HINDUSTHAN EDUCATIONAL AND CHARITABLE TRUST

HICET

HINDUSTHAN

COLLEGE OF ENGINEERING AND TECHNOLOGY

(An Autonomous Institution)

Coimbatore – 641032

DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

Curriculum and Syllabus for the Batch 2021-2025

(Academic Council Meeting Held on 03.03.2023)

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 2021)

(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
			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 /21CS5331	**Professional Elective -I/** Angular JS(IBM)	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
PRACTICALS										
7	21EC5001	VLSI Design Lab	PC	0	0	3	1.5	50	50	100
8	21EC5002	Microprocessors and MicrocontrollersLab	PC	0	0	3	1.5	50	50	100
MANDATORY COURSES										
9	21HE5071	Soft Skills - I	EEC	1	0	0	1	100	0	100
10	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 Miroservices(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	50	50	100
6	21EC6253	Digital Communication	PC	2	0	3	3.5	50	50	100
PRACTICALS										
7	19IT6003	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
6	21EC5305	Data Science	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 Rights and Gender Equality	OE	3	0	0	3	40	60	100
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 for the 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

Vertical I

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	21MB5231	Financial Management	MDC	3	0	0	3	3
2	21MB6231	Fundamentals of Investment	MDC	3	0	0	3	3
3	21MB6232	Banking, Financial Services and Insurance	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	21MB5232	Foundations of Entrepreneurship	MDC	3	0	0	3	3
2	21MB6233	Team Building & Leadership Management for Business	MDC	3	0	0	3	3
3	21MB6234	Creativity & Innovation in Entrepreneurship	MDC	3	0	0	3	3
4	21MB7233	Principles of Marketing Management For Business	MDC	3	0	0	3	3
5	21MB72334	Human Resource Management for Entrepreneurs	MDC	3	0	0	3	3
6	21MB8232	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	21CE5232	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

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 Networks	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

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	HS	4	4				3			11
2	BS	10	10	4	4					28
3	ES	6	8							14
4	PC			16	17	19	12	12	6	82
5	PE					3	3	3		9
6	OE						3	3		6
7	EEC					2	3	2	8	15
	Total	**20**	**22**	**20**	**21**	**24**	**24**	**20**	**14**	**165**

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 BoS

Dean Academics

Principal

Chairman - BoS
ECE - HiCET

Dean (Academics)
HiCET

PRINCIPAL
Hindusthan College Of Engineering & Technology
[illegible] - 641 032.

SYLLABUS

For the students admitted during the academic year 2021-2022

IV SEM

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

Course Objective

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

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

Course Outcome

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

TEXT BOOKS:

T1 - Saeed Ghahramani, "Fundamentals of probability with stochastic processes", Prentice Hall New Jersy, 2016
T2 –Douglas C.Montgomery and George C Runger,"Applied statistics and probability for Engineers",Wiley,Delhi, 2014.

REFERENCE BOOKS :

R1 – Ibe. O.C., "Fundamentals of Applied Probability and Random Processes", Elsevier, 1st Indian Reprint, 2010 .
R2 - Veerarajan, T., "Probability, Statistics and Random Processes". Tata McGraw-Hill,2nd Edition, New Delhi, 2010.
R3 - Miller. S.L. and Childers. D.G., "Probability and Random Processes with Applications to Signal Processing and Communications", Academic Press, 2nd Edition, 2014

Chairman - BoS
ECE - HiCET

ACADEMIC COUNCIL * HINDUSTHAN COLLEGE OF ENGG & TECH * Chairman

Dean (Academics)
HiCET

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

Course Objective

1. To understand the basic laws and concepts of electromagnetism
2. To obtain the electric and magnetic fields for simple configurations under static conditions.
3. To analyze time varying electric and magnetic fields.
4. To understand Maxwell's equation in different forms and different media
5. To understand wave propagation in lossy and lossless media

UNIT I STATIC ELECTRIC FIELDS 12

Vector Algebra, Coordinate Systems, Vector differential operator, Gradient, Divergence, Curl, Divergence theorem, Stokes theorem, Coulombs law, Electric field intensity, Point, Line, Surface and Volume charge distributions, Electric flux density, Gauss law, Absolute Electric potential, Potential difference, Calculation of potential differences for different configurations, Electric dipole, Electrostatic Energy and Energy density

UNIT II CONDUCTORS AND DIELECTRICS 12

Current and current density, Ohms Law in Point form, Continuity equation of current, Boundary conditions of perfect dielectric materials. Permittivity of dielectric materials, Capacitance, Parallel plate, Coaxial and Spherical capacitors, Boundary conditions for perfect dielectric materials, Poisson's equation, Laplace's equation

UNIT III STATIC MAGNETIC FIELDS 12

Biot -Savart Law, Magnetic field Intensity, Estimation of Magnetic field Intensity for straight and circular conductors. Ampere's Circuital Law, Point form of Ampere's Circuital Law, Magnetic flux and magnetic flux density. The Scalar and Vector Magnetic potentials, Force on a moving charge, Force on a differential current element. Force between current elements, Force and torque on a closed circuit, Magnetic boundary conditions involving magnetic fields, Inductance, Basic expressions for self and mutual inductances, Inductance and Inductors ,Magnetic Energy – Magnetic forces and Torques.

UNIT IV TIME-VARYING FIELDS AND MAXWELL's EQUATIONS 12

Faraday's law, Displacement current and Maxwell-Ampere law, Maxwell's equations, Potential Functions, Electromagnetic boundary conditions, Wave equations and solutions, Time Harmonic Fields

UNIT V PLANE ELECTROMAGNETIC WAVES 12

Plane waves in lossless media, Plane waves in lossy media (low-loss dielectrics and good conductors), Group velocity, Electromagnetic power flow and Poynting vector, Normal incidence at a plane conducting boundary, Normal incidence at a plane dielectric boundary

OUTCOMES:

Upon completion of the course, the students would be able to

- Understand the basic laws of electromagnetism.
- Analyze field potentials due to static charges and static magnetic fields.
- Analyze time varying electric and magnetic fields.
- To understand Maxwell's equation in integral, differential and phasor forms
- Explain Electromagnetic wave propagation in Lossy and Lossless media.

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BE 65

TEXT BOOKS:

1. D.K.Cheng, Field and Wave electromagnetics, 2nd Edition,Pearson(India),2004
2. Willium H Hayt and Jr John A Buck, "Engineering Electromagnetics" Tata Mc Graw-Hill Publishing Company Ltd, New Delhi, 2008

REFERENCES:

1. M. N. O. Sadiku, "Elements of Electromagnetics", Oxford University Publication, 2014.
2. A. Pramanik, "Electromagnetism - Theory and applications", PHI Learning Pvt. Ltd, New Delhi,2009.
3. A. Pramanik, "Electromagnetism-Problems with solution", Prentice Hall India, 2012.
4. E.C.Jordan and K.G. Balmain, "Electromagnetic Waves and Radiating Systems"2nd Edition, Prentice Hall of India, 2006John D Kraus and Daniel A Fleisch, "Electromagnetics with Applications", Mc Graw Hill Book Co. 2005
5. Karl E Longman and Sava V Savov, "Fundamentals of Electromagnetics", Prentice Hall of India, New Delhi, 2006
6. Ashutosh Pramanic, "Electromagnetism", Prentice Hall of India , New Delhi, 2006

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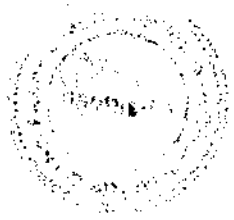

Programme	Course Code	Name of the Course	L	T	P	C
BE	21EC4202	Analog Communication	3	1	0	4

Course Objective

1. To introduce the concept of Amplitude Modulation and methods to generate and detect AM waves.
2. To introduce the concept of Angle Modulation and methods to generate and detect FM waves
3. To impart knowledge on the impact of noises in communication systems
4. To impart knowledge on different types of Radio Transmitters and receivers.
5. To understand the concepts of analog pulse modulation techniques.

Unit	Description	Instructional Hours
I	**AMPLITUDE MODULATION SYSTEMS:** Communication system model - Need for modulation -Amplitude Modulation – Modulation index, frequency spectrum, Average power- DSBSC, SSB, VSB– Amplitude modulator circuits- collector modulator, Balanced modulator, Ring modulator–SSB generation- Amplitude Demodulator circuits –Envelope detectors.	12
II	**ANGLE MODULATION SYSTEMS:** Angle modulation –FM and PM –Narrow band, Wideband FM -Spectral analysis of modulated signal – Bandwidth requirements- Carson's Rule - Pre emphasis, De-emphasis - Generation and demodulation of FM waves -Indirect and Direct FM generation, Balanced Frequency Discriminator and PLL demodulator.	12
III	**NOISE IN CONTINUOUS WAVE MODULATION SYSTEMS:** Noise Sources -Noise Figure, Effective Noise Temperature and Noise Bandwidth-Noise in CW Modulation systems- Noise in Linear Receiver using coherent detection, Noise in AM receivers using envelope Detection - Noise in FM receivers	12
IV	**TRANSMITTERS AND RECEIVERS:** AM broadcasting transmitters- Low Level and High Level transmitters - Pilot carrier SSB Transmitter- FM transmitters- Armstrong FM systems. Tuned radio frequency receiver - Super heterodyne receiver - FM receiver – Diversity reception techniques-TDM,FDM	12
V	**ANALOG PULSE MODULATION SYSTEMS** Sampling process –Generation and Detection- Pulse-amplitude modulation – Pulse-Width modulation – Pulse Position Modulation -Bandwidth-noise trade off-Noise consideration in Pulse modulation systems.	12
	Total Instructional Hours	**45**

Course Outcome

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

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TEXT BOOKS:

TI- Dennis Roddy, John Coolen ,"Electronic Communications", 4th edition, Pearson Education, 2009(Unit I,II,III)

TI - Simon Haykin, "Communication Systems", 4th edition, Wiley Publication, New Delhi, 2011. (Unit IV,V)

REFERENCE BOOKS :

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

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

R3 - Kennedy G. "Electronic Communication systems", Tata McGraw Hill, New Delhi, 2009.

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

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

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

Course Objective

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

Unit	Description	Instructional Hours
I	**BASICS OF OPERATIONAL AMPLIFIERS** Basic information about op-amps – Ideal Operational Amplifier - General operational amplifier stages,DC and AC performance characteristics, slew rate, Open and closed loop configurations.	9
II	**APPLICATIONS OF OPERATIONAL AMPLIFIERS** Sign Changer, Scale Changer, Phase Shift Circuits, Voltage Follower, V-to-I and I-to-V converters, adder, subtractor, Instrumentation amplifier, Integrator, Differentiator, Precision rectifier, clipper and clamper, Low-pass, high-pass and band-pass Butterworth filters.	9
III	**COMPARATORS AND WAVEFORM GENERATORS** Comparators, Schmitt trigger, astable and monostable multivibrator, triangular wave generator, Sine-wavegenerators using IC 741, astable and monostable multivibrator using IC 555. Frequency to Voltage and Voltage to Frequency converters.	9
IV	**ANALOG TO DIGITAL AND DIGITAL TO ANALOG CONVERTERS** D/A converter – specifications - weighted resistor type, R-2R Ladder type, Voltage Mode and Current-Mode -R - 2RLadder types - switches for D/A converters. A/D Converters – specifications - Flash type - Successive Approximation type - Single Slope type – Dual Slope type.	9
V	**PLL AND VOLTAGE REGULATORS** Operation of the basic PLL, Voltage controlled oscillator, Application of PLL for AM detection, FM detection, IC Voltage regulators – Three terminal fixed voltage regulators , adjustable voltage regulators,general purpose regulators using IC 723.	9
	Total Instructional Hours	**45**

Course Outcome

CO1: To understand the characteristics of opamp.
CO2: To understand the various applications of opamp.
CO3: To understand the various wave generating and shaping circuits.
CO4: To apply ADC and DAC for various applications.
CO5: To understand the concept of PLL and voltage regulators.

TEXT BOOKS:

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

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

REFERENCE BOOKS:

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

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

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

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

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

Course Objective

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

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

Course Outcome

CO1: To understand the concept of mathematically modeling of control systems.
CO2: To remember the different time domain specifications and implement in the steady state error concept.
CO3: To interpret the concepts of various frequency response plots.
CO4: To understand the concept of the stability of closed loop control system.
CO5: To retrieve the concepts of mathematical modeling and implement in a state variable approach.

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TEXT BOOKS:

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

REFERENCE BOOKS:

R1- Katsushiko Ogata,"Modern control engineering",Pearson education,5th Edition, 2010.
R2- Schaum's Outline Series, "Feed back and Control Systems" ,Tata McGraw-Hill, 2nd Edition,2013.
R3- A.Nagoorkani,"Control Systems Engineering",RBA publications, First edition,2014.
R4- John J.D Azzo & Constantine H.Houpis, "Linear Control System Analysis and Design", TMH, 1995.

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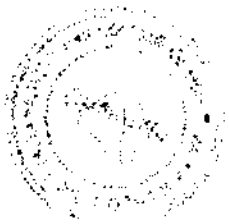

Programme	Course Code	Name of the Course	L	T	P	C
BE	21EC4252	DESIGN THINKING-An introduction	2	0	2	3

Course Objective

1. Expose students to the design process as a tool for innovation.
2. Develop students' professional skills in client management and communication.
3. Students develop a portfolio of work to set them apart in the job market.
4. Provide an authentic opportunity for students to develop teamwork and leadership skills.
5. Demonstrate the value of developing a local network and assist students in making lasting connections with the business community

Unit	Description	Instructional Hours
I	**DESIGN THINKING HISTORY AND OVERVIEW** Understand what came before Design Thinking-Identify who did what to bring it about-Learn how it built upon previous approaches-How design thinking is introduced in an organization-Understand the transformation required-What outcomes are possible-Understand the whole approach to design thinking-Determine what is most important.	6
II	**KEY HABITS** Introduction to key habits-types-avoid common anti-patterns-Optimize for success with these habits-Introduction to loop-Importance of iteration-How to observe, Reflect &Make-Drill down and do tomorrow. Illustrative activities: Listening, HMW	6+4(P)
III	**USER RESEARCH AND MAKE** Importance of user research-Apperciate empathy through listening-Key methods of user research-How make fits into the loop-Leverage observe information-Ideation, story boarding &Prototyping. Illustrative activities: User research, Practice mapping insights from user research, Practice ideation and prioritization, Collaboratively consolidate storyboards, Develop a summary hill statement, Build your story board and hill into a prototype.	5+9(P)
IV	**USER FEEDBACK AND TEACHING** User feedback and the loop-Different types of user feedback-How to carryout getting feedback-Understand the challenges of teaching EDT-Valuable hints and tips-Ready to teach the course. Illustrative activities: Practice teaching selected section	4+5(P)
V	**LOGISTICS AND APPLICATIONS** Understand what type of room you need-Learn what materials and supplies you need-Learn how to setup the room-Domains that are applicable-Digital versus physical-Explore some technology specialization.	6(P)

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Description of the Experiments

1. Listening
2. HMW
3. User Research
4. Practice mapping insights from user research
5. Practice ideation and prioritization
6. Collaboratively consolidate storyboards
7. Develop a summary Hill statement
8. Build your story board and hill into a prototype
9. Practice teaching selected section

Total Instructional Hours **(27 + 18) 45**

Course Outcome

CO1: Students develop a strong understanding of the Design Process and how it can be applied in a variety of business settings

CO2: Students learn to build empathy for target audiences from different "cultures"

CO3: Students learn to research and understand the unique needs of a company around specific challenges

CO4: Students learn to develop and test innovative ideas through a rapid iteration cycle

TEXT BOOKS:

T1 :IBM Course Ware

REFERENCE BOOKS:

R1:Creative Confidence-Tom Kelley.,2013

R2:Change by Design-Tim Brown.,2009

R3:Design Thinking-Nigel Cross.,Kindle Edition

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

Course Objective

1. To apply operational amplifier in linear applications.
2. To apply operational amplifiers in nonlinear applications
3. To use SPICE software for circuit design.

