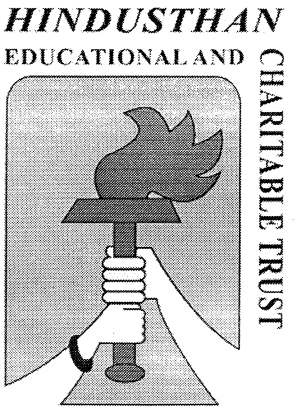


HINDUSTHAN

COLLEGE OF ENGINEERING AND TECHNOLOGY

(An Autonomous Institution)

Coimbatore – 641032

DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

Curriculum and Syllabus for the Batch 2019-2023

2019 REGULATIONS

VISION OF THE DEPARTMENT

To nurture Electronic and Communication Professionals with exemplary skills adorned with ethical values.

MISSION OF THE DEPARTMENT

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

PROGRAME EDUCATIONAL OBJECTIVES (PEOs)

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

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

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

PROGRAME SPECIFIC OUTCOMES (PSOs)

PSO1: Graduates will be able to provide solutions for real time embedded systems using Internet of Things to meet the global needs.

PSO2: Graduates will have the perseverance to design and develop products using cutting edge technologies in Signal processing and Communication systems.

PROGRAME OUTCOMES (POs)

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

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

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

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

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

activities with an understanding of the limitations

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

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

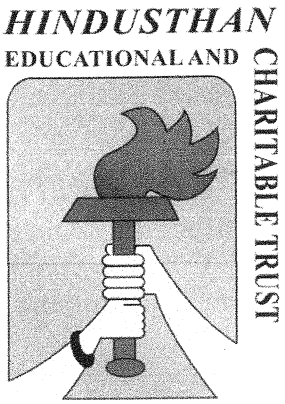
8. Ethics: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice

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

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

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

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



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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 2019-2023

(Academic Council Meeting Held on 13.08.2021)

2019 REGULATIONS

HINDUSTHAN EDUCATIONAL AND CHARITABLE TRUST
HICET

Hindusthan College of Engineering and Technolog
(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.

TÜVRheinland CERTIFIED

DETAILS OF CHANGES CARRIED OUT IN CURRICULUM & SYLLABUS

CBCS PATTERN

UNDERGRADUATE PROGRAMMES

B.E ELECTRONICS AND COMMUNICATION ENGINEERING (UG)

REGULATION-2019 (Revised on July 2021)

(For the students admitted during the academic year 2019-2020 and onwards)

SEMESTER I

S.No.	Course Code	Course Title	Category	L	T	P	C	CIA	ESE	TOTAL
THEORY										
1	19HE1101	Technical English	HS	2	1	0	3	25	75	100
2	19MA1103	Calculus and Differential Equations	BS	3	1	0	4	25	75	100
THEORY WITH LAB COMPONENT										
3	19PH1151	Applied Physics	BS	2	0	2	3	50	50	100
4	19CY1151	Chemistry for Engineers	BS	2	0	2	3	50	50	100
5	19CS1151	Python Programming and Practices	ES	2	0	2	3	50	50	100
6	19EC1153	Electron devices and Electric Circuits	ES	2	0	2	3	50	50	100
PRACTICAL										
7	19HE1071	Language Competency Enhancement Course-I	HS	0	0	2	1	0	100	100
			Total	**13**	**2**	**10**	**20**	**250**	**450**	**700**

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	Essentials of C & C ++ programming	ES	2	0	2	3	50	50	100
6	19ME2154	Engineering Graphics	ES	1	0	4	3	50	50	100
PRACTICAL										
7	19ME2001 /19EE2001	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
			Total	**12**	**2**	**16**	**22**	**300**	**500**	**800**

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	19EC3203	Electronic Circuits	PC	3	0	0	3	25	75	100
THEORY WITH LAB COMPONENT										
5	19CS3252	Oops using Java	PC	2	0	2	3	50	50	100
PRACTICAL										
6	19EC3001	Electronic circuits lab	PC	0	0	3	1.5	50	50	100
7	19EC3002	Digital Electronics Lab	PC	0	0	3	1.5	50	50	100
MANDATORY COURSES										
8	19MC3191	Indian Constitution	MC	2	0	0	0	100	0	100
			Total	**16**	**2**	**8**	**20**	**350**	**450**	**800**

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	19EC4201	Electro Magnetic Fields and waves	PC	3	1	0	4	25	75	100
3	19EC4202	Analog Communication	PC	3	1	0	4	25	75	100
4	19EC4203	Linear Integrated Circuits	PC	3	0	0	3	25	75	100
THEORY WITH LAB COMPONENT										
5	19EC4251	Control Systems	PC	2	0	2	3	50	50	100
PRACTICAL										
6	19EC4001	Linear Integrated Circuits Lab	PC	0	0	3	1.5	50	50	100
7	19EC4002	Analog communication Lab	PC	0	0	3	1.5	50	50	100
MANDATORY COURSES										
8	19MC4191	Essence of Indian tradition knowledge/Value Education	MC	2	0	0	0	100	0	100
			Total	**16**	**3**	**8**	**21**	**350**	**450**	**800**

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 Wave Guides	PC	3	1	0	4	25	75	100
3	19EC5203	VLSI Design	PC	3	0	0	3	25	75	100
4	19EC53XX	**Professional Elective I**	PE	3	0	0	3	25	75	100
THEORY WITH LAB COMPONENT										
5	19EC5251	Data Communication and Networks	PC	2	0	2	3	50	50	100
6	19EC5252	Digital Signal Processing	PC	2	0	2	3	50	50	100
PRACTICALS										
7	19EC5001	VLSI Design Lab	PC	0	0	3	1.5	50	50	100
8	19EC5002	Microprocessors and Microcontrollers Lab	PC	0	0	3	1.5	50	50	100
MANDATORY COURSES										

9	19HE5071	Soft Skills - I	EEC	1	0	0	1	100	0	100
10	19HE5072	Design Thinking	EEC	1	0	0	1	100	0	100
			Total	**18**	**1**	**10**	**24**	**500**	**500**	**1000**

SEMESTER VI

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

SEMESTER VII

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

8	19CH7901	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	19EC8901	Project Work – Phase II	EEC	0	0	16	8	100	100	200
			Total	**6**	**0**	**16**	**14**	**200**	**200**	**400**

TOTAL NO OF CREDITS: 165

LIST OF PROFESSIONAL ELECTIVES

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

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

LIST OF OPEN ELECTIVES

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

7	19LSZ405	Yoga for Human Excellence	OE	3	0	0	3	25	75	100

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

CREDIT DISTRIBUTION

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

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

Chairman, Board of Studies

Chairman - Bos
ECE - HiCET

Dean - Academics

Principal

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

Programme	Course Code	Name of the Course	L	T	P	C
BE/B.TECH	19MA3102	FOURIER ANALYSIS AND TRANSFORMS (COMMON TO EEE, ECE, EIE, AGRI, BM & FT)	3	1	0	4

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

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

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

TEXT BOOKS:

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

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

REFERENCE BOOKS :

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

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

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

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

CHAIRMAN BOS

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ECE - HiCET

PRINCIPAL

Programme	Course Code	Name of the Course	L	T	P	C
BE	19EC3201	Digital Electronics	3	0	0	3

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

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

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

TEXT BOOKS:

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

REFERENCE BOOKS:

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

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

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PRINCIPAL

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

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

CHAIRMAN BOS

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

PRINCIPAL

Programme	Course Code	Name of the Course	L	T	P	C
BE	19EC3202	Signals and Systems	3	1	0	4

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

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

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

TEXT BOOKS:

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

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

REFERENCE BOOKS:

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

R3 - Ramesh Babu.P and Ananda natarajan, "Signals and Systems",Fifth edition,Scitech publications,2017.

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

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

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PRINCIPAL

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

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HINDUSTHAN COLLEGE OF ENGG. & TECH. CBE-32

PRINCIPAL

Programme	Course Code	Name of the Course	L	T	P	C
BE	19EC3203	Electronic Circuits	3	0	0	3

Course Objective

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

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

Course Outcome

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

TEXT BOOKS:

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

REFERENCE BOOKS:

R1-Robert L.Boylestad, Louis Nasheisky, "Electronic Devices and Circuit Theory", 9th Edition, 2007.

R2- Jacob Millman,Christos C.Halkias,"Electronic Devices and Circuits" McGraw Hill , Edition 1991.

R3- D.Schilling and C.Belove, "Electronic Circuits", 3rd Edition, McGraw Hill, 1989.

R4- David A. Bell, "Electronic Devices and Circuits", fifth edition,Oxford Higher education

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PRINCIPAL

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

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PRINCIPAL

Programme	Course Code	Name of the Course	L	T	P	C
BE	19CS3252	OOPS using Java	2	0	2	3

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

Unit	Description	Instructional Hours
I	**OVERVIEW OF JAVA PROGRAMMING** Review of Object oriented programming-Introduction to java programming-Features of Java Language, JVM -The Java Environment-Primitive Data types-variables-arrays-control statements- classes and objects-access specifier-methods-constructor-string. **Programs:** 1. Arrange the given character array in ascending order by getting the user input. 2. method overriding 3. add two complex numbers using constructors	7+2(P)
II	**BASIC JAVA FEATURES** Inheritance – class hierarchy – polymorphism – dynamic binding – final keyword Defining an interface-implementing an interface-applying interface-variables in interface-extended interface - Exception Handling-exception types-uncaught exception-multiple catch - nested try – throw and finally - built-in exceptions. **Programs:** 1. Bank Details using Multi-Level Inheritance 2. Student's internal and external Mark statements using Interface with exception handling	7+2(P)
III	**PACKAGES AND MULTITHREAD** Packages-defining package-access protection-importing packages -Multithreaded programming -java thread model-thread priorities-synchronization- thread class and runnable interface-creating multiple threads. **Programs:** 1. Calculate simple interest and compound interest using packages and exception handling. 2. Program to illustrate multi threads.	7+2(P)
IV	**I/O STREAMS AND COLLECTIONS FRAMEWORK** I/O basics- Streams, Byte streams, Character streams, reading console input-writing console output-reading and writing files. Collections overview –interfaces (Collection, List, Set, Sorted Set, Navigable Set)-classes (Array List, LinkedList, HashSet, Linked HashSet, TreeSet)-an iterator. **Programs:** 1. Convert uppercase into lowercase using file I/O. 2. Linked List implementation using collections.	7+2(P)
V	**FRAMES AND WINDOWS** Applet fundamentals-Applet Basics-An Applet Skeleton-Simple Applet Display Methods-The HTML APPLET Tag-Passing Parameters to Applets. Window Fundamentals- Working with Frame Windows-Creating a Frame Window in an Applet-Displaying Information Within a Window-Working with Graphics-Drawing Lines-Drawing Rectangles-Drawing Ellipses and Circles-Working with Color-Working with Fonts. **Programs:** 1. Create simple banner using applet 2. Create an applet using shapes, color and fonts.	7+2(P)
	Total Instructional Hours	**35+10**

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

TEXT BOOKS:

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

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

REFERENCES BOOKS:

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

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

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

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PRINCIPAL

Programme	Course Code	Name of the Course	L	P	T	C
BE	19EC3001	Electronic Circuits Lab	0	0	3	1.5

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

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

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PRINCIPAL

Programme	Course Code	Name of the Course	L	P	T	C
BE	19EC3002	Digital Electronics Lab	0	0	3	1.5

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

Course Outcome

CO1-Analyze the performance of various combinational circuits.
CO2-Design and develop various synchronous logic circuits.
CO3-Formulate the design procedure of combinational digital circuits using Hardware Description Language
CO4-Formulate the design procedure of sequential digital circuits using Hardware Description Language
CO5-Understand & Simulate VHDL programming

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

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PRINCIPAL

Programme	Course Code	Name of the Course	L	P	T	C
B.E. / B.Tech	19MC3191	Indian Constitution	2	0	0	0

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

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

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

TEXT BOOKS:

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

T2-R.C.Agarwal, (1997) "Indian Political System", S.Chand and Company, New Delhi.

