19HE2073	Entrepreneurship & Innovation	EEC	1	0	0	0	100	0	100
			Total :	**15**	**2**	**16**	**22**	**500**	**500**	**1000**

SEMESTER III

S.No	Course Code	Course Title	Category	L	T	P	C	CIA	ESE	TOTAL
THEORY										
1	19MA3102	Fourier analysis and transforms	BS	3	1	0	4	25	75	100
2	19EC3201	Digital Electronics	PC	3	0	0	3	25	75	100
3	19EC3202	Signals and Systems	PC	3	1	0	4	25	75	100
4	19EC3203R	Electronic Circuits	PC	3	0	0	3	25	75	100
THEORY WITH LAB COMPONENT										
5	19CS3252	Oops using Java	PC	2	0	2	3	50	50	100
PRACTICAL										
6	19EC3001	Electronic circuits lab	PC	0	0	3	1.5	50	50	100
7	19EC3002	Digital Electronics Lab	PC	0	0	3	1.5	50	50	100
MANDATORY COURSES										
8	19MC3191	Indian Constitution	MC	2	0	0	0	100	0	100
9	19HE3072	**Career Guidance Level – III** Personality, Aptitude and Career Development	EEC	2	0	0	0	100	0	100
10	19HE3073	Leadership Management Skills	EEC	1	0	0	0	100	0	100
			Total	**19**	**2**	**8**	**20**	**550**	**450**	**1000**

SEMESTER IV

S.No	Course Code	Course Title	Category	L	T	P	C	CIA	ESE	TOTAL
THEORY										
1	19MA4104	Probability and Random Processes	BS	3	1	0	4	25	75	100
2	19EC4201R	Electro Magnetic Fields and waves	PC	3	1	0	4	25	75	100
3	19EC4202R	Analog Communication	PC	3	1	0	4	25	75	100
4	19EC4203	Linear Integrated Circuits	PC	3	0	0	3	25	75	100
THEORY WITH LAB COMPONENT										
5	19EC4251	Control Systems	PC	2	0	2	3	50	50	100
PRACTICAL										
6	19EC4001	Linear Integrated Circuits Lab	PC	0	0	3	1.5	50	50	100
7	19EC4002	Analog communication Lab	PC	0	0	3	1.5	50	50	100
MANDATORY COURSES										
8	19MC4191	Essence of Indian tradition knowledge/Value Education	MC	2	0	0	0	100	0	100
9	19HE4072	**Career Guidance Level – IV** Personality, Aptitude and Career Development	EEC	2	0	0	0	100	0	100
10	19HE4073	Ideation Skills	EEC	2	0	0	0	100	0	100
			Total	**20**	**3**	**8**	**21**	**550**	**450**	**1000**

SEMESTER V

S.No.	Course Code	Course Title	Category	L	T	P	C	CIA	ESE	TOTAL
THEORY										
1	19EC5201	Microprocessor and Microcontroller	PC	3	0	0	3	25	75	100
2	19EC5202	Transmission lines and WaveGuides	PC	3	1	0	4	25	75	100
3	19EC5203	VLSI Design	PC	3	0	0	3	25	75	100
4	19EC53XX	**Professional Elective -I**	PE	3	0	0	3	25	75	100
THEORY WITH LAB COMPONENT										
5	19EC5251	Data Communication and Networks	PC	2	0	2	3	50	50	100
6	19EC5252	Digital Signal Processing	PC	2	0	2	3	50	50	100
PRACTICALS										
7	19EC5001	VLSI Design Lab	PC	0	0	3	1.5	50	50	100

8	19EC5002	Microprocessors and Microcontrollers Lab	PC	0	0	3	1.5	50	50	100
MANDATORY COURSES										
9	19HE5071	Soft Skills - I	EEC	1	0	0	1	100	0	100
10	19HE5072	Design Thinking	EEC	1	0	0	1	100	0	100
			Total	**18**	**1**	**10**	**24**	**500**	**500**	**1000**

SEMESTER VI

S.No.	Course Code	Course Title	Category	L	T	P	C	CIA	ESE	TOTAL
THEORY										
1	19EC6201	Digital Communication	PC	3	0	0	3	25	75	100
2	19EC6202	Antenna and Wave Propagation	PC	3	1	0	4	25	75	100
3	19EC6181	Principles of Management	HS	3	0	0	3	25	75	100
4	19EC63XX	**Professional Elective - II**	PE	3	0	0	3	25	75	100
5	19XX64XX	**Open Elective– I**	OE	3	0	0	3	25	75	100
THEORY WITH LAB COMPONENTS										
6	19EC6251	**Embedded Systems and IOT**	PC	2	0	3	3.5	50	50	100
PRACTICALS										
7	19EC6001	Digital Communication Lab	PC	0	0	3	1.5	50	50	100
MANDATORY COURSES										
8	19EC6701	Internship	EEC	-	-	-	1	100	0	100
9	19HE6071	Soft Skills - II	EEC	1	0	0	1	100	0	100
10	19HE6072	Intellectual Property Rights (IPR)	EEC	1	0	0	1	100	0	100
			Total	**19**	**1**	**6**	**24**	**525**	**475**	**1000**

SEMESTER VII

S.No.	Course Code	Course Title	Category	L	T	P	C	CIA	ESE	TOTAL
THEORY										
1	19EC7201	Digital Image Processing	PC	3	0	0	3	25	75	100
2	19EC7202	Optical and Microwave Engineering	PC	3	0	0	3	25	75	100
3	19EC73XX	**Professional Elective-III**	PE	3	0	0	3	25	75	100
4	19XX74XX	**Open Elective – II**	OE	3	0	0	3	25	75	100
THEORY WITH LAB COMPONENTS										
5	19EC7251	Wireless Communication	PC	2	0	2	3	50	50	100
PRACTICALS										
6	19EC7001	Digital Image processing Lab	PC	0	0	3	1.5	50	50	100
7	19EC7002	Optical Communication andMicrowave Lab	PC	0	0	3	1.5	50	50	100

PROJECT WORK										
8	19EC7901	Project Work – Phase I	EEC	0	0	4	2	50	50	100
			Total	**14**	**0**	**12**	**20**	**300**	**500**	**800**

SEMESTER VIII

S.No.	Course Code	Course Title	Category	L	T	P	C	CIA	ESE	TOTAL
THEORY										
1	19EC83XX	**Professional Elective –IV**	PE	3	0	0	3	25	75	100
2	19EC83XX	**Professional Elective- V**	PE	3	0	0	3	25	75	100
PROJECT WORK										
3	19CH8901	Project Work – Phase II	EEC	0	0	16	8	100	100	200
			Total	**6**	**0**	**16**	**14**	**150**	**250**	**400**

TOTAL NO OF CREDITS: 165

LIST OF PROFESSIONAL ELECTIVES

S.No.	Course Code	Course Title	Category	L	T	P	C	CIA	ESE	TOTAL
PROFESSIONAL ELECTIVE I										
1	19EC5301	Measurements and Instrumentation	PE	3	0	0	3	25	75	100
2	19EC5302	PCB Design	PE	3	0	0	3	25	75	100
3	19EC5303	RF System Design	PE	3	0	0	3	25	75	100
4	19EC5304	Network Security	PE	3	0	0	3	25	75	100
5	19EC5181	Total Quality Management	PE	3	0	0	3	25	75	100
PROFESSIONAL ELECTIVE II										
1	19EC6301	Medical Electronics	PE	3	0	0	3	25	75	100
2	19EC6302	Industrial Automation	PE	3	0	0	3	25	75	100
3	19EC6303	Mobile Communication	PE	3	0	0	3	25	75	100
4	19EC6304	High Speed Networks	PE	3	0	0	3	25	75	100
5	19EC6182	E-Commerce Technology	PE	3	0	0	3	25	75	100
PROFESSIONAL ELECTIVE III										
1	19EC7301	Robotics	PE	3	0	0	3	25	75	100
2	19EC7302	ASIC Design	PE	3	0	0	3	25	75	100
3	19EC7303	Global Positioning Systems	PE	3	0	0	3	25	75	100
4	19EC7304	Cloud Computing	PE	3	0	0	3	25	75	100
5	19EC7181	Entrepreneurship Development	PE	3	0	0	3	25	75	100
6	19EC7305	Digital Design Verification	PE	2	0	2	3	25	75	100
7	19EC7306	Embedded Controllers and IoT System Design	PE	2	0	2	3	25	75	100

