Pimpri Chinchwad Education Trust's

PIMPRI CHINCHWAD COLLEGE OF ENGINEERING

SECTOR NO. 26, PRADHIKARAN, NIGDI, PUNE 411044

An Autonomous Institute Approved by AICTE and affiliated to SPPU, Pune

DEPARTMENT OF ELECTRONICS AND TELECOMMUNICATION ENGINEERING

Curriculum Structure and Syllabus of SY B. Tech. E&TC (Course 2020)

Effective from the Academic Year 2023-24
(Updated with minor changes)

Institute Vision

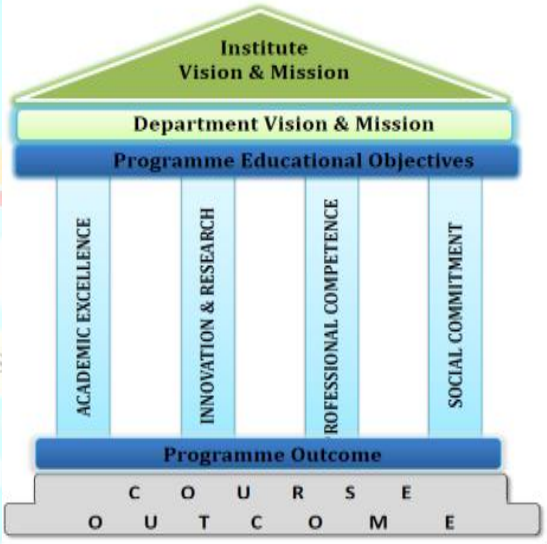
To be one of the top 100 Engineering Institutes of India in coming five years by offering exemplarily Ethical, Sustainable and Value-Added Quality Education through a matching ecosystem for building successful careers.

Institute Mission

1. Serving the needs of the society at large through establishment of a state-of-art Engineering Institute
2. Imparting right Attitude, Skills, Knowledge for self-sustenance through Quality Education
3. Creating globally competent and Sensible engineers, researchers and entrepreneurs with an ability to think and act independently in demanding situations

Quality Policy

We at PCCOE are committed to impart Value Added Quality Education to satisfy the applicable requirements, needs and expectations of the Students and Stakeholders. We shall strive for academic excellence, professional competence and social commitment in fine blend with innovation and research. We shall achieve this by establishing and strengthening state-of- the-art Engineering and Management Institute through continual improvement in effective implementation of Quality Management System.



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List of Abbreviations

ABBREVATION	TYPE OF COURSE
BSC	Basic Science Course
ECC	Engineering Core/ Science Course
HSMC	Humanities, Social Sciences And Management Course
PCC	Professional Core Course
PEC	Programme Elective Course
OEC	Open Elective Course
PROJ	Project
INTR	Internship
Audit	Audit Course
MC	Mandatory Course
LS	Life Skill
PFC	Proficiency Course
MO	MOOC

CURRICULUM FRAMEWORK

(2020-2021; 2021-2022; 2022-2023; 2023-2024)

The Course and Credit Distribution

Sr. No.	Type of Courses	No of Courses	Total Credits No
1.	Basic Science Course (BSC)	7	23
2.	Engineering Core/ Science Course (ECC)	8	22
3.	Humanities, Social Sciences And Management Course (HSMC)	6	13
4.	Professional Core Course (PCC)	27	48
5.	Professional Elective Course (PEC)	12	18
6.	Open Elective Course (OEC)	6	18
7.	Project (PROJ)	2	14
8.	Internship (INTR)	1	3
9.	Audit Course (Audit)	3	-
10.	Mandatory Course (MC)	2	-
11.	Life Skill (LS)	4	-
12.	Proficiency Course (PFC)	3	-
13.	Massive Open Online Course (MOOC)	1	-
	Total	**82**	**161**

Semester wise Course Distribution

COURSE DISTRIBUTION : SEMESTER WISE										
Sr. No.	**Type of Course**	**No of Courses/ Semester**								**Total**
		1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	
1.	Basic Science Course (BSC)	3	2	2	-	-	-	-	-	7
2.	Engineering Core Course (ECC)	3	3	1	1	-	-	-	-	8
3.	Humanities, Social Sciences And Management Course (HSMC)	1	1	1	1	1	1	-	-	6
4.	Professional Core Course (PCC)	-	-	7	7	4	4	5	-	27
5.	Professional Elective Course (PEC)	-	-	-	-	4	4	4	-	12
6.	Open Elective Course (OEC)	-	-	-	1	1	2	2	-	6
7.	Project (PROJ)	-	1	-	-	-	-	-	1	2
8.	Internship (INTR)	-	-	-	-	-	-	-	1	1
9.	Audit Course (Audit)	-	-	-	1	1	1	-	-	3
10.	Mandatory Course (MC)	-	-	-	-	1	1	-	-	2
11.	Life Skill (LS)	1	1	1	1	-	-	-	-	4
12.	Proficiency Course (PFC)	-	-	1	1	1	1	-	-	3
13.	MOOCs								1	1
Total		**8**	**8**	**12**	**13**	**13**	**14**	**13**	**3**	**82**

Semester wise Credit Distribution

CREDIT DISTRIBUTION : SEMESTER WISE										
1 Lecture hour = 1 Credit		2 Lab Hours = 1 Credit			1 Tutorial Hour = 1 Credit					
Sr. No.	**Type of Courses**	**No of Credits /Semester**								**Total**
		1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	
1.	Basic Science Course (BSC)	9	9	5	-	-	-	-		23
2.	Engineering Core Course (ECC)	9	7	3	3	-	-	-		22
3.	Humanities, Social Sciences And Management Course (HSMC)	2	2	3	2	2	2	-		13
4.	Professional Core Course (PCC)	-	-	12	12	8	8	8		48
5.	Professional Elective Course (PEC)	-	-	-	-	6	6	6		18
6.	Open Elective Course (OEC)	-	-	-	3	3	6	6		18
7.	Project (PROJ)	-	2	-	-	-	-	-	14	14
8.	Internship (INTR)	-	-	-	-	-	-	-	3	3
9.	Audit Course (Audit)	-	-	-	-	-	-	-	-	-
10.	Mandatory Course (MC)	-	-	-	-	-	-	-	-	-
11.	Life Skill (LS)	-	-	-	-	-	-	-	-	-
12.	Proficiency Course (PFC)	-	-	-	-	-	-	-	-	-
13.	MOOCs	-	-	-	-	-	-	-	-	-
Total		**20**	**20**	**23**	**20**	**19**	**22**	**20**	**17**	**161**

Curriculum Structure

S.Y. B.Tech.

E&TC Engineering

Semester-III

STRUCTURE FOR SECOND YEAR B. TECH SEM-III (E&TC ENGINEERING)

B.TECH Semester-III														
Course Code	**Course Type**	**Course Name**	**Teaching Scheme**					**Evaluation Scheme**						
			L	**PR**	**T**	**H**	**CR**	**IE**	**MTE**	**ETE**	**TW**	**PR**	**OR**	**Total**
BAS3203	BSC	Applied Mathematics	3	-	-	3	3	20	30	50	-	-	-	100
BET3201	BSC	Basic Signal Transforms	2	-	-	2	2	10	15	25	-	-	-	50
BET3301	ECC	Sensors and Automation	3	-	-	3	3	20	30	50	-	-	-	100
BET3401	PCC	Electronic Devices & Circuits	3	-	-	3	3	20	30	50	-	-	-	100
BET3402	PCC	Electronic Devices & Circuits Lab	-	2	-	2	1	-	-	-	25	25	-	50
BET3403	PCC	Digital Circuit Design	3	-	-	3	3	20	30	50	-	-	-	100
BET3404	PCC	Digital Circuit Design Lab	-	2	-	2	1	-	-	-	25	25	-	50
BET3405	PCC	Network Analysis	3	-	-	3	3	20	30	50	-	-	-	100
BET3406	PCC	Project Based Learning-III	-	2	-	2	1	-	-	-	50	-	-	50
BHM3101	HSMC	Universal Human Values	3	-	-	3	3	30	-	20	-	-	-	50
BHM3939	LS	Life skills-III	-	2	-	2	-	-	-	-	-	-	-	-
Total			**20**	**8**	**-**	**28**	**23**	**-**	**-**	**-**	**-**	**-**	**-**	**750**

Abbreviations: L-Lecture, PR-Practical, T-Tutorial, H-Hour, CR-Credits, IE-Internal Evaluation, MTE-Mid-Term Evaluation, ETE-End-Term Evaluation, TW-Term work, OR-Oral.

Semester- III
List of Life Skill Courses

Course Code	Course Name: Life Skills-III	
BHM3939	1. Practicing Meditation 2. Sports	Choose any one
	Performing Arts: Music, Singing, Poetry, Indian Conventional Dancing, Photography, Short Movie Making, Painting/ Sketching/ Drawing, Theatre Arts, Anchoring, Calligraphy etc.	Choose any one performing arts

Curriculum Structure

S.Y. B.Tech.

E&TC Engineering

Semester-IV

STRUCTURE FOR SECOND YEAR B. TECH SEM-IV (E&TC ENGINEERING)

B.TECH Semester-IV													
Course Code	**Course Type**	**Course Name**	**Teaching Scheme**							**Evaluation Scheme**				
			L	**P**	**T**	**H**	**CR**	**IE**	**MTE**	**ETE**	**TW**	**PR**	**OR**	**Total**
BET4302	ECC	Data Structures and Programming	2	-	-	2	2	20	30	50	-	-	-	100
BET4303	ECC	Data Structures and Programming Lab.	-	2	-	2	1	-	-	-	25	25	-	50
BET4407	PCC	Analog Communication	3	-	-	3	3	20	30	50	-	-	-	100
BET4408	PCC	Analog Communication Lab.	-	2	-	2	1	-	-	-	25	-	-	25
BET4409	PCC	Analog Integrated Circuits	3	-	-	3	3	20	30	50	-	-	-	100
BET4410	PCC	Analog Integrated Circuits Lab.	-	2	-	2	1	-	-	-	25	25	-	50
BET4411	PCC	Microcontrollers	2	0	-	2	2	20	30	50	-	-	-	100
BET4412	PCC	Microcontrollers Lab.	-	2	-	2	1	-	-	-	25	-	-	25
BET4413	PCC	Project Based Learning-IV	-	2	-	2	1	-	-	-	50	-	-	50
BAS46xx	OEC	Open Elective-I (Mathematics Only)	3	-	-	3	3	20	30	50	-	-	-	100
BHM4101	HSMC	Professional Skills for Engineers.	1	2	-	3	2	30	-	20	-	-	-	50
BET49xx	PFC	Proficiency Courses	-	2	-	2	-	-	-	-	-	-	-	-
BHM4940	LS	Life Skills-IV	-	2	-	2	-	-	-	-	-	-	-	-
BHM996x	Audit	Audit Course	-	1	-	1	-	-	-	-	-	-	-	-
Total			**14**	**17**	**-**	**31**	**20**	**-**	**-**	**-**	**-**	**-**	**-**	**750**

Abbreviations: L-Lecture, PR-Practical, T-Tutorial, H-Hour, CR-Credits, IE-Internal Evaluation, MTE-Mid-Term Evaluation, ETE-End-Term Evaluation, TW-Term work, OR-Oral.