T3-Maciver and Page, " Society: An Introduction Analysis ", Mac Milan India Ltd., New Delhi.

T4-K.L.Sharma, (1997) "Social Stratification in India: Issues and Themes", Jawaharlal Nehru University, NewDelhi.

REFERENCE BOOKS:

R1. Sharma, Brij Kishore, " Introduction to the Constitution of India:, Prentice Hall of India, New Delhi.

R2. U.R.Gahai, "Indian Political System ", New Academic Publishing House, Jalaendhar.

R3. R.N. Sharma, "Indian Social Problems ", Media Promoters and Publishers Pvt. Ltd.

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

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PRINCIPAL

Programme	Course Code	Name of the Course	L	T	P	C
BE/B.TECH	19MA4104	PROBABILITY AND RANDOM PROCESSES (ECE)	3	1	0	4

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

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

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

TEXT BOOKS:

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

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

REFERENCE BOOKS :

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

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

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

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

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PRINCIPAL

Programme	Course Code	Name of the Course	L	T	P	C
BE	19EC4201	Electro Magnetic Fields and Waves	3	1	0	4

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

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

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

TEXT BOOKS:

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

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

REFERENCE BOOKS:

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

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

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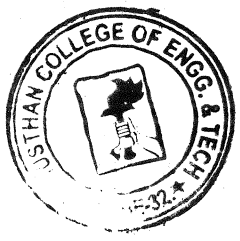

	R3-Ramo, Whinnery and Van Duzer: "Fields and Waves in Communications Electronics" ,John Wiley & Sons, 3rd edition 2003
	R4-David K.Cheng: "Field and Wave Electromagnetics - Second revised Edition-Pearson,2013.
	R5-RG.S.N. Raju, Electromagnetic Field Theory & Transmission Lines, Pearson Education, 2006.

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

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Programme	Course Code	Name of the Course	L	T	P	C
BE	19EC4202	Analog Communication	3	1	0	4

Course Objective

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

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

Course Outcome

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

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TEXT BOOKS:

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

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

REFERENCE BOOKS:

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

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

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

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

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

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

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PRINCIPAL

Programme	Course Code	Name of the Course	L	T	P	C
BE	19EC4203	Linear Integrated Circuits	3	0	0	3

Course Objective

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

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

Course Outcome

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

TEXT BOOKS:

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

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

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.

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	R3-Robert F.Coughlin, Frederick F.Driscoll, "Operational Amplifiers and Linear Integrated Circuits", Sixth Edition, PHI, 2001.
	R4-B.S. Sonde, "System design using Integrated Circuits" , 2nd Edition, New Age Pub, 2001.
	R5-Gray and Meyer, "Analysis and Design of Analog Integrated Circuits", Wiley International, 2005.

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

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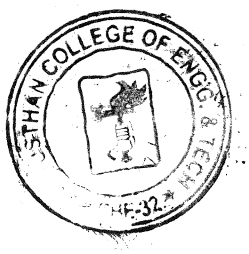

PRINCIPAL

Programme	Course Code	Name of the Course	L	T	P	C
BE	19EC4251	Control Systems	2	0	2	3

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

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

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

TEXT BOOKS:

T1- J.Nagrath and M.Gopal, "Control System Engineering", New Age International Publishers, 6th Edition, 2018.

T2- Benjamin.C.Kuo, "Automatic control systems", Wiley,9th Edition,2014.

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REFERENCE BOOKS:

R1- 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.

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

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Programme	Course Code	Name of the Course	L	P	T	C
BE	19EC4001	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	Phase shift and Wien bridge oscillators using 741 op-amp.
5	Astable and Mono stable multivibrators using NE555 Timer.
6	Function Generator using ICL8038.
	Simulate the following experiments
7	Integrator, Differentiator and Instrumentation Amplifier using SPICE.
8	Astable & Monostable multivibrators with NE555 Timer using SPICE.
9	Phase shift and Wien bridge oscillators with op-amp using SPICE.
10	D/A and A/D converters using SPICE.
Total Practical Hours	**45**

Course Outcome

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

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

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Programme	Course Code	Name of the Course	L	P	T	C
B.E	19EC4002	Analog Communication Lab	0	0	4	2

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

Exp.No.	Description of the Experiments
1	Design and testing of Amplitude Modulation and Demodulation
2	Design and testing of Frequency Modulation and Demodulation.
3	Design and testing of Pre Emphasis - De Emphasis Circuits
4	Design and testing of Mixer Circuit
5	Design and testing of Phase locked loop
6	Pulse Amplitude Width Modulation
7	Time Division Multiplexing.
	Simulation Experiments
8	DSB SC Modulation and Demodulation.
9	Pulse Width and Pulse Position modulation
10	Spectral Characteristics of AM & FM
	Total Practical Hours 45

Course Outcome	CO1-Analyze the performance of various modulation and demodulation methods CO2-Interpret the spectral characteristics of the modulated signals CO3-Analyze multiplexing techniques in signal reception CO4-Evaluate Spectral Characteristics of AM CO5-Assess Spectral Characteristics of FM

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

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Programme	Course Code	Name of the Course	L	T	P	C
BE	19MC4191	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**

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, Velliarnad. Kerala

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

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Programme	Course Code	Name of the Course	L	T	P	C
BE	22EC4252	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,storyboarding&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)
	Total Instructional Hours	**(27 + 18) 45**

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

Outcome	**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

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

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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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 using Button 3. Install NodeJS and work with REPL Terminal 4. Control LED using Mobile in Raspberry Pi 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 create flow on Bluemix Node- Red app	15

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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Program	Course Code	Name of the Course	L	T	P	C
BE		Block Chain	3	0	0	3

Course Objective

1. Understand how blockchain solutions are transforming the landscape of the industry
2. Understand the concept of blockchain and how they are getting created
3. Analyze how docker images are getting migrated
4. Understand how blockchain can be used for business
5. Understanding the ethics and security in blockchain

Unit	Description	Instructional Hours
I	**Introduction to Block Chain:** Blockchain explained - Why is blockchain relevant? - Summary & resources - Blockchain Implementations - State of the Community - Blockchain vs Bitcoin - public and private key basics, pros and cons of Blockchain, Myths about Bitcoin	9
II	**Containerization using Dockers** What is Containers – Introduction to dockers – Namespaces in containers – VMs vs Containers – Need for dockers – Create your first dockers – implementation of the docker – Run Multiple containers – Cleaning the used containers	9
III	**Docker Images** Definition of Docker Image – Creating a Docker Image – Docker Registry- Public vs Private Registry- Docker Image Layers –Container Orchestration - Create Python App within Dockers – Create and Run Docker – Push and Deploy t	9
IV	**Blockchain for business:** Types of Blockchain- Requirements of a Blockchain – Blockchain for Enterprise – Hyperledger Fabric architecture – Applying blockchain to a business model – chaincode query methods – Adding query logic to smart contracts – chaincode best practice -	9
V	**Security in Chaincode:** Identity and Access control Certificates and Certificate Authorities – Public Key Infrastructure – Digital Certificates and authority – Membership service providers – Data Privacy – Encryption – Public and Private key infrastructure – Network channels – Private Data collections	9
	Total Instructional Hours	45

Course Outcome

CO1: Get basic overview on the blockchain concepts

CO2: Understand how a docker is important in present proceedings
CO3: Perform a real-time docker container and port them over internet
CO4: Understand how security is implemented over critical blockchain

TEXT BOOKS:

T1 :IBM Courseware

REFERENCE BOOKS:

R1: "Docker Deep Dive" by Nigel Poulton
R2: "Mastering Docker" by Russ McKendrick
R3: Mastering Blockchain: Unlocking the Power of Cryptocurrencies, Smart Contracts, and Decentralized Applications" by Imran Bashir

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Programme	Course Code	Name of the Course	L	T	P	C
BE	19CS5331	Angular JS	29	-	16	3

Course Objective	1. Learn the core concepts of Angular including components. 2. Learn and Apply directives, Services & dependency injection, pipes, views, forms and tables, Animation, Angular with SQL 3. Explored the essential Angular features and have gained the skills you need to build robust single-page applications. 4. Learn various testing tools. 5. Learn Material design for Mobile.

Unit	Description	Instructional Hours
I	**INTRODUCTION TO JAVASCRIPT** JavaScript-SinglePageApp-MVC-Controller-Template-Expression-Modules-Filter-Difference between Angular and React.	9
II	**ANGULAR 7** Node Js-NPM-Angular CLI-IDE-Angular Architecture-Life cycle core feature-Angular 7 with Bootstrap.	7+2(P)
III	**ANGULAR 7 CORE COMPONENTS** Modules-Services-Pipes-CustomPipes-Events-Forms-Tables-DOM-Directives-Views-Routing-Animation-Angular with SQL-Angular with Server-Material Design for Mobile.	5+4(P)
IV	**TESTING APPS** Introduction of Karma and Jasmine -Setup and tear down-Test Class-Angular Testbed(ATB)-ATB features.	3+6(P)
V	**BOILERPLATE** Introduction to Boilerplate-Boilerplate code-Boilerplate component-initialize boilerplate	5+4(P)
	Total Instructional Hours	**(29 + 16) 45**

Course Outcomes:

CO1:Demonstrate Angular concepts including components, Modules & Directive.
CO2:Demonstrate Services, Animation, forms & tables, Events .
CO3:Demonstrate Angular using SQL.
CO4:Understand how to use Karma and Jasmine for E2E testing.
CO5:Demonstrate Material design for Mobile.

TEXT BOOKS:

T1 :IBM CE-AngularJS

REFERENCE BOOKS:

R1: Angular: Up and Running: Learning Angular, Step by Step by Shyam Seshadri.
R2: Angular : From Theory to Practice by Asim Hussain
R3: Getting MEAN with Mongo, Express, Angular, and Node by Simon Holmes

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Programme	Course Code	Name of the Course	L	T	P	C
BE	19CS5231	Angular JS	29	-	16	3

Course Objective	1. Learn the core concepts of Angular including components. 2. Learn and Apply directives, Services & dependency injection, pipes, views, forms and tables, Animation, Angular with SQL 3. Explored the essential Angular features and have gained the skills you need to build robust single-page applications. 4. Learn various testing tools. 5. Learn Material design for Mobile.