PROFESSIONAL ELECTIVE IV										
1	19EC8301	Neural networks and Deep learning	PE	3	0	0	3	25	75	100
2	19EC8302	Embedded Controllers	PE	3	0	0	3	25	75	100
3	19EC8303	Satellite Communication	PE	3	0	0	3	25	75	100
4	19EC8304	Wireless Sensors and Networks	PE	3	0	0	3	25	75	100
5	19EC8181	Foundation Skills in Integrated Product Development	PE	3	0	0	3	25	75	100
PROFESSIONAL ELECTIVE V										
1	19EC8306	Artificial Intelligence	PE	3	0	0	3	25	75	100
2	19EC8307	Low Power VLSI	PE	3	0	0	3	25	75	100
3	19EC8308	Software Defined Radio	PE	3	0	0	3	25	75	100
4	19EC8309	Photonic Networks	PE	3	0	0	3	25	75	100
5	19EC8182	Intellectual Property Rights and Innovations	PE	3	0	0	3	25	75	100

LIST OF OPEN ELECTIVES

ELECTRONICS AND COMMUNICATION ENGINEERING										
S.No.	**Course Code**	**Course Title**	**Category**	**L**	**T**	**P**	**C**	**CIA**	**ESE**	**TOTAL**
1	19EC6401	Consumer Electronics	OE	3	0	0	3	25	75	100
2	19EC7401	Introduction to IOT	OE	3	0	0	3	25	75	100
LIFE SKILL COURSES										
3	19LSZ401	General Studies for Competitive Examinations	OE	3	0	0	3	25	75	100
4	19LSZ402	Human Rights, Women's Rights and Gender Equality	OE	3	0	0	3	25	75	100
5	19LSZ403	Indian Ethos and Human Values	OE	3	0	0	3	25	75	100
6	19LSZ404	Indian Constitution and Political System	OE	3	0	0	3	25	75	100
7	19LSZ405	Yoga for Human Excellence	OE	3	0	0	3	25	75	100

		Excellence								

(Note: Z Stands for semester, students can't choose twice the course)

LIST OF INDUSTRIAL CORE COURSES

S.No.	CODE	Courses	CAT	L	T	P	C	CIA	ESE	TOTAL
1	19CS1152	Object Oriented Programming using Python	IC	2	0	2	3	50	50	100
2	19CS2153	Java Fundamentals	IC	2	0	2	3	50	50	100
3	19IT3252	Relational Database Management System	IC	2	0	2	3	50	50	100
4	19CS4204	Design Thinking	IC	2	0	2	3	50	50	100
5	19CS5231	Angular JS	IC	3	0	0	3	25	75	100
6	19CS6231	Node JS and Micro services	IC	3	0	0	3	25	75	100
7	19EC6252	IoT and Spring Framework	IC	3	0	0	3	25	75	100
8	19EC7305	Blockchain	IC	3	0	0	3	25	75	100

CREDIT DISTRIBUTION

Semester	I	II	III	IV	V	VI	VII	VIII	Total
Credits	20	22	20	21	24	24	20	14	165

*** Student can earn extra credit 35 over and above the total credits**

Chairman, Board of Studies

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HiCET

Principal

PRINCIPAL
Hindusthan College Of Engineering & Tec
COIMBATORE - 641 032

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**

After completion of the course the learner will be able to

Course Outcome

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.

TEXT BOOKS:

T1- Rafael C Gonzalez, Richard E Woods, "Digital Image Processing", Pearson Education Inc, Fourth Edition, 2018. (Units I – V)
T2- Anil K- Jain, "Fundamentals of Digital Image Processing", Pearson/Prentice Hall of India, 2002.

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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.

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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

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ACADEMIC COUNCIL * HICET * Chairman

Dean (Academics)
HiCET

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:

T1- Gerd Keiser "Optical Fiber Communicationl, McGraw Hill Education (India) Private Limited. Fifth Edition, Reprint 2013. (UNIT I, II, III)

T2 - Annapurna Das and Sisir K Das, "Microwave Engineering", Mc Graw Hill Inc., 2004. (UNIT IV, V)

REFERENCE BOOKS:

R1. John M.Senior, —Optical fiber communication, Pearson Education, second edition.2007. (UNIT I, II, III)

R2 - D.M.Pozar, "Microwave Engineering.", John Wiley & sons, Inc., 2006. . (UNIT IV, V)

R3- Samuel Y Liao, "Microwave Devices & Circuits", Prentice Hall of India, 2006. (UNIT IV, V)

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Chairman - BoS
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ACADEMIC COUNCIL * HNOUSTHAN COLLEGE OF ENGG & TECH * Chairman

DEAN/PRINCIPAL

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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		
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

List of Experiments

Study of wireless Communications using Communication Trainer Kits

1. To study the FHSS Modulation and Demodulation Techniques
2. To study the DS spread spectrum Modulation and Demodulation Technique

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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.
CO4: 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..

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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.

TOTAL HOURS 45

Course Outcome

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.

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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: Analyze the performance of various optical links.
CO3: Test microwave components
CO4: Analyze the radiation of pattern of antenna.
CO5: Test optical components

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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. Formulate a real-world problem, identify the requirement and develop the design solutions.
CO2. Identify technical ideas, strategies and methodologies.
CO3. Utilize the new tools, algorithms, techniques that contribute to obtain the solution of the project. Test and validate through conformance of the developed prototype and analysis the cost effectiveness.
CO4. Prepare report and present the oral demonstrations.

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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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Programme	Course Code	Name of the Course	L	T	P	C
B.E./B.Tech.	19EC7305	DIGITAL DESIGN VERIFICATION	2	0	2	3

Course Objective

1. To understand the basics of HDL - Verilog
2. To comprehend the basics verification language and system Verilog
3. To get insights into the system Verilog constraints and arrays
4. To be familiar with inter process communication, interface and coverage
5. To get through the verification architecture and environment construction

Unit	Description	Instructional Hours
I	**BASICS OF HDL - VERILOG** Introduction - Data types (reg,wire) - Operators - Assignments (Blocking, Non Blocking, Continuous, Procedural statement, delay) - Control Construct (if-else, case, forever, repeat, while, for loop) - Structure (Module, port, signals) - Procedural Block (always, initial, function, task) - Exercise on Designing Digital Circuit (combinational, sequential).	9
II	**BASICS OF VERIFICATION CONSTRUCTS , DATA TYPES AND OOPS** Importance of Verification language and System Verilog(SV) – Difference between Verilog and SV – SV Data types – 2 State Data types – 4 State Data types – User-defined data types - OOPs – Encapsulation – Polymorphism – Inheritance - Built-in Methods: Randomization, object Creation (new) – User Defined Methods: print method, copy methods (copy-by-handle, Shallow copy, Deep Copy). Exercise on implementing SV Constructs.	9
III	**SV CONSTRAINTS AND ARRAYS** Simple Constraints – Weighted Distributed Constraint – Implication Operator Based Constraint – If-else Constraint – Variable Order Based Constraint – Soft Constraint – Inline Constraint – Unique Constraint – For each Constraint – Inside Constraint – SV Arrays – Pack & Unpack Arrays – Static Array – Dynamic Arrays (Dynamic, Associative and Queue Array) - Exercise on implementing transactions with constraints.	9
IV	**INTER PROCESS COMMUNICATION (IPC), INTERFACE AND COVERAGE** IPC - Semaphore - Mailbox - Events - Interface - Virtual Interface - Modport - Clocking Block - Coverage - Functional Coverage - Code Coverage - Cross Coverage - Coverage option - Exercise on Constructing Synchronization module between Testbench Components.	9
V	**VERIFICATION ARCHITECTURE AND ENVIRONMENT CONSTRUCTION** SV Verification Blocks - Generator Block – Bus Functional Model(BFM) Block – Interface Block – Monitor Block – Scoreboard Block – Coverage Block – Environment Block – Program Block – Top Module - Exercise on constructing SV environment for Combinational and Sequential circuit.	9
	Total Instructional Hours	**45**
		15

Lab Experiments

1. Implement a Parameterized simple FIFO with queue Inputs: data_in, w_fifo, r_fifo; Outputs: empty, full, data_out. Manage them with built in methods and show the output..
2. Design a Content Addressable Memory (CAM) using Associate Array and show their output in System verilog.
3. Declare a register to perform write read operation using Pre and post randomization methods.
4. Design an Inter process Synchronization - Mailbox between Generator and Driver component to receive the transaction using System Verilog.
5. Design an Interface with Modport and Clocking Block using System verilog.