Exp.No.	Description of the Experiments
	Design and Test the following experiments
1	Voltage Follower, Inverting & Non inverting amplifiers using 741 op-amp.
2	Active low-pass, High-pass and band-pass filters using 741 op-amp.
3	Astable multivibrator, Monostable multivibrator and Schmitt Trigger using 741 op-amp.
4	PLL characteristics.
5	Voltage regulator using IC 723
6	Function Generator using IC 8038.
	Simulate the following experiments
7	Integrator, Differentiator and Instrumentation Amplifier using SPICE.
8	Astable & Monostable multivibrators with NE555 Timer using SPICE.
9	Phase shift and Wien bridge oscillators with op-amp using SPICE.
10	D/A and A/D converters using SPICE.

Total Practical Hours 45

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RE 75

Programme	Course Code	Name of the Course	L	T	P	C
B.E	21EC4002	Analog Communication Laboratory	0	0	3	1.5

Course Objective

1. To understand different modulation and demodulation schemes.
2. To analyze spectral characteristics of modulated signals
3. To understand the concept of multiplexing of signals.

Exp.No.	Description of the Experiments
1	Design and testing of Amplitude Modulation and Demodulation
2	Design and testing of Frequency Modulation and Demodulation.
3	Design and testing of Pre Emphasis - De Emphasis Circuits
4	Design and testing of Mixer Circuit
5	Design and testing of Phase locked loop
6	Pulse Amplitude Width Modulation
7	Time Division Multiplexing.
	Simulation Experiments
8	DSB SC Modulation and Demodulation.
9	Pulse Width and Pulse Position modulation
10	Spectral Characteristics of AM & FM

Total Practical Hours 45

Course Outcome

CO1: Analyze the performance of various modulation and demodulation methods.
CO2: Able to interpret the spectral characteristics of the modulated signals
CO3: Able to analyze multiplexing techniques in signal reception

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BE76

Programme	Course Code	Name of the Course	L	T	P	C
BE	21MC4191	ESSENCE OF INDIAN TRADITIONAL KNOWLEDGE	2	0	0	0

Course Objective

1. To facilitate the students with the concepts of Indian traditional knowledge and to make them understand the Importance of roots of knowledge system
2. To make the students understand the traditional knowledge and analyze it and apply it to their day to day life
3. To impart basic principles of thought process. Itiha s and Dharma Shastra and connecting society and nature
4. To understand the concept of Intellectual and intellectual property rights with special reference.
5. To focus on introduction to Indian Knowledge System, Indian perspective of modern scientific world-view and basic principles of Yoga and Indian philosopy

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

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B&T

Course Outcome

CO1: Identify the concept of Traditional knowledge and its importance

CO2: Explain the need and importance of protecting traditional knowledge.

CO3: Explain the need and importance of Itihas and Dharma Shastra.

CO4: Interpret the concepts of Intellectual property to protect the traditional knowledge.

CO5: Interpret the concepts of indian philosophy to protect the traditional knowledge

REFERENCE BOOKS:

1. Traditional Knowledge System in India. by Amit Jha. 2009.
2. Traditional Knowledge System in India by Amit Jha Atlantic publishers, 2002.
3. "Knowledge Traditions and Practices of India" Kapil Kapoor1, Michel Danino2.
4. V. Sivaramakrishna (Ed.), Cultural Heritage of India-Course Material, Bharatiya Vidya Bhavan, Mumbai, 5th Edition, 2014.
5. V N Jha (Eng. Trans,), Tarkasangraha of Annam Bhatta, Inernational Chinmay Foundation, Veliarnad, Amaku,am.

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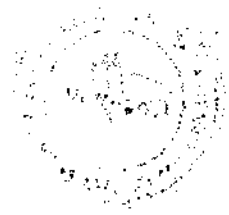

Course code	Course title	L	T	P	C
21HE4072	Career Guidance – Level IV Personality, Aptitude and Career Development	2	0	0	0
Pre-requisite	None	Syllabus version 1			

Course Objectives:

- Solve Logical Reasoning questions of easy to intermediate level [SLO 6]
- Solve Quantitative Aptitude questions of easy to intermediate level [SLO 7]
- Solve Verbal Ability questions of easy to intermediate level [SLO 8]
- Crack mock interviews with ease [SLO 13]
- Be introduced to problem-solving techniques and algorithms [SLO 14]

Expected Course Outcome:

Enable students to solve Aptitude questions of placement level with ease, as well as write effective essays.

Student Learning Outcomes (SLO): 6, 7, 8, 13, 14

Module:1 Logical Reasoning **3 hours** **SLO:6**

Logical connectives, Syllogism and Venn diagrams

- Logical Connectives
- Syllogisms
- Venn Diagrams – Interpretation
- Venn Diagrams - Solving

Module:2 Quantitative Aptitude **6 hours** **SLO: 7**

Logarithms, Progressions, Geometry and Quadratic equations

- Logarithm
- Arithmetic Progression
- Geometric Progression
- Geometry
- Mensuration
- Coded inequalities
- Quadratic Equations

Permutation, Combination and Probability

- Fundamental Counting Principle
- Permutation and Combination
- Computation of Permutation
- Circular Permutations
- Computation of Combination
- Probability

Module:3 Verbal Ability **2 hours** **SLO: 8**

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Critical Reasoning

- Argument – Identifying the Different Parts (Premise, assumption, conclusion)
- Strengthening statement
- Weakening statement
- Mimic the pattern

Module:4 Recruitment Essentials **1 hour** **SLO:** 12

Cracking interviews - demonstration through a few mocks

Sample mock interviews to demonstrate how to crack the:

- HR interview
- MR interview
- Technical interview

Cracking other kinds of interviews

- Skype/ Telephonic interviews
- Panel interviews
- Stress interviews

Resume building – workshop

A workshop to make students write an accurate resume

Module:5 Problem solving and Algorithmic skills **8 hours** **SLO:** 12

- Logical methods to solve problem statements in Programming
- Basic algorithms introduced

Total Lecture hours: 20 hours

Mode of Evaluation: Assignments, Mock interviews, 3 Assessments with End Semester (Computer Based Test)

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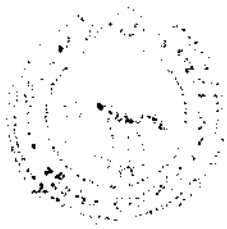

Programme	Course Code	Name of the Course	L	T	P	C
B.E./B.Tech.	**19HE4073**	**IDEATION SKILLS**	1	0	0	0

Course Objective

- To study the importance of ideation.
- To learn about the various tools for Ideation.
- To provide an insight in Prototyping and its significance.

Unit	Description	Instructional Hours
	IDEATION: INTRODUCTION TO DESIGN THINKING METHODOLOGY	
I	Design Thinking Methodology and how it can be used as a powerful tool for developing new and innovative solutions - Inspiration – Implementation - Disruptive technology.	4
	IDEATION: TOOLS FOR IDEATION	
II	Various resources to kindle new ideas for innovation. Explore the types of ideas in the past – Effect of the ideas and innovation of past on the world – Innovation Thinking – Case studies.	4
	IDEATION: INTRODUCTION TO CUSTOMER DISCOVERY	
III	Intro to Customer Discovery - development of customer discovery plan that can lead to powerful business innovation - Customer Discovery Plan	4
	PROTOTYPING AND PRODUCT IDEATION	
IV	Introduction to Prototyping - minimum viable product - High fidelity prototype vs low fidelity prototype – Prototyping tools	3
	Total Instructional Hours	**15**

Course Outcome

Upon completion of the course, students will be able to
CO1: Develop a strong understanding and importance of ideation
CO2: Learn about the different kinds of tools for Ideation.
CO3: Learn the need and significance of prototyping and its significance.

TEXT BOOKS:

T1 - Mark Baskinger and William Bardel, "Drawing Ideas: A Hand-Drawn Approach for Better Design",2013
T2 - Nigel Cross, "Design Thinking", Kindle Edition

REFERENCE BOOKS:

R1 - Kurt Hanks and Larry Belliston, "Rapid Viz : A New Method for the Rapid Visualitzation of Ideas", 2008.
R2 - Kathryn McElroy , "Prototyping for Designers: Developing the Best Digital and Physical Products". 2017.

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SYLLABUS

For the students admitted during the academic year 2020-2021

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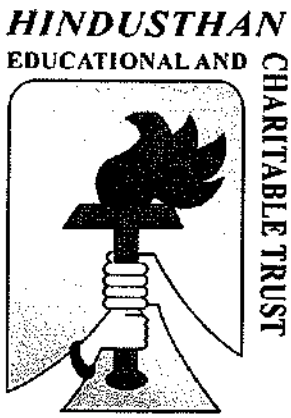

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HINDUSTHAN

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

(Academic Council Meeting Held on 03.03.2023)

2019 REGULATIONS

HINDUSTHAN EDUCATIONAL AND CHARITABLE TRUST
HICET

Hindusthan College of Engineering and Technology

(An Autonomous Institution, Affiliated to Anna University, Chennai
Approved by AICTE, New Delhi & Accredited by NAAC with 'A' Grade)
Valley Campus, Pollachi Highways, Coimbatore, Tamilnadu.

DETAILS OF CHANGES CARRIED OUT IN CURRICULUM & SYLLABUS

CBCS PATTERN

UNDERGRADUATE PROGRAMMES

B.E ELECTRONICS AND COMMUNICATION ENGINEERING (UG)

REGULATION-2019

(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/ 19CS1152	Python Programming and Practices/ Object Oriented Programming using Python(IBM)	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 Methods and 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/ 19CS2153	Essentials of C&C++Programming/ Java Fundamentals (IBM)	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/ 19IT3252	Oops using Java/ Relational Database Management System	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	19EC4203R	Linear Integrated Circuits	PC	3	0	0	3	25	75	100
THEORY WITH LAB COMPONENT										
5	19EC4251 /19EC4252	Control Systems/ Design Thinking-An Introduction (IBM)	PC	2	0	2	3	50	50	100
PRACTICAL										
6	19EC4001R	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 /19CS5331	**Professional Elective -I/** Angular JS(IBM)	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	19EC6202	Antenna and Wave Propagation	PC	3	1	0	4	25	75	100
2	19EC6181	Principles of Management	HS	3	0	0	3	25	75	100
3	19EC63XX	Professional Elective – II	PE	3	0	0	3	25	75	100
4	19XX64XX	Open Elective– I	OE	3	0	0	3	25	75	100
THEORY WITH LAB COMPONENTS										
5	19EC6251	Embedded Systems and IOT	PC	2	0	3	3	50	50	100
PRACTICALS										
MANDATORY COURSES										
			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	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 /19EC7331	**Professional Elective-III/** Blockchain	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 and Microwave 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
6	19EC5305	Data Science	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
6	19EC6305	Virtual Reality And Augmented Reality	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	19EC7181	Entrepreneurship Development	PE	3	0	0	3	25	75	100
5	19EC7305	Cyber Forensics	PE	3	0	0	3	25	75	100
6	19EC7306	Embedded Controllers	PE	3	0	0	3	25	75	100
PROFESSIONAL ELECTIVE IV										
1	19EC8301	Neural networks and Deep learning	PE	3	0	0	3	25	75	100
2	19EC8303	Satellite Communication	PE	3	0	0	3	25	75	100
3	19EC8304	Wireless Sensors and Networks	PE	3	0	0	3	25	75	100
4	19EC8181	Foundation Skills in Integrated Product Development	PE	3	0	0	3	25	75	100
5	19EC8305	Medical Image Processing	PE	3	0	0	3	25	75	100
7.	19EC8312	Cloud Computing	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
6	19EC8310	Fundamentals of Nano Science	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

(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	19EC4252	Design Thinking-An Introduction	IC	2	0	2	3	50	50	100
5	19CS5331	Angular JS	IC	2	0	2	3	50	50	100
6	19CS6351	Node JS and Micro services	IC	2	0	2	3	50	50	100
7	19CS6255	IoT and Spring Framework	IC	2	0	2	3	50	50	100
8	19EC7331	Blockchain	IC	2	0	2	3	50	50	100

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	HS	4	4				3			11
2	BS	10	10	4	4					28
3	ES	6	8							14
4	PC			16	17	19	12	12	6	82
5	PE					3	3	3		9
6	OE						3	3		6
7	EEC					2	3	2	8	15
	Total	20	22	20	21	24	24	20	14	165

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**

P. Haylal
Chairman BoS

Chairman - BoS
ECE - HiCET

Dean Academics

Dean (Academics)
HiCET

Principal

PRINCIPAL
Hindusthan College Of Engineering & Technology
COIMBATORE - 641 032.

SYLLABUS

For the students admitted during the academic year 2019-2020

VIII SEM

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

Course Objective

The student should be able to

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

S.No Guidelines

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

Course Outcome

1. Formulate a real world problem, identify the requirement and develop the design solutions.
2. Identify technical ideas, strategies and methodologies.
3. 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.
4. Prepare report and present the oral demonstrations.

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

Course Objective

The student should be able to

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

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

Course Outcome

After completion of the course the learner will be able to

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

TEXT BOOKS:

T1 - Barry Leatham - Jones, "Elements of industrial Robotics", Pitman Publishing, 1987.
T2 - J. M. Selig. "Introductory Robotics". Prentice Hall, 1992.

REFERENCE BOOKS:

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

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

Course Objective

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

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

Course Outcome

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

TEXT BOOKS:

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

REFERENCES BOOKS:

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

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

Course Objective

The student should be able to

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

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

Course Outcome

After completion of the course the learner will be able to

CO1: Discriminate RISC and CISC processors, and work with PIC microcontrollers.

CO2: Work with the 16 bit microcontroller RL78 and design microcontroller based systems for a Real world application.

CO3: Apply the concept of multitasking and RTOS in embedded system design.

CO4: Gaining design knowledge and concepts on MSP430 family of Microcontroller.

CO5: Ability to design and develop microcontroller based smart electronic system and home appliances.

TEXT BOOKS:

T1- Muhammad Ali Mazidi, Rolind D. Mckinlay and Danny Causey. "PIC Microcontroller and Embedded Systems". Pearson Education, 2008. (Unit I and III).

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T2-John H. Davies, "MSP 430 Micro controller basics", Elsevier, 2008. (Unit IV and V).

REFERENCE BOOKS:

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

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

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

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

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

Course Objective

The student should be conversant with

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

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

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Course Outcome

After the completion of the course, the learner will be able to

CO1: Understand principle, working and operation of various sub systems of satellite as well as the earth station.