Semester- IV

List of Open Electives (Code:BAS46xx)

Course Code	Course Name	
BAS4601	Numerical Methods	Choose any one
BAS4602	Mathematical Optimization	
BAS4606	Neural Network and fuzzy logic Control	

List of Proficiency Courses (BET49xx)

Course Code	Course Name	
BET4911	MATLAB Certifications	Choose any one
BET4912	Basics of LabVIEW	
BET4913	Compliance Testing	
BET4914	Introduction to Data Science using Python	
BET4915	EDA(Electronic Design Automation) Introduction	

List of Life Skill Courses

Course Code	Course Name: Life Skills-IV	
BHM4940	1. Social welfare and Cultural Awareness 2. Transactional Analysis	Choose any one
	Caring and service Hospital Caring, Personal Safety, First Aid, Disaster Management Gardening, Organic farming, Cooking etc.	Choose any one caring & service

List of Audit Courses (Code: BHM996x)

Course Code	Name of Course	
BHM9961	Environmental Science	Choose any one.
BHM9962	Constitution of India	
BHM9963	Emotional Intelligence	
BHM9964	Entrepreneurship Development	
BHM9965	Research Article Writing	

Course Syllabus

S.Y. B.Tech.

Semester-III

Program:	**B. Tech.(E&TC)**			**Semester :**		**III**	
Course :	Applied Mathematics			**Code:**BAS3203			
Teaching Scheme				**Evaluation Scheme**			
Lecture	**Practical**	**Tutorial**	**Credit**	**IE**	**MTE**	**ETE**	**Total**
3	-	-	3	20	30	50	100

Prior Knowledge of:

1) Univariate Calculus
2) Multivariate Calculus is essential

Course Objectives:

This course aims at enabling students,

1. To get acquainted with mathematical modeling of physical systems and their solution through Higher Order Linear Differential Equation.
2. To develop the problem solving skill using Statistical analysis and Probability theory.
3. To achieve a solid understanding of higher level mathematics and their applications in E&TC Engineering.

Course Outcomes: After completion of the course, students will be able to

1) **Calculate** current for Electrical circuit's problems using the concepts of higher order linear differential equations.
2) **Apply** descriptive statistical techniques to find measures of variability of numerical data**.**
3) **Analyze** the data using probability theory and hypothesis testing.
4) **Examine** the vector fields using concepts of vector differentiation**.**
5) **Use** vector integration for conversion of line to surface integration and surface to volume integration.
6) **Understand** the analytical functions of complex variables and **Integrate** it using Cauchy's theorems.

Detailed Syllabus:

Unit	**Description**	**Duration [Hrs]**
I	**Linear Differential Equations and Applications:** Introduction of Linear and Nonlinear differential equations, Linear differential equation of nth order with constant coefficients ,General method, Shortcut Methods, Method of Variation of Parameters and Application of Linear differential equation in Electrical Circuits.	**8**
II	**Statistics:** Measures of Variability: Standard deviation, Coefficient of variation, Moments, Skewness and Kurtosis, Curve fitting, Correlation and Regression.	**7**

III	**Probability Distributions :**Probability, Theorems on Probability, Mathematical Expectation, Binomial, Poisson, and Normal Distributions. **Hypothesis Test**: p-Test, z-test, t-test, Chi-Squaretest, ANOVATest.	**8**
IV	**Vector Differentiation Calculus:** Introduction, Vector differential operators, Gradient, Divergent, Curl, Physical Interpretation of Vector Differentiation, Directional Derivatives, Solenoidal, Irrotational and conservative fields, Scalar Potential.	**7**
V	**Vector Integration Calculus and Applications:** Line, Surface,and Volume Integration of vectors, Work-done, Green's Lemma, Gauss's Divergence theorem, Stoke's theorem, Application to problems in Electro-Magnetic fields.	**8**
VI	**Calculus of Complex Functions:** Introduction, Functions of Complex Variables, Analytic Functions, Cauchy-Reimann equations, Cauchy's integral formula, Residue Theorem.	**7**
	Total	**45**

Text Books:

1. B.V. Ramana , "Higher Engineering Mathematics", Tata McGraw-Hill, 34 edition, ISBN 13:9780070634190
2. Erwin Kreyszig, "Advanced Engineering Mathematics" Wiley Eastern Ltd.,10 Edition, ISBN 13: 9780470458365

Reference Books:

1. Peter V. O'Neil, "Advanced Engineering Mathematics", Thomson Learning ,7 Edition, ISBN 13: 9781337274524
2. M. D. Greenberg , "Advanced Engineering Mathematics", Pearson Education, 2 Edition, ISBN 13: 9780486492797
3. S.R.K. Iyengar, Rajendra K. Jain, "Advanced Engineering Mathematics", Alpha Science International, Ltd,4 Edition, ISBN 13: 9781842658468
4. B. S. Grewal , "Higher Engineering Mathematics", Khanna Publication, 42 Edition, ISBN 13: .9788174091955
5. N. P. Bali, Manish Goyal, " A textbook of Engineering Mathematics", 9th Edition, ISBN 16:978-8131808320

e-sources:

1. **NPTEL Course lectures links:**
   https://nptel.ac.in/courses/111/105/111105090/ (Probability)
   https://onlinecourses.nptel.ac.in/noc20_ma13/ (Advanced Engineering Mathematics)
2. **V-lab (IIT-Bombay) link: http://vlabs.iitb.ac.in/vlabs-dev/labs/numerical_lab/labs/explist.php**

Program: B. Tech. (E&TC)				Semester: III			
Course: Basic Signal Transforms				Code: BET3201			
Teaching Scheme				Evaluation Scheme			
Lecture	Tutorial	Credit	Hours	IE	MTE	ETE	Total
2	-	2	2	10	15	25	50

Prior Knowledge of:

1. Linear Algebra & Differential Calculus **is essential**

Course Objectives:

1. To develop the understanding of students to the basic ideas of the transforms encountered in engineering.

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Course Outcomes:

After completion of this course, students will be able to,

1. Classify the basic signals and systems based on their properties and perform operations on signals.
2. Analyze the signals in the frequency domain using Fourier series and Fourier transform.
3. Resolve the signals and LTI system in the complex frequency domain using the Laplace transform.
4. Analyze discrete signals and systems by using the Z-transform.

Detailed Syllabus

Unit	Description	Duration(H)
I	**Signals and systems:** Classification of signals: Continuous-time and discrete-time signals, Periodic signals, Power and energy signals, Causal signals. Operations on signals: time shifting, time reversal, time scaling, amplitude scaling, signal addition, subtraction, signal multiplication. Classification of systems: Continuous-time and discrete-time systems, Linear time invariant systems, Stable systems, Real systems, Causal systems. Convolution: Definition of impulse response, convolution integral, computation of convolution integral using graphical method.	**10**
II	Fourier Transform: Complex exponential form of Fourier series, Fourier Transform (FT) representation of aperiodic continuous time (CT) signals, Dirichlet condition for existence of Fourier transform, evaluation of magnitude and phase response, FT of standard CT signals, Properties and their significance, Interplay between time and frequency domain using sinc and rectangular signals, Fourier Transform for periodic signals.	**7**
III	Laplace Transform: Definition of Laplace Transform (LT), Limitations of Fourier transform and need of Laplace transform, ROC, Properties of ROC, Laplace transform of standard periodic and aperiodic functions, properties of Laplace transform and their significance, Laplace transform evaluation using properties, Inverse Laplace transform, stability considerations in S domain, Application of Laplace transforms to the Linear Time Invariant (LTI) system analysis	**7**

IV	Z - Transform (ZT): Introduction, Definition, Standard properties, ZT of standard sequences and their inverses. Convolution Sum, Solution of difference equations.	**6**
	Total	**30**

Text Books:

1. A.V. Oppenheim, A.S. Willsky ―Signals and systems‖, Prentice-Hall signal processing series. 2nd Edition, 2015
2. A. Nagoor Kanni ―Signals and Systems‖, McGraw Hill, 2nd Edition, 2017

Reference Books:

1. B P Lathi ―Linear Systems and Signals‖, Oxford University Press, Second Edition, 2005
2. Simon Haykins and Barry Van Veen ―Signals and Systems‖, Wiley India, 2nd Edition. 2017
3. M.J. Roberts ―Signal and Systems‖, Tata McGraw Hill, Third Edition ,2019.
4. Charles Phillips ―Signals, Systems and Transforms‖, Pearson Education, 4th Edition. 2013
5. R. J. Beerends, H. G. ter Morsche ―Fourier and Laplace Transforms‖ Cambridge University Press, 2003.

NPTEL Courses Link

1. https://onlinecourses.nptel.ac.in/noc21_ee28/preview
2. **https://archive.nptel.ac.in/courses/108/104/108104100/**

Program: B. Tech.(E&TC)				Semester: III			
Course: Sensors and Automation				Code: BET3301			
Teaching Scheme				Evaluation Scheme			
Lecture	Tutorial	Credit	Hours	IE	MTE	ETE	Total
3	-	3	3	20	30	50	100

Prior knowledge of

. Basic Electrical Engineering
. Basic Electronics Engineering

Is essential

Course Objectives:

1. Enable students to identify different methods of measurement and recognize errors in measurements.
2. Provide a thorough understanding of various types of transducers, their working principles, and their characteristics.
3. Familiarize students with process control automation techniques.
4. Provide hands-on experience in designing basic logic gates using ladder programming.

Course Outcomes:

After completion of this course, students will be able to,

1. Identify different methods of measurement and errors in measurements.
2. Illustrate the working principle of various transducers and their characteristics.
3. Recognize the scope for process control automation techniques.
4. Illustrate concepts of force and temperature sensors in industrial automation systems.
5. Analyze the DAQ system for temperature measurement using the appropriate sensor.
6. Design basic logic gates using ladder programming.