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Total Instructional Hours **45+15=60**

Course Outcome

CO1:Understand the basics of HDL - Verilog
CO2:Comprehends the basics verification language and system Verilog
CO3: Get insights into the system Verilog constraints and arrays
CO4: Familiar with inter process communication, interface and coverage
CO5:Get through the verification architecture and environment construction

TEXT BOOKS:

T1-S.Palnitkar,Verilog HDL:A Guide to Digital Design and Synthesis,Prentice Hall, 2nd edition, 2003.
T2- Chris Spear and Greg Tumbush , System Verilog for Verification, Third Edition, Springer US ,2012

REFERENCE BOOKS:

R1-Stuart Sutherland , Simon Davidmann , Peter Flake , SystemVerilog for Design, Second Edition, Springer New York, NY,2006.

R2-https://www.chipverify.com/systemverilog/systemverilog-tutorial/

R3-https://verificationguide.com/systemverilog/systemverilog-tutorial/

R4-http://www.testbench.in/

R5-System Verilog LRM

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Programme	Course code	Name of the course	L	T	P	C
BE	19EC7306	EMBEDDED CONTROLLERS AND IOT SYSTEM DESIGN	2	0	2	3

Course Objective

1.To introduce the concept of Embedded controllers.
2.To gain knowledge about MSP430 Peripheral Interfacing
3.To gain knowledge about multi tasking and the real time operating system.
4.To learn the protocols of IoT and fundamentals of Embedded Networking
5.To understand the CC3200 SimpleLink Wi-Fi Module.

Unit	Description	Instructional Hours
I	**Introduction to Embedded Controllers** Definition, History, Classification, Characteristics and quality attributes of Embedded System, Application Case study: Automobile industry.MSP430 Family Architecture, Features of embedded C as applicable to MSP430, development environment, Fundamentals of Physical Interfacing. Digital Output, Configuration of Digital Output, Introduction to LED, different connection methods of LED. Digital Input, Configuration of Digital Output, Introduction to Switches, different connection methods of Switch.	6
II	**MSP430 Peripheral Interfacing** Introduction to analog signal, DAC basics, PWM signal duty cycle calculation, analog output Exercises, ADC basics, analog input Exercises, Introduction to Sensors, Analog sensor interfacing (Temperature Sensor), Digital Sensor Interfacing (PIR Sensor), Ultrasonic Sensor interfacing.	6
III	**MSP430 Timer, Communication Protocols & RTOS** Timers: Classification of timers, Watchdog Timer, interrupts, Communication Protocols: UART, SPI, I2C.The challenge of multitasking and real time, multitasking with sequential programming, State machines, Real time operating system, RTOS services	6
IV	**IOT Introduction** Definition and Characteristics of IoT,Things in IoT, IoT Protocols, Functional Blocks, Communication Models, IPv6 over IPv4. Embedded Networking fundamentals. IoT overview and architecture. Cloud of Things	6
V	**IOT Implementation** Introduction to CC3200 SimpleLink Wi-Fi Module – Block Diagram, Features, applications. Overview of wireless sensor networks and design examples. Various wireless protocols and its applications. Introduction to HTTP, IoT Case Studies and Challenges Associated with IoT.	6
	List of Experiments 1. To blink the inbuilt LED. 2. To interface a external LED. a) Positive Logic Connection of LED b) Negative Logic Connection of LED 3. To glow inbuilt LED using inbuilt switch. 4. To interface external push button. a) Positive Logic Connection of switch. b) Negative Logic Connection of switch. 5. To fade out an inbuilt led using analog output. 6. Introduction to Serial Monitor. 7. To read the analog voltage using ADC. 8. To interface analog temperature sensor.	15

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9. To detect occupancy of an area using PIR sensor.
10. To measure the distance of an object using ultrasonic sensor
11. Introduction to serial communications with two devices.
12. HTTP data uploading to webpage.
13. HTTP data controlling using webpage.
14. Uploading data to cloud using HTTP.

Hardware Requirement:

1. MSP430 Launchpad kit.
2. CC3200 Launchpad kit.
3. Temperature Sensor-LM35/TMP36
4. PIR sensor
5. Ultrasonic sensor
6. Push Switch
7. LED
8. Resistor 220 ohm
9. Pot 1 K ohm
10. Bread Board, Jumper and Connection Wires.

Software Requirement:

1. Energia IDE open source

Total Instructional Hours 45

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

Course Outcome

After completion of the course the learner will be able to

CO1: Understand the MSP430 Family Architecture, Features of embedded C.
CO2: Gain knowledge about MSP430 Peripheral Interfacing
CO3: Apply the concept of multitasking and RTOS in embedded system design
CO4: Understanding the protocols of IoT and fundamentals of Embedded Networking
CO5: Get insights of CC3200 SimpleLink Wi-Fi Module

TEXT BOOKS

T1-MSP430 Microcontroller Basics - John Davies, Elsevier, 2008.
T2- Sudip Mishra, Anandarup Mukherjee, Arijit Roy: Introduction to IOT, Cambridge University Press

REFERENCE BOOKS

R1-Microcontroller Programming and Interfacing with Texas Instruments MSP430FR2433 and MSP430FR5994-Steven F. Barrett,Daniel J. Pack,Morgan& Claypool, 2019
R2-Texas Instrument MSP430 reference Page:
http://www.ti.com/lsds/ti/microcontrollers_16-bit_32-bit/msp/overview.page
R3-Energia is an open-sourced,community-driven IDE- http://energia.nu/guide/
R4-Embedded Software Premier David Simon (Pearson)
R5-https://www.ti.com/lit/pdf/swru372
R6:https://www.ti.com/lit/ds/symlink/cc3200.pdf?ts=1685867757024&ref_url=https%253A%252F%252Fwww.google.com%252F
R7-ArshdeepBahga, Vijay Madisetti, "Internet of Things, A Hands-on-Approach", 1st Edition, Universities press Pvt. Ltd., India, 2015

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Programme	Course Code	Name of the Course	L	T	P	C
BE	21EC6401	**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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Name of the Course	L	T	P	C
Introduction to IOT Common to all Branches)	3	0	0	3

to
tals of Internet of Things.
ıbedded system using Arduino / Raspberry Pi or equivalent boards.
rnet of Things in the real world scenario
ım with specifications and requirements.
stem using IoT

currencies, Smart Contracts, and

Description	Instructional Hours
ın Overview s-Physical design - Protocols – Logical design – IoT Levels – Domain Specific IoTs: Home	9
ıt – IoT Platforms Design Methodology – and Application Development.	9
y Pi Interfaces – Programming – Other IoT	9
o/Arduino ring the Linux Console - Arduino IDE – ıo Language Reference and APIs – Servo API.	9
se Studies ɔud Offerings: WAMP – Django – Amazon Web ıart Lighting – Weather Monitoring System – ter.	9
Total Instructional Hours	**45**

ourse the learner will be able to
arious tools.
oT using Arduino/ equivalent boards and relevant protocols.
es to access/control IoT devices.
ication and connect to the cloud.
ıs of IoT in real time scenario

et of Things – A hands-on approach", Universities Press, 2015. (Unit

ıd Intel® Galileo Gen 2: API Features and Arduino Projects for Linux

Mulligan, Stefan Avesand, Stamatis Karnouskos, David Boyle, "From
s: Introduction to a New Age of Intelligence", 1st Edition, Academic

ı the Arduino Yun", Packt Publishing, 2014.

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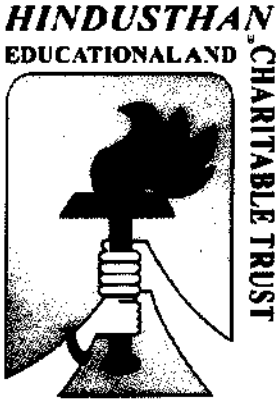

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COLLEGE OF ENGINEERING AND TECHNOLOGY

(An Autonomous Institution)

Coimbatore – 641032

DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

2022 REGULATIONS

2023-2024

Hindusthan College of Engineering and Technology

Approved by AICTE, New Delhi and Accredited with 'A' Grade by NAAC

(An Autonomous Institution, Affiliated to Anna University, Chennai)

Othakalmandapam Post, Coimbatore

VISION OF THE DEPARTMENT

To evolve as a centre of excellence in Electronics and Communication Engineering, to cater the global industrial needs.

MISSION OF THE DEPARTMENT

1. To expand frontiers of knowledge through the provision of inspiring learning environment.
2. To develop the intellectual skills towards employability by fostering innovation, and creativity in learning.
3. To provide a quality system for wholesome learning to achieve progress and prosperity in life along with moral values

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PROGRAMME OUTCOMES

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 considerations for the public health and safety, and the cultural, societal and environmental consideration.