Unit	Description	Instructional Hours
I	**INTRODUCTION TO JAVASCRIPT** JavaScript-SinglePageApp-MVC-Controller-Template-Expression-Modules-Filter-Difference between Angular and React.	9
II	**ANGULAR 7** Node Js-NPM-Angular CLI-IDE-Angular Architecture-Life cycle core feature-Angular 7 with Bootstrap.	7+2(P)
III	**ANGULAR 7 CORE COMPONENTS** Modules-Services-Pipes-CustomPipes-Events-Forms-Tables-DOM-Directives-Views-Routing-Animation-Angular with SQL-Angular with Server-Material Design for Mobile.	5+4(P)
IV	**TESTING APPS** Introduction of Karma and Jasmine -Setup and tear down-Test Class-Angular Testbed(ATB)-ATB features.	3+6(P)
V	**BOILERPLATE** Introduction to Boilerplate-Boilerplate code-Boilerplate component-initialize boilerplate	5+4(P)
	Total Instructional Hours	**(29 + 16) 45**

Course Outcomes:

CO1:Demonstrate Angular concepts including components, Modules & Directive.
CO2:Demonstrate Services, Animation, forms & tables, Events .
CO3:Demonstrate Angular using SQL.
CO4:Understand how to use Karma and Jasmine for E2E testing.
CO5:Demonstrate Material design for Mobile.

TEXT BOOKS:

T1 :IBM CE-AngularJS

REFERENCE BOOKS:

R1: Angular: Up and Running: Learning Angular, Step by Step by Shyam Seshadri.
R2: Angular : From Theory to Practice by Asim Hussain
R3: Getting MEAN with Mongo, Express, Angular, and Node by Simon Holmes

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Programme	Course Code	Name of the Course	L	T	P	C
BE	22EC5251	Angular JS	29	-	16	3

Course Objective	1. Learn the core concepts of Angular including components. 2. Learn and Apply directives, Services & dependency injection, pipes, views, forms and tables, Animation, Angular with SQL 3. Explored the essential Angular features and have gained the skills you need to build robust single-page applications. 4. Learn various testing tools. 5. Learn Material design for Mobile.

Unit	Description	Instructional Hours
I	**INTRODUCTION TO JAVASCRIPT** JavaScript-SinglePageApp-MVC-Controller-Template-Expression-Modules-Filter-Difference between Angular and React.	9
II	**ANGULAR 7** Node Js-NPM-Angular CLI-IDE-Angular Architecture-Life cycle core feature-Angular 7 with Bootstrap.	7+2(P)
III	**ANGULAR 7 CORE COMPONENTS** Modules-Services-Pipes-CustomPipes-Events-Forms-Tables-DOM-Directives-Views-Routing-Animation-Angular with SQL-Angular with Server-Material Design for Mobile.	5+4(P)
IV	**TESTING APPS** Introduction of Karma and Jasmine -Setup and tear down-Test Class-Angular Testbed(ATB)-ATB features.	3+6(P)
V	**BOILERPLATE** Introduction to Boilerplate-Boilerplate code-Boilerplate component-initialize boilerplate	5+4(P)
	Total Instructional Hours	**(29 + 16) 45**

Course Outcomes:

CO1:Demonstrate Angular concepts including components, Modules & Directive.
CO2:Demonstrate Services, Animation, forms & tables, Events .
CO3:Demonstrate Angular using SQL.
CO4:Understand how to use Karma and Jasmine for E2E testing.
CO5:Demonstrate Material design for Mobile.

TEXT BOOKS:

T1 :IBM CE-AngularJS

REFERENCE BOOKS:

R1: Angular: Up and Running: Learning Angular, Step by Step by Shyam Seshadri.
R2: Angular : From Theory to Practice by Asim Hussain
R3: Getting MEAN with Mongo, Express, Angular, and Node by Simon Holmes

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Program	Course Code	Name of the Course	L	T	P	C
B.E	19CS6351	NODE JS AND MICRO SERVICES	2	0	2	3

Course Objectives

1. To know about monolithic architecture and microservice architecture
2. To describe about Microservice security and Gateways
3. To know about microservice governance
4. To provide basics of NodeJS and Mongo DB
5. To focus on Containers, Dockers and Kubernetes

Unit	Description	Instruction alhours
I	**MONOLITHIC AND MICROSERVICE ARCHITECTURE** What is Monolithic Application - Its Components - Advantages and Disadvantages of monolithic application - Scaling your application - Domain Driven Design - Everyone vision is cloud native - Evolutionary Design-Introduction and benefits of Microservices - What is Service oriented architecture - How is Microservice different than Service oriented - Microservice Architecture - Characteristics of microservice architecture	6 Hrs
II	**MICROSERVICE SECURITY, API MANAGEMENT ANDGATEWAYS** Complexity of Microservices – Microservices Security- Authentication and Authorization service- What is an API - API Management - Microservices, SOA and APIs combined: Deep Integration- Service Exposure – Rest API- Future of Microservices	6 Hrs
III	**MICROSERVICE GOVERNANCE** Microservice Governance - Microservice Governance Framework– Elements of Microservices Governance- Guiding Principles for Microservices Governance -Centralized Microservice Governance - Centralized Logging for Microservices- Decentralized Governance - Decentralization of Data stores	6 Hrs
IV	**NODEJS, FILE SYSTEM & CONNECTION TO DATABASE** Introduction to NodeJS - Node Express Command Prompt - node eclipse plugin - Basic Routing – Global objects - viewing templates - serving static content - Handling HTTP and HTTPS – Connectivity - MongoDB Installation & Setup - NodeJS Mongo driver - Performing CRUD Operation- Connection pooling - Connection pooling using NodeJS Mongo driver	6 Hrs
V	**CONTAINER, DOCKER & KUBERNETES** What are containers - Benefits of container - VM vs Containers - Dev vs Ops-Docker Mission-Docker Adoption -Docker Basic Concepts - Docker Architecture - Typical workflow - Container Ecosystem - Container Orchestration - What is kubernetes – Strength – Architecture – Components - Building blocks - Deployingapplication on kubernetes – Helm - Application centre components- Pod health checking - kubectl commands - Cloud application component architecture - Benefits of Kubernetes with IBM Containers.	6 Hrs

PRACTICAL 15 Hrs

1. Working REPL Commands (Ctrl+c, Ctrl+d,.help, .break, .clear,.save). Save the program and execute it. Perform arithmetic operations (+,-,*,/,%) and mathematical calculations such as sin, pow, sqrt operations using variables
2. Perform File operations (Read and Write) using node.js
3. Build a simple Web application that returns a message as "Hello World" when user request the server with node.js
4. Install Express in nodejs and Build an API from scratch with NodeJS and Express
5. Implement Model View Controller (MVC) for node application (User Registration & Login).
6. Create database named Student with the fields of RegNo, Student name, Degree, Semester, CGPA and Perform the following operations using Mongo DB:
   a. Insert the data of 10 student details
   b. Display all the students in CSE in ascending order
   c. Display the student details of Regno 5,6,7 in descending order of percentage
   d. Display all the ECE students with CGPA greater than 6, but less than 7.5
7. Implement CRUD Operation using NodeJS, MongoDB and Express.

Total Instructional Hours **30+15=45hrs**

Course Outcomes

Upon successful completion of this course, the student will be able to:
CO1: Understand the difference between Monolithic and Microservices Architectural styles and evaluate the design.
CO2: Analyze the service and communication between APIs.
CO3: Understand the workflow of microservice governance and Datastores
CO4: Create Microservice Application using NodeJS and Mongo DB
CO5: Design a microservices architecture with Docker, Containers

TEXT BOOKS:

T1: IBM Course ware

REFERENCE BOOKS:

R1: "Monolith to Microservices **Evolutionary Patterns to Transform Your Monolith"** By Sam Newman

R2 : **"Microservice Architecture"** by Irakli Nadareishvili, Ronnie Mitra, Matt McLarty, Mike Amundsen Released August 2016.

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PROGRAMME	COURSE CODE	NAME OF THE COURSE	L	T	P	C
B.Tech	22IT3252	Relational Database Management System	2	0	2	3

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

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

S.No	List of Experiments
1	Creating indexes
2	Create Tables
3	Create Stored Procedures and Functions
4	Read data using SELECT statements
5	Query Multiple tables with join statements
6	Create database and connecting to table using Java API
7	CRUD Operation using JPA
8	Set permissions on database
9	Restore a database
Course Outcome	CO1: Describe the fundamental elements of relational database management systems CO2: Explain the basic concepts of relational data model, entity-relationship model, relational CO3: Improve the database design by normalization. CO4: Design ER-models to represent simple database application scenarios CO5: Convert the ER-model to relational tables, populate relational database and formulate SQL queries on data.

TEXT BOOKS:

T1: IBM Course Ware
REFERENCE BOOKS:
R1: Database Design and Relational Theor-Normal Forms and All That Jazz.,2019
R2: Pro SQL Server Relational Database Design and Implementation-Louis Davidson, Jessica Moss.,2016
R3: Relational Theory for Computer Professionals-C.J. Date.,2013

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PROGRAMME	COURSE CODE	NAME OF THE COURSE	L	T	P	C
B.Tech	21IT3252	Relational Database Management System	2	0	2	3

Course Objective	6. List and explain the fundamental concepts of a relational database system. 7. Utilize a wide range of features available in a DBMS package. 8. Develop the logical design of the database using data modeling concepts such as entity-relationship diagrams. 9. Manipulate a database using SQL. 10. Assess the quality and ease of use of data modeling and diagramming tools.

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

S.No	List of Experiments
1	Creating indexes
2	Create Tables
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4	Read data using SELECT statements
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TEXT BOOKS:
T1: IBM Course Ware

REFERENCE BOOKS:

R1: Database Design and Relational Theor-Normal Forms and All That Jazz.,2019
R2: Pro SQL Server Relational Database Design and Implementation-Louis Davidson, Jessica Moss.,2016
R3: Relational Theory for Computer Professionals-C.J. Date.,2013

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PROGRAMME	COURSE CODE	NAME OF THE COURSE	L	T	P	C
B.Tech	19IT3252	Relational Database Management System	2	0	2	3
	11. List and explain the fundamental concepts of a relational database system. 12. Utilize a wide range of features available in a DBMS package.					

Course Objective	13. Develop the logical design of the database using data modeling concepts such as entity-relationship diagrams. 14. Manipulate a database using SQL. 15. Assess the quality and ease of use of data modeling and diagramming tools.