Detailed Syllabus:

Unit	Description	Duration (H)
I.	**Introduction to Measurement Systems** Significance of Measurements, Methods of Measurement. Direct Methods, Indirect Methods, Applications of Measurement Systems. Static and dynamic Characteristics, Errors in Measurements, True Value, Static Error, Static Correction, Scale Range and Scale Span, Error Calibration Curve, Accuracy and Precision, Linearity, Hysteresis, Threshold, Dead Zone, Dead band; Dead time	**07**
II.	**Introduction of Transducers** Introduction, Advantages and Disadvantages of Electrical Transducers, Classification of Transducers, Static and Dynamic characteristics, Principle of measurement of displacement. Resistive potentiometers, variable inductance & variable reluctance pickups, LVDT	**07**

III.	**Speed, Distance and Motion Sensors (Sensors-I)** Basic methods of speed measurement: Electromagnetic, photoelectric and rotor variable reluctance tachometer. Types of distance measurement: Ultrasonic, IR proximity and laser sensor. Methods of motion detection using proximity Sensors: Inductive, Capacitive, Optical Through Beam, Diffuse, Retro Reflective	**08**
IV.	**Force and Temperature Sensors (Sensors-II)** Basic methods and types of force measurement: elastic force, strain gauge, piezoelectric, inductive, Capacitive load cells. Methods of temperature measurement: Optical Fiber, Resistance Temperature Detectors, Thermistor, Thermocouples	**08**
V.	**Computer Aided Process Control and Automation Systems** Introduction of computer aided process control hardware, Industrial communication systems, Introduction of Computer based data acquisition system (DAQ), Fundamentals of automation, Automation principles and strategies, reasons for automating, basic elements of an automated system: Power, Program and control system	**07**
VI.	**Introduction of Programmable Logic Controllers** Fundamentals of PLC, PLC selection criteria and applications of PLC, Introduction to PLC, programming, Ladder diagram, Sequential flow chart, Industrial bus systems, Case Study: Basic Logic Gates implementation using Ladder programming, Temperature Measurement with interfacing to DAQ	**08**
	Total	**45**

Text Books:

1. 1Jonathan Love, Process Automation Handbook: A Guide to Theory and Practice, CRC Press, 1st Edition, 2007
2. Terry L.M. Bartelt, Industrial Instrumentation: Principles and Design, Cengage Learning, 2nd Edition, 2018
3. Alan S Morris, Measurement and Instrumentation: Theory and Application, Elsevier, 3rd Edition, 2019
4. Mikell P. Groover, Automation, Production Systems, and Computer-Integrated Manufacturing, Pearson, 4th Edition, 2013

Reference Books:

1. Thomas A. Hughes, Measurement and Control Basics, 4th Edition, ISA, 2016
2. Terry L. M. Bartelt, Instrumentation and Process Control, Pearson, 3rd Edition, 2010
3. D. W. M. Hofkes, Control Engineering: An Introductory Course, Wiley, 2016

NPTEL Links :

1. Course: Industrial Instrumentation, Prof. Alok Barua, IIT Guwahati,
   Link: https://nptel.ac.in/courses/117/102/117102049/
2. Course: Industrial Automation and Control, Prof. S. Mukhopadhyay, IIT Kharagpur,
   Link: https://nptel.ac.in/courses/117/105/117105090/

Program: B. Tech. (E&TC)				Semester: III			
Course: Electronic Devices and Circuits				Code: BET3401			
Teaching Scheme				Evaluation Scheme			
Lecture	Tutorial	Credit	Hours	IE	MTE	ETE	Total
3	-	3	3	20	30	50	100

Prior knowledge of

1. Basics of semiconductor Physics
2. Basic Electronics Engineering

is essential.

Course Objectives:

1. To provide students with a broad understanding of the principles underlying electronic devices.
2. To educate students on modeling techniques, including modeling complex devices like BJT, JFET, and MOSFET, that are used to build and analyze real-world circuits.

Course Outcomes:

After completion of this course, students will be able to,

1. Analyze electronic circuits using a small signal BJT and FET model.
2. Describe MOSFET characteristics and examine the DC biasing circuit for MOSFETs.
3. Analyze electronic circuits using a small signal MOSFET model.
4. Illustrate the concept of feedback and study feedback amplifiers and oscillators.
5. Compare various power amplifiers.
6. Design various circuits utilizing semiconductor devices.

Detailed Syllabus

Unit	Description	Duration (H)
I.	**Small Signal Amplifier and It's Frequency Response:** Single Stage Amplifiers using BJT, Small signal analysis using h- parameters approximate model, Comparison of CE, CB, CC amplifiers, Introduction to multistage amplifiers. FET small signal model, Analysis of CS amplifier. Comparison of CS, CG and CD amplifiers. Concept of frequency response, Square wave testing of amplifiers, Miller's theorem, Effect of coupling, bypass, junction and stray capacitances on frequency response for BJT and FET amplifiers.	**09**
II.	**MOSFET& its DC Analysis:** Basics of MOS Transistor operation, Construction of n-channel E- MOSFET, E- MOSFET characteristics & parameters, Non-ideal voltage current characteristics viz. Finite output resistance, Body effect, Sub-threshold conduction, Breakdown effects and Temperature effects. Common source circuit, Load Line & Modes of operation, common MOSFETconfigurations: DCAnalysis.	**07**

III.	**MOSFET AC Circuit Analysis**: The MOSFET CS small signal amplifier, Small signal parameters, Small signal equivalent circuit, Modelling Body effect, Analysis of CS amplifier, Introduction to BiCMOS technology, The MOSFET internal capacitances and high frequency model, Introduction to MOSFET as a basic element inVLSI.	**07**
IV.	**Feedback amplifiers and Oscillators :** Four types of amplifiers, Types of Feedback, Feedback topologies and their comparison, Effect of feedback on terminal characteristics of amplifiers, Examples of voltage series and Current series feedback amplifiers and their analysis. Barkhausen criterion, Types of Oscillator, RC Phase Shift oscillator, Hartley Oscillator, Colpitts oscillator .Crystal oscillator	**07**
V.	**Power Amplifiers:** Classification of Power Amplifiers, Class A –Series Fed and Transformer-Coupled type, Class B- Push Pull & Complementary Symmetry Amplifier, Class AB Amplifier, Class C amplifiers ,Class D amplifiers, Distortions in amplifiers,Concept of Total Harmonic Distortion (THD), Comparison of power amplifiers.	**07**
VI.	**Applications of Semiconductor Devices:** Diode wave shaping circuits- Clippers and Clampers ,Voltage multipliers. Transistor as a switch, Transistorized relay driver circuit DC Regulated power supply, and it's performance parameters, Types: series regulator, shunt regulator, Protection circuits: overvoltage protection, over current protection.	**08**
	Total	**45**

Text Books:

1. Boylestead &Nashelsky,―Electronic devices and Circuits Theory‖, PHI, 11th edition, 2022
2. Donald Neaman,―Electronic Circuit Analysis and Design‖, Tata McGraw Hill, 3rd Edition,2016
3. S.Salivahanan,―Electronic Devices and Circuits‖ ,Tata McGraw Hill, 2nd Edition, 2014
4. N.P. Deshpande, ―Electronic Devices and Circuits Principles and Applications, Tata McGraw Hill ,1st Edition ,2009

Reference Books:

1. David A.Bell,―Electronic Device and Circuits‖, PHI, 5th Edition,2012
2. JacobMillman,ChristosC.Halkies,ChetanD.Parikh,―IntegratedElectronics-AnalogandDigitalCircuits and Systems, Tata McGraw Hill , 2nd Edition,2016
3. Floyd,―Electronic Devices‖, Pearson, 10th Edition,2017
4. Anil K. Maini and Varsha Agarwal ,―Electronic Devices and Circuits‖, Wiley India , 2nd Edition, 2022

Program: B. Tech. (E&TC)				**Semester: III**			
Course: Electronic Devices and Circuits Lab				**Code: BET3402**			
Teaching Scheme				**Evaluation Scheme**			
Practical	**Tutorial**	**Credit**	**Hours**	**TW**	**OR**	**PR**	**Total**
2	-	1	2	25	-	25	50

Prior knowledge of

1. Basics of semiconductor Physics
2. Basic Electronics Engineering

is essential.

Course Objectives:

1. To provide the students with knowledge of Designing, Building, Testing, and Analyzing aspects of electronic circuits.
2. To equip students with the skills necessary to simulate electronic circuits using simulation tools

Course Outcomes:

After completion of this course, the students will be able to,

1. Identify basic devices such as BJT/JFET/MOSFET from their package information by referring to manufacturer's Datasheet.
2. Design linear applications of basic devices (BJT/JFET/MOSFET) and further analyze the performance of it.
3. Simulate basic electronic circuits using appropriate circuit SimulationPackage.

Guidelines:

Detailed Syllabus

Expt. No.	**Suggested List of Experiments**
1	Drain and Transfer Characteristics of MOSFET.
2	Design and test a JFET/MOSFET CS amplifier for a given operating point.
3	Single stage JFET/MOSFET CS amplifier (Find Av, Ri, Ro)
4	Simulate frequency response of single stage BJT CE / JFET CS amplifier. (Effect of coupling and bypass capacitors.)
5	Simulate frequency response of single stage MOSFET CS amplifier. (Effect of coupling and bypass capacitors.)
6	Design and Implement RC phase shift oscillator.
7	Simulate Hartley /Colpitts oscillator

8	Build and test Current Series Feedback amplifier.
9	Simulate Voltage Series Feedback Amplifier.
10	Simulate Class A/ Class AB complementary symmetry Power Amplifiers.
11	Build and Test diode as a clipper and clamper.
12	Design a regulated DC power supply using discrete components and plot its line and load regulation characteristics.

Reference Books:

1. Boylestead &Nashelsky,—Electronic devices and Circuits Theory‖, PHI, 11th edition, 2022
2. Donald Neaman,—Electronic Circuit Analysis and Design‖, Tata McGraw Hill, 3rd Edition,2016
3. S.Salivahanan,—Electronic Devices and Circuits‖ ,Tata McGraw Hill, 2nd Edition, 2014
4. N.P. Deshpande, —Electronic Devices and Circuits Principles and Applications, Tata McGraw Hill ,1st Edition ,2009
5. David A.Bell,—Electronic Device and Circuits‖, PHI, 5th Edition,2012
6. JacobMillman,ChristosC.Halkies,ChetanD.Parikh,—IntegratedElectronics-AnalogandDigitalCircuits and Systems, Tata McGraw Hill , 2nd Edition,2016
7. Floyd,—Electronic Devices‖, Pearson, 10th Edition,2017
8. Anil K. Maini and Varsha Agarwal ,—Electronic Devices and Circuits‖, Wiley India , 2nd Edition, 2022

Program: B. Tech. (E&TC)				Semester : III			
Course : Digital Circuit Design				Code : BET3403			
Teaching Scheme				Evaluation Scheme			
Lecture	**Tutorial**	**Credit**	**Hours**	**IE**	**MTE**	**ETE**	**Total**
3	-	3	3	20	30	50	100

Prior knowledge of
a. Basics of Electronics,
b. Basics of Electrical and Electronics.
is essential.