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 modelling 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 environment.

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.

PROGRAMME SPECIFIC OUTCOMES

PSO 1: Graduates will be able to disseminate the knowledge in Communication Engineering towards Technical Incubation.

PSO 2: Graduates will have the perseverance to learn the modern design tools for

Electronic system design and analysis.

PROGRAMME EDUCATIONAL OBJECTIVES

PEO1: Exhibit their technical skills and knowledge in their working environment, higher studies and research.

PEO2: Succeed in multidisciplinary dimensions by excelling through life-long learning.

PEO3: Become leaders and innovators by devising engineering solutions for social issues and problems.

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Othakalmandapam Post, Coimbatore

B.E ELECTRONICS AND COMMUNICATION ENGINEERING (UG)
CO'S, PO'S & PSO'S MAPPING

SEMESTER I

22MA1101 MATRICES AND CALCULUS

PO / CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3	3	3	3	-	-	-	-	-	-	2	2	1
CO2	3	3	3	2	2	-	-	-	-	-	-	2	2	2
CO3	3	3	3	2	3	-	-	-	-	-	-	2	2	2
CO4	3	3	3	3	3	-	-	-	-	-	-	2	2	3
CO5	3	3	3	3	3	-	-	-	-	-	-	2	1	2
AVG	3	3	3	2.6	2.8	-	-	-	-	-	-	2	1.8	2

22CY1151 CHEMISTRY FOR CIRCUIT ENGINEERING

PO & PSO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	2	3	3	1	1	1	1	-	1	-	1	2	-	-
CO2	2	3	2	1	1	1	1	-	1	-	1	2	-	-
CO3	2	2	2	2	1	1	1	-	1	-	1	2	-	-
CO4	2	2	3	1	2	1	1	-	1	-	2	2	-	1
CO5	2	3	3	2	2	1	1	-	1	-	1	2	-	-
Avg	2	2.6	2.6	1.4	1.4	1	1	-	1	-	1.2	2	-	1

22HE1151 ENGLISH FOR ENGINEERS

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

22EC1151 ELECTRON DEVICES

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

AVG	3	2	2		1							2	2	2

22IT1151/ 22CS1152 PYTHON PROGRAMMING AND PRACTICES/ OBJECT ORIENTED PROGRAMMING USING PYTHON(IBM STUDENTS ONLY)

PO & PSO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO11**	**PSO12**
CO1	2	3	3	-	2	-	-	-	-	-	-	2	2	2
CO2	2	3	3	-	2	-	-	-	2	-	-	2	2	2
CO3	2	3	3	-	2	-	-	-	2	-	-	2	2	2
CO4	2	3	3	-	2	-	-	-	2	-	-	2	2	2
CO5	2	3	3	-	2	-	-	-	2	-	-	2	2	2
Avg	2	3	3	-	2	-	-	-	2	-	-	2	2	2

22HE1071 UHV

PO & PSO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO11**	**PSO12**
CO1	2	3	3	-	2	-	-	-	-	-	-	2	2	2
C	2	3	3	-	2	-	-	-	2	-	-	2	2	2

O2														
CO3	2	3	3	-	2	-	-	-	2	-	-	2	2	2
CO4	2	3	3	-	2	-	-	-	2	-	-	2	2	2
CO5	2	3	3	-	2	-	-	-	2	-	-	2	2	2
Avg	2	3	3	-	2	-	-	-	2	-	-	2	2	2

22HE1072 ENTREPRENEURSHIP & INNOVATION

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

22MC1091/22MC1092 தமிழரசும் ததிழலில் நடபமசும்/Indian Constitution

PO & PSO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	2	3	3	-	2	-	-	-	-	-	-	2	2	2

CO2	2	3	3	-	2	-	-	-	2	-	-	2	2	2
CO3	2	3	3	-	2	-	-	-	2	-	-	2	2	2
CO4	2	3	3	-	2	-	-	-	2	-	-	2	2	2
CO5	2	3	3	-	2	-	-	-	2	-	-	2	2	2
Avg	2	3	3	-	2	-	-	-	2	-	-	2	2	2

SEMESTER III

22MA3102 COMPLEX ANALYSIS AND TRANSFORMS (common to ECE,EEE,EIE)

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	PS O2
CO1	3	3	3	2	2	-	-	-	-	-	-	2	2	2
CO2	3	3	3	2	3	-	-	-	-	-	-	2	2	2
CO3	3	3	3	3	3	-	-	-	-	-	-	2	2	2
CO4	3	3	3	3	3	-	-	-	-	-	-	2	1	2
CO5	3	3	3	3	3	-	-	-	-	-	-	2	2	1
Avg	3	3	3	2.6	2.8	-	-	-	-	-	-	2	1.8	1.8

22EC3201 ELECTRONIC CIRCUITS

PO CO	P O 1	PO 2	P O3	PO4	PO5	PO6	PO 7	PO 8	PO9	PO 10	PO1 1	PO1 2	PSO 1	PSO 2
CO1	**3**	3	3	3	-	3	-	3	-	-	**1**	**3**	**2**	**3**
CO2	**3**	3	3	3	-	3	-	3	-	-	**1**	**3**	**2**	**3**
CO3	**3**	3	3	3	-	3	-	3	-	-	**1**	**3**	**2**	**3**
CO4	**3**	3	3	3	-	3	-	3	-	-	**1**	**3**	**2**	**3**
CO5	**3**	3	3	3	-	3	-	3	-	-	**1**	**3**	**2**	**3**
AV G	**3**	**3**	**3**	**3**	-	**3**	-	**3**	-	-	**1**	**3**	**2**	**3**

22EC3202 SIGNALS AND SYSTEMS

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	2	2	-	-	-	-	-	-	-	-	1	2	-
CO2	3	2	2	-	-	-	-	-	-	-	-	1	2	-
CO3	3	2	2	-	-	-	-	-	-	-	-	1	2	-
CO4	3	2	2	-	-	-	-	-	-	-	-	1	2	-
CO5	3	2	2	-	-	-	-	-	-	-	-	1	2	-
AVG	3	2	2									1	2	-

22EC3203 DIGITAL ELECTRONICS

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
CO 1	3	2	2	-	-	-	-	-	-	-	-	1	2	-
CO 2	3	2	2	-	-	-	-	-	-	-	-	1	2	-
CO 3	3	2	2	-	-	-	-	-	-	-	-	1	2	-
CO 4	3	2	2	-	-	-	-	-	-	-	-	1	2	-
CO 5	3	2	2	-	-	-	-	-	-	-	-	1	2	-
AVG	3	2	2									1	2	-

22EC3204 CIRCUITS AND NETWORKS

PO & PSO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO10	PO11	PO12	PSO 1	PSO 2
CO 1	3	2	2	-	-	-	-	-	-	-	-	1	2	1
CO 2	3	2	2	-	-	-	-	-	-	-	-	1	2	1
CO 3	3	2	2	-	-	-	-	-	-	-	-	1	2	1
CO 4	3	2	2	-	-	-	-	-	-	-	-	1	2	1
CO 5	3	2	2	-	-	-	-	-	-	-	-	1	2	1
AV G	3	2	2									1	2	1

22EC3251/22IT3252 OOPS USING JAVA/RELATIONAL DATABASE MANAGEMENT SYSTEM (IBM STUDENTS ONLY)

PO CO	PO 1	PO 2	PO3	PO4	PO5	PO6	PO 7	PO 8	PO9	PO 10	PO11	PO12	PSO 1	PSO 2
CO 1	3	3	3	3	-	3	-	3	-	-	1	3	2	3
CO 2	3	3	3	3	-	3	-	3	-	-	1	3	2	3
CO 3	3	3	3	3	-	3	-	3	-	-	1	3	2	3
CO 4	3	3	3	3	-	3	-	3	-	-	1	3	2	3
CO 5	3	3	3	3	-	3	-	3	-	-	1	3	2	3
AV G	3	3	3	3	-	3	-	3	-	-	1	3	2	3

22EC3001 ELECTRONIC CIRCUITS LABORATORY

O O	PO 1	PO 2	PO 3	PO4	PO5	PO6	PO 7	PO 8	PO9	PO 10	PO11	PO12	PSO 1	PSO 2
O1	3	3	3	2	-	2	-	3	-	-	2	3	2	2
O2	3	3	3	2	-	2	-	3	-	-	2	3	2	2
O3	3	3	3	2	-	2	-	3	-	-	2	3	2	2
O4	3	3	3	2	-	2	-	3	-	-	2	3	2	2
O5	3	3	3	2	-	2	-	3	-	-	2	3	2	2
V	3	3	3	2	-	2	-	3	-	-	2	3	2	2