CO2: Understand Effects of radio propagation in satellites

CO3: Apply various communication techniques for satellite applications

CO4: Analyze and design satellite communication link

CO5: Learn advanced techniques and regulatory aspects of satellite communication and Understand role of satellite in various applications

TEXT BOOKS:

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

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

REFERENCE BOOKS:

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

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

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869

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

Course Objective

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

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

Course Outcome

CO4: Outline the characteristics and challenges of Wireless Sensor Networks
CO5: Demonstrate the WSN network architecture and its operation
CO6: Summarize various medium access protocols used for WSN.
CO4: Illustrate the various mechanism for time synchronization and topology control in WSN
CO5: Infer the routing techniques used in WSN

TEXT BOOKS:

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

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

REFERENCE BOOKS:

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

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

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

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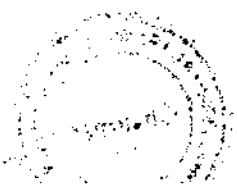

Programme	Course code	Name of the Course	L	T	P	C
BE	19EC8305	Medical Image Processing	3	0	0	3

Course Objective

1. To acquaint the basic concepts of various medical imaging modalities
2. To understand the concepts of ultrasound imaging methodologies
3. To familiarize the medical image formats and basic processing methodologies
4. To analyse the computational methods for segmentation in medical imaging
5. To interpret image guided and computer aided diagnosis of diseases.

Unit	Description	Instructional Hours
I	**INTRODUCTION TO MEDICAL IMAGING** Introduction to medical imaging technology, systems, and modalities. importance; applications; trends; challenges. Medical Image Formation Principles: X-Ray physics; X-Ray generation, attenuation, scattering; dose Basic principles of CT; reconstruction methods; artifacts.	9
II	**NUCLEAR IMAGING** PET and SPECT Ultrasound Imaging methods; mathematical principles; resolution; noise effect;3D imaging; Medical Image Search and Retrieval Current technology in medical image search, Image Guided Surgery, Image Guided Therapy, Computer Aided Diagnosis/Diagnostic Support Systems.	9
III	**MEDICAL IMAGE STORAGE AND PROCESSING** Medical Image Storage, Formats: DICOM Radiology Information Systems (RIS) and Hospital Information Systems (HIS). Medical Image Processing, Enhancement, Filtering Basic image processing algorithms Thresholding; contrast enhancement; SNR characteristics; filtering;histogram modeling.	9
IV	**MEDICAL IMAGE SEGMENTATION** Histogram-based methods; Region growing and watersheds; Markov Random Field models; active contours; model-based segmentation. Multi-scale segmentation; semi-automated methods; clustering-based methods; classification-based methods; optimization techniques	9
V	**MEDICAL IMAGE ANALYSIS OF SHAPE AND TEXTURE** Representation of shapes and contours – Shape factors – Models for generation of texture – Statistical analysis of texture – Fractal analysis – Fourier domain analysis of texture – Segmentation and structural analysis of texture. Pattern classification and diagnostic decision – Measures of diagnostic accuracy – Applications: Contrast enhancement of mammograms – Detection of calcifications by region growing – Shape and texture analysis of tumours.	9
	Total Instructional Hours	45

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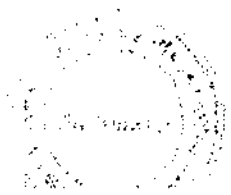

Course Outcome

Upon Completion of the course, the students should be able to:

CO1: Analyze various medical Imaging modalities

CO2: Analyze various methodologies to interpret the ultrasound images.

CO3: Design and implement image processing applications that incorporates different concepts of medical Image Processing

CO4: Critically analyze different approaches to implement mini projects in medical domain

CO5: extract, model, and analyze information from medical data and applications in order to help diagnosis, treatment and monitoring of diseases through computer science.

TEXT BOOKS:

1 Paul Suetens, "Fundamentals of Medical Imaging", Second Edition, Cambridge University Press, 2009.

2 Sinha G. R, Patel, B. C., "Medical Image Processing: Concepts And Applications", Prentice Hall, 2014.

3 J. Michael Fitzpatrick and Milan Sonka, "Handbook of Medical Imaging, Volume 2. Medical Image Processing and Analysis", SPIE Publications, 2009.

REFERENCE BOOKS :

1 KayvanNajarian, Robert Splinter, "Biomedical Signal and Image Processing", Second Edition, CRC Press, 2014.

2 Gonzalez R C, Woods R E, "Digital Image Processing", Third Edition, Prentice Hall, 2007.

3 Geoff Dougherty, "Digital Image Processing for Medical Applications", First Edition, Cambridge University Press, 2009.

4 John L. Semmlow, "Biosignal and Medical Image Processing", Second Edition, CRC Press, 2008.

5 Deserno T M, "Biomedical Image Processing", Springer, 2011.

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

Course Objective

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

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

Course Outcome

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

TEXT BOOKS:

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

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REFERENCE BOOKS:

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

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

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

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BE 96

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

Course Objective

The student should be able to

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

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

Course Outcome

After completion of the course the learner will be able to

CO1: Use appropriate search algorithms for any AI problem.

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

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

CO4: Use Learning methods for the different types of problem

CO5: Design applications for NLP that use Artificial Intelligence

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

REFERENCE BOOKS:

R1-M. Tim Jones, —Artificial Intelligence: A Systems Approach(Computer Science)l, Jones and Bartlett Publishers, Inc.; First Edition, 2008
R2-David L. Poole and Alan K. Mackworth, —Artificial Intelligence: Foundations of Computational Agentsl, Cambridge University Press, 2010.
R3-Gerhard Weiss, —Multi Agent Systemsl, Second Edition, MIT Press, 2013

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DEPT

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

Course Objective

The student should be able to

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

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

Course Outcome

After completion of the course the learner will be able to

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

TEXT BOOKS:

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

REFERENCE BOOKS:

R1.J.B.Kulo and J.H Lou, "Low voltage CMOS VLSI Circuits", Wiley 1999.

R2. A.P.Chandrasekaran and R.W.Broadersen, "Low power digital CMOS design", Kluwer, 1995.

R3.Gary Yeap, "Practical low power digital VLSI design", Kluwer, 1998.

R4. AbdelatifBelaouar, Mohamed.I.Elmasry, "Low power digital VLSI design", Kluwer, 1995.

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

Course Objective

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

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

Course Outcome

CO1: ToAnalyze technical aspects of SDR.
CO2: To apply the concept of SDR.
CO3:Toanalyze the latest technologies.
CO4: To design architecture of cognitiveradio.
CO5: To apply the smart radio concept.

TEXT BOOKS:

T1- Andreas F. Molisch, "Wireless Communications", 2nd Edition, John Wiley & Sons Ltd, 2011.
T2- H. Venkataraman, G. Muntean (editores). Cognitive Radio and its Application for Next Generation Cellular and Wireless Networks. 2013. Spriger. ISBN 978-94-007-1826-5.

REFERENCE BOOKS:

R1- Markus Dillinger, "Software Defined Radio: Architectures, Systems and Functions", 2003.
R2- HuseyinArslan , "Cognitive Radio, Software Defined Radio and Adaptive wireless system,Springer, 1 edition ,September 24, 2007.

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

Course Objective

The student should be able

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

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

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Course Outcome

After completion of the course the learner will be able to

CO1: To gain knowledge on Photonic components in optical communication systems.

CO2:To know concept of Optical modulation and demodulation techniques.

CO3: To understand the basic aspects of routing networks .

CO4: To Analyze the architectures and the protocol stack.

CO5: To Compare the differences in the design of data plane, control plane, routing, switching, resource allocation methods, network management and protection methods.

TEXT BOOKS:

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

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

REFERENCE BOOKS:

R1 - Gerd Keiser – Optical Fiber : Third edition 2000

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

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

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0812

Programme	Course code	Name of the Course	L	T	P	C
BE	21EC8310	FUNDAMENTALS OF NANOSCIENCE	3	0	0	3

Course Objective

The student should be made to:

1. Study the basics of Nano science and Material
2. Understand the various preparation methods
3. Study the various nanomaterials preparation, properties and applications
4. Learn the different types of characterization techniques
5. Study the applications of Nano science

Unit	Description	Instructional Hours
I	**INTRODUCTION TO NANOSCIENCE** Nanoscale Science and Technology- Implications for Physics, Chemistry, Biology and Engineering-Classifications of nanostructured materials- Nano particles- quantum dots, nanowires ultra-thin films-multilayered materials. Length Scales involved and effect on properties: Mechanical, Electronic, Optical, Magnetic and Thermal properties. Introduction to properties and motivation for study (qualitative only).	9
II	**GENERAL METHODS OF PREPARATION** Bottom-up Synthesis-Top-down Approach: Co-Precipitation, Ultrasonication, Mechanical Milling, Colloidal routes, Self-assembly, Vapour phase deposition, MOCVD, Sputtering, Evaporation, Molecular Beam Epitaxy, Atomic Layer Epitaxy, MOMBE.	9
III	**NANOMATERIALS** Nano forms of Carbon - Buckminster fullerene- graphene and carbon nanotube, Single wall carbon Nanotubes (SWCNT) and Multi wall carbon nanotubes (MWCNT)- methods of synthesis(arc growth, laser ablation, CVD routes, Plasma CVD), structure-property Relationships applications Nano metal oxides-ZnO, TiO2,MgO, ZrO2, NiO, Nano alumina, CaO, AgTiO2, Ferrites, Nano clays-functionalization and applications-Quantum wires, Quantum dots-preparation, properties and applications	9
IV	**CHARACTERIZATION TECHNIQUES** X-ray diffraction technique, Scanning Electron Microscopy - environmental techniques, Transmission Electron Microscopy including high-resolution imaging, Surface Analysis techniques FM, SPM, STM, SNOM, ESCA, SIMS-Nano indentation	9
V	**APPLICATIONS** Nano InfoTech: Information storage- Nano computer, molecular switch, super chip, nanocrystal, Nano biotechnology: Nano probes in medical diagnostics and biotechnology, Nano medicines, Targeted drug delivery, Bio imaging - Micro Electro Mechanical Systems (MEMS), Nano Electro Mechanical Systems (NEMS)- Nano sensors, Nano crystalline silver for bacterial inhibition, Nanoparticles for sun barrier products - In Photostat, printing, solar cell, battery.	9
	Total Instructional Hours	45

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Course Outcome	Upon Completion of the course, the students should be able to: CO1: Familiarize about the science of nanomaterials CO2: Demonstrate the preparation of nanomaterials CO3: Familiarize about the properties and applications of nanomaterials CO4: Analyze the different types of characterization techniques in nanoscience CO5: Will develop knowledge in different applications of Nano science

TEXT BOOKS:

T1. A.S. Edelstein and R.C. Cammearata, eds., "Nanomaterials: Synthesis, Properties and Applications", Institute of Physics Publishing, Bristol and Philadelphia, 1996.

T2. N John Dinardo, "Nanoscale Characterization of surfaces & Interfaces", 2nd edition, Weinheim Cambridge, Wiley-VCH, 2000.

REFERENCES:

R1. G Timp, "Nanotechnology", AIP press/Springer, 1999.

R2. Akhlesh Lakhtakia,"The Hand Book of Nano Technology, Nanometer Structure, Theory, Modeling and Simulations". Prentice-Hall of India (P) Ltd, New Delhi, 2007.

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BE/04

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

Course Objective

The student should be able

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

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

Course Outcome

After completion of the course the learner will be able to

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

TEXT BOOKS:

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

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

REFERENCE BOOKS:

R1 - Intellectual Property Today : Volume 8, No. 5, May 2001, [www.iptoday.com].
R2 - Using the Internet for non-patent prior art searches. Derwent IP Matters. July 2000.

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VI Sem

HINDUSTHAN EDUCATIONAL AND CHARITABLE TRUST

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

(Academic Council Meeting Held on 03.03.2023)

2019 REGULATIONS

HINDUSTHAN EDUCATIONAL AND CHARITABLE TRUST
HICET

Hindusthan College of Engineering and Technology

(An Autonomous Institution, Affiliated to Anna University, Chennai
Approved by AICTE, New Delhi & Accredited by NAAC with 'A' Grade)
Valley Campus, Pollachi Highways, Coimbatore, Tamilnadu.

DETAILS OF CHANGES CARRIED OUT IN CURRICULUM & SYLLABUS

CBCS PATTERN

UNDERGRADUATE PROGRAMMES

B.E ELECTRONICS AND COMMUNICATION ENGINEERING (UG)

REGULATION-2019

(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/ 19CS1152	Python Programming and Practices/ Object Oriented Programming using Python(IBM)	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 Methods and 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/ 19CS2153	Essentials of C&C++Programming/ Java Fundamentals (IBM)	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/ 19IT3252	Oops using Java/ Relational Database Management System	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	19EC4203R	Linear Integrated Circuits	PC	3	0	0	3	25	75	100
THEORY WITH LAB COMPONENT										
5	19EC4251 /19EC4252	Control Systems/ Design Thinking-An Introduction (IBM)	PC	2	0	2	3	50	50	100
PRACTICAL										
6	19EC4001R	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 /19CS5331	**Professional Elective -I/** Angular JS(IBM)	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	19EC6202	Antenna and Wave Propagation	PC	3	1	0	4	25	75	100
2	19EC6181	Principles of Management	HS	3	0	0	3	25	75	100
3	19EC63XX	Professional Elective – II	PE	3	0	0	3	25	75	100
4	19XX64XX	Open Elective– I	OE	3	0	0	3	25	75	100
THEORY WITH LAB COMPONENTS										
5	19EC6251	Embedded Systems and IOT	PC	2	0	3	3	50	50	100
PRACTICALS										
MANDATORY COURSES										
		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	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 /19EC7331	**Professional Elective-III/** Blockchain	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 and Microwave 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
6	19EC5305	Data Science	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
6	19EC6305	Virtual Reality And Augmented Reality	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	19EC7181	Entrepreneurship Development	PE	3	0	0	3	25	75	100
5	19EC7305	Cyber Forensics	PE	3	0	0	3	25	75	100
6	19EC7306	Embedded Controllers	PE	3	0	0	3	25	75	100
PROFESSIONAL ELECTIVE IV										
1	19EC8301	Neural networks and Deep learning	PE	3	0	0	3	25	75	100
2	19EC8303	Satellite Communication	PE	3	0	0	3	25	75	100
3	19EC8304	Wireless Sensors and Networks	PE	3	0	0	3	25	75	100
4	19EC8181	Foundation Skills in Integrated Product Development	PE	3	0	0	3	25	75	100
5	19EC8305	Medical Image Processing	PE	3	0	0	3	25	75	100
7.	19EC8312	Cloud Computing	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
6	19EC8310	Fundamentals of Nano Science	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

(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	19EC4252	Design Thinking-An Introduction	IC	2	0	2	3	50	50	100
5	19CS5331	Angular JS	IC	2	0	2	3	50	50	100
6	19CS6351	Node JS and Micro services	IC	2	0	2	3	50	50	100
7	19CS6255	IoT and Spring Framework	IC	2	0	2	3	50	50	100
8	19EC7331	Blockchain	IC	2	0	2	3	50	50	100

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	HS	4	4				3			11
2	BS	10	10	4	4					28
3	ES	6	8							14
4	PC			16	17	19	12	12	6	82
5	PE					3	3	3		9
6	OE						3	3		6
7	EEC					2	3	2	8	15
	Total	20	22	20	21	24	24	20	14	165

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.