Course Objectives:
1. To explore the basic concepts of digital electronics and programmable devices.
2. To introduce the students to implementation of combinational and sequential logical operations for digital applications.
    1. To lay the foundation for the design and implementation of digital circuits for various applications in VLSI etc.

Course Outcomes:
After completion of this course, students will be able to,
1. Understand basic combinational logic circuits.
2. Build modular combinational circuits with MUX/DEMUX, Decoder, Comparator etc
3. Construct sequential logic circuits
4. Understand the concept of state machines, PLA, PAL or PLD
5. Apply knowledge of the digital logic family for the selection of ICs used in applications.
6. Design and simulate arithmetic and sequential circuits using HDL toolflow.

Detailed Syllabus

Unit	Description	Duration (Hrs)
I	**Combinational Logic Design-I** Definition of combinational logic, canonical forms, Standard representations for logic functions, k-map representation of logic functions (SOP and POS forms), minimization of logical functions for min-terms and max-terms (up to 4 variables), don't care conditions, Design Examples: Arithmetic Circuits, BCD - to – 7 segment decoder, Code converters. Adders and their use as subtractor, 4-bit Binary Adder, 4-bit BCD adder, look ahead carry, ALU.	08
II	**Combinational Logic Design-II** Digital Comparator, Parity generators/checkers, Multiplexers and their use in combinational logic designs, multiplexer trees, De-multiplexers and their use in combinational logic designs, Decoders, Demultiplexer trees.	07
III	**Sequential Logic Design:** 1-Bit Memory Cell, Clocked SR, JK, MS J-K flip flop, D and T flip-flops. Use of preset and clear terminals, Excitation Table for flip flops, Timing parameters of flip flops. Application of Flip flops: Registers, Shift registers, Counters (ring counters, twisted ring counters), ripple counters, up/down counters, synchronous counters.	08

IV	**State Machines & Programmable Logic Devices:** Basic design steps- State diagram, State table, State reduction, State assignment, Mealy and Moore machines representation, Implementation, finite state machine implementation, Sequence detector. Programmable logic devices: Detail architecture, Study of PROM, PAL, PLA, Designing combinational circuits using PLDs. General Architecture of FPGA and CPLD.	08
V	**Digital Logic Families:** Classification of logic families, Characteristics of digital ICs, Operation of TTL NAND gate, active pull up, wired-AND, open collector output, unconnected inputs. Tri-State logic. CMOS logic – CMOS inverter, NAND, NOR gates, unconnected inputs, wired logic, open drain output. Interfacing CMOS and TTL. Comparison table of Characteristics of TTL, CMOS, ECL, RTL, I2L, DCTL.	06
VI	**Digital Design using VHDL:** Introduction to VLSI Design flow and ISE tool, VHDL, Modeling combinational circuits using VHDL, VHDL models for a multiplexer, Compilation and simulation of VHDL code converter, Variables, Signals and constants, VHDL operators, Packages and libraries, VHDL model for a counter, Modeling a sequential machine.	08
	Total	**45**

Text Books:

1. R.P. Jain, “Modern digital electronics”, 3rd edition, 12th reprint Tata McGraw Hill Publication, 2007.
2. M. Morris Mano, “Digital Logic and Computer Design”, 4th edition, Prentice Hall of India, 2013.
3. D. L. Perry, "VHDL Programming by Example" 4th Edition, McGraw Hill Publication, 2002.

Reference Books:

1. W. H. Gothman, “Digital Electronics-An introduction to theory and practice”, Pearson Education,1982
2. C.H. Roth, “Digital System Design using VHDL”, 3rd Edition, CENGAGE Learning, 2016
3. J.F.Wakerly, “Digital Design: Principles and Practices", 3rd Edition, Pearson Education, 2010
4. A. Anand Kumar, “Fundamentals of digital circuits”, 4th Edition, Prentice Hall of India Learning, 2016.
5. D.P. Leach, A. P. Malvino and G. Saha, " Digital Principles And Application" 7th Edition, Tata McGraw Hill Publication, 2011
6. S. Brown and Z. Vranesic, "Fundamentals of Digital Logic with VHDL Design" 3rd Addition, McGraw Hill Publication, 2017

Program: B. Tech. (E&TC)				Semester : III			
Course : Digital Circuit Design Lab				Code : BET3404			
Teaching Scheme				Evaluation Scheme			
Practical	Tutorial	Credit	Hours	TW	OR	PR	Total
2	-	1	2	25	-	25	50

Prior knowledge of

a. Basic Digital Circuits

b. Digital Number Systems

is essential

Course Objectives:

1. To introduce Basic Digital ICs and their working principles.
2. To deliver concepts related to designing basic combinational logic circuits for arithmetic operations.
3. To demonstrate designing of basic sequential circuits.
4. To introduce FSM design and implementations for real time applications.

Course Outcomes:

After the completion of this course, the students will be able to:

1. Demonstrate the use of digital ICs in designing combinational circuits.
2. Demonstrate the use of digital ICs in designing sequential circuits such as counters, registers, etc.
3. Design and Simulate Sequential Circuits using EDA Tools
4. Design and Simulate basic combinational and sequential using HDL design flow

General Guidelines: Any 3 from Part A and B. All experiments from Part C is compulsory

Detailed Syllabus

Expt.No.	Suggested List of Experiments/Tutorials
	Part A: Combinational Logic Circuit Implementation
1	Study of IC-74LS153 as a Multiplexer: a. Design and Implement 8:1 MUX using IC-74LS153 & Verify its Truth-Table. b. Design & Implement the given 4 variable functions using IC74LS153. Verify its Truth-Table.
2	Study of IC-74LS138 as a Demultiplexer / Decoder: a. Design and Implement full adder / subtractor function using IC-74LS138. b. Design & Implement 3-bit code converter using IC-74LS138. (Gray to Binary/Binary to Gray).
3	Study of IC-74LS83 as a BCD adder: a. Design and Implement 1 digit BCD adder using IC-74LS83.
4	Study of IC-74LS85 as a magnitude comparator: a. Design and Implement 5-bit comparator.

Part B: Sequential Logic Circuit Implementation	
5.	Study of Counters 1: a. Design and Implement MOD-N / MOD-NN using IC-74LS90 and draw a Timing diagram.
6.	Study of Counters 2: Design & Implement MOD-N Up/down Counter using IC74HC191/ IC74HC193. Draw Timing Diagram.
7.	Study of Shift Register: Design and Simulate 4-bit right shift and left shift register using D-flip flop using EDA Tool.
8.	Study of Shift Register (74HC194/74LS95): a. Design and Simulate a Pulse train generator using IC-74HC194/IC74LS95 (Use right shift/ left shift) using EDA Tool. a. b. Design and Simulate 4-bit Ring Counter/ Twisted ring Counter using shift registers IC 74HC194/IC74LS95 using EDA Tool.
Part C: VHDL based Design and Simulation	
9.	Design and Simulate adder, subtractor and 3 bit binary to gray converter using VHDL/ Verilog
10.	Design and Simulate 3 bit up/ down counter using VHDL/ Verilog

Reference Books:

1. S. Brown and Z. Vranesic, "Fundamentals of Digital Logic with VHDL Design" 3rd Addition, McGraw Hill Publication, 2017
2. Anand Kumar, “Fundamentals of digital circuits”, 4e, Prentice Hall of India Learning, 2016
3. Charles Roth, “Digital System Design using VHDL”, 3rd Edition, CENGAGE Learning, 2016
4. J.F. Wakerly, “Digital Design: Principles and Practices", 3e, Pearson Education, 2010
5. D. L. Perry, "VHDL Programming by Example" 4th Edition, McGraw Hill Publication, 2002.
6. Gothman, “Digital Electronics-An introduction to theory and practice”, Pearson Education,1982
7. https://www.ics.uci.edu/~jmoorkan/vhdlref/vhdl_golden_reference_guide.pdf

Program: B. Tech. (E&TC)				Semester : III			
Course : Network Analysis				Code: BE3405			
Teaching Scheme				Evaluation Scheme			
Lecture	Tutorial	Credit	Hours	IE	MTE	ETE	Total
3	-	3	3	20	30	50	100

Prior knowledge of

1. Basics of electrical & electronics engineering
2. Fundamentals of mathematics

Is essential

Course Objectives:

1. To introduce the fundamentals of network simplification techniques and network theorems for linear circuits.
2. To deliver the concepts related to fundamentals of network graph theory for resistive networks.
3. To introduce the transient analysis of linear circuits like series RL, RC and RLC circuits using time as well as frequency domain analysis.
4. To make students familiarize about the two port network parameters and network functions.

Course Outcomes:

After completion of this course students will be able to:

1. Analyze the DC & AC linear circuits for current, voltage or power using basic circuit simplification techniques
2. Analyze the DC & AC linear circuits for current, voltage or power using network theorems.
3. Solve the given resistive network using graph theory for current, voltage or power.
4. Analyze the responses of series RL, RC, RLC circuits using time domain method.
5. Analyze the responses of series RL, RC, RLC circuits using frequency domain method.
6. Determine the network parameters of two port networks and driving point, transfer functions for one port & two port networks.

Detailed Syllabus

Unit	Description	Duration (H)
I	**Unit I: Basic Circuit Analysis and Simplification Techniques** Introduction: Basic Laws, Independent and dependent sources and their interconnection and power calculations. Network analysis: Mesh, Super mesh, Node and Supernode analysis, Source transformation and source shifting.	**08**
II	**Unit II: Network Theorems** Superposition theorem, Thevenin's theorem, Norton's theorem, maximum power transfer theorem, reciprocity theorem and Miller's Theorem.	**08**
III	**Unit III: Graph Theory for Linear Networks** Network graph, tree, co-tree, and loops. Incidence matrix, tie-set, cut-set matrix. Formulation of equilibrium equations in matrix form, solution of resistive networks.	**07**

IV	Unit IV: Transient analysis of linear circuits using time domain method Initial conditions, Analysis of source free and source driven series RL & RC circuits for DC voltage source. Introduction to source free and source driven series RLC circuits for DC voltage source. Over damped, Under damped and critical damped series RLC circuit.	**08**
V	Unit V: Transient analysis of linear circuits using frequency domain method Laplace transform equivalence of R, L & C, Analysis of source free and source driven series RL, RC and RLC circuits or DC voltage source using Laplace transform.	**06**
VI	Unit VI: Two Port Network Parameters and Network Functions Terminal characteristics of network: Z, Y, h, ABCD Parameters; Reciprocity and Symmetry conditions, Applications of the parameters. Network functions for the one port and two port networks: Driving point and transfer functions, Poles and Zeros of Network functions, necessary conditions for stability and realizability of point & transfer functions, Time domain behaviour from Pole-Zero plot and Stability of network.	**08**
	Total	**45**

Textbooks:

1) Ravish Singh, Network Analysis and Synthesis, TMH, 2nd edition 2019.
2) William H Hayt, Jack E Kimmerly and Steven M. Durbin, Engineering Circuit Analysis, Tata McGraw Hill, 9th edition 2019.