22EC3002 DIGITAL ELECTRONICS LABORATORY

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

22HE3071 SOFT SKILLS -2

PO & PSO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO11	PSO1
CO1	2	3	3	-	2	-	-	-	-	-	-	2	2	2
CO2	2	3	3	-	2	-	-	-	2	-	-	2	2	2
CO3	2	3	3	-	2	-	-	-	2	-	-	2	2	2
CO4	2	3	3	-	2	-	-	-	2	-	-	2	2	2
CO5	2	3	3	-	2	-	-	-	2	-	-	2	2	2
Avg	2	3	3	-	2	-	-	-	2	-	-	2	2	2

22EC3901 MINI PROJECT 1

PO & PSO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PS02
CO1	3	2	2	3	2	2	2	3	3	3	3	1	3	3
CO2	3	2	2	3	2	2	2	3	3	3	3	1	3	3
CO3	3	2	2	3	2	2	2	3	3	3	3	1	3	3
CO4	3	2	2	3	2	2	2	3	3	3	3	1	3	3
CO5	3	2	2	3	2	2	2	3	3	3	3	1	3	3
AVG	3	2	2	3	2	2	2	3	3	3	3	1	3	3

SEMESTER V

22EC5201 DIGITAL COMMUNICATION

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

22EC5202 ANTENNA AND WAVE PROPAGATION

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

22EC5203 MICROPROCESSORS AND MICROCONTROLLERS

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

22EC5251 ANGULAR JS(IBM STUDENTS ONLY)

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

22EC5001 MICROPROCESSORS AND MICROCONTROLLERS LAB

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

22EC5002 DIGITAL COMMUNICATION LAB														
PO / CO	PO 1	PO 2	PO 3	PO4	PO5	PO6	PO 7	PO 8	PO9	PO 10	PO1 1	PO1 2	**PSO 1**	**PSO 2**
CO1	3	2	2	2		2						2	2	3
CO2	3	2	2	2		2						2	2	3
CO3	3	2	2	2		2						2	2	3
CO4	3	2	2	2		2						2	2	3
CO5	3	2	2	2		2						2	2	3
AV G	3	2	2	2		2						2	2	3

22HE5071 SOFT SKILLS -4 / FOREIGN LANGUAGES														
PO / CO	PO 1	PO 2	PO 3	PO4	PO5	PO6	PO 7	PO 8	PO9	PO 10	PO1 1	PO1 2	**PSO 1**	**PSO 2**
CO1	**3**	3	3	3	-	3	-	3	-	-	**1**	**3**	**2**	**3**
CO2	**3**	3	3	3	-	3	-	3	-	-	**1**	**3**	**2**	**3**
CO3	**3**	3	3	3	-	3	-	3	-	-	**1**	**3**	**2**	**3**
CO4	**3**	3	3	3	-	3	-	3	-	-	**1**	**3**	**2**	**3**
CO5	**3**	3	3	3	-	3	-	3	-	-	**1**	**3**	**2**	**3**
AV G	**3**	**3**	**3**	**3**	-	**3**	-	**3**	-	-	**1**	**3**	**2**	**3**

SEMESTER VII

22EC7201 WIRELESS COMMUNICATION NETWORKS														
PO / CO	PO 1	PO 2	P O3	PO4	PO5	PO6	PO 7	PO 8	PO9	PO 10	PO1 1	PO1 2	**PSO 1**	**PSO 2**
CO1	**3**	3	**2**	3	-	3	-	3	-	-	**1**	**3**	**2**	**3**
CO2	**3**	3	**2**	3	-	3	-	3	-	-	**1**	**3**	**2**	**3**
CO3	**3**	3	**2**	3	-	3	-	3	-	-	**1**	**3**	**2**	**3**
CO4	**3**	3	**2**	3	-	3	-	3	-	-	**1**	**3**	**2**	**3**
CO5	**3**	3	**2**	3	-	3	-	3	-	-	**1**	**3**	**2**	**3**
AV G	**3**	**3**	**2**	**3**	-	**3**	-	**3**	-	-	**1**	**3**	**2**	**3**

22EC7251 BLOCKCHAIN(IBM STUDENTS ONLY)

PO / CO	PO 1	PO 2	PO 3	PO4	PO5	PO6	PO 7	PO 8	PO9	PO 10	PO1 1	PO1 2	PSO 1	PSO 2
CO1	3	3	3	3	-	3	-	3	-	-	1	3	2	3
CO2	3	3	3	3	-	3	-	3	-	-	1	3	2	3
CO3	3	3	3	3	-	3	-	3	-	-	1	3	2	3
CO4	3	3	3	3	-	3	-	3	-	-	1	3	2	3
CO5	3	3	3	3	-	3	-	3	-	-	1	3	2	3
AV G	3	3	3	3	-	3	-	3	-	-	1	3	2	3

22EC7001 EMBEDDED SYSTEMS AND IOT

PO / CO	PO 1	PO 2	PO3	PO4	PO5	PO6	PO 7	PO 8	PO9	PO 10	PO1 1	PO1 2	PSO 1	PSO 2
CO1	3	2	3	3	-	3	-	2	-	-	1	3	2	3
CO2	3	2	3	3	-	3	-	2	-	-	1	3	2	3
CO3	3	2	3	3	-	3	-	2	-	-	1	3	2	3
CO4	3	2	3	3	-	3	-	2	-	-	1	3	2	3
CO5	3	2	3	3	-	3	-	2	-	-	1	3	2	3
AV G	3	2	3	3	-	3	-	2	-	-	1	3	2	3

22EC7001 OPTICAL COMMUNICATION AND MICROWAVE ENGINEERING

PO / CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PS C1	PS O2
CO 1	3	2	2	3	2	2	2					1	3	1
CO 2	3	2	2	3	2	2	2					1	3	1
CO 3	3	2	2	3	2	2	2					1	3	1
CO 4	3	2	2	3	2	2	2					1	3	1
CO 5	3	2	2	3	2	2	2					1	3	1
AV G	3	2	2	3	2	2	2					2	2	1

22EC7901 INTERNSHIP

PO / CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO1	PSO2
CO 1	3	3	3	3	-	3	-	3	-	-	1	3	2	3
CO 2	3	3	3	3	-	3	-	3	-	-	1	3	2	3
CO 3	3	3	3	3	-	3	-	3	-	-	1	3	2	3
CO 4	3	3	3	3	-	3	-	3	-	-	1	3	2	3
CO 5	3	3	3	3	-	3	-	3	-	-	1	3	2	3
AVG	3	3	3	3	-	3	-	3	-	-	1	3	2	3

Mapping of Course Outcome and Programme Outcome:

Year	Sem	Course code & Name	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
I	I	22MA1101 MATRICES AND CALCULUS	3	3	3	2.6	2.8	-	-	-	-	-	-	2	1.8	2
		22CY1151 CHEMISTRY FOR CIRCUIT ENGINEERING	2	2.6	2.6	1.4	1.4	1	1	-	1	-	1.2	2	-	1
		22HE1151 ENGLISH FOR ENGINEERS	2	1	-	-	1	1	1.6	2.2	2.4	3	1	1.2	1	2
		22EC1151 ELECTRON DEVICES	3	2	2		1							2	2	2
		22IT1151/ 22CS1152 PYTHON PROGRAMMING AND PRACTICES/ OBJECT ORIENTED PROGRAMMING USING PYTHON(IBM STUDENTS ONLY)	2	3	3	-	2	-	-	-	2	-	-	2	2	2