VI SEM

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

Course Objective

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

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

Course Outcome

After completion of the course the learner will be able to

CO1: Understand the radiation phenomena and the antenna parameters
CO2: Understand the radiation characteristics of different types of aperture and slot antennas
CO3: Understand the radiation mechanism of various types of array antennas.
CO4: Understand the purpose on special antennas and some of the basic antenna measurements
CO5: Understand the characteristics of different types of radio wave propagation at different frequencies

TEXT BOOKS:

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

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

REFERENCE BOOKS:

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

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

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

Course Objective

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

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

Course Outcome

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

TEXT BOOKS:

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

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

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REFERENCE BOOKS:

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

R2 - Robert Kreitner & Mamata Mohapatra, "Management", Biztantra, 2008.

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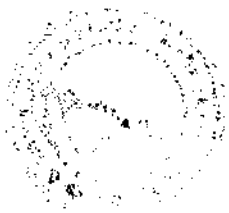
BE-23



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

Course Objective

The student should be able to

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

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

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RC24

CourseOutcome

After completion of the course the learner will be able to
CO1: Design and develop embedded systems.
CO2: Analyze program design and scheduling of the process.
CO3: Design portable IoT using Raspberry Pi /open platform.
CO4: Develop IoT applications using Raspberry Pi/open platform.
CO5: Explore deployment platforms for IoT applications.

TEXT BOOKS:

T1-Introduction to Embedded System. Shibu.K.V, McGraw and Hill Education. 13th Edition, 2014. (Unit 1&2).
T2- Internet of Things: An hands on approach. ArshdeepBahga, Vijay Madisetti. University Press. 2014. (Unit 3, 4, 5).

REFERENCE BOOKS:

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

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R22

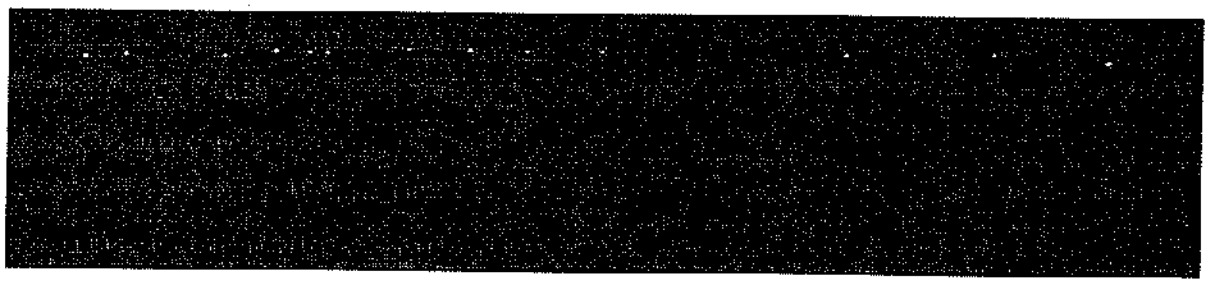
Programme	Course Code	Name of the Course	L	T	P	C
BE	19EC6253	Digital Communication	2	0	2	3.5

Course Objective

1. To understand the principles of sampling, quantization and waveform coding.
2. To study the various baseband signaling schemes.
3. To learn the various digital modulation techniques
4. To know the fundamentals of Error Control coding techniques.
5. To provide a detailed concept of the spread spectrum techniques used in communication system

Unit	Description	Instructional Hours
	WAVEFORM CODING AND REPRESENTATION	
I	Sampling–Aliasing–Quantization – Uniform & non-uniform quantization –Quantization noise- companding – PCM –DPCM - DM -ADM– Line codes	6
	BASEBAND SIGNALLING	6
II	Correlative Coding schemes –ISI Eye pattern – Equalization : Zero Forcing Equalizer- Adaptive Equalizer	
	DIGITAL MODULATION TECHNIQUES	6
III	Digital Modulation Formats–Coherent Modulation Techniques: ASK,BFSK-DPSK - QPSK QAM – Non-Coherent Modulation Techniques : BFSK, DPSK	
	ERROR CONTROL CODING :	6
IV	Channel coding theorems -Linear Block codes - Hamming codes–cyclic codes Convolutional Codes - Code Tree, Trellis, and State diagram - Viterbi Algorithm	
	SPREAD-SPECTRUM SYSTEMS	6
V	PN Sequences - Direct-Sequence Spread-Spectrum System-Frequency Hopping Systems– Synchronization - Applications : CDMA –Multipath Suppression.	
	Total Instructional Hours	**30**

LIST OF EXPERIMENTS



Total Instructional Hours	15

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Course Outcome	CO1: Understand the fundamental concepts of sampling and waveform coding CO2:Design and implement of various base band transmission schemes. CO3: Design and implement of various Digital Modulation Techniques. CO4: Estimation of errors detection and correction in transmission and reception CO5: Describe the attractive feature of secure and reliable communication in Spread spectrum

TEXT BOOKS:

T1 -S.Haykin, Digital Communications, John Wiley & Sons, 2009. (UNIT I – V)

T2 - P.Ramakrishna Rao, "Digital Communications",Tata Mc Graw Hill Company,2011. (UNIT II – V)

REFERENCES :

1. B. Sklar, "Digital Communication Fundamentals and Applications", 2nd Edition. Pearson Education. 2009

2. B.P.Lathi. "Modern Digital and Analog Communication Systems" 3rd Edition, Oxford University Press 2007.

3. H P Hsu, Schaum Outline Series - "Analog and Digital Communications", TMH 2006 4. J.G Proakis. "Digital Communication", 4th Edition, Tata Mc Graw Hill Company, 2001.

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Program	Course Code	Name of the Course	L	T	P	C
B.E	19CS6255	IOT AND SPRING FRAMEWORK	2	0	2	3

Course Objectives

1. To know about the basics of Internet of Things
2. To focus on Sensors and Actuators for
3. To leant about how signals from sensors are processing
4. To work with MQTT
5. To learn about application using Node Red and Bluemix

Unit	Description	Instructional hours
I	**INTRODUCTION TO IOT AND ELECTRONICS PRIMER** What is IOT – Applications - Diode, LED, Resistor, Capacitor –Breadboard – Jumper wires - Multi meter – Tools - Communication	6
II	**SENSORS ACTUATORS AND PROCESSING ELEMENTS** Architecture – Sensor – Actuator - Transfer Function - More Specs (Accuracy, repeatability, Resolution, Hysteresis) - Processing Elements	6
III	**JAVASCRIPT AND NODEJS** Introduction to JavaScript - Introduction to NodeJS - Event loop in Node JS - Architecture of NodeJS - Examples of NodeJS	6
IV	**MQTT AND NODE RED** Basics - IoT Needs – MQTT - Introduction to Node – Red -Function Node	6
V	**IBM BLUEMIX** Introduction to IBM Bluemix - Services in Bluemix - Testing-Security - Analysis	6
	Practicals - IoT 1. Setting up Raspberry Pi and Installation of OS 2. Working with Linux commands on GO-LED Blink usingButton 3. Install NodeJS and work with REPL Terminal 4. Control LED using Mobile in Raspberry Pi	15

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5. Setup Raspberry Pi to connect with DHT22.
6. Installation of Node-RED and Hello World in Node-RED
7. Code for RPi to send DHT data periodically and createflow on Bluemix Node- Red app

Total Instructional Hours 45

Course Outcomes Upon successful completion of this course the students will be able to:

CO1: Understand Real time examples of IoT with their working Mechanism
CO2: Analyze How sensors are transmitting data for processing output
CO3: Understand NodeJS implementation in IoT
CO4: Apply MQTT Server with Node Red
CO5: Implement IoT application in Bluemix

TEXT BOOKS:

T1: IBM Course ware

REFERENCE BOOKS:

R1: "Learning Internet of Things" by Peter Waher

R2: "Precision: Principles, Practices and Solutions for the Internet of Things" by Timothy Chou

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

Course Objective

1. To provide students with opportunities to make connections between the theory and practice of academic study and the practical application of that study in a professional work environment.
2. Gain insight into a possible career path of interest while learning about the industry in which the organization resides, organizational structure, and roles and responsibilities within that structure
3. Develop professional connections and identify a strategy for maintaining those connections.

S.NO.	Description
1.	Conduct an informational interview with an individual at your organization other than your site supervisor to explore a profession of interest and summarize your findings.
2.	Analyze your internship experience, reflecting on lessons learned and how your liberal arts education prepared you for the internship.
3.	Add details about your experience including new skills developed and results obtained during the internship.

Course Outcome

CO1: Ability to articulate what was learned and how it will be apply to your professional career goals

CO2: Identification of professions that may be of interest as a result of this experience

CO3: Identification of additional skills that will need to be developed to ensure career readiness. This might include learning a new technology, developing a broader network, additional coursework, etc.

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

Course Objectives:

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

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

Course Outcome:

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

REFERENCE BOOKS

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

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

Course Objectives:

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

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

Course Outcome:

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

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Professional Electives

Professional Elective II

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

Course Objective

The student should be able to

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

Unit	Description	Instructional Hours
I	**ELECTRO-PHYSIOLOGY AND BIO-POTENTIAL RECORDING** The origin of Biopotentials; biopotential electrodes, biological amplifiers, ECG,EEG,EMG,PCG,lead systems and recording methods, typical waveforms and signal characteristics.	9
II	**BIO-CHEMICAL AND NON ELECTRICAL PARAMETER MEASUREMENT** pH, PO_2, PCO_2, colorimeter, Auto analyzer, Blood flow meter, cardiac output, respiratory measurement, Blood pressure, temperature, pulse, Blood Cell Counters..	9
III	**ASSIST DEVICES** Cardiac pacemakers, DC Defibrillator, Dialyser, Ventilators, Magnetic Resonance Imaging Systems, Ultrasonic Imaging Systems, Heart lung machine.	9
IV	**PHYSICAL MEDICINE AND BIOTELEMETRY** Diathermies-Shortwave, ultrasonic and microwave type and their applications, Surgical Diathermy-Telemetry principles, biotelemetry	9
V	**RECENT TRENDS IN MEDICAL INSTRUMENTATION** Thermograph,endoscopy unit, Laser in medicine, Introduction to telemedicine, Insulin Pumps, Rādio pill, Brain machine interface, Lab on a chip.	9
	Total Instructional Hours	45

Course Outcome

After completion of the course the learner will be able to

CO1: Know the human body electro- physiological parameters and recording of bio-potentials

CO2:Comprehend the non-electrical physiological parameters and their measurement – body temperature, blood pressure, pulse, blood cell count, blood flow meter etc.

CO3: Interpret the various assist devices used in the hospitals viz. pacemakers, defibrillators, dialyzers and ventilators CO4: Understand the physical medicine methods eg. ultrasonic, shortwave, microwave surgical diathermies , and bio-telemetry principles and methods

CO5: Discuss about recent trends in medical instrumentation

TEXT BOOKS:

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

REFERENCE BOOKS:

R1 – John G.Webster, "Medical Instrumentation Application and Design". 3rd Edition, Wiley India Edition, 2007.

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

R3 – Joseph J.Carr and John M.Brown,"Introduction to Biomedical Equipment Technology",John Wiley and Sons,NewYork, 2004

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Programme	Course Code	Name of the Course	L	T	P	C
BE	19EC6302	Industrial Automation	3	0	0	3

Course Objective

1. To Provide the knowledge of automation component and machine elements
2. To learn the SCADA communication and protocols
3. To educate on the components used in distributed network protocol
4. To introduce the M2M to Internet of Things
5. To study the Modern Industrial Automation

Unit	Description	Instructional Hours
I	**AUTOMATION COMPONENT AND MACHINE ELEMENTS** Automation, concept – analog and digital. input and output data, Components and hardware- Controllers, operator interfaces, sensors, power control, distribution and discrete controls, actuators and movements, AC and DC motors, mechanisms and machine elements, structure and framing.	9
II	**SCADA AND PROTOCOLS** Fundamentals of SCADA Communications – SCADA Systems, Remote terminal units, PLCs used as RTUs, Communication architectures, Communication philosophies, Basic standards – RS232 and RS485,SCADA protocols, open SCADA protocols DNP3 and IEC 60870, Preview of DNP3.	9
III	**DISTRIBUTED NETWORK PROTOCOL** Fundamentals concepts, physical layer, data link layer, transport layer, application layer message handling and functions, data object library. Fundamental of IEC 60870-5: standard, protocol architecture, information elements, application functions.	9
IV	**M2M to INTERNET OF THINGS** M2M communication, M2M towards IoT, M2M and IoT value chains, M2M to IoT architecture overview, devices and gateways, local and wide area networking, data management, M2M to IoT analytics. Human-Machine interface.	9
V	**MODERN INDUSTRIAL AUTOMATION** Virtual instrumentation, programming platforms, hardware and software design, graphical user interface design, software testing –strategies, processes and steps, software performance testing, real world applications- RSFIMC architecture, functions.	9
	Total Instructional Hours	**45**

Course Outcome

CO1: Emphasize the signals from automation components and machine elements.
CO2: Explain the concepts of SCADA Communication and protocols
CO3: Familiarize the concept of Distribution Network Protocol and IEC standard.
CO4: Explain the need for M2M to Internet of Things.
CO5: Familiarize the concepts of Modern Industrial Automation.

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T1- Frank Lamb," Industrial Automation Hands-on", - The McGraw Hill Education.(Unit -1)
T2- Gordon Clarke, "Practical Modern SCADA Protocols:DNP3, 60870.5 and Related Systems", - Academic Press is an imprint of Elsevier, 2004.(Unit – 2,3)

REFERENCE BOOKS:

R1 - Jan Holler, "From Machine-to-Machineto the Internet of Things", - Academic Press is an imprint of Elsevier, 2014 (Unit - 4)
R2 - Lingfeng Wang, "Modern Industrial Automation Software Design- Principles and Real- World Applications", - A John Wiley & Sons, Inc., Publication. (Unit - 5)

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BE 96

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

Course Objective

The student should be able to

1. To understand the design aspects of a cellular system
2. To illustrate the behavior of the wireless channel and its impact on system design
3. To interpret the mathematical models of propagation in wireless communications.
4. To understand the wireless systems and standards in wireless communication.
5. To understand the relevance of multiple layers and their functionalities.

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

Course Outcome

After completion of the course the learner will be able to

CO1: Describe the cellular concept of wireless communication system.

CO2: Illustrate the behavior of the wireless channel and its impact on system design

CO3: Interpret the mathematical modelsof propagation in wireless communications.

CO4: Understand the wireless systems and standards in wireless communication.