Reference Books:

1) M. E. Van Valkenburg, Network Analysis, PHI / Pearson Education, 3rd edition. Reprint 2006.
2) D Roy Choudhury, Networks and Systems, New Age International Publishers, 2nd edition 2010.
3) A.K. Chakraborty, S.P. Ghosh, Network Analysis and Synthesis, Tata McGraw Hill, 1st edition .
4) Franklin F. Kuo, Network analysis and Synthesis, Wiley International Edition, 2nd edition 2006.

NPTEL Links:

1. https://nptel.ac.in/courses/108/105/108105159/

List of Tutorials:

Sr. No.	Title of Tutorial
1	**Determine** the Current, Voltage or Power for given linear circuits using mesh analysis, node analysis and other circuit simplification techniques.
2	**Determine** the Current, Voltage or Power for given linear circuits using Network theorems.
3a	1. **Draw** relevant network graph, tree, co-tree, and loops for given linear resistive network. 2. **Formulate** incidence matrix, tie-set, cut-set matrix whichever is applicable.
3b	**Formulate** equilibrium equations in matrix form for a given linear resistive network and **solve** for loop, branch currents or node voltages using graph theory.
4	**Carry out** the transient analysis to **determine** the current and/or voltage for a given linear circuits (RL and RC circuits) using time domain method.
	Mid Term Submissions
5	**Carry out** the transient analysis to **determine** the current and/or voltage for a given linear circuits (RL and RC circuits) using frequency domain method.
6a	**Determine** the z, y, h, ABCD parameters for a given network and/or **find** the conditions for Reciprocity and Symmetry.
6b	**Find** the network transfer function for a given one port or two port network using Laplace Transform and **sketch** the pole-zero plot to **find** network stability.
7	**Analyze** a given circuit using any EDA tools like MULTISIM, PSIM, FALSTAD, TINKERCAD, LTSpice, PSICE, etc. **(Course Activity)**
	End term Submissions

Program: B. Tech. (E&Tc)					**Semester: III**		
Course: Project Based Learning-III					**Code: BET3406**		
Teaching Scheme				**Evaluation Scheme**			
Lecture	**Practical**	**Tutorial**	**Credit**	**TW**	**OR**	**PR**	**TOTAL**
-	2	-	1	50	-	-	50

Prior knowledge of

Electronic devices and Digital systems design

is essential.

Course Objectives:

1. To introduce students to various hardware & software tools used for circuit simulation and PCB design.
2. To make students acquainted with the electronics, including reading and implementation of schematics.
1. To develop practical skills required for designing electronics projects.

Course Outcomes:

After the completion of the course, students will be able to-

1. Identify electronic components symbols & footprints
2. Demonstrate a PCB schematic of an analog / digital circuit.
3. Apply practical knowledge and skills by the development of electrical & electronics systems using suitable tools.

Detailed Syllabus:

Unit	**Description**	**Duration**
1.	**Overview of Electronic Circuit Simulation and Layout Software** Basics of circuit simulation, Overview of various open-source and commercial EDA tools for circuit design, simulation and PCB design, Demonstration of Analog and Digital Circuit Simulation **Activity Assignment 1:** ➢ Implementing a circuit in the EDA tool (Voltage dividers, Op-Amp, Timer circuits, etc.) ➢ PSpice tools and working ➢ Simulation of analog and digital circuits	**10**
2.	**Introduction to PCB Design software** Schematic Entry, Netlist Creation, working with component libraries, Design of Boards, Layout of Parts, Optimizing Parts Placements, Pads and Vi a, Manual and Auto Routing, Handling Multiple Layers, Gerber files, Gerber View **Activity Assignment 2:** ➢ Implementing PCB Layout in PCB Design tool (Power supply, Inverter, Microcontroller based circuit, etc.) ➢ Fabrication of PCB ➢ Assembling components and Soldering on PCB.	**10**

3	**Exploring MATLAB software for Design of Electronics Systems** Write simple program scripts and functions in MATLAB, Use MATLAB for applications in electrical & electronics engineering, collect data and analyze basic electronic sensors and circuits, analyze signals and explore algorithms. **Activity Assignment 3:** ➢ Implementing MATLAB scripts and functions ➢ Developing a Simulink model (RC and RLC Circuits, Filter Circuits, Wien Bridge Oscillator, etc.) ➢ Simulation and Analysis of circuits in MATLAB	**10**
	Total Hrs.	**30**

Guidelines for Assignments Submission:

1. Each Practical assignment is to be completed by a group of maximum three students.
2. Students shall identify their technical domain, and perform the Mini-project or Case study implementation upon identified problem statement.
3. Each group will be associated with a project mentor/guide. The group should meet with the project mentor/guide periodically. Record of the meetings and work discussed must be documented.
4. Department has to allocate a minimum six turns for the mini-project, case study and implementation of a practical assignment by the student groups. These turns shall be utilized for reviewing progress, sharing resources and delivering technical guidance to student groups.
5. The assessment of practical assignment for term work will be done at least two times at the department level by giving a presentation to panel members which consist of at least two members as examiners (including the project guide/mentor)
6. At the end of the semester, every group has to submit a report on their practical assignment which summarizes the results of the Mini-project or Case study implementation.
7. Students shall submit certificates of participation in various technical activities/proof of outcomes related to their practical assignment.

References:

1. Farid N. Nazm, Circuit Simulation, Wiley, 1st edition
2. Bossart, Printed Circuit Boards: Design and Technology, Tata McGraw Hill, 1st edition
3. Rajkumar Bansal, MATLAB and its Applications in Engineering Pearson Publishers, 2nd edition
4. Franco, Design with Operational Amplifiers & Analog Integrated Circuits, Tata McGraw Hill, 3rd edition
5. Horowitz & Hill, The Art of Electronics; Cambridge University Press, 3rd edition
6. Mitzner.K, Complete PCB Design Using Orcad Capture and Layout, Elsevier/ Newnes, 1st edition
7. Félix E. Guerrero-Castro and Ofelia Cervantes-Villagomez, Advanced Circuit Simulation Using Multisim Workbench, Morgan & Claypool Publishers, 1st edition
8. R. L. Boylstad, L. Nashlesky, Electronic Devices and circuits Theory, Prentice Hall of India, 9th edition
9. Dr. R. S. Sedha, Digital Electronics, S. Chand Publications, 3rd edition

Program:	**B. Tech. (All branches)**			Semester :**III**					
Course : **Universal Human Values**				Code: **BHM3101**					
Teaching Scheme				**Evaluation Scheme**					
Lecture	**Practical**	**Tutorial**	**Credit**	**IE**	**MTE**	**ETE**	**TW**	**PR**	**Total**
3	-	-	3	30	-	20	-	-	50

Course Objectives:

1. To help the students appreciate the essential complementarily between 'VALUES' and 'SKILLS' to ensure sustained happiness and prosperity which are the core aspirations of all human beings
2. To facilitate the development of a Holistic perspective among students towards life and profession as well as towards happiness and prosperity based on a correct understanding of the Human reality and the rest of existence. Such a holistic perspective forms the basis of Universal Human Values and movement towards value-based living in a natural way.
3. To highlight plausible implications of such a Holistic understanding in terms of ethical human conduct, trustful and mutually fulfilling human behavior and mutually enriching interaction with Nature.

Course Outcomes:

After learning the course, the students will be able to:

1. Understand the relevance of Universal Human Values.
2. Interpret the concept of 'Self' & 'Body'.
3. Develop harmony in the family based on nine Universal Human Values.
4. Apply the sense of Harmony in society.
5. Take part in maintaining coexistence with Nature.
6. Integrate Universal Human Values in personal and professional life.

Detailed Syllabus:

Unit	Description	Duration
1	**Introduction to Value Education:** Understanding Value Education, Self-exploration as the Process for Value Education, Continuous Happiness and Prosperity – the Basic Human Aspirations, Right Understanding, Relationship and Physical Facility, Happiness and Prosperity – Current Scenario, Method to fulfill the Basic Human Aspirations	06
	Practice Session: Sharing about Oneself, Exploring Human Consciousness, Exploring Natural Acceptance	03

2	**Harmony in the Human Being:** Understanding Human being as the Co-existence of the Self and the Body, Distinguishing between the Needs of the Self and the Body, The Body as an Instrument of the Self, Understanding Harmony in the Self, Harmony of the Self with the Body, Programme to ensure self-regulation and Health	06
	Practice Session: Exploring the difference of Needs of Self and Body, Exploring Sources of Imagination in the Self, Exploring Harmony of Self with the Body	03
3	**Harmony in the Family:** Harmony in the Family – the Basic Unit of Human Interaction, Values in Human-to-Human Relationship, Nine universal values in relationships viz. Trust, Respect, Affection, Care, Guidance, Reverence, Glory, Gratitude, Love	04
	Practice Session: Exploring the Feeling of Trust, Exploring the Feeling of Respect	03
4	**Harmony in Society:** Understanding Harmony in the Society, Vision for the Universal Human Order**,** Human Order Five Dimensions	03
	Practice Session: Exploring Systems to fulfill Human Goal	02
5	**Harmony in the Nature/Existence:** Understanding Harmony in the Nature, Interconnectedness, self-regulation and Mutual Fulfillment among the Four Orders of Nature, Realizing Existence as Coexistence at All Levels, The Holistic Perception of Harmony in Existence	03
	Practice Session: Exploring the Four Orders of Nature, Exploring Co-existence in Existence	02
6	**Implications of the Holistic Understanding – a Look at Professional Ethics:** Natural Acceptance of Human Values, Definitiveness of (Ethical) Human Conduct, A Basis for Humanistic Education, Humanistic Constitution and Universal Human Order, Competence in Professional Ethics, Holistic Technologies, Production Systems and Management Models-Typical Case Studies, Strategies for Transition towards Value-based Life and Profession	04
	Practice Session: Exploring Ethical Human Conduct, Exploring Humanistic Models in Education, Exploring Steps of Transition towards Universal Human Order	06
	Total	**45**

Program:	S.Y.B. Tech. (All Branches)			Semester:		IV	
Course :	Professional skills for Engineers			Code:		BHM4101	
Teaching Scheme				Evaluation Scheme			
Lecture	Practical	Tutorial	Credit	Internal Evaluation	MTE	ETE	Total
1	2	-	2	30	-	20	50

Prior knowledge of

1. Basic Language Skills

Course Objectives:

This course aims at enabling students:

1. To introduce students to the fundamentals of effective communication
2. To introduce students to the skills to prepare and deliver effective presentations and learn techniques of mastering group discussions.
3. To introduce students to interview skills and corporate etiquettes
4. To introduce students to professional ethics and organizational skills

Course Outcomes:

After learning the course, the students will be able to

1. **Understand** the nuances of effective communication skills at the workplace.
2. **Demonstrate** presentation skills and group discussions skills to excel in the professional environment.
3. **Apply** interview skills and corporate etiquettes effectively to hone the opportunities of employability.
4. **Analyze** career management skills that can lead to improved employment.