		22HE1071 UHV	2	3	3	-	2	-	-	-	2	-	-	2	2	2
I		22HE1072 ENTREPRENEURSHIP & INNOVATION	3	2	2									1	2	2
		22MC1091/ 22MC1092 தமிழரசும் தமிழி ல் நுட்பமும் /Indian Constitution	2	3	3	-	2	-	-	-	2	-	-	2	2	2
	III	22MA3102 COMPLEX ANALYSIS AND TRANSFORMS (common to ECE,EEE,EIE)	3	3	3	2.6	2.8	-	-	-	-	-	-	2	1.8	1.8
		22EC3201 ELECTRONIC CIRCUITS	3	3	3	3	-	3	-	3	-	-	1	3	2	3
		22EC3202 SIGNALS AND SYSTEMS	3	2	2									1	2	-
		22EC3203 DIGITAL ELECTRONICS	3	2	2									1	2	-
		22EC3204 CIRCUITS AND NETWORKS	3	2	2									1	2	1
		22EC3251/22IT3252 OOPS USING JAVA/RELATIONAL DATABASE MANAGEMENT SYSTEM (IBM STUDENTS ONLY)	3	3	3	3	-	3	-	3	-	-	1	3	2	3
		22EC3001 ELECTRONIC CIRCUITS LABORATORY	3	3	3	2	-	2	-	3	-	-	2	3	2	2
II		22EC3002 DIGITAL ELECTRONICS LABORATORY	3	3	3	3	-	3	-	3	-	-	1	3	2	3
		22HE3071 SOFT SKILLS -2	2	3	3	-	2	-	-	-	2	-	-	2	2	2
		22EC3901MINI PROJECT 1	3	2	2	3	2	2	2	3	3	3	3	1	3	3
III	V	22EC5201 DIGITAL COMMUNICATION	3	2	2	2		2						2	3	3
		22EC5202 ANTENNA AND WAVE PROPAGATION	3	3	3	3	2	2							3	2
		22EC5203 MICROPROCESSORS AND MICROCONTROLLERS	3	3	3	2	2	2	2	3	3	-	-	3	3	3
		22EC5251 ANGULAR	3	3	3	3	-	3	-	3	-	-	1	3	2	3

		JS(IBM STUDENTS ONLY)														
		22EC5001 MICROPROCESSORS AND MICROCONTROLLERS LAB	3	3	3	3	-	3	-	3	-	-	1	3	2	3
		22EC5002 DIGITAL COMMUNICATION LAB	3	2	2	2		2						2	2	3
		22HE5071 SOFT SKILLS -4 / FOREIGN LANGUAGES	3	3	3	3	-	3	-	3	-	-	1	3	2	3
IV	VII	22EC7201 WIRELESS COMMUNICATION NETWORKS	3	3	2	3	-	3	-	3	-	-	1	3	2	3
		22EC7251 BLOCKCHAIN(IBM STUDENTS ONLY)	3	3	3	3	-	3	-	3	-	-	1	3	2	3
		22EC7001 EMBEDDED SYSTEMS AND IOT	3	2	3	3	-	3	-	2	-	-	1	3	2	3
		22EC7001 OPTICAL COMMUNICATION AND MICROWAVE ENGINEERING	3	2	2	3	2	2	2					2	2	1
		22EC7901 INTERNSHIP	3	3	3	3	-	3	-	3	-	-	1	3	2	3

P. Hayka
Chairman - BoS
ECE - HiCET

Chairman

Dean (Academics)
HiCET

HindusthanCollegeofEngineering andTechnology

(AnAutonomousInstitution, Affiliatedto AnnaUniversity,Chennai
ApprovedbyAICTE,NewDelhi&AccreditedbyNAACwith'A'Grade)
ValleyCampus,PollachiHighways,Coimbatore,Tamilnadu.

DETAILS OF CHANGES CoPos

CBCS PATTERN

UNDERGRADUATE PROGRAMMES

B.E ELECTRONICS AND COMMUNICATION ENGINEERING (UG)

REGULATION-2022 (Revised on June 2021)

Amendments on June 2023

SEMESTER I

22MA1101 MATRICES AND CALCULUS

PO / CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3	3	3	3	-	-	-	-	-	-	2	2	1
CO2	3	3	3	2	2	-	-	-	-	-	-	2	2	2
CO3	3	3	3	2	3	-	-	-	-	-	-	2	2	2
CO4	3	3	3	3	3	-	-	-	-	-	-	2	2	3
CO5	3	3	3	3	3	-	-	-	-	-	-	2	1	2
AVG	3	3	3	2.6	2.8	-	-	-	-	-	-	2	1.8	2

22CY1151 CHEMISTRY FOR CIRCUIT ENGINEERING

PO & PSO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	2	3	3	1	1	1	1	-	1	-	1	2	-	-

CO 2	2	3	2	1	1	1	1	-	1	-	1	2	-	-
CO 3	2	2	2	2	1	1	1	-	1	-	1	2	-	-
CO 4	2	2	3	1	2	1	1	-	1	-	2	2	-	1
CO 5	2	3	3	2	2	1	1	-	1	-	1	2	-	-
Avg	2	2.6	2.6	1.4	1.4	1	1	-	1	-	1.2	2	-	1

22HE1151 ENGLISH FOR ENGINEERS

POPSO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	2	1				1	2	2				1	1	2
CO2	2	1			1	1	1	2				2		2
CO3	2	1			1	1	2	3				1	1	2
CO4	2	1				1	2	2				1		
CO5	2	1				1	1	2				1	1	2
Avg	2	1	-	-	1	1	1.6	2.2				1.2	1	2

22EC1151 ELECTRON DEVICES

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

22IT1151/ 22CS1152 PYTHON PROGRAMMING AND PRACTICES/ OBJECT ORIENTED

PROGRAMMING USING PYTHON(IBM STUDENTS ONLY)

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

22HE1071 UHV

PO & PSO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	2	3	3	-	2	-	-	-	-	-	-	2	2	2
CO2	2	3	3	-	2	-	-	-	2	-	-	2	2	2
CO3	2	3	3	-	2	-	-	-	2	-	-	2	2	2
C	2	3	3	-	2	-	-	-	2	-	-	2	2	2

O4														
CO5	2	3	3	-	2	-	-	-	2	-	-	2	2	2
Avg	2	3	3	-	2	-	-	-	2	-	-	2	2	2

22HE1072 ENTREPRENEURSHIP & INNOVATION

PO CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	**PSO1**	**PSO2**
CO1	3	3	3	3	3	-	-	-	-	-	-	2	2	1
CO2	3	3	3	2	2	-	-	-	-	-	-	2	2	2
CO3	3	3	3	2	3	-	-	-	-	-	-	2	2	2
CO4	3	3	3	3	3	-	-	-	-	-	-	2	2	3
CO5	3	3	3	3	3	-	-	-	-	-	-	2	1	2
AVG	3	3	3	2.6	2.8	-	-	-	-	-	-	2	1.8	2

22MC1091/22MC1092 தமிழரசும் ததமிழிலல் நசடபமசும்/Indian Constitution

PO & PSO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	2	3	3	-	2	-	-	-	-	-	-	2	2	2
CO2	2	3	3	-	2	-	-	-	2	-	-	2	2	2
CO3	2	3	3	-	2	-	-	-	2	-	-	2	2	2

CO4	2	3	3	-	2	-	-	-	2	-	-	2	2	2
CO5	2	3	3	-	2	-	-	-	2	-	-	2	2	2
Avg	2	3	3	-	2	-	-	-	2	-	-	2	2	2

SEMESTER III

22MA3102 COMPLEX ANALYSIS AND TRANSFORMS (common to ECE,EEE,EIE)

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**	**PSO2**
CO1	3	3	3	2	2	-	-	2	-	2	-	2	2	2
CO2	3	3	3	2	3	-	-	2	-	2	-	2	2	2
CO3	3	3	3	3	3	-	-	2	-	2	-	2	2	2
CO4	3	3	3	3	3	-	-	2	-	2	-	2	1	2
CO5	3	3	3	3	3	-	-	2	-	2	-	2	2	1
Avg	3	3	3	2.6	2.8	-	-	2	-	2	-	2	1.8	1.8

22EC3201 ELECTRONIC CIRCUITS

PO CO	PO 1	PO 2	PO3	PO4	PO5	PO6	PO 7	PO 8	PO9	PO 10	PO1 1	PO1 2	**PSO 1**	**PSO 2**
CO1	**3**	3	3	3	**-**	3	**-**	3	**-**	2	**1**	**3**	**2**	**3**
CO2	**3**	3	3	3	**-**	3	**-**	3	**-**	2	**1**	**3**	**2**	**3**
CO3	**3**	3	3	3	**-**	3	**-**	3	**-**	2	**1**	**3**	**2**	**3**
CO4	**3**	3	3	3	**-**	3	**-**	3	**-**	2	**1**	**3**	**2**	**3**
CO5	**3**	3	3	3	**-**	3	**-**	3	**-**	2	**1**	**3**	**2**	**3**
AVG	**3**	**3**	**3**	**3**	-	**3**	**-**	**3**	-	2	**1**	**3**	**2**	**3**