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

S.No	List of Experiments
1	Creating indexes
2	Create Tables
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TEXT BOOKS:

T1: IBM Course Ware

REFERENCE BOOKS:

R1: Database Design and Relational Theor-Normal Forms and All That Jazz.,2019

R2: Pro SQL Server Relational Database Design and Implementation-Louis Davidson, Jessica Moss.,2016

R3: Relational Theory for Computer Professionals-C.J. Date.,2013

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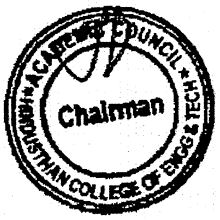

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Programme	Course Code	Name of the Course	L	T	P	C
BE	19EC5201	MICROPROCESSOR AND MICRO CONTROLLER	3	0	0	3

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

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

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

TEXT BOOKS:

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

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

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

REFERENCE BOOKS:

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

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

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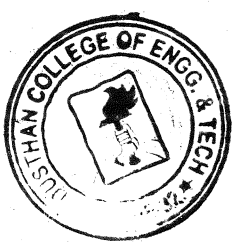

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3	2	2	-	-	-	-	-	-	-	2	3	3
CO2	3	3	3	3	-	-	-	-	3	-	-	2	3	3
CO3	3	2	2	2	-	-	-	-	2	-	-	3	3	3
CO4	3	3	3	2	-	-	-	-	3	-	-	3	3	3
CO5	3	3	2	3	-	-	-	-	3	-	-	3	3	3
AVG	3	2.8	2.4	2.4	-	-	-	-	2.8	-	-	2.6	3	3

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

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

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

TEXT BOOKS:

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

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

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REFERENCE BOOKS:

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

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

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

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

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

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

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

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

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

TEXT BOOKS:

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

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

REFERENCE BOOKS:

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

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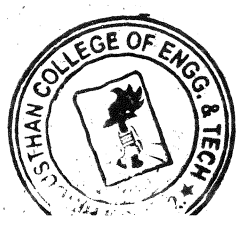

R2 - Neil H E Weste and David money Haris, "CMOS VLSI Design: A circuits and systems Perspective", Addison Wesley, New Delhi, 2010.

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

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

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HINDUSTHAN COLLEGE OF ENGG. & TECH.

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

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

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

TEXT BOOKS:

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

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

REFERENCE BOOKS:

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

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

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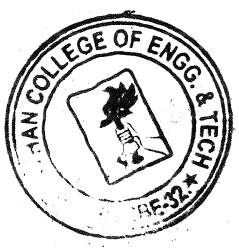

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3	3	3	3		-	-		3	-	3	3	2
CO2	3	3	3	3	3		-	-	-	3	-	3	3	3
CO3	3	3	3	3	3		-	-	-	-	-	3	3	3
CO4	3	3	3	3	3		-		3	-	-	3	3	3
CO5	3	3	3	3	3		-	-	3	3	-	3	3	2
AVG	3	3	3	3	3		-	-	3	3	-	3	3	2.6

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

Course Objective

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

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

Course Outcome

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

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

TEXT BOOKS

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

REFERENCE BOOK

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

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

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PRINCIPAL

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

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

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

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PRINCIPAL

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

Course Objectives:

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

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

Course Outcome:

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

REFERENCE BOOKS:

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

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

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

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

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

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

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PRINCIPAL

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

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

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

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PRINCIPAL

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

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

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

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

TEXT BOOKS:

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

REFERENCE BOOKS:

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

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

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PRINCIPAL

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

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

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

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

TEXT BOOKS:

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

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

REFERENCE BOOKS:

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

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

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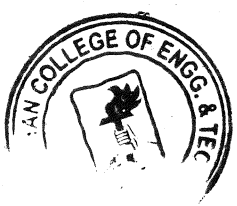

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3	3	3	-	-	-	-	-	-	-	3	3	2
CO2	3	3	3	3	-	-	-	-	-	-	-	3	3	2
CO3	3	3	3	3	-	-	-	-	-	-	-	3	3	2
CO4	3	3	3	3	-	-	-	-	-	-	-	3	3	2
CO5	3	3	3	3	-	-	-	-	-	-	-	3	3	2
AVG	3	3	3	3	-	-	-	-	-	-	-	3	3	2

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PRINCIPAL

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

Course Objective

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

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

Course Outcome

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

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TEXT BOOKS:

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

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

REFERENCE BOOKS:

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

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

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

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PRINCIPAL

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

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

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

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

TEXT BOOKS:

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

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

REFERENCE BOOKS:

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

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

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PRINCIPAL

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

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

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

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PRINCIPAL

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

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

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

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PRINCIPAL

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

Course Objectives:

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

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

Course Outcome:

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

REFERENCE BOOKS

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

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

Course Objectives:

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

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

Course Outcome:

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

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

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PRINCIPAL

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

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

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

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

TEXT BOOKS:

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

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

REFERENCE BOOKS:

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

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

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

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

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PRINCIPAL

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

Course Objective

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

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

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

TEXT BOOKS:

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

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

REFERENCE BOOKS:

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

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

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

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PRINCIPAL

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

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

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

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

TEXT BOOKS:

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

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

REFERENCE BOOKS:

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

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

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

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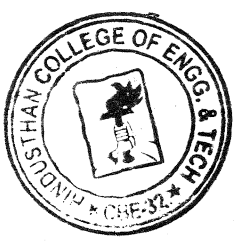

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3	2	2	2	-	-	-	-	-	-	2	3	3
CO2	3	3	3	3	3	-	-	-	-	-	-	2	2	3
CO3	3	2	2	2	2	-	-	-	-	-	-	-	3	3
CO4	3	3	3	2	2	-	-	-	-	-	-	3	2	3
CO5	3	3	2	3	3	-	-	-	-	-	-	3	3	3
AVG	3	2.8	2.4	2.4	2.4	-	-	-	-	-	-	2.5	2.6	3

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PRINCIPAL

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

Course Objective

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

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

Course Outcome

After completion of the course the learner will be able to

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

TEXT BOOKS:

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

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

REFERENCE BOOKS:

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

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

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

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PRINCIPAL

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

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

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

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

TEXT BOOKS:

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

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

REFERENCE BOOKS:

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

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

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

R4- ISO9001-2015 standards

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

PRINCIPAL

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

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PRINCIPAL

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

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

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

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

TEXT BOOKS:

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

REFERENCE BOOKS:

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

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

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

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PRINCIPAL

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

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PRINCIPAL

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

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

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

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

TEXT BOOKS:

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

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

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REFERENCE BOOKS:

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

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

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

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PRINCIPAL

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

Course Objective

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

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

Course Outcome

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

TEXT BOOKS:

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

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

REFERENCE BOOKS:

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

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

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

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PRINCIPAL

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

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

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

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

TEXT BOOKS:

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

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

REFERENCE BOOKS:

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

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

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

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

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

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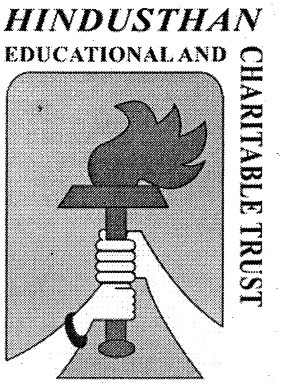

HICET

HINDUSTHAN

COLLEGE OF ENGINEERING AND TECHNOLOGY

(An Autonomous Institution)

Coimbatore – 641032

DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

Revised Curriculum and Syllabus for the Batch 2021-2025

(Academic Council Meeting Held on 13.08.2021)

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.

TÜVRheinland CERTIFIED

DETAILS OF CHANGES CARRIED OUT IN CURRICULUM & SYLLABUS

CBCS PATTERN

UNDERGRADUATE PROGRAMMES

B.E ELECTRONICS AND COMMUNICATION ENGINEERING (UG)

REGULATION-2019 (Revised on July 2021)

(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	25	75	100
2	21MA1103	Calculus and Differential Equations	BS	3	1	0	4	25	75	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	Python Programming and Practices	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	25	75	100
2	21MA2103	Linear Algebra, Numerical Methods and Transform Calculus	BS	3	1	0	4	25	75	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	Essentials of C&C++Programming	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	25	75	100
2	21EC3201	Digital Electronics	PC	3	0	0	3	25	75	100
3	21EC3202	Signals and Systems	PC	3	1	0	4	25	75	100
4	21EC3203	Electronic Circuits	PC	3	0	0	3	25	75	100
THEORY WITH LAB COMPONENT										
5	21CS3252	Oops using Java	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	25	75	100
2	21EC4201	Electro Magnetic Fields and waves	PC	3	1	0	4	25	75	100
3	21EC4202	Analog Communication	PC	3	1	0	4	25	75	100
4	21EC4203	Linear Integrated Circuits	PC	3	0	0	3	25	75	100
THEORY WITH LAB COMPONENT										
5	21EC4251	Control Systems	PC	2	0	2	3	50	50	100
PRACTICAL										
6	21EC4001	Linear Integrated Circuits Lab	PC	0	0	3	1.5	50	50	100
7	21EC4002	Analog communication Lab	PC	0	0	3	1.5	50	50	100
MANDATORY COURSES										
8	21MC4191	Essence of Indian tradition knowledge/Value Education	MC	2	0	0	0	100	0	100
9	21HE4072	**Career Guidance Level – IV** Personality, Aptitude and Career Development	EEC	2	0	0	0	100	0	100
10	21HE4073	Ideation Skills	EEC	2	0	0	0	100	0	100
		Total		**20**	**3**	**8**	**21**	**550**	**450**	**1000**

SEMESTER V

S. No.	Course Code	Course Title	Category	L	T	P	C	CIA	ESE	TOTAL
THEORY										
1	21EC5201	Microprocessor and Microcontroller	PC	3	0	0	3	25	75	100
2	21EC5202	Transmission lines and Wave Guides	PC	3	1	0	4	25	75	100
3	21EC5203	VLSI Design	PC	3	0	0	3	25	75	100
4	21EC53XX	**Professional Elective -I**	PE	3	0	0	3	25	75	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 Microcontrollers Lab	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	21EC6201	Digital Communication	PC	3	0	0	3	25	75	100
2	21EC6202	Antenna and Wave Propagation	PC	3	1	0	4	25	75	100
3	21EC6181	Principles of Management	HS	3	0	0	3	25	75	100
4	21EC63XX	**Professional Elective - II**	PE	3	0	0	3	25	75	100
5	21XX64XX	**Open Elective– I**	OE	3	0	0	3	25	75	100
THEORY WITH LAB COMPONENTS										
6	21EC6251	**Embedded Systems and IOT**	PC	2	0	3	3.5	50	50	100
PRACTICALS										
7	21EC6001	Digital Communication Lab	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**	**525**	**475**	**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	25	75	100
2	21EC7202	Optical and Microwave Engineering	PC	3	0	0	3	25	75	100
3	21EC73XX	**Professional Elective-III**	PE	3	0	0	3	25	75	100
4	21XX74XX	**Open Elective – II**	OE	3	0	0	3	25	75	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	25	75	100
2	21EC83XX	**Professional Elective- V**	PE	3	0	0	3	25	75	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	25	75	100
2	21EC5302	PCB Design	PE	3	0	0	3	25	75	100
3	21EC5303	RF System Design	PE	3	0	0	3	25	75	100
4	21EC5304	Network Security	PE	3	0	0	3	25	75	100
5	21EC5181	Total Quality Management	PE	3	0	0	3	25	75	100
PROFESSIONAL ELECTIVE II										
1	21EC6301	Medical Electronics	PE	3	0	0	3	25	75	100
2	21EC6302	Industrial Automation	PE	3	0	0	3	25	75	100
3	21EC6303	Mobile Communication	PE	3	0	0	3	25	75	100
4	21EC6304	High Speed Networks	PE	3	0	0	3	25	75	100
5	21EC6182	E-Commerce Technology	PE	3	0	0	3	25	75	100
PROFESSIONAL ELECTIVE III										
1	21EC7301	Robotics	PE	3	0	0	3	25	75	100
2	21EC7302	ASIC Design	PE	3	0	0	3	25	75	100
3	21EC7303	Global Positioning Systems	PE	3	0	0	3	25	75	100
4	21EC7304	Cloud Computing	PE	3	0	0	3	25	75	100