Detailed Syllabus:

Unit	Description	Duration (Hrs)
I	**Introduction and Fundamentals of Communication:** Need for effective communication, Functions of Communication, Organizational Communication, Verbal-Oral and Written communication, Non-verbal communication, Barriers to Effective Communication	11
II	**Presentation Skills:** 4Ps (Planning, Preparation, Practice, Presentation), guidelines for developing PPT, Outlining, Effective use of A/V aids and Modes of Delivery **Mastering Group Discussion skills:** Skills evaluated in Group discussion, Types of Group discussion- Factual, Abstract, Controversial and Case studies, Do's and Don'ts in Group Discussion	12
III	**Interview Skills:** Interview Process, Types of Interview: Job interview, Appraisal Interview, Exit, Interview, Panel Interview; Self Introduction, Pre and Post interview activities, Skills evaluated in interview, Do's and Don'ts during Interview **Cover letter & Resume**: Job Application letter, Difference between CV and Resume Writing skills, Resume writing, Writing SOPs **Corporate Etiquettes:** Dressing Etiquettes, Dining Etiquettes, Telephonic etiquette, Business card Etiquettes, Email etiquettes	11
IV	**Professional Ethics:** Integrity, Objectivity, Professional competence and due care, Confidentiality Professional behavior. **Organizational Skills:** Physical Organization, Digital Organization, Planning, Time management & Communication	11
	Total	45

Text Books:

1. R.Gajendra Singh Chauhan and Sangeeta Sharma, Soft Skills-An Integrated Approach to Maximize Personality, Wiley Publication, ISBN: 987-81-265-5639-7

Reference Books:

1. Muralikrishna C., Sunita Mishra, Communication Skills for Engineers 2nd edition, Pearson, 2. New Delhi 2010
2. Indrajit Bhattacharya, An Approach to Communication Skills, DhanpatRai, Delhi, 2008 4.
3. Simon Sweeney, English for Business Communication, Cambridge University Press.
4. Sanjay Kumar and Pushpa Lata, Communication Skills, Oxford University Press.
5. Barun K.Mitra, Personality Development & Soft Skills, Oxford University Press, 2012 New Delhi.

E-sources:

1. https://nptel.ac.in/courses/109107121
2. https://nptel.ac.in/courses/122106031https://www.coursera.org/learn/principles-of-management (Ethics)

Program:	B. Tech. (All branches)								Semester: III
Course :	Life Skills-III								Code : BHM3939
Teaching Scheme				Evaluation Scheme					
Lecture	Practical	Tutorial	Credit	IE	MTE	ETE	TW	OR	Total
--	2	--	--	--	-	-	-		-

Prior knowledge: Nil

Course Objectives:

1. To attain mental, emotional balance and spiritually to achieve self-realization and enlightenment to help better understanding of the inner personality & its establishment of harmony with the external demands.
2. To learn to build team spirit and adapt to the various skills required in various sports activities.
3. To provide a platform to express their mind, body, and emotions through performing arts.

Course Outcomes:

After completing the course, the students should be able to:

1. Achieve a balanced state of mind and enjoy improved mental, physical, emotional, and spiritual wellbeing.
2. Apply sportsmanship skills in the context of leadership, sports management etc.
3. Demonstrate the ability to think critically about a variety of visual and performing arts.

Detailed Syllabus:

Unit	Description	Duration (Hrs)
1.	**Practicing Meditation** Pranayama and Breathing exercises, Meditation Technique, Thoughtless Awareness : Through Patanjali /Sahajayoga/Vipassana /Madhyastha Darshan/ Art of Living etc., or **Sports**: Indoor Games / Outdoor Games	**12**
2.	**Performing arts** Music, Singing, Poetry, Indian Conventional Dancing, Photography, Short Movie Making, Painting/ Sketching/ Drawing, Theatre Arts, Anchoring, Calligraphy etc.	**12**
	Total	**24**

Reference Books:

1. Vishnu Devananda, “Meditation and Mantras”, 1978.
2. Swami Vivekananda, “Patanjali‟s Yoga Sutras”, 1 Jan 2012.
3. Shri Mataji Nirmala Devi, “Sahajayoga an Introduction”
4. William Hart , S. N. Goenka, “The Art of Living”, 4 August 2009.
5. Dennis Hill, “Meditation Deep Peace”, Trafford Publishing, 7 August 2014.
6. Boria Majumdar, Sachin Tendulakar, “Sachin Tendulkar – Playing It My Way”, Hodder & Stoughton, Hachette Livre publishing, 6 November 2014.
7. Milkha Singh, “The Race of My Life”, 2013.
8. Sfurti Sahare, “Think and Win like Dhoni”, 3 July 2016.
9. Dina Serto and Mary Kom, “Unbreakable”, 19 November 2013.
10. Ronojoy Sen, “Nation at Play: A History of Sport in India”, 2015.
11. Andre Agassi, “Open”, 2009.
12. Dr. Monica Hiten Shah, “Sangeet Aradhana”, Aradhana Sangeet Academy Ahmedabad, Edition 2018.
13. Kishori Amonkar , “Recreating A Dream”, Standard Edition .
14. Veejay Sai & foreward by Girish Karnad, “Drama Queens – Women who created history on Stage”, Roli Books publication.
15. Jiwan Pani, “Back to the roots – Essays on Performing Arts of India”, 1 January 2004.

Course Syllabus

S.Y. B.Tech.

Semester-IV

Program: B. Tech. (E&TC)				**Semester: IV**			
Course: Data structures and Programming				**Code: BET4302**			
Teaching Scheme				**Evaluation Scheme**			
Lecture	**Tutorial**	**Credit**	**Hours**	**IE**	**MTE**	**ETE**	**Total**
2	-	2	2	20	30	50	100

Prior Knowledge of:

1. Programming & Problem Solving **is essential**

Course Objectives:

1. Demonstrate the basics of C Programming language.
2. Compare and demonstrate the different sorting and searching algorithms and their analysis.
3. Illustrate and demonstrate the linear data structures: Stacks, Queues, linked list and their applications.
4. Outline and assign problems on non-linear data structures: binary trees, binary search trees, and graphs.

Course Outcomes:

After completion of this course, the students will be able to,

1. Solve the mathematical problem using the basic C Programming with arrays, structures, functions & pointers.
2. Implement the searching & sorting algorithms and analyze the computational efficiency of the algorithms.
3. Develop applications of stack and queue using arrays and linked lists.
4. Demonstrate the applicability of non-linear data structures such as Trees and Graphs

Detailed Syllabus

Unit	**Description**	**Duration (H)**
I.	**Fundamentals of C Programming** Constants, variables and keywords in C, Data Types, Operators, Control structure, Arrays, Pointers and String manipulation, structure, Union, Functions: parameter passing, call by value and call by reference, scope rules	**8**
II.	**Introduction to Data Structure & Algorithms** Introduction & classification of Data structure, Introduction to the Algorithm: Time & Space complexity of an algorithm, Asymptotic notations, Searching: Need and types of searching, Linear and Binary Searching Methods, Applications, Hashing Technique: Advanced Search Technique, Sorting: Need and types of Sorting, Methods: Bubble & Quick Applications	**7**
III.	**Linked List, Stacks and Queues** Linked List: Concept and Types, Singly Linked Lists, Circularly Linked lists, Doubly Linked lists, Singly Linked Lists: Basic Operations & Implementation, Linked List as ADT, Application of Linked list Stacks: Concept, Basic Stack operations, Array & Linked representation of stacks, Stack as ADT, Stack Applications: Arithmetic expressions conversion, Queues: Concept, Queue operations, Array & Linked representation of queues, Queue as ADT, Circular queues, Priority Queue, Application of queues.	**8**
IV.	**Trees & Graph** Trees: Basic Tree Concepts, Binary Trees: Concept & Terminologies, Traversing a binary tree, Binary Search Trees (BST): Basic Concepts, BST operations, Applications, Graph: Basic Concepts & terminology, Adjacency matrix & List, traversing a graph: BFS & DFS, Spanning trees: Minimum Spanning Tree (MST): Kruskal‘s Algorithm, Prim‘s Algorithm	**7**
	Total	**30**

Text Books:

1. E Balgurusamy,‖ Programming in ANSI C‖, Tata McGraw-Hill, Eighth Edition,2019.
2. Yashavant Kanetkar, ―Data Structures Through C: Learn the fundamentals of Data Structures through C‖, BPB Publication, Third Edition, 2019.
3. Herbert Schildt, ―C: The Complete Reference‖, Tata McGraw-Hill, Fourth Edition, 2017.

Reference Books:

1. Ellis Horowitz, Sartaj Sahni, ―Fundamentals of Data Structures‖, Galgotia Books Source, Second Edition, 2008.
2. Reema Thareja, ―Data Structures using C‖, Second Edition, Oxford University Press, 2014.

MOOC / NPTEL:

1. NPTEL Course **"Programming & Data Structure"** https://nptel.ac.in/courses/106/105/106105085/

2. NPTEL Course **―Data Structures & Algorithms"** https://nptel.ac.in/courses/106/102/106102064/

Program:	**B. Tech. (E&TC)**			**Semester: IV**			
Course:	**Data structures and Programming Lab**			**Code: BET4303**			
Teaching Scheme				**Evaluation Scheme**			
Practical	**Tutorial**	**Credit**	**Hours**	**TW**	**OR**	**PR**	**Total**
2	-	1	2	25	-	25	50

Course Objectives:

1. Demonstrate the basics of C Programming language.
2. Demonstrate different sorting and searching algorithms and their analysis.
3. Demonstrate linear data structures: Stacks, Queues, Linked list and their applications.
4. Demonstrate logic to solve the problems using non-linear data structures: Trees and Graphs

Course Outcomes:

After completion of this course, the students will be able to,

1. Apply the basic C Programming using arrays, structures, functions & pointers to solve mathematical problems.
2. Choose appropriate searching & sorting algorithms and analyze the computational efficiency of the algorithms.
3. Develop applications of Stack and Queue using Arrays and Linked lists.
4. Show the applicability of non-linear data structures such as Binary Trees and Graphs

Guidelines: Any 12 experiments from the following list need to be completed using Code Blocks /Turbo C / Online GDB.