22EC3202 SIGNALS AND SYSTEMS

PO & PSO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO10	PO11	PO12	PSO 1	PSO 2
CO 1	3	2	2	-	-	-	-	2	-	2	-	1	2	-
CO 2	3	2	2	-	-	-	-	2	-	2	-	1	2	-
CO 3	3	2	2	-	-	-	-	2	-	2	-	1	2	-
CO 4	3	2	2	-	-	-	-	2	-	2	-	1	2	-
CO 5	3	2	2	-	-	-	-	2	-	2	-	1	2	-
AVG	3	2	2					2		2		1	2	-

22EC3203 DIGITAL ELECTRONICS

PO & PSO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO10	PO11	PO12	PSO 1	PSO 2
CO 1	3	2	2	-	-	-	-	2	-	2	-	1	2	-
CO 2	3	2	2	-	-	-	-	2	-	2	-	1	2	-
CO 3	3	2	2	-	-	-	-	2	-	2	-	1	2	-
CO 4	3	2	2	-	-	-	-	2	-	2	-	1	2	-
CO 5	3	2	2	-	-	-	-	2	-	2	-	1	2	-
AVG	3	2	2					2		2		1	2	-

22EC3204 CIRCUITS AND NETWORKS

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

22EC3251/22IT3252 OOPS USING JAVA/RELATIONAL DATABASE MANAGEMENT SYSTEM (IBM STUDENTS ONLY)

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

22EC3001 ELECTRONIC CIRCUITS LABORATORY

PO CO	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	3	1	3	-	3	1	1	**1**	**3**	**2**	**3**
CO2	**3**	3	3	3	1	3	-	3	1	1	**1**	**3**	**2**	**3**
CO3	**3**	3	3	3	1	3	-	3	1	1	**1**	**3**	**2**	**3**
CO4	**3**	3	3	3	1	3	-	3	1	1	**1**	**3**	**2**	**3**
CO5	**3**	3	3	3	1	3	-	3	1	1	**1**	**3**	**2**	**3**
AVG	3	3	3	3	1	3	-	3	1	1	1	3	2	3

21MC1191 Essence of Indian Tradition Knowledge

PO CO	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	3	1	3	-	3	1	1	**1**	**3**	**2**	**3**
CO2	**3**	3	3	3	1	3	-	3	1	1	**1**	**3**	**2**	**3**
CO3	**3**	3	3	3	1	3	-	3	1	1	**1**	**3**	**2**	**3**
CO4	**3**	3	3	3	1	3	-	3	1	1	**1**	**3**	**2**	**3**
CO5	**3**	3	3	3	1	3	-	3	1	1	**1**	**3**	**2**	**3**
AVG	3	3	3	3	1	3	-	3	1	1	1	3	2	3

22EC3002 DIGITAL ELECTRONICS LABORATORY

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

22HE3071 SOFT SKILLS -2

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

22EC3901 MINI PROJECT 1

PO & PSO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PS02
CO1	3	2	2	3	2	2	2	3	3	3	3	1	3	3
CO2	3	2	2	3	2	2	2	3	3	3	3	1	3	3
CO3	3	2	2	3	2	2	2	3	3	3	3	1	3	3
CO4	3	2	2	3	2	2	2	3	3	3	3	1	3	3
CO5	3	2	2	3	2	2	2	3	3	3	3	1	3	3
AVG	3	2	2	3	2	2	2	3	3	3	3	1	3	3

SEMESTER V

21EC5201 Microprocessor and Microcontroller

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

21EC5202 Transmission lines and WaveGuides

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

CO 5	3	3	1	1	1	2	2	1	-	2	-	-	2	1
AVG	2.8	2.8	2	1	2.2	1.6	2	1	-	2	-	-	2.6	2

21EC5203 VLSI Design

	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO12**	**PSO1**	**PSO2**
CO 1	3	3	2	3	2	2	3	1	2	3	1	2	3	2
CO 2	3	3	2	3	2	2	2	1	1	2	2	2	2	2
CO 3	3	2	3	3	2	2	2	1	-	2	-	2	3	2
CO 4	3	2	3	2	2	2	2	1	2	2	1	2	2	2
CO 5	3	2	3	3	2	2	2	1	-	2	1	2	2	3
AVG	**3**	3	3	3	1.8	1.8	1.4	1	1	1.8	1	2.4	3	3

21EC5301 Measurement and Instrumentation

	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO12**	**PSO1**	**PSO2**
CO 1	3	3	2	3	2	2	3	1	2	3	1	2	3	2
CO 2	3	3	2	3	2	2	2	1	1	2	2	2	2	2
CO 3	3	2	3	3	2	2	2	1	-	2	-	2	3	2
CO 4	3	2	3	2	2	2	2	1	2	2	1	2	2	2
CO 5	3	2	3	3	2	2	2	1	-	2	1	2	2	3
AVG	**3**	3	3	3	1.8	1.8	1.4	1	1	1.8	1	2.4	3	3

21EC5251 Data Communication and Networks

	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO11**	**PO12**	**PSO1**	**PSO2**

CO 1	3	3	3	3	-	3	-	3	3	3	2	3	3	2
CO 2	3	3	3	3	3	3	-	3	-	3	-	3	3	3
CO 3	3	3	3	3	3	-	3	-	-	-	-	3	3	3
CO 4	3	3	3	3	-	-	2	3	3	-	2	-	3	3
CO 5	3	3	3	3	3	3	2	-	3	3	2	3	3	2
AV G	**3**	3	3	3	1.8	1.8	1.4	1.8	1.8	1.8	2	2.4	3	3

21EC5252 Digital Signal Processing

	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO12**	**PSO 1**	**PSO 2**
CO 1	3	3	2	3	2	3	3	1	-	1	-	1	2	3
CO 2	3	3	3	3	2	3	2	1	-	1	-	1	3	3
CO 3	3	3	2	3	3	3	3	1	-	1	-	1	3	3
CO 4	3	3	3	3	3	3	2	1	-	1	-	1	3	3
CO 5	3	3	3	3	3	3	3	1	-	1	-	1	2	3
AV G	**3**	3	2.6	3	2.6	3	2.6	1	-	1	-	1	2.6	3

21EC5001 VLSI Design Lab

	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO12**	**PSO 1**	**PSO 2**
CO 1	3	3	3	3	3	3	3	1	-	1	-	1	2	3
CO 2	3	3	3	3	3	3	3	1	-	1	-	1	3	3
CO 3	3	3	3	3	3	3	3	1	-	1	-	1	3	3
CO 4	3	3	3	3	3	3	3	1	-	1	-	1	3	3

CO 5	3	3	3	3	3	3	3	1	-	1	-	1	3	3
AVG	**3**	3	3	3	3	3	3	1	-	1	-	1	3	3

21EC5002 Microprocessors and Microcontrollers Lab

	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO12**	**PSO 1**	**PSO 2**
CO 1	3	3	2	3	2	3	3	1	-	1	-	1	2	3
CO 2	3	3	3	3	2	3	2	1	-	1	-	1	3	3
CO 3	3	3	2	3	3	3	3	1	-	1	-	1	3	3
CO 4	3	3	3	3	3	3	2	1	-	1	-	1	3	3
CO 5	3	3	3	3	3	3	3	1	-	1	-	1	2	3
AVG	**3**	3	2.6	3	2.6	3	2.6	1	-	1	-	1	1	3

21HE5071 Soft Skills - I

	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO12**	**PSO 1**	**PSO 2**
CO 1	3	3	3	3	3	3	3	1	-	1	-	1	2	3
CO 2	3	3	3	3	3	3	3	1	-	1	-	1	3	3
CO 3	3	3	3	3	3	3	3	1	-	1	-	1	3	3
CO 4	3	3	3	3	3	3	3	1	-	1	-	1	3	3
CO 5	3	3	3	3	3	3	3	1	-	1	-	1	3	3
AVG	**3**	3	3	3	3	3	3	1	-	1	-	1	3	3

21HE5072 Design Thinking

	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO12**	**PSO 1**	**PSO 2**

CO 1	3	3	3	3	3	3	3	1	-	1	-	1	2	3
CO 2	3	3	3	3	3	3	3	1	-	1	-	1	3	3
CO 3	3	3	3	3	3	3	3	1	-	1	-	1	3	3
CO 4	3	3	3	3	3	3	3	1	-	1	-	1	3	3
CO 5	3	3	3	3	3	3	3	1	-	1	-	1	3	3
AVG	**3**	3	3	3	3	3	3	1	-	1	-	1	3	3