5	21EC7181	Entrepreneurship Development	PE	3	0	0	3	25	75	100
PROFESSIONAL ELECTIVE IV										
1	21EC8301	Neural networks and Deep learning	PE	3	0	0	3	25	75	100
2	21EC8302	Embedded Controllers	PE	3	0	0	3	25	75	100
3	21EC8303	Satellite Communication	PE	3	0	0	3	25	75	100
4	21EC8304	Wireless Sensors and Networks	PE	3	0	0	3	25	75	100
5	21EC8181	Foundation Skills in Integrated Product Development	PE	3	0	0	3	25	75	100
PROFESSIONAL ELECTIVE V										
1	21EC8306	Artificial Intelligence	PE	3	0	0	3	25	75	100
2	21EC8307	Low Power VLSI	PE	3	0	0	3	25	75	100
3	21EC8308	Software Defined Radio	PE	3	0	0	3	25	75	100
4	21EC8309	Photonic Networks	PE	3	0	0	3	25	75	100
5	21EC8182	Intellectual Property Rights and Innovations	PE	3	0	0	3	25	75	100

LIST OF OPEN ELECTIVES

ELECTRONICS AND COMMUNICATION ENGINEERING										
S.No.	**Course Code**	**Course Title**	**Category**	**L**	**T**	**P**	**C**	**CIA**	**ESE**	**TOTAL**
1	21EC6401	Consumer Electronics	OE	3	0	0	3	25	75	100
2	21EC7401	Introduction to IOT	OE	3	0	0	3	25	75	100
LIFE SKILL COURSES										
3	21LSZ401	General Studies for Competitive Examinations	OE	3	0	0	3	25	75	100
4	21LSZ402	Human Rights, Women's Rights and Gender Equality	OE	3	0	0	3	25	75	100
5	21LSZ403	Indian Ethos and Human Values	OE	3	0	0	3	25	75	100

6	21LSZ404	Indian Constitution and Political System	OE	3	0	0	3	25	75	100
7	21LSZ405	Yoga for Human Excellence	OE	3	0	0	3	25	75	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	25	75	100
9	21HEZ402	NCC course level 2	OE	3	0	0	3	25	75	100

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

Industrial Core Courses

S.No.	Course Code	Course Title	Category	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	21CS4204	Design Thinking	IC	2	0	2	3	50	50	100
5	21CS5231	Angular JS	IC	3	0	0	3	25	75	100
6	21CS6231	Node JS and Micro services	IC	3	0	0	3	25	75	100
7	21EC6252	IoT and Spring Framework	IC	3	0	0	3	25	75	100
8	21EC7305	Blockchain	IC	3	0	0	3	25	75	100

CREDIT DISTRIBUTION

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

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

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SYLLABUS

VISION OF THE DEPARTMENT

To nurture Electronic and Communication Professionals with exemplary skills adorned with ethical values.

MISSION OF THE DEPARTMENT

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

PROGRAME EDUCATIONAL OBJECTIVES (PEOs)

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

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

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

PROGRAME SPECIFIC OUTCOMES (PSOs)

PSO1: Graduates will be able to provide solutions for real time embedded systems using Internet of Things to meet the global needs.

PSO2: Graduates will have the perseverance to design and develop products using cutting edge technologies in Signal processing and Communication systems.

PROGRAME OUTCOMES (POs)

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

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

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

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

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

activities with an understanding of the limitations

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

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

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

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

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

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

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

Programme	Course Code	Name of the Course	L	T	P	C
B.E/B.Tech	21HE1101	**TECHNICAL ENGLISH** (COMMON TO ALL BRANCHES)	2	1	0	3

Course Objective	✓ Train to maintain coherence in formal communication. ✓ Provide Practice to create and interpret descriptive communication. ✓ Introduce the professional protocol. ✓ Acquiredifferent types of communication and professional etiquette. ✓ Educate to improve interpersonal and intrapersonal skills.

Unit	Description	Instructional Hours
I	**Listening and Speaking** – Opening a conversation, maintaining coherence, turn taking, closing a conversation (excuse, general wishes, positive comments and thanks) **Reading** –Reading articles from newspaper, Reading comprehension **Writing** Chart analysis, process description, Writing instructions **Grammar and Vocabulary**- Tenses, Regular and irregular verb, technical vocabulary.	9
II	**Listening and Speaking**- listening to product description, equipment & work place (purpose, appearance, function) **Reading**- Reading technical articles **Writing**- Letter phrases, writing personal letters, **Grammar and Vocabulary**-articles, Cause & effect, Prepositions.	9
III	**Listening and Speaking**- - listening to announcements **Reading**- Reading about technical inventions, research and development **Writing**- Letter inviting a candidate for interview, Job application and resume preparation **Grammar and Vocabulary**- Homophones and Homonyms.	9
IV	**Listening and Speaking**- - Practice telephone skills and telephone etiquette (listening and responding, asking questions).**Reading**- Reading short texts and memos **Writing**- invitation letters, accepting an invitation and declining an invitation **Grammar and Vocabulary**- Modal verbs, Collocation, Conditionals, Subject verb agreement and Pronoun-Antecedent agreement.	9
V	**Listening and Speaking**- listening to technical group discussions and participating in GDs**Reading**- reading biographical writing - **Writing**- Proposal writing, Writing definitions, **Grammar and Vocabulary**- Abbreviation and Acronym, Prefixes & suffixes, phrasal verbs.	9
	Total Instructional Hours	45

Course Outcome	CO1-Understand about basic grammar and elements of professional communication. CO2-Assess formal and technical communication CO3-Apply the basic elements of grammar and communication in professional situation. CO4-Analyse and interpret different styles of correspondence. CO5-Compose official letters and technical proposals and make presentations.

TEXT BOOKS:

T1- Norman Whitby, "Business Benchmark-Pre-intermediate to Intermediate",Cambridge University Press, 2016.

T2-Raymond Murphy, "Essential English Grammar", Cambridge University Press, 2019.

REFERENCE BOOKS :

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

R2- Raymond Murphy, "English Grammar in Use"-4th editionCambridge University Press, 2004.

R3- KamaleshSadanan "A Foundation Course for the Speakers of Tamil-Part-I &II", Orient Blackswan,2010.

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

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Programme/sem	Course Code	Name of the Course	L	T	P	C
B.E./B.Tech/ I	21MA1103	**CALCULUS AND DIFFERENTIAL EQUATIONS** (COMMON TO EEE, ECE, EIE AND BM)	3	1	0	4

Course Objective	1. Understand the concept of differentiation. 2. Compute the functions of several variables which are needed in many branches of engineering. 3. Understand the concept of double integrals. 4. Understand the concept of triple integrals. 5. Solve ordinary differential equations of certain types using Wronskian technique.

Unit	Description	Instructional Hours
I	**DIFFERENTIAL CALCULUS** Rolle's Theorem – Lagrange's Mean Value Theorem- Maxima and Minima – Taylor's and Maclaurin's Theorem.	12
II	**MULTIVARIATE CALCULUS (DIFFERENTIATION)** Totalderivatives - Jacobians – Maxima, M inima and Saddle points - Lagrange's method ofundeterminedmultipliers – Gradient, divergence, curl and derivatives.	12
III	**DOUBLE INTEGRATION** DoubleintegralsinCartesiancoordinates– Area enclosed by the plane curves (excluding surface area)– Green's Theorem (Simple Application) - Stoke's Theorem – Simple Application involving cubes and rectangular parellopiped.	12
IV	**TRIPLE INTEGRATION** Tripleintegrals in Cartesian co-ordinates – Volume of solids (Sphere, Ellipsoid, Tetrahedron) using Cartesian co-ordinates. Gauss Divergence Theorem – Simple Application involving cubes and rectangular parellopiped.	12
V	**ORDINARYDIFFERENTIALEQUATIONS** Ordinary differential equations of second order - Second orderlineardifferentialequationswithconstantcoefficients – Cauchy – Euler's Equation - Cauchy – Legendre's Equation - Method ofvariationfparameters.	12
	Total Instructional Hours	**60**

Course Outcome	CO1-Apply the concept of differentiation in any curve. CO2-Identify the maximum and minimum values of surfaces. CO3-Apply double integrals to compute the area of plane curves. CO4-Evaluation of triple integrals to compute volume of solids. CO5-Develop sound knowledge of techniques in solving ordinary differential equations that model engineering problems

TEXT BOOKS:

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

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

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" 12th Edition,Pearson India 2016.

R3 - Grewal B.S, "Higher Engineering Mathematics", 42nd Edition, Khanna Publications, Delhi, 2012.