CO5: Explore relevance of multiple layers and their functionalities

TEXT BOOKS:

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

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

REFERENCE BOOKS:

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

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

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

Course Objective

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

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

Course Outcome

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

TEXT BOOKS:

T1- William Stallings, "High-Speed Networks and Internets: Performance and Quality of Service", Pearson Education, Second Edition, 2002
T2- Jean Warland and Pravin Varaiya, "High Performance Communication Networks!", Jean Harcourt Asia Pvt.
Ltd., Second Edition, 2001

REFERENCE BOOKS:

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

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BE 33

Programme	Course code	Name of the Course	L	T	P	C
BE ECE	19EC6305	VIRTUAL REALITY AND AUGMENTED REALITY	3	0	0	3

Course Objective

1. To introduce the concept of basic input output devices used in VR technology.
2. To give an insight on the various modelling techniques used for VR development process.
3. To explore the methodology and terminologies used for content creation in VR.
4. To understand the possible applications of virtual reality and augmented reality in engineering applications.
5. To know the basic building blocks of the VR on mobile and web.

Unit	Description	Instructional Hours
	INPUT/ OUTPUT DEVICES	
I	The three I's of virtual reality-commercial VR technology and the five classic components of a VR system - Input Devices: Three-dimensional position trackers, navigation and manipulation-interfaces and gesture interfaces-Output Devices: Graphics displays-sound displays & haptic feedback.	9
	VR DEVELOPMENT PROCESS	
II	Geometric modeling - kinematics modeling- physical modeling - behaviour modeling - model Management.	9
	CONTENT CREATION CONSIDERATIONS FOR VR	
III	Methodology and terminology-user performance studies-VR health and safety issues-Usability of virtual reality system- cyber sickness -side effects of exposures to virtual reality environment	9
	VR ON THE WEB & VR ON THE MOBILE	
IV	JS-pros and cons-building blocks (WebVR, WebGL, Three.js, device orientation events)-frameworks (A-frame, React VR)-Google VR for Android-Scripts, mobile device configuration, building to android-cameras and interaction-teleporting-spatial audio-Assessing human parameters-device development and drivers-Design Haptics	9
	APPLICATIONS	
V	Medical applications-military applications-robotics applications- Advanced Real time Tracking other applications- games, movies, simulations, therapy	9
	Total Instructional Hours	**45**

Course Outcome

The student should be able to:

CO1 - Select the appropriate input output device for an application.

CO2 - Apply the suitable modelling for the given problem statement.

CO3 - Design appropriate VR content for an application.

CO4- Construct the building blocks for VR in mobile and web.

CO5 - Analyse & Design VR systems for various applications.

TEXT BOOKS:

T1- C. Burdea & Philippe Coiffet, "Virtual Reality Technology", Second Edition, Gregory, John Wiley & Sons, Inc.,2008 2. Jason Jerald. 2015.

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T2-. Jason Jerald. 2015. The VR Book: Human-Centered Design for Virtual Reality. Association for Computing Machinery and Morgan & Claypool, New York, NY, USA.

REFERENCE BOOKS :

R1-1. Augmented Reality: Principles and Practice (Usability) by Dieter Schmalstieg & Tobias Hollerer, Pearson Education (US), Addison-Wesley Educational Publishers Inc New Jersey, United States, 2016. ISBN: 9780321883575

R2-2. Practical Augmented Reality: A Guide to the Technologies, Applications, and Human Factors for AR and VR (Usability),Steve Aukstakalnis, Addison-Wesley Professional; 1 edition, 2016.

R3. Learning Virtual Reality: Developing Immersive Experiences and Applications for Desktop, Web, and Mobile, Tony Parisi, O'Reilly Media; 1 edition, 2015.

R4. Programming 3D Applications with HTML5 and WebGL: 3D Animation and Visualization for Web Pages, Tony Parisi, O'Reilly Media; 1 edition, 2014.

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

The student should be conversant with

Course Objective

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

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

Course Outcome

After the completion of the course, the learner will be able to

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

TEXT BOOKS:

T1- Ravi Kalakota, Andrew Winston, "Frontiers of Electronic Commerce", Addison Wesley.
T2 – Pete Lohsin , John Vacca "Electronic Commerce", New Age International

REFERENCE BOOKS:

R1 – Goel, Ritendra "E-commerce", New Age International
R2-Laudon, "E-Commerce: Business, Technology, Society", Pearson Education
R3-Bajaj and Nag, "E-Commerce the cutting edge of Business", TMH
R4-Turban, "Electronic Commerce 2004: A Managerial Perspective", Pearson Education

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Fast track subjects

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

Course Objective

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

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

Course Outcome

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

TEXT BOOKS:

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

REFERENCES BOOKS:

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

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

Course Objective

The student should be able to

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

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

Course Outcome

After completion of the course the learner will be able to

CO1: Discriminate RISC and CISC processors, and work with PIC microcontrollers.

CO2: Work with the 16 bit microcontroller RL78 and design microcontroller based systems for a Real world application.

CO3: Apply the concept of multitasking and RTOS in embedded system design.

CO4: Gaining design knowledge and concepts on MSP430 family of Microcontroller.

CO5: Ability to design and develop microcontroller based smart electronic system and home appliances.

TEXT BOOKS:

T1 - Muhammad Ali Mazidi, Rolind D. Mckinlay and Danny Causey. "PIC Microcontroller and Embedded Systems", Pearson Education, 2008. (Unit I and III).

T2-John H. Davies, "MSP 430 Micro controller basics", Elsevier, 2008. (Unit IV and V).

REFERENCE BOOKS:

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

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

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

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

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

Course Objective

The student should be conversant with

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

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

Course Outcome

After the completion of the course, the learner will be able to

CO1: Understand principle, working and operation of various sub systems of satellite as well as the earth station.

CO2: Understand Effects of radio propagation in satellites

CO3: Apply various communication techniques for satellite applications

CO4: Analyze and design satellite communication link

CO5: Learn advanced techniques and regulatory aspects of satellite communication and Understand role of satellite in various applications

TEXT BOOKS:

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

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

REFERENCE BOOKS:

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

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

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

Course Objective

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

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

Course Outcome

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

TEXT BOOKS:

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

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

REFERENCE BOOKS:

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

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

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

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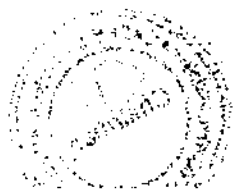

Programme	Course code	Name of the Course	L	T	P	C
BE	19EC8305	Medical Image Processing	3	0	0	3

Course Objective

1. To acquaint the basic concepts of various medical imaging modalities
2. To understand the concepts of ultrasound imaging methodologies
3. To familiarize the medical image formats and basic processing methodologies
4. To analyse the computational methods for segmentation in medical imaging
5. To interpret image guided and computer aided diagnosis of diseases.

Unit	Description	Instructional Hours
I	**INTRODUCTION TO MEDICAL IMAGING** Introduction to medical imaging technology, systems, and modalities. importance; applications; trends; challenges. Medical Image Formation Principles: X-Ray physics; X-Ray generation, attenuation, scattering; dose Basic principles of CT; reconstruction methods; artifacts.	9
II	**NUCLEAR IMAGING** PET and SPECT Ultrasound Imaging methods; mathematical principles; resolution; noise effect;3D imaging; Medical Image Search and Retrieval Current technology in medical image search, Image Guided Surgery, Image Guided Therapy, Computer Aided Diagnosis/Diagnostic Support Systems.	9
III	**MEDICAL IMAGE STORAGE AND PROCESSING** Medical Image Storage, Formats: DICOM Radiology Information Systems (RIS) and Hospital Information Systems (HIS). Medical Image Processing, Enhancement, Filtering Basic image processing algorithms Thresholding; contrast enhancement; SNR characteristics; filtering;histogram modeling.	9
IV	**MEDICAL IMAGE SEGMENTATION** Histogram-based methods; Region growing and watersheds; Markov Random Field models; active contours; model-based segmentation. Multi-scale segmentation; semi-automated methods; clustering-based methods; classification-based methods; optimization techniques	9
V	**MEDICAL IMAGE ANALYSIS OF SHAPE AND TEXTURE** Representation of shapes and contours – Shape factors – Models for generation of texture – Statistical analysis of texture – Fractal analysis – Fourier domain analysis of texture – Segmentation and structural analysis of texture. Pattern classification and diagnostic decision – Measures of diagnostic accuracy – Applications: Contrast enhancement of mammograms – Detection of calcifications by region growing – Shape and texture analysis of tumours.	9
	Total Instructional Hours	45

Course Outcome — Upon Completion of the course, the students should be able to:

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CO1: Analyze various medical Imaging modalities

CO2: Analyze various methodologies to interpret the ultrasound images.

CO3: Design and implement image processing applications that incorporates different concepts of medical Image Processing

CO4: Critically analyze different approaches to implement mini projects in medical domain

CO5: extract, model, and analyze information from medical data and applications in order to help diagnosis, treatment and monitoring of diseases through computer science.

TEXT BOOKS:

1 Paul Suetens, "Fundamentals of Medical Imaging", Second Edition, Cambridge University Press, 2009.

2 Sinha G. R, Patel, B. C., "Medical Image Processing: Concepts And Applications", Prentice Hall, 2014.

3 J. Michael Fitzpatrick and Milan Sonka, "Handbook of Medical Imaging, Volume 2. Medical Image Processing and Analysis", SPIE Publications, 2009.

REFERENCE BOOKS :

1 KayvanNajarian, Robert Splinter, "Biomedical Signal and Image Processing", Second Edition, CRC Press, 2014.

2 Gonzalez R C, Woods R E, "Digital Image Processing", Third Edition, Prentice Hall, 2007

3 Geoff Dougherty, "Digital Image Processing for Medical Applications", First Edition, Cambridge University Press, 2009.

4 John L. Semmlow, "Biosignal and Medical Image Processing", Second Edition, CRC Press, 2008.

5 Deserno T M, "Biomedical Image Processing", Springer, 2011.

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

Course Objective

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

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

Course Outcome

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

TEXT BOOKS:

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

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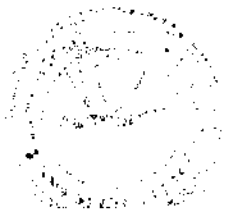

REFERENCE BOOKS:

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

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

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

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Programme	Course Code	Name of the Course	L	T	P	C
BE	19EC8311	Computer Communication and Internet Protocol	3	0	0	3

Course Objective

1. To understand the state-of-the-art in communication networks and switching.
2. To study the concepts of various medium access layer protocols
3. To impart technical knowledge in network layer algorithm
4. To study the behavior of transport layer protocol.
5. To provide an insight on the features of application layer protocols.

Unit	Description	Instructional Hours
I	**INTRODUCTION TO COMMUNICATION NETWORKS** Basis for Data Communication - Guided Transmission Media - Data Encoding – Data Communication Interface - The Public Switched Telephone Network - Circuit Switching and Packet Switching.	9
II	**MEDIUM ACCESS CONTROL LAYER** The Channel Allocation Problem - Multiple Access Protocols – Ethernet - Wireless LANs - Broadband Wireless – Bluetooth - Data Link Layer Switching	9
III	**NETWORK LAYER** Network Layer Design Issues - Routing Algorithms - Congestion Control Algorithms - Quality of Service – Internetworking - The Network Layer in the Internet	9
IV	**TRANSPORT LAYER** The Transport Service - Elements of Transport Protocols - A Simple Transport Protocol - The Internet Transport Protocols: UDP - The Internet Transport Protocols: TCP	9
V	**DISTRIBUTED APPLICATIONS** Abstract Syntax Notation One (ASN.I) - Network Management: SNMPV2 - Electronic Mail-SMTP and MIME - Uniform Resource Locators (URL) and Universal Resource Identifiers (URI) - Hypertext Transfer Protocol (HTTP)	9
	Total Instructional Hours	**45**

Course Outcome

After completion of the course the learner will be able to

CO1: Identify the characteristics of networks and switching.
CO2: Understand the medium access control layer services.
CO3: Analyze and explain important design considerations at the network layer
CO4: Understand the behavior of transport layer protocols
CO5: Analyze a typical network architecture and the importance of network layers.

TEXT BOOKS:

T1 - Andrew S Tanenbaum, "Computer networks", Prentice Hall of India, New Delhi, 2010.

T2 - William Stallings, "Data and Computer Communication", Prentice Hall of India, New Delhi, 2007

REFERENCE BOOKS:

R1 - Behrouz A Forouzan , "Data Communication and Networking", McGraw-Hill, New Delhi, 2012.

R2 - Larry L. Peterson, Bruce S. Davie, "Computer Networks: A Systems Approach", Fifth Edition, Morgan Kaufmann Publishers, 2011

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Open Electives

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

Course Objective

The student should be able to

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

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

Course Outcome

After completion of the course the learner will be able to

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

TEXT BOOKS:

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

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

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

Course Objectives:

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

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

Course Outcom

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

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

CO3:Understanding and reasoning using con epts framed in words: Critical verbal reasoning;

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e: Reading Comprehension; Application of verbal reasoning in aptitude tests.

CO4:Students will possess the basic understanding of computer hardware and software, utilizing web technologies, basic understanding of network principles, Keyboard Shortcuts and
various Operating System.

CO5:Students will be updated with awareness and knowledge regarding the occurrences around
the world.

REFERNCES

R1: Quantitative Aptitude for Competitive Examinations – Abhijith Guptha

R2: The Pearson Guide to Quantitative Aptitude - Dinesh Khattar

R3: Analytical Reasoning and Logical Reasoning- Peeyush Bharadwaj

R4: A New Approach to Reasoning - B.S. Sijwali & S. Sijwali Arihant

R5: Word Power made easy - Norman Lewis

R6: Verbal Ability & Reading Comprehension for the CAT – Arun Sharma, Meenakshi Upadhyay -Mcgraw-hill Education

R7: Computer Awareness - Arihant Publication

R8: General Knowledge and General Awareness - Arihant Manhar Pandey

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

COURSE OBJECTIVES

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

Unit	Description	Instructional Hours
I	**Introduction** Human Rights – Evolution of the concept of Human Rights - Meaning, origin and Development. Notion and Classification of Rights – Natural, Moral and Legal Rights, Civil and Political rights. Economic, Social and Cultural Rights - Theories of Human Rights - Philosophical foundations of Human Rights	9
II	**Human Rights national and international perspective** Human Rights in India – Constitutional Provisions / Guarantees – Redressal Mechanisms at National and International levels – Constitutional Remedies and Directions of state policy - Geneva Convention of 1864. Universal declaration of Human Rights, 1948. UN agencies to monitor and compliance – UNHRC (United Nations Human Rights Commission)	9
III	**CONSTITUTIONAL RIGHTS OF WOMEN IN INDIA** Indian constitution relating to women - Fundamental rights - Directive principles of state policy - right to equality - rights against exploitation, the right to constitutional remedy - University Declaration of Human Rights - Enforcement of Human Rights for Women and Children - Role of Cells and Counseling Centers - Legal AID cells, Help line, State and National level Commission	9
IV	**POLITICAL RIGHTS OF WOMEN IN INDIA AND LAWS** Political Rights of Women in India - Electoral process - women as voters - candidates and leader - pressure group, Representation of women in local self government – women in Rural and urban local bodies – Reservation of women – Laws against violence & Sexual crimes: eve teasing – rape - indecent representation of women - immoral trafficking	9
V	**GENDER EQUALITY** Gender roles: Biological vs cultural determinism – Private vs public dichotomy – Gender division of labour and asymmetric role structure Gender role socialization and formation of identity –Occupational segregation and wage discrimination – Gender stereotyping in work place – Human development indicators and gender disparity	9

COURSE OUTCOMES:

- Engineering students will have the basic knowledge of human rights
- Initiates the students to know the various national and international perspectives of human rights
- Gives an orientation on the various rights of women
- Makes them to understand the role of women in politics
- Provides a direction on gender equalities

TEXT BOOKS

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

REFERENCES

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

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

Course Objective

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

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

Course Outcome

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

TEXT BOOKS:

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

REFERENCE BOOKS:

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

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

Course Objective

OBJECTIVES:

- Teach history and philosophy of Political Science.
- Describe the Indian Constitution and fundamental rights.
- Summarize powers and functions and Emergency rule of Indian government.
- Explain Local Governance.
- Converse the challenges to Indian Democracy

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

Course Outcome

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

TEXT BOOKS:

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

REFERENCE BOOKS:

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

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

Course Objectives:

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

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

Text Book:

1. Yogic Life- VISION, Vethathiri Publications.

Reference Books:

1. VethathiriMaharishi, Yoga forModernage, 2017, VethathiriPublications, Erode.
2. Vethathiri Maharishi, Mind, 2017, Vethathiri Publications, Erode.
3. Dr.Mathuram Sekar, Medicine and Health, NarmadhaPublications.
4. Vethathiri Maharishi. Simplified Physical Exercises. 2013. Vethathiri Publications, Erode.
5. WCSC-VISION for Wisdom, Yogasanas. 2012. Vethathiri Publications. Erode.