SEMESTER VII

19EC7201 Digital Image Processing

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	3	3	1		1	2			2	2	3
CO2	3	3	3	3	3	1		1	2			2	2	3
CO3	3	3	3	3	3	1		1	2	3		2	2	3
CO4	3	3	3	2	3	1		1	2	3		2	2	3
CO5	3	3	3	3	3	1		1	2	3		2	2	3
AVG	3	3	3	3		1		1	2	1.4		2	1	3

19EC7202 Optical and Microwave Engineering

PO & PSO	**PO 1**	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO10**	**PO11**	**PO12**	**PSO 1**	**PSO 2**
CO 1	3	2	2	3	2	2	2	1		1		1	3	1
CO 2	3	2	2	3	2	2	2	1		1		1	3	1
CO 3	3	2	2	3	2	2	2	1		1		1	3	1

CO 4	3	2	2	3	2	2	2	1		1		1	3	1
CO 5	3	2	2	3	2	2	2	1		1		1	3	1
AV G	3	2	2	3	2	2	2	1		1		2	2	1

19EC7251 Wireless Communication

	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO1 0**	**PO1 1**	**PO1 2**	**PSO 1**	**PSO 2**
CO 1	3	3	3	3	2	2	-	1	-	3	3	1	3	3
CO 2	3	3	3	3	2	2	-	1	-	3	3	1	3	3
CO 3	3	3	3	2	2	2	-	1	-	3	3	1	3	3
CO 4	3	3	3	3	2	3	-	1	-	3	3	1	3	3
CO 5	3	3	3	3	2	2	-	1	-	3	3	1	3	3
AV G	3	3	3	3	2	2		1		3	3	1	3	3

19EC7001 Digital Image Processing Lab

PO & PSO	**PO 1**	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO1 0**	**PO1 1**	**PO1 2**	**PSO 1**	**PSO 2**
CO 1	3	2	2	3	2	2	2	3	3	3	3	1	3	1
CO 2	3	2	2	3	2	2	2	3	3	3	3	1	3	1
CO 3	3	2	2	3	2	2	2	3	3	3	3	1	3	1
CO 4	3	2	2	3	2	2	2	3	3	3	3	1	3	1
CO 5	3	2	2	3	2	2	2	3	3	3	3	1	3	1
AV G	3	2	2	3	2	2	2	3	3	3	3	2	2	1

19EC7002 Optical and Microwave Engineering Lab

PO & PSO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO10	PO11	PO12	PSO 1	PSO 2
CO 1	3	2	2	3	2	2	2	3	3	3	3	1	3	1
CO 2	3	2	2	3	2	2	2	3	3	3	3	1	3	1
CO 3	3	2	2	3	2	2	2	3	3	3	3	1	3	1
CO 4	3	2	2	3	2	2	2	3	3	3	3	1	3	1
CO 5	3	2	2	3	2	2	2	3	3	3	3	1	3	1
AVG	3	2	2	3	2	2	2	3	3	3	3	2	2	1

19EC7401 Introduction to IOT

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO10	PO11	PO12	PSO 1	PSO 2
CO 1	3	3	3	3	3	3	-	1	-	3	3	1	3	3
CO 2	3	3	3	3	3	2	-	1	-	3	3	1	3	3
CO 3	3	3	3	2	3	2	-	1	-	3	3	1	3	3
CO 4	3	3	3	3	3	2	-	1	-	3	3	1	3	3
CO 5	3	3	3	3	3	2	-	1	-	3	3	1	3	3
AVG	3	2	3	3	3	3	-	1	-	3-	1	3	2	3

19EC7901 Project Work – Phase I

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

Mapping of Course Outcome and Programme Outcome:

Year	Sem	Course code & Name	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO 10	PO 11	PO 12	PSO 1	PSO
I	I	22MA1101 MATRICES AND CALCULUS	3	3	3	2.6	2.8	-	-	-	-	-	-	2	1.8	2
		22CY1151 CHEMISTRY FOR CIRCUIT ENGINEERING	2	2.6	2.6	1.4	1.4	1	1	-	1	-	1.2	2	-	1
		22HE1151 ENGLISH FOR ENGINEERS	2	1	-	-	1	1	1.6	2.2	2.4	3	1	1.2	1	2
		22EC1151 ELECTRON DEVICES	3	2	2		1							2	2	2
		22IT1151/ 22CS1152 PYTHON PROGRAMMING AND PRACTICES/ OBJECT ORIENTED PROGRAMMING USING PYTHON(IBM STUDENTS ONLY)	2	3	3	-	2	-	-	-	2	-	-	2	2	2
		22HE1071 UHV	2	3	3	-	2	-	-	-	2	-	-	2	2	2
I		22HE1072 ENTREPRENEURSHIP & INNOVATION	3	2	2									1	2	2

		22MC1091/ 22MC1092 □□□□□□□□□□□□□□□□□□□□□□□□/Indian Constitution	2	3	3	-	2	-	-	-	2	-	-	2	2	2
	III	22MA3102 COMPLEX ANALYSIS AND TRANSFORMS (common to ECE,EEE,EIE)	3	3	3	2.6	2.8	-	-	2	-	2	-	2	1.8	1.8
		22EC3201 ELECTRONIC CIRCUITS	3	3	3	3	-	3	-	3	-	2	1	3	2	3
		22EC3202 SIGNALS AND SYSTEMS	3	2	2					2		2		1	2	-
		22EC3203 DIGITAL ELECTRONICS	3	2	2					2		2		1	2	-
		22EC3204 CIRCUITS AND NETWORKS	3	2	2	1	1	1	1	2	1	2	1	2	2	1
		22EC3251/22IT3252 OOPS USING JAVA/RELATIONAL DATABASE MANAGEMENT SYSTEM (IBM STUDENTS ONLY)	3	3	3	3	-	3	-	3	-	1	1	3	2	3
		22EC3001 ELECTRONIC CIRCUITS LABORATORY	3	3	3	2	1	2	1	3	1	1	2	3	2	2
II		22EC3002 DIGITAL ELECTRONICS LABORATORY	3	3	3	3	1	3	-	3	1	1	1	3	2	3
		21MC1191 Essence of Indian Tradition Knowledge	3	3	3	3	1	3	-	3	1	1	1	3	2	3
		22HE3071 SOFT SKILLS - 2	2	3	3	-	2	-	-	-	2	-	-	2	2	2
		22EC3901 MINI PROJECT 1	**3**	3	3	3	3	3	3	1	-	1	-	1	3	3
III	V	21EC5201 Microprocessor and Microcontroller	3	3	2	2	2	2	2	3	3	1	-	3	3	3
		21EC5202 Transmission lines and WaveGuides	3	3	2	1	3	2	2	1	-	2	-	-	2	2
		21EC5203 VLSI Design	**3**	3	3	3	1.8	1.8	1.4	1	1	1.8	1	2.4	3	3
		21EC5301 Professional Elective –I (Measurement and Instrumentation)	**3**	3	3	3	1.8	1.8	1.4	1	1	1.8	1	2.4	3	3
		21EC5251 Data Communication and Networks	**3**	3	3	3	1.8	1.8	1.4	1.8	1.8	1.8	2	2.4	3	3
		21EC5252 Digital Signal Processing	**3**	3	2.6	3	2.6	3	2.6	1	-	1	-	1	2.6	3
		21CS5331 Angular JS(for IBM students)														
		21EC5001 VLSI Design Lab	**3**	3	3	3	3	3	3	1	-	1	-	1	3	3
		21EC5002 Microprocessors and Microcontrollers Lab	**3**	3	2.6	3	2.6	3	2.6	1	-	1	-	1	1	3

		21HE5071 Soft Skills - I	3	**3**	3	3	3	3	3	3	1	-	1	-	1	3
		21HE5072 Design Thinking	**3**	3	3	3	3	3	3	1	-	1	-	1	3	3
IV	**VII**	19EC7201 Digital Image Processing	3	3	3	3		1		1	2	1.4		2	1	3
		19EC7202 Optical and Microwave Engineering	3	2	2	3	2	2	2	1		1		2	2	1
		19EC7401 Introduction to IOT	3	2	3	3	-	3	-	2	-	-	1	3	2	3
		19EC7251 Wireless Communication	3	3	3	3	2	2		1		3	3	1	3	3
		19EC7001 Digital Image processing Lab	3	2	2	3	2	2	2	3	3	3	3	2	2	1
		19EC7002 Optical Communication and Microwave Lab	3	2	2	3	2	2	2	3	3	3	3	2	2	1
		19EC7901 Project Work – Phase I	3	2	2	3	2	2	2	3	3	3	3	2	2	1

Chairman - BoS
ECE - HiCET

Chairman 107

Dean (Academics)
HiCET