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

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Programme/sem	Course Code	Name of the Course	L	T	P	C
B.E./B.Tech/ I	**21PH1151**	**APPLIED PHYSICS (Common to all branches)**	2	0	2	3

Course Objective	1. Enhance the fundamental knowledge in properties of matter 2. Analysis the oscillatory motions of particles 3. Extend the knowledge about wave optics 4. Gain knowledge about laser and their applications 5. Conversant with principles of optical fiber, types and applications of optical fiber

Unit	Description	Instructional Hours
I	**PROPERTIES OF MATTER** Elasticity – Hooke's law – Stress-strain diagram - Poisson's ratio – Bending moment – Depression of a cantilever – Derivation of Young's modulus of the material of the beam by Uniform bending theory and experiment. Determination of Young's modulus by uniform bending method	6 3
II	**OSCILLATONS** Translation motion –Vibration motion – Simple Harmonic motion – Differential Equation of SHM and its solution – Damped harmonic oscillation - Torsion stress and deformations – Torsion pendulum: theory and experiment. Determination of Rigidity modulus – Torsion pendulum	6 3
III	**WAVE OPTICS** Conditions for sustained Interference – air wedge and it's applications - Diffraction of light – Fraunhofer diffraction at single slit –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 3 3
IV	**LASER AND APPLICATIONS** Spontaneous emission and stimulated emission – Population inversion – Pumping methods – Derivation of Einstein's coefficients (A&B) – Type of lasers – Nd:YAG laser and CO_2 laser- Laser Applications – Holography – Construction and reconstruction of images. Determination of Wavelength and particl size using Laser	6 3
V	**FIBER OPTICS AND APPLICATIONS** Principle and propagation of light through optical fibers – Derivation of numerical aperture and acceptance angle – Classification of optical fibers (based on refractive index, modes and materials) – Fiber optical communication link – Fiber optic sensors – Temperature and displacement sensors.	6
	Total Instructional Hours	**45**

Course Outcome	**After completion of the course the learner will be able to** CO1-Illustrate the fundamental properties of matter CO2-Discuss the Oscillatory motions of particles CO3-Analyze the wavelength of different colors CO4-Understand the advanced technology of LASER in the field of Engineering CO5-Develop the technology of fiber optical communication in engineering field

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 - Arthur Beiser "Concepts of Modern Physics" Tata McGraw Hill, New Delhi – 2015

R2 - M.N Avadhanulu and PG Kshirsagar "A Text Book of Engineering physics" S. Chand and Company ltd., New Delhi 2016

R3 - Dr. G. Senthilkumar "Engineering Physics – I" VRB publishers Pvt Ltd., 2016

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

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Programme/sem	Course Code	Name of the Course	L	T	P	C
B.E./B.Tech/ I	21CY1151	**CHEMISTRY FOR ENGINEERS (COMMON TO ALL BRANCHES)**	2	0	2	3

Course Objective	The boiler feed water requirements, related problems and water treatment techniques. The principles of polymer chemistry and engineering applications of polymers and composites. The principles of electrochemistry and with the mechanism of corrosion and its control. The principles and generation of energy in batteries, nuclear reactors, solar cells, wind mills and fuel cells. The important concepts of spectroscopy and its applications.

Unit	Description	Instructional Hour
I	**WATER TECHNOLOGY** Hard water and soft water- Disadvantages of hard water- Hardness: types of hardness, simple calculations, estimation of hardness of water – EDTA method – Boiler troubles - Conditioning methods of hard water – External conditioning - demineralization process - desalination: definition, reverse osmosis – Potable water treatment – breakpoint chlorination. **Estimation of total, permanent and temporary hardness of water by EDTA**	6 +3=9
II	**POLYMER & COMPOSITES** polymerization – addition and condensation polymerization – mechanism of free radical addition polymerization – copolymers – plastics: classification – thermoplastics and thermosetting plastics, preparation, properties and uses of commercial plastics – PVC, Bakelite – moulding of plastics (extrusion and compression); Composites: definition, types of composites – polymer matrix composites (PMC) –FRP	6
III	**ELECTROCHEMISTRY AND CORROSION** Electrochemical cells – reversible and irreversible cells - EMF- Single electrode potential – Nernst equation (derivation only) – Conductometric titrations. Chemical corrosion – Pilling – Bedworth rule – electrochemical corrosion – different types –galvanic corrosion – differential aeration corrosion – corrosion control – sacrificial anode and impressed cathodic current methods - protective coatings – paints – constituents and functions. **Conductometric titration of strong acid vs strong base (HCl vs NaOH). Conductometric precipitation titration using $BaCl_2$ and Na_2SO_4. Estimation of Ferrous iron by Potentiometry.**	6+9 =15
IV	**ENERGY SOURCES AND STORAGE DEVICES** Introduction- nuclear energy- nuclear fission- controlled nuclear fission- nuclear fusion differences between nuclear fission and fusion- nuclear chain reactions- nuclear reactor power generator- classification of nuclear reactor- light water reactor- breeder reactor. Batteries and fuel cells: Types of batteries- alkaline battery- lead storage battery- lithium battery- fuel cell H_2 -O_2 fuel cell applications.	6
V	**ANALYTICAL TECHNIQUES** Beer-Lambert's law – UV-visible spectroscopy and IR spectroscopy – principles – instrumentation (block diagram only) – flame photometry – principle – instrumentation (block diagram only) – estimation of sodium by flame photometry – atomic absorption spectroscopy – principles – instrumentation (block diagram only) – estimation of nickel by atomic absorption spectroscopy. **Determination of iron content of the water sample using spectrophotometer.(1,10 phenanthroline / thiocyanate method).**	6+3
	Total Instructional Hours	45

Course Outcome	CO1: Differentiate hard and soft water and to solve the related problems on water purification and its significance in industries and daily life CO2: Acquire the basic knowledge of polymers, composites and FRP and their significance. CO3: Develop knowledge on the basic principles of electrochemistry and understand the causes of corrosion, its consequences to minimize corrosion to improve industrial design. CO4: Develop knowledge about the renewable energy resources and batteries along with the need of new materials to improve energy storage capabilities. CO5: Identify the structure and characteristics of unknown/new compound with the help of spectroscopy.

TEXT BOOKS

T1 - P. N. Madudeswaran and B.Jeyagowri, "Engineering Chemistry" Tata McGraw-Hill Pub.Co.Ltd.Chennai
T2 - P.C.Jain and Monica Jain, "Engineering Chemistry" Dhanpat Rai Pub. Co., New Delhi (2018).

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REFERENCES
R1 - B.Sivasankar "Engineering Chemistry" Tata McGraw-Hill Pub.Co.Ltd, New Delhi (2012).
R2 - S.S.Dara "A Text book of Engineering Chemistry" S.Chand& Co. Ltd., New Delhi (2017).

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

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Programme	Course Code	Name of the Course	L	T	P
BE	21CS1151	Python Programming and Practices	2	0	2

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

Unit	Description	Instructional Hour
I	**ALGORITHMIC PROBLEM SOLVING** Algorithms, building blocks of algorithms (statements, state, control flow, functions), notation(pseudo code, flow chart, programming language), algorithmic problem solving, simple strategiesfor developing algorithms (iteration, recursion). **Illustrative problems: find minimum in a list, insert acard in a list of sorted cards, guess an integer number in a range, Towers of Hanoi.**	9
II	**DATA, EXPRESSIONS, STATEMENTS** Python interpreter and interactive mode; values and types: int, float, boolean, string, and list;variables, expressions, statements, tuple assignment, precedence of operators, comments;modules and functions, function definition and use, flow of execution, parameters and arguments. **Illustrative programs: exchange the values of two variables, circulate the values of n variables, distance between two points.**	7+2
III	**CONTROL FLOW, FUNCTIONS** Conditionals: Boolean values and operators, conditional (if), alternative (if-else), chained conditional (if-elif-else); Iteration: state, while, for, break, continue, pass; Fruitful functions: returnvalues, parameters, local and global scope, function composition, recursion; Strings: string slices, immutability, string functions and methods, string module; Lists as arrays. **Illustrative programs: square root, gcd, exponentiation, sum an array of numbers, linear search, binary search.**	5+4
IV	**LISTS, TUPLES, DICTIONARIES** Lists: list operations, list slices, list methods, list loop, mutability, aliasing, cloning lists, listparameters; Tuples: tuple assignment, tuple as return value; Dictionaries: operations andmethods; advanced list processing - list comprehension; **Illustrative programs: selection sort, insertion sort, merge sort, histogram.**	3+6
V	**FILES, MODULES, PACKAGES** Files and exception: text files, reading and writing files, format operator; command line arguments,errors and exceptions, handling exceptions, modules, packages. **Illustrative programs: word count, copying file contents.**	5+4
	Total Instructional Hours	**29 + 16**

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

TEXT BOOKS

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

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

REFERENCE BOOKS:

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

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

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

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

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Programme	Course Code	Name of the Course	L	T	P
BE	21EC1153	Electron Devices and Electric Circuits	2	0	2

Course Objective	To be familiar with the theory, construction, and operation of PN junction and Zener diodes. To impart knowledge on the construction, operation and models of BJT & FET. To give an insight of the basic operation of special semiconductor devices To introduce the concept of electric circuits and its analysis. To introduce the phenomenon of circuit transients.

Unit	Description	Instructional Hours
I	**SEMICONDUCTOR DIODES** Theory of PN junction diode- Forward and Reverse bias characteristics- Breakdown in PN diodes- Diode current equations-Diode Applications-Zener diode and its characteristics. **Experimental study- Characteristics of PN Junction Diode and Zener Diode.**	6+3
II	**TRANSISTORS** Basic principle of operation of NPN and PNP configuration- Types of configurations - Input and Output characteristics of CE, CB and CC Configurations of BJT-JFET - Construction and working principle – Drain and Transfer characteristics -Comparison of JFET and BJT- MOSFET: E-MOSFET,D MOSFET - Comparison of JFET and MOSFET. **Experimental study –Input and Output Characteristics of BJT.**	6+3
III	**SPECIAL SEMICONDUCTOR DEVICES** UJT -Tunnel Diode-Thyristors-SCR,DIAC,TRIAC, LED, LCD, Photo diode, PhotoTransistor, Opto Coupler, Solar cell, CCD.**Experimental study-Characteristics of photo diode.**	6+3
IV	**CIRCUIT ANALYSIS TECHNIQUES** Ohm's Law,Kirchoff's current and voltage laws – series and parallel connections- Mesh analysis - Nodal Analysis - Network Theorems :Thevenin's theorem, Norton's theorem, Maximum power transfer theorem, Superposition theorem.**ExperimentalstudyVerificationof superposition theorem.**	6+3
V	**CIRCUIT TRANSIENTS AND TWO PORT NETWORKS** Basic RL, RC and RLC circuits and their responses to DC and sinusoidal inputs –frequency response – Parallel and series resonances – Q factor – Two port networks: Z and Y parameters.**Experimental study -Determination of Resonance Frequency of Series RLC Circuits**	6+3
	Total Instructional Hours	**30+15**

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Course Outcome	CO1: Ability to explain the theory, construction, and operation of PN junction and Zenerdiodes. CO2: Ability to explain the theory, construction, and operation of BJT & FET. CO3: Understand the working of various power devices and display devices. CO4: To apply network theorems for AC and DC Circuits CO5: Understand the concept of transient response of circuits.

TEXT BOOKS:

T1- W David A. Bell, "Electronic Devices and Circuits", Oxford University Press, 5Th Edition,(2008).

T2- S. Salivahanan, N. Suresh kumar and A. Vallavanraj, "Electronic Devices and Circuits",Tata McGraw Hill, 2nd Edition, (2008).

REFERENCE BOOKS:

R1 - M.Robert T. Paynter, "Introducing Electronics Devices and Circuits", PearsonEducation, 7thEducation, (2006).

R2 - William H. Hayt, J.V. Jack, E. Kemmebly and steven M. Durbin, "Engineering Circuit Analysis",Tata McGraw Hill, 6th Edition, 2002.

R3 - J. Millman&Halkins, SatyebrantaJit, "Electronic Devices &Circuits",Tata McGraw Hill, 2nd Edition, 2008.