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COLLEGE OF ENGINEERING AND TECHNOLOGY

(An Autonomous Institution)

Coimbatore– 641032

DEPARTMENT OF ELECTRONICS AND COMMUNICATION

CURRICULUM & I SEMESTER SYLLABUS
(Academic Council Meeting Held on 03.03.2023)

Batch: 2022-2026

REGULATIONS 2022

SEMESTER I											
S. NO	COURSE CODE	COURSE TITLE	COURSE CATEGORY	L	T	P	C	TCP	CIA	ESE	TOTAL
THEORY											
THEORY WITH LAB COMPONENT											
3	22HE1151	ENGLISH FOR ENGINEERS	HSC	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)											
MANDATORY COURSE											
		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											
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				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)											

10	22MC3001	[illegible] Heritage of India	MC	2	0	0	0	0	60	40	100
11	22MC3002	[illegible]	MC	2	0	0	0	0	60	40	100
		TOTAL CREDITS		**17**	**1**	**12**	**22**	**29**	**630**	**370**	**1000**

SEMESTER III											
S.NO	**COURSE CODE**	**COURSETITLE**	**COURSE CATEGORY**	**L**	**T**	**P**	**C**	**TCP**	**CIA**	**ESE**	**TOTAL**
THEORY											
1	22MA3102	COMPLEX ANALYSIS AND TRANSFORMS (common to ECE,EEE,EIE)	BSC	3	1	0	4	4	40	60	100
2	22EC3201	ELECTRONIC CIRCUITS	PCC	3	0	0	3	3	40	60	100
3	22EC3202	SIGNALS AND SYSTEMS	PCC	3	0	0	3	3	40	60	100
4	22EC3203	DIGITAL ELECTRONICS	PCC	3	0	0	3	3	40	60	100
5	22EC3204	CIRCUITS AND NETWORKS	ESC	2	0	0	2	3	100	-	100
THEORY WITH LAB COMPONENT											
6	22EC3251/ 22EC3252	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

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)											
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)											

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.

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

OPEN ELECTIVE I AND II
(EMERGING TECHNOLOGIES)

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

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

OPEN ELECTIVE I AND II

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

S NO.	COURSE CODE	COURSE TITLE	CATEGORY	PERIODS PER WEEK			TOTAL CONTACT PERIODS	CREDITS
				L	T	P		
1	22AE6401	Space Science	OEC	3	0	0	3	3
2	22MT6401	Introduction to Industrial Engineering	OEC	3	0	0	3	3
3	22MT6402	Industrial Safety and Environment	OEC	3	0	0	3	3
4	22CE6401	Climate Change and its Impact	OEC	3	0	0	3	3
5	22CE6402	Environment and Social Impact Assessment	OEC	3	0	0	3	3
6	22ME6401	Renewable Energy System	OEC	3	0	0	3	3
7	22ME6402	Additive Manufacturing systems	OEC	3	0	0	3	3

8	22EI6401	Introduction to Industrial Instrumentation and Control	OEC	3	0	0	3	3
9	22EI6402	Graphical Programming using Virtual Instrumentation	OEC	3	0	0	3	3
10	22AU6401	Recent Trends in Automotive Technology	OEC	3	0	0	3	3
11	22AU6402	Automotive Vehicle Safety	OEC	3	0	0	3	3
12	22EE6401	Digital Marketing	OEC	3	0	0	3	3
13	22EE6402	Research Methodology	OEC	3	0	0	3	3
14	22FT6401	Traditional Foods	OEC	3	0	0	3	3
15	22AG6401	Urban Agriculture and Organic Farming	OEC	3	0	0	3	3
16	22CH6401	Biomass and Bio Refinery	OEC	3	0	0	3	3

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

OPEN ELECTIVE III

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

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

OPEN ELECTIVE IV

SL. NO.	COURSE CODE	COURSE TITLE	CATEGORY	PERIODS PER WEEK			TOTAL CONTAC T PERIODS	CREDITS
				L	T	P		
1	22LS7401	General studies for competitive examinations	OEC	3	0	0	3	3
2	22LS7402	Human Rights, Women Rights and Gender equity	OEC	3	0	0	3	3
3	22LS7403	Indian ethos and Human values	OEC	3	0	0	3	3
4	22LS7404	Financial independence and management	OEC	3	0	0	3	3
5	22LS7405	Yoga for Human Excellence	OEC	3	0	0	3	3
6	22LS7406	Democracy and Good Governance	OEC	3	0	0	3	3
7	22LS7407	NCC Level - II	OEC	3	0	0	3	3

PROFESSIONAL ELECTIVE COURSES: VERTICALS

S NO.	Vertical 1 Medical Imaging	Vertical 2 VLSI Design	Vertical 3 Communication systems	Vertical 4 Wireless Communication	Vertical 5 Business and Management	Vertical 6 Image Processing
1	Measurements and Instrumentation	PCB Design	Fiber Optic Communication	Network Security	Total Quality Management	Digital Image Processing
2	Medical Electronics	Advanced Processors	Cellular and Mobile Communication	High Speed Networks	Principles of Management	Audio Signal Processing
3	Medical Informatics	ASIC Design	Satellite Communication	Cloud Computing	Entrepreneurship Development	Machine Vision

4	Medical Image Processing	Embedded Controllers	Global Positioning Systems	Wireless Sensors and Networks	Foundation Skills in Integrated Product Development	Neural Networks and Deep Learning
5	Artificial Intelligence	Low Power VLSI	RF System Design	Wireless Broadband Communications	Operations Management	Virtual Reality and Augmented Reality
6	Human Computer Interface	Industrial Automation	Software Defined Radio	Cyber Forensics	E-Commerce Technology	Robotics

PROFESSIONAL ELECTIVE COURSES: VERTICALS

VERTICAL 1: Medical Imaging

S No.	Course Code	Course Title	Category	Periods Per week			Total Contact Periods	Credits
				L	T	P		
1.	22EC5301	Measurements and Instrumentation	PEC1	3	0	0	3	3
2.	22EC5302	Medical Electronics	PEC2	3	0	0	3	3
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

VERTICAL 2: 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

VERTICAL 3: 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

VERTICAL 4: 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

VERTICAL 5: 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
3.	22EC5313	Entrepreneurship Development	PEC3	3	0	0	3	3
4.	22EC6309	Foundation Skills in Integrated Product Development	PEC4	3	0	0	3	3
5.	22EC6310	Operations Management	PEC5	3	0	0	3	3
6.	22EC7305	E-Commerce Technology	PEC6	3	0	0	3	3

VERTICAL 6: Image Processing

S No.	Course Code	Course Title	Category	Periods Per week			Total Contact Periods	Credits
				L	T	P		
1.	22EC5314	Digital Image Processing	PEC1	3	0	0	3	3
2.	22EC5315	Audio Signal Processing	PEC2	3	0	0	3	3
3.	22EC5316	Machine Vision	PEC3	3	0	0	3	3
4.	22EC6311	Neural networks and Deep learning	PEC4	3	0	0	3	3
5.	22EC6312	Virtual Reality and Augmented Reality	PEC5	3	0	0	3	3
6.	22EC7306	Robotics	PEC6	3	0	0	3	3

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

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

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

MINOR

Vertical I
Internet of Things

S No.	Course Code	Course Title	Category	Periods Per week			Total Contact Periods	Credits
				L	T	P		
1	22EC5231	Microprocessors and Microcontrollers	MDC	3	0	0	3	3
2	22EC6231	Introduction to Internet of Things	MDC	3	0	0	3	3
3	22EC6232	Introduction to Security of Cyber Physical Systems	MDC	3	0	0	3	3
4	22EC7231	Ubiquitous Sensing, Computing and Communication	MDC	3	0	0	3	3
5	22EC7232	Embedded Systems for IoT	MDC	3	0	0	3	3
6	22EC8231	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	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 and Insurance	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

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	22EC5204	Information Theory and Coding	PC	3	0	0	3	3
2	22EC6201	Cognitive Radio Network	PC	3	0	0	3	3
3	22EC6202	Advanced Wireless Broadband Communications	PC	3	0	0	3	3
4	22EC7202	Mobile and Vehicular Communication	PC	3	0	0	3	3
5	22EC7203	5G Technology	PC	3	0	0	3	3
6	22EC8201	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	22EC5205	Analog VLSI Design	PC	3	0	0	3	3
2	22EC6203	Signal and Image Processing	PC	3	0	0	3	3
3	22EC6204	VLSI Signal Processing	PC	3	0	0	3	3
4	22EC7204	Reconfigurable Computing	PC	3	0	0	3	3
5	22EC7205	Evolvable Hardware	PC	3	0	0	3	3
6	22EC8202	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	22EC5206	Wireless Broadband Networks	PC	3	0	0	3	3
2	22EC6205	Wireless Communication Techniques	PC	3	0	0	3	3
3	22EC6206	Wireless Sensor Network Design	PC	3	0	0	3	3
4	22EC7206	Access Technologies	PC	3	0	0	3	3
5	22EC7207	Free Space Optical Communication	PC	3	0	0	3	3
6	22EC8203	Antenna Design and Testing	PC	3	0	0	3	3

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

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COIMBATORE - 641 032.

SYLLABUS

For the students admitted during the academic year 2022-2023

II SEM

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

Course Objective

The learner should be able to

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

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

Course Outcome

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

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

TEXT BOOKS:

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

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

REFERENCE BOOKS :

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

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

Course Objective

The learner should be able to

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

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

Course Outcome

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

CO1: Discuss the importance of ecosystem and biodiversity for maintaining ecological balance.
CO2: Identify the causes of environmental pollution and hazards due to manmade activities.
CO3: Develop an understanding of different natural resources including renewable resources.
CO4: Demonstrate an appreciation for need for sustainable development and understand the various social issues and solutions to solve the issues.

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CO5: Describe about the importance of women and child education, existing technology to protect environment.

TEXT BOOKS:

T1 – S.Annadurai and P.N. Magudeswaran, "Environmental studies", Cengage Learning India Pvt.Ltd, Delhi, 2020

T2 - Anubha Kaushik and C. P. Kaushik, "Perspectives in Environmental studies", Sixth edition, New Age International Publishers,
New Delhi, 2019.

REFERENCE BOOKS:

R1 - Erach Bharucha. "Textbook of environmental studies" University Press (I) Pvt.ltd. Hyderabad. 2015

R2 - G.Tyler Miller, Jr and Scott E. Spoolman"Environmental Science" Thirteenth Edition, Cengage Learning, 2010.

R3 – Gilbert M. Masters and Wendell P. Ela "Introduction to Environmental Engineering and Science", 3rd edition, Pearson Education, 2013.

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

Course Objective

The student should be able to

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

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

Course Outcome

After completion of the course the learner will be able to

CO1: Understand the Crystal systems and crystal structures in the field of Engineering
CO2: Illustrate the fundamental of electrical properties of materials
CO3: Discuss concept of acceptor or donor levels and the band gap of a semiconducting materials
CO4: Develop the technology of the magnetic materials and its applications in engineering field
CO5: Understand the advanced technology of new engineering materials in the field of Engineering

TEXT BOOKS:

T1 - Rajendran V, "Materials Science", Tata McGraw Hill Publishing Company Limited, New Delhi, 2017.
T2- M.N Avadhanulu and PG Kshirsagar "A Text Book of Engineering physics" S. Chand and Company ltd., New Delhi 2022

REFERENCE BOOKS:

R1 – Charles Kittel "Introduction to Solid State Physics", Wiley., New Delhi 2017
R2 - Dr. M.Arumugam "Materials Science " Anuradha publications., 2019

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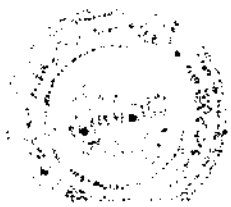

Programme/ Sem	Course Code	Name of the Course	L	T	P	C
BE/B.Tech/ II	22PH2151	PHYSICS FOR CIRCUIT ENGINEERING PROGRAMME (AIML,CSE,ECE,EEE,EIE,IT & BME)	2	0	2	3

Course Objective

The student should be able to

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

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

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After completion of the course the learner will be able to

Course Outcome

CO1: Understand the advanced technology of LASER and optical communication in the field of engineering

CO2: Illustrate the fundamental properties of matter

CO3: Discuss the Oscillatory motions of particles

CO4: Understand the dual nature of matter and the Necessity of quantum mechanics.

CO5: Develop the Ultrasonics technology and its applications in NDT.

TEXT BOOKS:

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

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

REFERENCE BOOKS:

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

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

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Programme/ Sem	Course Code	Name of the Course	L	T	P	C
B.E./B.Tech/ II	22HE2151	EFFECTIVE TECHNICAL COMMUNICATION (Common to all Branches)	2	0	2	3

Course Objective

The learner should be able

1. To improve essential business communication skills.
2. To enrich employability knowledge.
3. To acquire the crucial organizing ability in official forum.
4. To impart important business writings.
5. To make effective presentation with essential etiquette.

Unit	Description	Instructional Hours
I	Language Proficiency: Types of sentences in English according to structure Writing: writing definitions, Describing product, work place and service (purpose, appearance, function) Vocabulary – words on nature **Practical Component: Listening- Watching and interpreting advertisements/short films Speaking- Extempore speech**	9
II	Language Proficiency: Direct and Indirect speech. Writing: Formal memos. Job application and resume preparation Vocabulary - words on offense and ethics**Practical Component: Listening- Comprehensions based on telephonic conversation Speaking- Vote of thanks& welcome address**	9
III	Language Proficiency: Homophones and Homonyms, Writing: Preparing a detail plan for an official visit, schedule and Itinerary, reading comprehension. Vocabulary– words on society **Practical Component: Listening- Listening- paraphrasing the listened content Speaking- Group Discussion with preparation**	9
IV	Language Proficiency: Idioms Writing: Report writing (marketing, investigating) Vocabulary-words involved in business **Practical Component: Listening- Watching technical discussions and preparing MoM Speaking- On the spot Group Discussion**	9
V	Language Proficiency: spotting errors Writing: making /interpreting chart, sequencing of sentences Vocabulary- words involved in finance **Practical Component: Listening- Comprehensions based on announcements Speaking- Presentation on a technical topic with ppt.**	9
	Total Instructional Hours	45

Course Outcome

At the end of the course, learners will be able

CO1: To the business procedure and promotion skills.
CO2: To make oral and written presentation in corporate forum.
CO3: To schedule official events and participate in official discussions without reluctance.
CO4: To take an effective role and manage in an organizational sector.
CO5:To prepare and demonstrate a professional presentation

TEXT BOOKS:

T1 - Norman Whitby, "Business Benchmark-Pre-intermediate to Intermediate",Cambridge University Press. 2016.
T2- Ian Wood and Anne Willams. "Pass Cambridge BEC Preliminary". Cengage Learning press 2015.