Detailed Syllabus

Expt. No.	**Suggested List of Experiments**
1	Write a C program for generation of Fibonacci Series.
2	Write a C program for generating a Prime number.
3	Write a C program for generating a Palindrome number.
4	Write a C program for generating a Factorial.
5	Write a C program for generating a Armstrong number.
6	Write a C program for generation of Sum of Digits.
7	Write a C program for generation to Reverse Number.
8	Write a C program for generation to Swap two numbers without using third variable.
9	Write a C program for generation to Addition of Matrices
10	Write a C program for generation to Pyramid pattern using stars
11	Implement Student Database Management using array of structures with operations: Create, Display, Search and Sort.

12	Implement String Reversal using Stack
13	Implementation of Queue using Linked List
14	Implement Binary search tree with operations Create, Search, and Recursive traversal.
15	Implement Graph using Adjacency Matrix with BFS & DFS traversal.

Reference Books:

1. E. Balgurusamy,‖ Programming in ANSI C‖, Tata McGraw-Hill, Eighth Edition,2019.
2. Yashavant Kanetkar, ―Data Structures Through C: Learn the fundamentals of Data Structures through C‖, BPB Publication, Third Edition, 2019.
3. _Herbert Schildt, ―C: The Complete Reference‖, Tata McGraw-Hill, Fourth Edition, 2017.
4. Ellis Horowitz, Sartaj Sahni, ―Fundamentals of Data Structures‖, Galgotia Books Source, Second Edition, 2008.
5. Reema Thareja, ―Data Structures using C‖, Second Edition, Oxford University Press, 2014.

Program: B. Tech. (E&TC)				Semester : IV			
Course : Analog Communication				Code : BET4407			
Teaching Scheme				Evaluation Scheme			
Lecture	Tutorial	Credit	Hours	IE	MTE	ETE	Total
3	-	3	3	20	30	50	100

Prior knowledge of

1. Basic electronic circuit analysis **is essential.**

Course Objectives:

1. To introduce students to AM, FM, and PM generation, transmission, and reception principles.
2. To brief the impact of noise on AM, FM, and PM systems.
3. To introduce students to Pulse Analog Modulation techniques.

Course Outcomes:

After completion of this course students will be able to,

1. Compare the various AM generation techniques and AM transmission.
2. Analyze the AM receiver based on various performance parameters.
3. Compare the various techniques of Angle Modulation generation and FM transmission.
4. Analyze and compare various FM detection methods.
5. Examine the impact of noise in an analog communication system.
6. Comprehend the concept of Pulse Modulation techniques.

Detailed Syllabus

Unit	Description	Duration (H)
I	**AM Transmission** Baseband & Carrier communication, Generation of AM (DSBFC) and its spectrum, Power relations applied to sinusoidal signals, DSBSC – multiplier modulator, Nonlinear generation, switching modulator, Ring modulator & its spectrum, Modulation Index. SSBSC, ISB & VSB, their generation methods & Comparison, Block Diagram of AM Transmitter and Broadcast technical standards	**9**
II	**AM Reception** Block diagram of TRF AM Receivers, Super Heterodyne Receiver, and Performance Characteristics: Sensitivity, Selectivity, Fidelity, Image Frequency Rejection, and IFRR. Tracking, Mixers. AM Detection: Rectifier detection, Envelope detection; Demodulation of DSBSC: Synchronous detection; Demodulation of SSBSC: Envelope detection	**9**
III	**FM Transmission** Instantaneous frequency, Concept of Angle modulation, frequency spectrum& Eigen Values, Narrowband & wideband FM, Modulation index, Bandwidth, Phase Modulation, Bessel's Function and its mathematical analysis, Generation of FM (Direct & Indirect Method), FM stereo Transmitter, Two way FM Radio Transmitter, Comparison of FM and PM.	**9**

IV	**FM Reception** Block diagram of FM Receiver, FM Stereo Receiver, Two way FM Radio Receiver, FM detection using Phase lock loop (PLL), Slope detector, Balanced Slope detector, Ratio detector, Foster Seeley discriminator.	**6**
V	**Noise** Sources of Noise, Types of Noise, White Noise,Thermal noise, shot noise, partition noise, Low frequency or flicker noise, burst noise, avalanche noise, Signal to Noise Ratio, SNR of tandem connection, Noise Figure, Noise Temperature, Friss formula for Noise Figure, Noise Bandwidth, Behavior of Baseband systems and Amplitude modulated systems i.e.DSBSC.in presence of noise.	**6**
VI	**Pulse Analog Modulation** Band limited & time-limited signals, Narrowband signals, and systems, Sampling theorem in the time domain, Nyquist criteria, Types of sampling- ideal, natural, flat top, Aliasing & Aperture effect. PAM PWM & PPM. Introduction to Pulse Code Modulation.	**6**
	Total	**45**

Text Books:

1. B. P. Lathi, ―Modern Digital and Analog Communication Systems‖, Oxford University Press,3rd Edition,1998.
2. Simon Haykin, ―Communication Systems‖, John Wiley & Sons, 4th Edition,2000.

Reference Books:

1. Dennis Roddy &Coolen, ―Electronic Communication‖,Prentice-Hall,4th Edition,2008.
2. George Kennedy, ―Electronic Communication Systems‖, McGraw-Hill, 4th Edition,2009.
3. Taub& Schilling, ―Principles of Communication Systems‖, Tata McGraw-Hill, 3rd Edition,2011.
4. Frenzel, "Principles of Electronic Communication Systems", Tata McGraw-Hill,3rd Edition,2008.

Program:	**B. Tech. (E&TC)**			**Semester :IV**			
Course :	**Analog Communication Lab.**			**Code : BET4408**			
Teaching Scheme				**Evaluation Scheme**			
Practical	**Tutorial**	**Credit**	**Hours**	**TW**	**OR**	**PR**	**Total**
2	-	1	2	25	-	-	25

Prior knowledge of

1. Basic electronic circuit analysis **is essential.**

Course Objectives:

1. To demonstrate AM and FM generation to students.
2. To introduce basic sampling and pulse modulation through experimentation.
3. To make use of software tools for analysis of various modulation and demodulation methods.

Course Outcomes:

After completion of this course, students will be able to,

1. Evaluate the performance parameters of AM & FM modulation schemes.
2. Analyze the sampling theorem for various sampling frequencies.
3. Analyze various modulation and demodulation methods by software tools.

Guidelines :

Any 8 experiments from (Group A) and 2 experiments from (Group B) need to be completed.

Detailed Syllabus

Expt.No.	**Suggested List of Experiments/Tutorials (Group A)**
1.	AM Generation (DSB-FC): Calculation of modulation index by graphical method, Power of AM Wave for different modulating signal.
2.	Envelope Detector - Practical diode detector, Observe the effect of change in RC time constant which leads to diagonal and negative clipping
3.	Generation of DSB-SC with the help of Balanced Modulator IC1496/1596 & its detection. Calculation of BW.
4.	SSB modulator using Filter method/ phase shift method & its detection. Calculation of BW.
5.	Frequency modulator & demodulator using IC 565 (PLL based), calculation of modulation index & BW of FM. Observe Spectrum of FM on Spectrum Analyzer.
6.	Verification of Sampling Theorem, PAM Techniques, (Flat top & Natural sampling), reconstruction of the original signal, Observe Aliasing Effect in the frequency domain.

7.	Generation and Detection of PWM using IC 555
8.	Design of Low power AM system .
9.	Design of Low power FM system.
Simulation Practical (Group B)	
10.	Generate AM and FM waveform for given modulation index, signal frequency, and carrier Frequency using suitable software.
11.	Prove sampling Theorem. Reconstruct the analog signal from its samples. Observe the aliasing effect by varying sampling frequency.
12.	The behavior of the DSBFC (AM) in the presence of noise. Calculate SNR.

Reference Books:

1. Dennis Roddy &Coolen, ―Electronic Communication‖,Prentice-Hall,4th Edition,2008.
2. George Kennedy, ―Electronic Communication Systems‖, McGraw-Hill, 4th Edition,2009.
3. Taub& Schilling, ―Principles of Communication Systems‖, Tata McGraw-Hill, 3rd Edition,2011.

Program: B. Tech. (E&TC)				Semester: IV			
Course: Analog Integrated Circuits				Code: BET4409			
Teaching Scheme				Evaluation Scheme			
Lecture	**Tutorial**	**Credit**	**Hours**	**IE**	**MTE**	**ETE**	**Total**
3	-	3	3	20	30	50	100

Prior knowledge of :

1. Electronic Devices & Circuits
2. Network Analysis

is essential.

Course Objectives:

1. To explain characteristics of Op-Amp.
2. To make students aware of analysis and design of various linear and nonlinear applications of Op-Amp.
3. To make the students familiar with the functionalities of PLL and its applications.

Course Outcomes:

After completion of this course, student will be able to,

1. Comprehend the ideal and practical characteristics of op-amps.
2. Design linear applications of Op-Amp.
3. Design non- linear applications ofOp-amp.
4. Illustrate working of data converters using op-amp.
5. Describe the working of timers, PLL and its applications.
6. Explore the working of Voltage regulators.