R4 - Robert Boylestad and Louis Nashelsky, "Electron Devices and Circuit Theory" Prentice Hall, 10th edition, July 2008.

R5 - T.K.Nagsarkar, M.S.Sukhija," Basic Electrical Engineering",Oxfordpublications,second edition,2014.

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

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Programme	Course Code	Name of the Course	L	T	P	C
B.E/B.Tech	21HE1071	**LANGUAGE COMPETENCY ENHANCEMENT COURSE- I**	0	0	2	1

(COMMON TO ALL BRANCHES)

Course Objective	✓ To enhance student language competency ✓ To train the students in LSRW skills ✓ To develop student communication skills ✓ To empower the trainee in business writing skills. ✓ To train the students to react to different professional situations

Unit	Description	Instructional Hours
I	**Listening** Listening to technical group discussions and participating in GDs.listening to TED talks. Listen to Interviews & mock interview. Listening short texts and memos.	3
II	**Reading** Reading articles from newspaper, magazine. Reading comprehension. Reading about technical inventions, research and development. Reading short texts and memos.	3
III	**Writing** E-mail writing: Create and send email writing (to enquire about some details, to convey important message to all, to place an order, to share your joy and sad moment). Reply for an email writing.	3
IV	**Speaking** To present a seminar in a specific topic (what is important while choosing or deciding something to do). To respond or answer for general questions (answer for your personal details, about your family, education, your hobbies, your aim etc.,).	3
V	**Speaking** Participate in discussion or interactions (agree or disagree express your statement with a valid reason, involve in discussion to express your perspective on a particular topics).	3
	Total Instructional Hours	**15**

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Course Outcome	CO1- Trained to maintain coherence and communicate effectively. CO2- Practiced to create and interpret descriptive communication. CO3- Introduced to gain information of the professional world. CO4- acquired various types of communication and etiquette. CO5- Taught to improve interpersonal and intrapersonal skills.

TEXT BOOKS:
T1- Norman Whitby, "Business Benchmark-Pre-intermediate to Intermediate", Cambridge University Press, 2016.
T2- Raymond Murphy, "Essential English Grammar", Cambridge University Press, 2019.
REFERENCE BOOKS :
R1- Meenakshi Raman and Sangeetha Sharma. "Technical Communication- Principles and Practice", Oxford
University Press, 2009.

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Programme/sem	Course Code	Name of the Course	L	T	P	C
B.E./B.Tech/ II	21HE2101	**BUSINESS ENGLISH FOR ENGINEERS** (COMMON TO ALL BRANCHES)	2	1	0	3

Course Objective	1. Introduce business communication. 2. Train to respond different professional situations. 3. Make the learnersfamiliar with the managerial skills 4. Empower the trainee in business writing skills. 5. Educate to interpret and expertisedifferent business content.

Unit	Description	Instructional Hours
I	**Listening and Speaking** – listening and discussing about programme and conference arrangement **Reading** – reading auto biographies of successful personalities **Writing** Formal & informal email writing, Recommendations **Grammar and Vocabulary**- Business vocabulary, Adjectives & adverbs.	9
II	**Listening and Speaking**- listening to TED talks **Reading**-Making and interpretation of posters**Writing**- Business letters: letters giving good and bad news, Thank you letter, Congratulating someone on a success"**Grammar and Vocabulary**- Active & passive voice, Spotting errors (Tenses, Preposition, Articles).	9
III	**Listening and Speaking**-travel arrangements and experience **Reading**- travel reviews **Writing**- Business letters (Placing an order, making clarification & complaint letters). **Grammar and Vocabulary**- Direct and Indirect speech.	9
IV	**Listening and Speaking**- Role play- **Reading**- Sequencing of sentence **Writing**- Business report writing (marketing, investigating) **Grammar and Vocabulary**- Connectors, Gerund & infinitive.	9
V	**Listening and Speaking**- Listen to Interviews & mock interview **Reading**- Reading short stories, reading profile of a company - **Writing**- Descriptive writing (describing one's own experience) **Grammar and Vocabulary**- Editing a passage(punctuation, spelling& number rules).	9
	Total Instructional Hours	45

Course Outcome	CO1-Understand different modes of business communication CO2-Develop managerial techniques. CO3-Apply the rules of grammar and vocabulary in effective business communication. CO4-Analyze and interpret business documents CO5-Assess Draft business reports

TEXT BOOKS:

T1 - Norman Whitby, "Business Benchmark-Pre-intermediate to Intermediate",Cambridge University Press. 2016.

T2- Ian Wood and Anne Williams, "Pass Cambridge BEC Preliminary", Cengage Learning press 2015.

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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.

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

Programme/sem	Course Code	Name of the Course	L	T	P	C
B.E. / B.Tech/ II	21MA2103	**LINEAR ALGEBRA, NUMERICAL METHODS AND TRANSFORM CALCULUS (ECE)**	3	1	0	4
Course Objective	1. Develop the skill to use matrix algebra techniques that is needed by engineers for practical applications. 2. Analyze various methods to find the intermediate values for the given data. 3. Explain the concepts of numerical differentiation and integration of the unknown functions. 4. Explain single and multi step methods to solve Ordinary differential equations 5. Discuss the concept of Laplace and Inverse laplace transform.					

Unit	Description	Instructional Hours
I	**MATRICES** Eigen valuesand Eigen vectorsofarealmatrix– PropertiesofEigenvaluesandEigenvectors (without proof)Cayley - Hamilton Theorem (excluding proof) - Orthogonal matrices– Definition – Reduction of a quadratic form to canonical form by orthogonal transformation.	12
II	**INTERPOLATION** Interpolation - Newton's forward and backward difference formulae – Newton's divided difference formula and Lagrangian interpolation for unequal intervals.	12
III	**NUMERICAL DIFFERENTIATION AND INTEGRATION** Numerical Differentiation: Newton's forward and backward interpolation formulae for equal intervals –Newton's divided difference formula for unequal intervals. Numerical integration: Trapezoidal and Simpson's 1/3 rule - Double integration using Trapezoidal and Simpson's rules	12
IV	**INITIAL VALUE PROBLEMS FOR ORDINARY DIFFERENTIAL EQUATIONS** Single step methods for solving first order equations: Taylor's series method – Euler and Modified Euler methods – Fourth order Runge-kutta method -Multi step method: Milne's predictor and corrector method.	12
V	**TRANSFORM CALCULUS** Laplacetransform–Basic properties –Transforms ofderivativesandintegralsoffunctionsTransformsofunitstepfunctionandimpulsefunction– Transformofperiodic functions. InverseLaplacetransform-Convolutiontheorem (with outproof) –Solutionoflinear ODE of second order with constant coefficientsusingLaplace transforms..	12
	Total Instructional Hours	60

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Course Outcome	CO1-Calculate Eigen values and Eigen vectors for a matrix which are used to determine the natural frequencies. CO2-Apply various methods to find the intermediate values for the given data. CO3-Identify various methods to perform numerical differentiation and l integration CO4-Classify and solve ordinary differential equations by using single and multi-step methods. CO5-Infer the knowledge of Laplace and Inverse Laplace transform

TEXT BOOKS:

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

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

REFERENCE BOOKS :

R1-BaliN.P &ManishGoyal,"ATextbookofEngineeringMathematics",8th Edition, Laxmi Pub. Pvt. Ltd. 2011.

R2- Grewal B.S, "Higher Engineering Mathematics", 42nd Edition, Khanna Publications, Delhi, 2012.

R3- Grewal B.S. and Grewal J.S. " Numerical Methods in Engineering and Science ", 6th Edition , Khanna publishers, New Delhi 2004.

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

Programme/sem	Course Code	Name of the Course	L	T	P	C
B.E./B.Tech/ II	21PH2151	**Material Science (Common to all Branches)**	2	0	2	3

Course Objective	1. Acquire fundamental knowledge of semiconducting materials which is related to the engineering program 2. Extend the knowledge about the magnetic materials 3. Explore the behavior of super conducting materials 4. Gain knowledge about Crystal systems 5. Understand the importance of ultrasonic waves

Unit	Description	Instructional Hours
I	**SEMICONDUCTING MATERIALS** Introduction – Intrinsic semiconductor – Compound and elemental semiconductor - direct and indirect band gap of semiconductors. Carrier concentration derivation – Fermi level – Variation of Fermi level with temperature – electrical conductivity – band gap determination. Optical properties of semiconductor – Light through optical fiber(Qualitative). Determination of band gap of a semiconductor Determination of acceptance angle and numerical aperature in an optical fiber	6 3 3
II	**MAGNETIC MATERIALS** Origin of magnetic moment – Bohr magneton – comparison of Dia, Para and Ferro magnetism – Domain theory – Hysteresis – soft and hard magnetic materials – anti ferromagnetic materials – Ferrites and its applications. B – H curve by Magnetic hysteresis experiment	6 3
III	**PERCONDUCTING MATERIALS** Superconductivity : properties(Messiner effect. effect of magnetic field, effect of current and isotope effects) – Type I and Type II superconductors – High Tc superconductors – Applications of superconductors –Cryotron and magnetic levitation.	6

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IV	**CRYSTAL PHYSICS** Crystal systems - Bravais lattice - Lattice planes - Miller indices - Interplanar spacing in cubic lattice - Atomic radius, Coordination number and Packing factor for SC, BCC and FCC crystal structures.	6
V	**ULTRASONICS** Production – Magnetostrictive generator – Piezoelectric generator – Determination of velocity using acoustic grating – Cavitations – Viscous force – co-efficient of viscosity. Industrial applications – Drilling and welding – Non destructive testing – Ultrasonic pulse echo system. Determination of velocity of sound and compressibility of liquid – Ultrasonic wave Determination of Coefficient of viscosity of a liquid –Poiseuille's method	6 3 3
	Total Instructional Hours	**45**

Course Outcome	CO1-Understand the purpose of acceptor or donor levels and the band gap of a semiconductor CO2-Interpret the basic idea behind the process of magnetism and its applications in everyday CO3-Discuss the behavior of super conducting materials CO4-Illustrate the types and importance of crystal systems CO5-Evaluate the production of ultrasonics 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 - Arthur Beiser "Concepts of Modern Physics" Tata McGraw Hill, New Delhi – 2015

R2 - M.N Avadhanulu and PG Kshirsagar "A Text Book of Engineering physics" S. Chand and Company ltd., New Delhi 2016

R3 - Dr. G. Senthilkumar "Engineering Physics – II" VRB publishers Pvt Ltd., 2016

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

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Programme/sem	Course Code	Name of the Course	L	T	P	C
B.E./B.Tech/ II	21CY2151	**ENVIRONMENTAL STUDIES (COMMON TO ALL BRANCHES)**	2	0	2	3

Course Objective	1. The importance of environmental education, ecosystem and biodiversity. 2. The knowledge about environmental pollution – sources, effects and control measures of environmental pollution. 3. The natural resources, exploitation and its conservation 4. Scientific, technological, economic and political solutions to environmental problems. 5. An awareness of 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.	6
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.	6+9=15
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. **Determination of Dissolved Oxygen in sewage water by Winkler's method. Estimation of alkalinity of water sample by indicator method. Determination of chloride content of water sample by argentometric method.**	6
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. **Determination of pH in beverages.**	6+3=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. **Estimation of heavy metal ion (copper) in effluents by EDTA.**	6+3=9

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	Total Instructional Hours	**45**
Course Outcome	CO1-Realize the importance of ecosystem and biodiversity for maintaining ecological balance. CO2-Understand the causes of environmental pollution and hazards due to manmade activities. CO3-Develop an understanding of different natural resources including renewable resources CO4-Demonstrate an appreciation for need for sustainable development and understand the various social issues and solutions to solve the issues. CO5-Assess about the importance of women and child education and know about the 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.