REFERENCE BOOKS :

R1 -Michael Mc Carthy. "Grammar for Business". Cambridge University Press, 2009.
R2- Bill Mascull. "Business Vocabulary in use: Advanced 2nd Edition". Cambridge University Press. 2009.
R3-Frederick T. Wood, "Remedial English Grammar For Foreign Students", Macmillan publishers, 2001.

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

Course Objective

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

Unit	Description	Instructional Hours
I	**Basics of C Programming** Structure of C program - C programming: Data Types –Keywords – Variables - Operators: Precedence and Associativity - Expressions – Input / Outputstatements Decision making statements - Looping statements – Pre-processor directives - Compilation process	5+4(P)
II	**Arrays and Strings** Introduction to Arrays: Declaration, Initialization–One dimensional array –Two dimensional arrays – String operations and String functions	5+4(P)
III	**Functions and Pointers** Introduction to functions: Function prototype, function definition, function call - Parameter passing: Pass by value, Pass by reference – Recursion – Pointers – Pointer operators – Pointer arithmetic – Arrays and pointers	5+4(P)
IV	**Structures and Unions** Structure - Nested structures – Array of structures – Self-referential structures – Dynamic memory allocation – Typedef - Unions – Union of Structures	7+2(P)
V	**File Processing** Files – Types of file processing: Sequential access, Random access – Sequential access file- Random access file – Command line arguments	7+2(P)
	TOTAL INSTRUCTIONAL HOURS	45

S.No	List of Experiments
1	Programs using I/O statements and expressions
2	Write a program to find whether the given year is leap year or Not
3	Design a calculator to perform the operations, namely, addition, subtraction,

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	multiplication and division
4	Write a program to find Sum of Digits of two number
5	Check whether a given number is Armstrong number or not
6	Write a program to find addition of two Matrix.
7	Write a program for compute transpose of a matrix.
8	Write a program to find Palindrome of a given String
9	Find a factorial of a number using recursion
10	Sort the list of numbers using pass by reference
11	Compute internal marks of students for five different subjects using structures
12	Generate salary slip of employees
13	Write a program to copy the content of file to another file
14	Find the total number of characters, words and lines in given file.
15	Write a program to swap operation using command line arguments for input

Course Outcome

At the end of the course, the learner will be able to
CO1: Develop simple algorithms for arithmetic and logical problems.
CO2: Test and execute the programs and correct syntax and logical errors.
CO3: Implement conditional branching, iteration and recursion.
CO4: Decompose a problem into functions and synthesize a complete program and use arrays, pointers, strings and structures to formulate algorithms and programs.
CO5: Use files to perform read and write operations.

TEXT BOOKS:

T1: Balagurusamy, "Programming in ANSI C", Tata McGraw, 7th Edition, 2001. ISBN 13:9789339219666
T2: Behrouz A. Forouzan, Richard F. Gilberg, J. Jaya, S. Shankar, I. Jasmine SelvakumariJeya, M. Ramya Devi, "Computer Programming in C", Cengage Learning, 2022.
T3: Byron Gottfried, "Programming with C", Schaum's Outlines Series, McGraw Hill Education, 3rd edition, 2017.

REFERENCE BOOKS:

R1: Schildt Herbert, "C: The Complete Reference", Tata McGraw Hill Education, 4th edition, 2014.
R2: R. S. Bichkar, "Programming with C", Universities Press, 2nd edition 2012.
R3: Yashvant Kanetkar, "Exploring C", BPB Publishers, 2nd edition, 2003.
R4: W. Kernighan Brian, Dennis M. Ritchie, "The C Programming Language", PHI Learning, 2nd edition, 1988

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

Course Objective

The student should be able

1. To Understand the Basics of java Programming.
2. To discuss the packages and interfaces in java programming
3. To learn IO streams and multithreading in java
4. To learn generics and collections framework in java
5. To understand event handling and swing in java

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

Course Outcome

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

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

TEXT BOOKS:

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

REFERENCE BOOKS:

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

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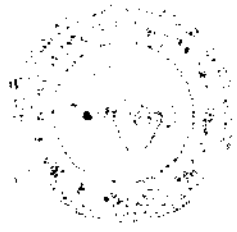

Programme	Course Code	Name of the Course	L	T	P	C
B.E/B.Tech	22ME2001	**ENGINEERING PRACTICES** (Common to all branches)	0	0	4	2

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

Unit **Description of the Experiments**

GROUP A (CIVIL AND MECHANICAL)

1. Preparation of Single pipe line and Double pipe line connection by using valves, taps, couplings, unions, reducers and elbows.
2. Arrangement of bricks using English Bond for one brick thick wall for right angle corner junction and T- junction
3. Arrangement of bricks using English Bond for one and a half brick thick wall for right angle corner and T- junction
4. Preparation of arc welding of Butt joints, Lap joints and Tee joints.
5. Practice on sheet metal Models– Trays and funnels
6. Hands-on-exercise in wood work, joints by sawing, planning and cutting.
7. Practice on simple step turning, taper turning and drilling.
8. Demonstration on Smithy operation.
9. Demonstration on Foundry operation.
10. Demonstration on Power tools.

GROUP B (ELECTRICAL ENGINEERING)

1. Residential house wiring using switches, fuse, indicator, lamp and energy meter.
2. Fluorescent lamp wiring.
3. Stair case wiring.
4. Measurement of Electrical quantities – voltage, current, power & power factor in single phase circuits.
5. Measurement of energy using single phase energy meter.
6. Soldering practice using general purpose PCB.
7. Measurement of Time, Frequency and Peak Value of an Alternating Quantity using CRO and Function Generator.
8. Study of Energy Efficient Equipment's and Measuring Instruments.

Total Instructional Hours 45

Course Outcome

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

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Programme/ Sem	Course Code	Name of the Course	L	T	P	C
BE/B.TECH II	22HE2071	DESIGN THINKING	1	0	2	2

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

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

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

TEXT BOOKS:

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

REFERENCE BOOKS:

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

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

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

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

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

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

REFERENCE BOOKS:

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

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அலகு I மொழி மற்றும் இலக்கியம்: 3
இந்திய மொழிக் குடும்பங்கள் – திராவிட மொழிகள் – தமிழ் ஒரு செம்மொழி – தமிழ் செவ்விலக்கியங்கள் - சங்க இலக்கியத்தின் சமயச் சார்பற்ற தன்மை – சங்க இலக்கியத்தில் பகிர்தல் அறம் – திருக்குறளில் மேலாண்மைக் கருத்துக்கள் – தமிழ்க் காப்பியங்கள், தமிழகத்தில் சமண பௌத்த சமயங்களின் தாக்கம் - பக்தி இலக்கியம், ஆழ்வார்கள் மற்றும் நாயன்மார்கள் – சிற்றிலக்கியங்கள் – தமிழில் நவீன இலக்கியத்தின் வளர்ச்சி – தமிழ் இலக்கிய வளர்ச்சியில் பாரதியார் மற்றும் பாரதிதாசன் ஆகியோரின் பங்களிப்பு.

அலகு II மரபு – பாறை ஓவியங்கள் முதல் நவீன ஓவியங்கள் வரை – சிற்பக் கலை: 3
நடுகல் முதல் நவீன சிற்பங்கள் வரை - ஐம்பொன் சிலைகள்- பழங்குடியினர் மற்றும் அவர்கள் தயாரிக்கும் கைவினைப் பொருட்கள், பொம்மைகள் – தேர் செய்யும் கலை – சுடுமண் சிற்பங்கள் – நாட்டுப்புறத் தெய்வங்கள் – குமரிமுனையில் திருவள்ளுவர் சிலை – இசைக் கருவிகள் – மிருதங்கம், பறை, வீணை, யாழ், நாதஸ்வரம் – தமிழர்களின் சமூக பொருளாதார வாழ்வில் கோவில்களின் பங்கு.

அலகு III நாட்டுப்புறக் கலைகள் மற்றும் வீர விளையாட்டுகள்: 3
தெருக்கூத்து, கரகாட்டம், வில்லுப்பாட்டு, கணியான் கூத்து, ஒயிலாட்டம், தோல்பாவைக் கூத்து, சிலம்பாட்டம், வளரி, புலியாட்டம், தமிழர்களின் விளையாட்டுகள்.

அலகு IV தமிழர்களின் திணைக் கோட்பாடுகள்: 3
தமிழகத்தின் தாவரங்களும், விலங்குகளும் – தொல்காப்பியம் மற்றும் சங்க இலக்கியத்தில் அகம் மற்றும் புறக் கோட்பாடுகள் – தமிழர்கள் போற்றிய அறக்கோட்பாடு – சங்ககாலத்தில் தமிழகத்தில் எழுத்தறிவும், கல்வியும் – சங்ககால நகரங்களும் துறை முகங்களும் – சங்ககாலத்தில் ஏற்றுமதி மற்றும் இறக்குமதி – கடல்கடந்த நாடுகளில் சோழர்களின் வெற்றி.

அலகு V இந்திய தேசிய இயக்கம் மற்றும் இந்திய பண்பாட்டிற்குத் தமிழர்களின் பங்களிப்பு: 3
இந்திய விடுதலைப்போரில் தமிழர்களின் பங்கு – இந்தியாவின் பிறப்பகுதிகளில் தமிழ்ப் பண்பாட்டின் தாக்கம் – சுயமரியாதை இயக்கம் – இந்திய மருத்துவத்தில், சித்த மருத்துவத்தின் பங்கு – கல்வெட்டுகள், கையெழுத்துப்படிகள் - தமிழ்ப் புத்தகங்களின் அச்சு வரலாறு.

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DE16

1. தமிழக வரலாறு – மக்களும் பண்பாடும் – கே.கே. பிள்ளை (வெளியீடு: தமிழ்நாடு பாடநூல் மற்றும் கல்வியியல் பணிகள் கழகம்).
2. கணினித் தமிழ் – முனைவர் இல. சுந்தரம். (விகடன் பிரசுரம்).
3. கீழடி – வைகை நதிக்கரையில் சங்ககால நகர நாகரிகம் (தொல்லியல் துறை வெளியீடு)
4. பொருநை – ஆற்றங்கரை நாகரிகம். (தொல்லியல் துறை வெளியீடு)
5. Social Life of Tamils (Dr.K.K.Pillay) A joint publication of TNTB & ESC and RMRL – (in print)
6. Social Life of the Tamils - The Classical Period (Dr.S.Singaravelu) (Published by: International Institute of Tamil Studies.
7. Historical Heritage of the Tamils (Dr.S.V.Subatamanian, Dr.K.D. Thirunavukkarasu) (Published by: International Institute of Tamil Studies).
8. The Contributions of the Tamils to Indian Culture (Dr.M.Valarmathi) (Published by: International Institute of Tamil Studies.)
9. Keeladi - 'Sangam City Civilization on the banks of river Vaigai' (Jointly Published by: Department ofArchaeology & Tamil Nadu Text Book and Educational Services Corporation, Tamil Nadu)
10. Studies in the History of India with Special Reference to Tamil Nadu (Dr.K.K.Pillay) (Publishedby: The Author)
11. Porunai Civilization (Jointly Published by: Department of Archaeology & Tamil Nadu Text Bookand Educational Services Corporation, Tamil Nadu)
12. Journey of Civilization Indus to Vaigai (R.Balakrishnan) (Published by: RMRL) – Reference Book.

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BE17

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

The learner should be able to

Course Objective

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

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

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

Course Outcome

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

TEXTBOOKS:

T1: Social Life of Tamils (Dr.K.K.Pillay) A joint publication of TNTB & ESC and RMRL – (in print)
T2: Social Life of the Tamils - The Classical Period (Dr.S.Singaravelu) (Published by: International Institute of Tamil Studies.
T3: Historical Heritage of the Tamils (Dr.S.V.Subatamanian, Dr.K.D. Thirunavukkarasu)(Published by: International Institute of Tamil Studies).

REFERENCEBOOKS:

R1-The Contributions of the Tamils to Indian Culture (Dr.M.Valarmathi) (Published by: International Institute of Tamil Studies)
R2- Porunai Civilization (Jointly Published by: Department of Archaeology & Tamil Nadu Text Bookand Educational Services Corporation, Tamil Nadu)
R3-Journey of Civilization Indus to Vaigai (R.Balakrishnan) (Published by: RMRL) – Reference Book.

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Dean (Academics)
HiCET

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

Course Objectives:

The student should be able to

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

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

Course Outcome:

After completion of the course the learner will be able to

CO1:Perform the social services on various occasions for better community and social life

CO2:Appreciate the need and requirement for disaster management and NCC role in disaster management activities.

CO3: Define thinking, reasoning, critical thinking and creative thinking

CO4:Use of bearing and service protector and locate the places and objects on the ground.

CO5:Understand the principles of flight and Aerofoil structure

Reference:

1. UGC and AICTE circulated syllabus.

Text Books :

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

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Dean (Academics)
HiCET

HINDUSTHAN EDUCATIONAL AND CHARITABLE TRUST

HICET

HINDUSTHAN

COLLEGE OF ENGINEERING AND TECHNOLOGY

(An Autonomous Institution)

Coimbatore – 641032

DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

2019 REGULATIONS with AMENDMENTS

2021-2022

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

SEMESTER I

21HE1101 Technical English

PO& PSO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO1
CO1	1	1	1	2	-	1	2	1	2	3	1	3	3	2
CO2	1	2	1	1	1	2	1	1	1	3	1	2	2	3
CO3	1	2	1	1	1	2	1	1	2	3	1	2	2	2
CO4	1	1	-	1	1	1	1	1	2	3	1	2	3	3
CO5	-	1	1	1	1	1	1	2	2	3	1	2	2	2
Avg	1	1.4	1	1.2	1	1.4	1.2	1.2	1.8	3	1	2.2	2.4	2.4

21MA1103 Calculus and Differential Equations

PO & PSO	PO 1	PO 2	PO 3	PO 4	PO 5	PO6	PO7	PO8	PO9	PO10	PO11	PO1 2	PSO1	PS O2
CO1	3	3	3	2	2	-	-	-	-	-	-	2	2	2
CO2	3	3	3	3	3	-	-	-	-	-	-	2	2	3
CO3	3	3	3	3	3	-	-	-	-	-	-	2	1	2
CO4	3	3	3	3	3	-	-	-	-	-	-	2	2	1
CO5	3	3	3	2	3	-	-	-	-	-	-	2	2	2

Avg	3	3	3	2.6	2.8	-	-	-	-	-	-	2	1.8	2

21PH1151Applied Physics

PO & PSO	**PO 1**	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO1 2**	**PSO1 1**	**PSO1 2**
CO 1	3	2	2	1	1	1	-	-	-	-	-	1	2	1
CO 2	3	3	1	1	2	-	-	-	-	-	-	1	3	3
CO 3	3	2	1	2	2	-	-	-	-	-	-	1	3	3
CO 4	3	2	3	2	3	1	-	-	-	-	-	1	2	2
CO 5	3	2	3	2	2	2	-	-	-	-	-	1	2	3
Avg	3	2.2	2	1.6	2	1.33	-	-	-	-	-	1	2.4	2.4

21CY1151Chemistry for Engineers

PO& PSO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO11**	**PSO12**
CO1	3	2	2	-	2	1	1	-	-	-	-	1	1	1
CO2	3	2	2	-	2	1	-	-	-	-	-	1	1	-
CO3	3	2	2	-	2	1	1	-	-	-	-	1	1	-
CO4	3	2	2	2	2	1	-	-	-	-	-	1	1	1
CO5	3	2	2	-	2	1	-	-	-	-	-	1	1	1
Avg	3	2	2	2	2	1	1	-	-	-	-	1	1	1

21CS1151Python Programming and Practices

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

21EC1153Electron devices and Electric Circuits

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	-

21HE1071Language Competency Enhancement Course-I

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	3	2	2	-	-	-	-	-	-	-	-	1	2	-

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

SEMESTER II

21HE2101 Business English for Engineers

PO& PSO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	1	2	1	1	1	2	1	2	2	3	-	3	1	-
CO2	2	1	1	1	1	2	2	2	2	3	-	2	-	1
CO3	2	2	1	1	1	2	2	2	2	3	1	3	1	-
CO4	2	2	1	1	2	2	2	2	3	3	1	3	1	1
CO5	1	1	1	1	1	2	2	1	2	3	1	3	1	1
Avg	1.6	1.6	1	1	1.2	2	1.8	1.8	2.2	3	1	2.8	1	1

21MA2103Linear Algebra, Numerical Methods and Transform Calculus

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

21PH2151Material Science

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

21CY2151Environmental Studies

PO& PSO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO 10	PO 11	PO 12	PSO 1	PS O2
CO1	2	-	-	-	-	2	3	3	2	-	-	2	-	-
CO2	2	-	-	-	-	2	3	3	2	-	-	2	-	-
CO3	2	1	1	-	-	2	3	3	2	-	-	2	-	-
CO4	2	1	2	-	-	2	3	3	2	-	-	2	-	-
CO5	2	1	2	-	-	2	3	3	2	-	-	2	-	-
Avg	2	1	1.7	-	-	1	2	3	2	-	-	2	-	-

21CS2152 Essentials of C& C ++ programming

PO& PSO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO 10	PO 11	PO 12	PSO1	PSO 2
CO1	3	3	1	-	-	-	1	-	-	-	1	1	1	2
CO2	3	3	2	1	-	-	1	-	-	-	1	1	1	2
CO3	3	3	1	-	-	1	1	-	-	1	1	-	1	1
CO4	3	3	2	1	-	2	1	-	-	1	1	1	1	1
CO5	3	3	2	1	-	3	1	-	-	1	1	1	1	1
Avg	3	3	1.6	1		2	1			1	1	1	1	1.4

21ME2154Engineering Graphics

PO& PSO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO1 0	PO1 1	PO1 2	PSO1	PSO 2
CO1	2	3	2	-	1	-	1	-	-	1	1	1	1	2
CO2	3	3	2	1	1	-	1	-	-	1	1	1	1	2
CO3	3	3	3	-	1	1	1	-	-	1	1	-	1	1
CO4	3	3	3	1	1	2	1	-	-	1	1	1	1	1
CO5	3	3	3	1	1	3	1	-	-	1	1	1	1	1
Avg	2.8	3	2.6	1	1	2	1	-	-	1	1	1	1	1.4

21ME2001/19EE2001 Engineering Practices

PO& PSO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO 10	PO 11	PO 12	PSO1	PSO 2
CO1	3	-	3	-	3	-	1	-	1	-	-	-	1	2
CO2														
CO3														
CO4														
CO5														
Avg	3		3		3				1				1	2

SEMESTER III

21MA3102Fourier analysis and transforms

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

21EC3201Digital Electronics

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

21EC3202 Signals and Systems

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

21EC3203 Electronic Circuits

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**

21CS3252 Oops using Java

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**

21EC3001 Electronic circuits lab

PO / CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	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**
AVG	**3**	**3**	**3**	**3**	-	**3**	-	**3**	-	-	**1**	**3**	**2**	**3**

21EC3002 Digital Electronics Lab

PO / CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	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**
AVG	**3**	**3**	**3**	**3**	-	**3**	-	**3**	-	-	**1**	**3**	**2**	**3**

SEMESTER IV

21MA4104 Probability and Random Processes

PO & PSO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	2	3	2	1	1	-	-	-	-	-	1	2	2	2
CO2	2	3	2	1	1	-	-	-	-	-	1	2	2	2
CO3	2	2	2	2	1	-	-	-	-	-	1	2	2	2
CO4	2	2	3	1	2	-	-	-	-	-	2	2	3	3
CO5	2	3	3	2	2	-	-	-	-	-	3	2	3	3
Avg	2	2.6	2.4	1.4	1.4	-	-	-	-	-	1.6	2	2.4	2.4

21EC4201 Electro Magnetic Fields and waves

PO & PSO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO1	PO8	PO10	PO11	PO12	PSO1	PSO2
CO1	3	2	2	3	-	-	2	-	-	-	-	3	3	1
CO2	3	3	3	3	-	-	2	-	-	-	-	3	3	1
CO3	3	2	2	3	-	-	1	-	-	-	-	3	3	1
CO4	3	3	3	2	-	-	2	-	-	-	-	3	3	1
CO5	3	2	2	2	-	-	1	-	-	-	-	3	3	1
AVG	3	2.4	2.4	2.5	-	-	1.6	-	-	-	-	3	3	1

21EC4202 Analog Communication

PO & PSO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	2	3	3	2	2	2	-	-	3	-	3	2	**3**
CO2	3	2	3	3	2	2	2	-	-	3	-	3	2	3
CO3	3	2	3	3	2	2	2	-	-	3	-	3	2	-
CO4	3	2	3	3	2	2	2	-	-	3	-	3	2	3
CO5	3	2	3	3	2	2	2	-	-	3	-	3	2	-
AV	3	3	3	3	2	2	2			2		3	3	1.8

21EC4203 Linear Integrated Circuits

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

21EC4251 Control Systems

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

21EC4001 Linear Integrated Circuits Lab

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

21EC4002 Analog communication Lab

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

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

21EC5202 Transmission lines and WaveGuides

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2

CO 1	3	**3**	3	**1**	2	**1**	**2**	**-**	**-**	**2**	**-**	**-**	**3**	**3**
CO 2	2	2	2	1	3	1	2	**-**	**-**	**2**	**-**	**-**	**3**	**2**
CO 3	3	3	2	1	2	2	2	**-**	**-**	**2**	**-**	**-**	**3**	**2**
CO 4	3	3	2	1	3	2	2	-	-	2	-	-	2	2
CO 5	3	3	1	1	1	2	2	-	-	2	-	-	2	1
AVG	2.8	2.8	2	1	2.2	1.6	2	-	-	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**	**PO11**	**PO12**	**PSO 1**	**PSO 2**
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**	**PSO 1**	**PSO 2**
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	3	3	3	3	3	3	2	-	3	3	2	3	3	2

5														
AVG	**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

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

21EC5001 VLSI Design Lab

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

21EC5002 Microprocessors and Microcontrollers Lab

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

CO 3	3	3	2	3	3	3	3	-	-	-	-	-	3	3
CO 4	3	3	3	3	3	3	2	-	-	-	-	-	3	3
CO 5	3	3	3	3	3	3	3	-	-	-	-	-	2	3
AV G	**3**	3	2.6	3	2.6	3	2.6	-	-	-	-	-	2.6	3

SEMESTER VI

21EC6202 Antenna and Wave Propagation

	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 O1**	**PSO 2**
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

21EC6181 Principles of Management

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	2		2				3			3	3
CO2	3	2	2	2		2				3			3	3
CO3	3	2	2	2		2				3			3	3
CO4	3	2	2	2		2				3		2	3	3
CO5	3	2	2	2		2				3		2	3	3
AVG	3	2	2	2		2				3		2	3	3

21EC6251 **Embedded Systems and IOT**

	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	2	2	3	3	3	2	2	2	-	-	-	2	1	2

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

21EC6201 Digital Communication

PO&PSO ⟶	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	3	2	2			2							3	3
CO2	3	2	2			2							3	3
CO3	3	2	2	2		2								3
CO4	3	2	2			2						2		3
CO5	3	2	2	3		2						2		3
AVG	3	2	2	2.5		2						1.5	1.5	3

21EC6001 Digital Communication Lab

PO&PSO ⟶	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	3	2	2			2							3	3
CO2	3	2	2			2							3	3
CO3	3	2	2	2		2								3
CO4	3	2	2			2						2		3
CO5	3	2	2	3		2						2		3
AVG	3	2	2	2.5		2						1.5	1.5	3

21EC7201 Digital Image Processing

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

AVG	3	3	3	3		1			2	1.4		2	1	3

16EC7202 Optical and Microwave Engineering

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

21EC7251 Wireless Communication

	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

21EC7001 Digital Image processing Lab

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

										4				

21EC7002 Optical Communication and Microwave Lab

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

21EC7901 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

SEMESTER VIII

21EC8901 Project Work – Phase II

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

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	PSO2
I	I	21HE1101 Technical English	1	1.4	1	1.2	1	1.4	1.2	1.2	1.8	3	1	2.2	2.4	2.4
		21MA1103Calculus and Differential Equations	3	3	3	2.6	2.8	-	-	-	-	-	-	2	1.8	2
		21PH1151Applied Physics	3	2.2	2	1.6	2	1.33	-	-	-	-	-	1	2.4	2.4
		21CY1151Chemistry for Engineers	3	2	2	2	2	1	1	-	-	-	-	1	1	1
		21CS1151Python Programming and Practices	2	3	3	-	2	-	-	-	2	-	-	2	2	2
		21EC1153 Electron devices and Electric Circuits	3	2	2	-	-	-	-	-	-	-	-	1	2	-
I	II	21HE2101Business English for Engineers	1.6	1.6	1	1	1.2	2	1.8	1.8	2.2	3	1	2.8	1	1
		21MA2103Linear Algebra,Numerical Methodsand Transform Calculus	3	3	3	2.6	2.8	-	-	-	-	-	-	2	1	-
		21PH2151 Material Science	3	2.4	1.2	1.8	1.8	1	2	-	-	-	-	1	2	2.2
		21CY2151Environmental Studies	2	1	1.7	-	-	1	2	3	2	-	-	2	-	-
		21CS2152Essentials of C&C++Programming	3	3	1.6	1		2	1			1	1	1	1	1.4
		21ME2154Engineering Graphics	2.8	3	2.6	1	1	2	1	-	-	1	1	1	1	1.4
		21ME2001Engineering Practices	3		3		3				1				1	2
II	III	21EC3201 Digital	3	2	2									1	2	-

		Electronics														
		21MA3102 Fourier analysis and transforms	3	3	3	3	2.6	-	-	-	-	-	-	2	2	1.2
		21EC3202 Signals and Systems	3	2	2									1	2	-
		21EC3203RElectronic Circuits	3	3	3	3	-	3	-	3	-	-	1	3	2	3
		21CS3252Oops using Java	3	3	3	3	-	3	-	3	-	-	1	3	2	3
		21EC3001Electronic circuits lab	3	3	3	3	-	3	-	3	-	-	1	3	2	3
		21EC3002Digital Electronics Lab	3	3	3	3	-	3	-	3	-	-	1	3	2	3
	IV	21MA4104 Probability and Random Processes	2	2.6	2.4	1.4	1.4	-	-	-	-	-	1.6	2	2.4	2.4
		21EC4201R Electro Magnetic Fields and waves	3	2.4	2.4	2.5	-	-	1.6	-	-	-	-	3	3	1
		21EC4202R Analog Communication	3	3	3	3	2	2	2			2		3	3	1.8
		21EC4203 Linear Integrated Circuits	3	3	2	3	2	2						-	2	2
		21EC4251 Control Systems	3	3	3	2	2	2	2						2	2
		21EC4001Linear Integrated Circuits Lab	3	3	3	2	2	2	2						2	2
		21EC4002Analog communication Lab	3	3	3	2	2	2	2						2	2
III	V	21EC5201 Microprocessor and Microcontroller	3	3	2	2	2	2	2	3	3	-	-	3	3	3
		21EC5202 Transmission lines and Wave Guides	2.8	2.8	2	1	2.2	1.6	2	-	-	2	-	-	2.6	2
		21EC5203 / VLSI design	3	3	3	3	1.8	1.8	1.4	1	1	1.8	1	2.4	3	3
		21EC5251/DATA COMMUNICATION	3	3	3	3	1.8	1.8	1.4	1.8	1.8	1.8	2	2.4	3	3

		NETWORKS														
		21EC5252 Digital Signal Processing	**3**	3	2.6	3	2.6	3	2.6	-	-	-	-	-	2.6	3
		21EC5301 Measurements and Instrumentation	2	2	3	1	2	3	2			2			2	1
		21EC5181/ Total Quality Management	1.2	1.6	1	2		1	1	3	2.8	2.6	1	2	2	1.4
		21EC5001VLSI Design Lab	**3**	3	3	3	3	3	3	-	-	-	-	-	3	3
		21EC5002Microprocessors and Microcontrollers Lab	**3**	3	2.6	3	2.6	3	2.6	-	-	-	-	-	2.6	3
III	**VI**	21EC6201 Digital Communication	3	2	2	2.5		2						1.5	1.5	3
		21EC6202 Antenna and Wave Propagation	3	3	3	3	2	2							3	2
		21EC6181 Principles of Management	3	2	2	2		2				3		2	3	3
		21EC6251 Embedded Systems and IOT	2	2	3	3	3	2	2	2				2	1	2
		21EC6001 Digital Communication Lab	3	2	2	2.5		2						1.5	1.5	3
IV	**VII**	21EC7201 Digital Image Processing	3	3	3	3		1			2	1.4		2	1	3
		21EC7202 Optical and Microwave Engineering	3	2	2	3	2	2	2					2	2	1
		21EC7251 Wireless Communication	3	3	3	3	2	2							3	2
	VII	21EC7001 Digital Image processing Lab	3	3	3	3		1			2	1.4		2	1	3
		21EC7002 Optical Communication and Microwave Lab	3	2	2	3	2	2	2					2	2	1

		21EC7901 Project Work – Phase I	3	2	2	3	2	2	2	3	3	3	3	2	2	1
	VII	21EC8901 Project Work – Phase II	3	2	2	3	2	2	2	3	3	3	3	1	3	3

Chairman - BoS
ECE - HiCET

Chairman
107

Dean (Academics)
HiCET