REFERENCES:

R1 – ErachBharucha, "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.

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

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Programme	Course Code	Name of the Course	L	T	P	C
BE	21CS2152	Essentials of C and C++ programming	2	0	2	3

Course Objective	1. To Learn and develop basics of C programming 2. To understand Object Oriented Programming concepts and basic characteristics of C++. 3. Be familiar with the constructors and operator overloading. 4. To understand the concepts of inheritance, polymorphism and virtual function 5. To learn and define concept of templates and exception handling

Unit	Description	Instructional Hours
I	**BASICS OF 'C' PROGRAMMING** Fundamentals of ' C' programming – Structure of a 'C' program – Constants - Variables – Data Types – Expressions using operators in 'C' – Managing Input and Output operations- Branching and Looping - Arrays – One dimensional and Two dimensional arrays. **Programs: 1. Write a C program to calculate sum of individual digits of a given number. 2. Write a C program to count no. of positive numbers, negative numbers and zeros in the array. 3. Write a C program to find sum of two numbers using functions with arguments and without return type.**	3+6(P)
II	**BASICS OF 'C++' PROGRAMMING** Introduction to C++ – structures and unions- Object oriented programming concepts–Defining a Class – creating objects - access specifiers – Function in C++ - function and data members default arguments – function overloading – Inline functions - friend functions – constant with class – static member of a class – nested classes – local classes. **Program: Write a C++ program to accept the student detail such as name and 3 differentmarks by get_data() method and display the name and average of marks using display() method. Define a friend class for calculating the average of marks using the method mark_avg().**	6+3(P)
III	**CONSTRUCTOR AND OPERATOR OVERLOADING** Constructors - Default, Copy, Parameterized, Dynamic constructors, Default argument – Destructor. - Function overloading- Operator overloading-Unary, Binary - Binary operators using friend function. **Program: Write a C++ program to calculate the volume of different geometric shapes like cube, cylinder and sphere and hence implement the concept of Function Overloading.**	7+2(P)
IV	**INHERITANCE AND POLYMORPHISM** Inheritance – Public, Private and Protected derivations– Single– Multiple– Multilevel– Hybrid– Hierarchical - Virtual base class – abstract class – composite objects- Runtime polymorphism – virtual functions – pure virtual functions. **Program: Demonstrate Simple Inheritance concept by creating a base class FATHER with data members SurName and BankBalance and creating a derived class SON, which inherits SurName and BankBalance feature from base class but provides its own feature FirstName and DOB. Create and initialize F1 andS1 objects with appropriate constructors and display the Father & Son details. (Hint: While creating S1 object, call Father base class parameterized constructor through derived class by sending values).**	7+2(P)
V	**TEMPLATES AND EXCEPTION HANDLING** Function and class templates - Exception handling – try-catch-throw paradigm – exception specification – terminate and Unexpected functions – Uncaught exception. **Program: Write a C++ program to create a template function for Bubble Sort and demonstrate sorting of integers and doubles**	7+2(P)
	Total Instructional Hours	**30+15**

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Course Outcome	CO1-Develop simple applications in C using basic constructs. CO2-Apply solutions to real world problems using basic characteristics of C++ CO3-Write object-oriented programs using operator overloading, constructors and destructors. CO4-Develop programs with the concepts of inheritance and polymorphism. CO5-Understand and define solutions with C++ advanced features such as templates and execution handling

TEXT BOOKS:

T1- E.Balagurusamy, "Programming in ANSI C", 7th Edition, McGraw HillPublication, 2016.

T2- E.Balagurusamy, "Object Oriented Programming with C++", 7th Edition, McGraw Hill Publication, 2017.

REFERENCES BOOKS:

R1-Yashavant P. Kanetkar. "Let Us C", BPB Publications, 2011.

R2-RohitKhurana, "Object Oriented Programming with C++",Vikas Publishing, 2nd Edition, 2016.

R3- B. Trivedi, "Programming with ANSI C++", Oxford University Press, 2007.

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

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Programme/sem	Course Code	Name of the Course	L	T	P	C
BE/B.TECH/III	21ME2154	Engineering Graphics	1	0	4	3

Course Objective	1.To gain the knowledge of Engineer's language of expressing complete details about objects and construction of conics and special curves 2.To learn about the orthogonal projections of straight lines and planes 3.To acquire the knowledge of projections of simple solid objects in plan and elevation 4.To learn about the projection of sections of solids and development of surfaces.

Unit	Description	Instructional Hours
I	**PLANE CURVE** importance of engineering drawing; drafting instruments; drawing sheets – layout and folding; Lettering and dimensioning, BIS standards, scales.Geometrical constructions, Engineering Curves Conic sections – Construction of ellipse, parabola and hyperbola by eccentricity method. Construction of cycloids and involutes of square and circle – Drawing of tangents and normal to the above curves.	12
II	**PROJECTIONS OF POINTS, LINES AND PLANE SURFACES** Introduction to Orthographic projections- Projection of points. Projection of straight lines inclined to both the planes, Determination of true lengths and true inclinations by rotating line method. Projection of planes (polygonal and circular surfaces) inclined to both the planes by rotating object method (First angle projections only).	12
III	**PROJECTIONS OF SOLIDS** Projection of simple solids like prisms, pyramids, cylinder and cone when the axis is perpendicular and inclined to one plane by rotating object method.	12
IV	**SECTION OF SOLIDS AND DEVELOPMENT OF SURFACES** Sectioning of simple solids with their axis in vertical position when the cutting plane is inclined to one of the principal planes and perpendicular to the other – Obtaining true shape of section. Development of lateral surfaces of simple and sectioned solids – Prisms, pyramids, cylinder and cone. Development of lateral surfaces of truncated solids.	12
V	**ISOMETRIC AND ORTHOGRAPHIC PROJECTIONS** Isometric views and projections simple and truncated solids such as - Prisms, pyramids, cylinders, cones- combination of two solid objects in simple vertical positions.Free hand sketching of multiple views from a pictorial drawing. Basics of drafting using AutoCAD software	12
	Total Instructional Hours	60

Course Outcome	Upon Completion of the course students can be able to CO1-Understand and interpret the engineering drawings in order to visualize the objects and draw the conics and special curves.CO2: Draw the orthogonal projections of straight lines and planes. CO2-Draw the orthogonal projections of straight lines and planes. CO3-Interpret the projections of simple solid objects in plan and elevation isometric projections and the perspective views of different objects. CO4-Outline the projections of section of solids and development of surfaces of solids. CO5-Draw the isometric projections and the perspective views of different objects.

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TEXT BOOKS:

T1-K.Venugopal, V.Prabu Raja, "Engineering Drawing, AutoCAD, Building Drawings", 5th edition New Age International Publishers, New delhi 2016

T2- K.V.Natarajan, "A textbook of Engineering Graphics", Dhanlaksmi Publishers, Chennai.

REFERENCE BOOKS :

R1-Basant Agrawal and C.M.Agrawal, "Engineering Drawing", Tata McGraw Hill Publishing company Limited,New Delhi 2008.

R2-N.S. Parthasarathy, Vela Murali, "Engineering Drawing", Oxford University PRESS, India 2015.

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

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Programme	Course Code	Name of the Course	L	P	T	C
BE	21ME2001/ 21EE2001	Engineering Practices	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.					
	GROUP A CIVIL AND MECHANICAL ENGINEERING PRACTICES					
Exp.No.	**Description of the Experiments**					
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 1brick thick wall and 11/2 brick thick wall for right angle corner junction.					
3.	Arrangement of bricks using English bond for 1brick thick wall and 11/2 brick thick wall for 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 PRACTICES						
Exp.No.	**Description of the Experiments**					
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					
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.					

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8.	Study of Energy Efficient Equipment's and Measuring Instruments.	
	Total Practical Hours	**45**
Course Outcome	At the end of the course the students shall be able to CO1-Build wooden components and pipe connections including plumbing works. CO2-Develop simple weld joints. CO3-Create different electrical wiring circuits and understand the AC Circuits. CO4-Construct wooden components and pipe connections including plumbing works. CO5-Create simple weld joints.	

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

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Programme	Course Code	Name of the Course	L	T	P	C
B.E/B.Tech	21HE2071	**LANGUAGE COMPETENCY ENHANCEMENT COURSE- II**	0	0	2	1

(COMMON TO ALL BRANCHES)

Course Objective	✓ **To introduce to business communication.** ✓ **To train the students to react to different professional situations.** ✓ **To make the learner familiar with the managerial skills** ✓ **To empower the trainee in business writing skills.** ✓ **To learn to interpret and expertise different content.**

Unit	Description	Instructional Hours
I	**Listening and Speaking** – listening and discussing about programme and conference arrangement **Reading** –reading auto biographies of successful personalities **Writing** Formal & informal email writing, Recommendations **Grammar and Vocabulary-** Business vocabulary, Adjectives & adverbs.	3
II	**Listening and Speaking-** listening to TED talks **Reading-**Making and interpretation of posters**Writing-** Business letters: letters giving good and bad news, Thank you letter, Congratulating someone on a success" **Grammar and Vocabulary-** Active & passive voice, Spotting errors (Tenses, Preposition, Articles).	3
III	**Listening and Speaking-**travel arrangements and experience **Reading-** travel reviews **Writing-** Business letters (Placing an order, making clarification & complaint letters). **Grammar and Vocabulary-** Direct and Indirect speech.	3
IV	**Listening and Speaking-** Role play- **Reading-** Sequencing of sentence **Writing-** Business report writing (marketing, investigating) **Grammar and Vocabulary-** Connectors, Gerund & infinitive.	3
V	**Listening and Speaking-** Listen to Interviews & mock interview **Reading-** Reading short stories, reading profile of a company - **Writing-** Descriptive writing (describing one's own experience) **Grammar and Vocabulary-** Editing a passage(punctuation, spelling & number rules).	3
	Total Instructional Hours	15

Course Outcome	CO1- Introduced to different modes and types of business communication. CO2- Practiced to face and react to various professional situations efficiently. CO3- learnt to practice managerial skills. CO4- Familiarized with proper guidance to business writing. CO5- Trained to analyze and respond to different types of communication.

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

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