Detailed Syllabus

Unit	Description	Duration(H)
I	**Introduction to OP-AMP and its Parameters:** Block diagram of typical op-amp, Differential Amplifier configurations, DC and AC Analysis of Differential amplifier for dual-input balanced-output configuration, Current sources, Current mirror. level shifters, Output stage. Various DC and AC parameters of op-amp, Ideal vs practical op-amp.	**09**
II	**Linear Applications of OP-AMP:** Concept of Virtual ground and virtual short, Inverting and Non- inverting amplifier, Summing amplifier, Averaging circuit, Difference amplifier, Voltage follower,Ideal and practical Integrator, Ideal and practical Differentiator, Instrumentation amplifier.	**07**
III	**Non Linear Applications of OP-AMP:** Comparators, Limitations of op-amp as comparator, Schmitt Trigger, Precision half wave and full wave rectifiers, Peak Detectors, Sample and Hold circuits, Waveform generators, Wein bridge Oscillator and Quadrature oscillator.	**07**
IV	**Converters using OP-AMP:** V to F converter, I to V converter and V to I converter, DAC: types, characteristics, specifications, advantages and disadvantages. ADC: types, characteristics, specifications, advantages and disadvantages. Comparison of different configurations of ADC and DAC.	**07**

V	**Timers and PLL:** Timer: IC555 functional block diagram, Astable and Monostable mode of operation. Phase Locked Loop (PLL): Block diagram, types, characteristics and different applications. Voltage controlled oscillators.	**07**
VI	**Voltage Regulators:** Linear Regulator: functional block diagram, specifications, typical applications of fixed voltage regulator IC (78XX and 79XX series), functional block diagram, specifications, typical applications of variable voltage regulator IC (LM317 and LM337). Dual power supply, LDO. Switching Regulators: Block diagram, types, Comparison with Linear Regulator, Switching Regulator IC LM3524.	**08**
	Total	**45**

Text Books:

1. Ramakant A.Gayakwad,―OpAmps and Linear Integrated Circuits‖, Prentice Hall of India Pvt Ltd.,4th edition,2014.
2. Salivahanan and Kanchana Bhaskaran,― Linear Integrated Circuits‖, Tata McGraw Hill,India , 3rd Edition, 2018.

Reference Books:

1. George ClaytonandSteve Winder,―OperationalAmplifiers‖,Newnes5thEdition,2015
2. Sergio Franco, ―Design with OperationalAmplifiers and AnalogIntegrated Circuits‖, Tata McGraw Hill,2012.
3. Robert F.Coughlin and Frederick F.Driscoll,―Operational Amplifiers and Linear Integrated Circuits‖, Pearson Education, Bangalore 6th Edition,2015.
4. J D.Roy Choudhury, ―Linear integrated Circuits‖, New-Age International Publishers, Chennai, 5thEdition2017.

Program: B. Tech. (E&TC)				**Semester: IV**			
Course: Analog Integrated Circuits Lab				**Code: BET4410**			
Teaching Scheme				**Evaluation Scheme**			
Practical	**Tutorial**	**Credit**	**Hours**	**TW**	**OR**	**PR**	**Total**
2	-	1	2	25	-	25	50

Course Objectives:

1. To demonstrate parametric characterization of Op-Amp.
2. To make students to design various linear and nonlinear applications ofOp-Amp.
3. To Simulate basic applications of op amp

Course Outcomes:

After completion of this course, students will be able to,

1. Experiment with op-amp for parametric characterization.
2. Design linear and nonlinear applications ofOp-Amp.
3. Simulate linear or non linear applications of opamp .

Guidelines:

1. Any 10 experiments from following list need to be completed to meet mentioned Course outcomes

Detailed Syllabus

Expt. No.	**Suggested List of Experiments**
1.	Measure and verify op-amp parameters and compare with the specifications.
2.	Design, build and test practical integrator for given cut off frequency.
3.	Build and test three Op-Amp instrumentation amplifiers for typical application.
4.	Simulate precision half & full wave rectifier.
5.	Design, build and test Schmitt trigger and plot transfer characteristics.
6.	Design, build and test PLL for typical centre frequency
7.	Simulate 2-bit R-2R Ladder DAC.
8.	Implement and verify working of 2-bit ADC. (Flash type)
9.	Design, build and test square & triangular wave generator.
10.	Design, built and test astable multivibrator using IC555
11.	Simulate monostable multivibrator using IC555.
12.	Design , build and test a regulated DC power supply using three pin voltage regulator IC.

Reference Books:

1. Ramakant A.Gayakwad,―OpAmps and Linear Integrated Circuits‖, Prentice Hall of India Pvt Ltd.,4th edition,2014.
2. Salivahanan and Kanchana Bhaskaran,― Linear Integrated Circuits‖, Tata McGraw Hill,India , 3rd Edition, 2018.
3. George Clayton and Steve Winder, ―Operational Amplifiers‖, Newnes 5th Edition,2015.
4. Sergio Franco, ―Design with Operational Amplifiers and Analog Integrated Circuits‖, Tata McGraw Hill,2012.
5. Robert F. Coughlin and Frederick F. Driscoll, ―Operational Amplifiers and Linear Integrated Circuits‖, Pearson Education, Bangalore 6th Edition, 2015.
6. J D. Roy Choudhury, ―Linear integrated Circuits‖, New-Age International Publishers, Chennai. 5th Edition 2017.

Program: B. Tech. (E&TC)				Semester: IV			
Course: Microcontrollers				Code: BET4411			
Teaching Scheme				Evaluation Scheme			
Lecture	Tutorial	Credit	Hours	IE	MTE	ETE	Total
2	-	2	2	20	30	50	100

Prior Knowledge of:

1. Basic electronics
2. Digital systems design

Is essential.

Course Objectives:

1. To introduce the architecture and features of microprocessors and microcontrollers.
2. To make aware of the importance of microcontrollers and its tools for developing real-life applications.
3. To teach the interfacing of real-world peripheral devices with microcontrollers.

Course Outcomes:

After the completion of this course, the students will be able to:

1. Understand microprocessor and microcontroller architecture
2. Apply a combination of hardware and software tools to design microcontroller-based systems.
3. Develop interfacing of microcontroller peripherals with real-world devices.
4. Program microcontrollers for developing real time applications.

Detailed Syllabus

Unit	Description	Duration (H)
I.	**INTRODUCTION TO MICROPROCESSORS AND MICROCONTROLLERS** Microprocessor Vs Microcontroller, Architecture of 8086 microprocessor, Architecture of 8051, Features and pin diagram of 8051, Memory organization, Addressing Modes, Overview of Instruction set, Assembly directives, Assembly software programs with algorithms	**7**
II.	**PROGRAMMING OF 8051** Programming environment for microcontrollers, Study of software and hardware development tools, Port structure, Interrupt structure, timers and its modes, serial communication and its modes. (All programs in embedded C)	**8**
III.	**INTERFACING WITH 8051 - PART 1** GPIO programming of 8051, Interfacing of: LEDs, Keypad, 16x2 LCD, Interfacing of: Stepper motor (All programs in embedded C)	**8**
IV.	**INTERFACING WITH 8051 - PART 2** ADC interfacing to 8051, DAC interfacing to 8051, Interfacing of: Relay, Buzzer, Opto-isolator (All programs in embedded C), Introduction to advanced 8-bit microcontrollers like AVR, PIC. Case study of: I. Data Acquisition system **II.** Robot Control system III. Both side serial communication between 8051 and PC	**7**
	Total	30

Text Books:

1. Ramesh Gaonkar, ―Microprocessor Architecture, Programming and Applications with the 8085‖, Prentice Hall, 6th edition,2013.
2. Kenneth J. Ayala, The 8051 Microcontroller, Cengage Learning, 3rd edition,2012.
3. M.A. Mazidi, R.D. McKinlay, J.G. Mazidi, ―The 8051 Microcontroller: A Systems Approach‖, Pearson, 2nd edition,2013.

Reference Books:

1. William C. Wray, Joseph D. Greenfield, Ross Bannatyne, ―Using Microprocessors and Microcomputers‖, Pearson Publication, 4th edition.2015.
2. Bruce A. Artwick, Microprocessor Interfacing, Prentice-Hall series in personal computing, 1st edition,2008.
3. Pal Ajit, Microcontrollers: Principles and Applications, EEE, PHI, New Delhi 1st edition,2012
4. Predko Michael, Programming and customizing the 8051 microcontroller, McGraw-Hill, 1st edition,2013.
5. Datasheet manuals of 8085, 8086, 8051, etc. https://www.datasheetarchive.com/

Program: B. Tech. (E&TC)				Semester: IV			
Course: Microcontrollers Lab				**Code: BET4412**			
Teaching Scheme				**Evaluation Scheme**			
Practical	**Tutorial**	**Credit**	**Hours**	**TW**	**OR**	**PR**	**Total**
2	-	1	2	25	-	-	25

Prior knowledge of:

1. Digital systems design
2. Microcontrollers

is essential

Course Objectives:

1. To make students aware of the architecture and programming of microcontrollers.
2. To demonstrate various hardware and software tools for developing applications.
3. To practice the microcontroller interfacing with real-world peripheral devices.

Course Outcomes:

After the completion of this course, the students will be able to:

1. Explain the fundamentals of programming of microcontrollers.
2. Demonstrate the use of software & hardware tools for microcontroller-based development.
3. Interface microcontroller with real-world peripheral devices.

Guidelines: Any 10 experiments from the following list need to be completed.

Detailed Syllabus

Expt. No.	Suggested List of Experiments/Tutorials
1	Simple assembly program for 8051:Arithmetic operations: Multi-byte Addition, Subtraction, Multiplication, Division.
2	Simple assembly program for 8051:To find smallest number and largest number from given array of numbers.
3	Write an assembly program for 8051: -To arrange block of ten numbers in ascending and descending order
4	Write an assembly program for 8051: -To transfer a block of data from internal memory to external memory -To convert decimal number to hexadecimal
5	Write an embedded c program for Parallel port interfacing of LEDs (Different programs for flashing LEDs in BCD and HEX counter)
6	Write an embedded c program to generate square wave using timer with interrupt
7	Write an embedded c program for both side serial communication between 8051 and computer.
8	Develop a data acquisition system using ADC chip and 8051 Microcontroller
9	Write an embedded c program for triangular waveform Generation using DAC Interfacing to 8051

10	Write an embedded c program for 16x2 LCD interfacing with 8051. (8-bit mode)
11	Write an embedded c program for interfacing of Stepper motor to 8051
12	Write an embedded c program for interfacing of DC motor/servo motor to 8051

Reference Books:

1. William C. Wray, Joseph D. Greenfield, Ross Bannatyne, ―Using Microprocessors and Microcomputers‖, Pearson Publication, 4th edition.2015.
2. Bruce A. Artwick, Microprocessor Interfacing, Prentice-Hall series in personal computing, 1st edition,2008.
3. Pal Ajit, Microcontrollers: Principles and Applications, EEE, PHI, New Delhi 1st edition,2012
4. Predko Michael, Programming and customizing the 8051 microcontroller, McGraw-Hill, 1st edition,2013.
5. Datasheet manuals of 8085, 8086, 8051, etc. https://www.datasheetarchive.com/

Program: B. Tech. (E&TC)				Semester: IV			
Course: Project Based Learning-IV				Code: BET4413			
Teaching Scheme				Evaluation Scheme			
Practical	**Tutorial**	**Credit**	**Hours**	**TW**	**OR**	**PR**	**Total**
2	-	1	2	50	-	-	50

Course Objectives:

1. To make student identify the real-world problem through a rigorous literature survey and able to choose a suitable solution.
2. To make student illustrate the technology used in proposed work in oral and written form.

Course Outcomes:

After completion of this course, students will be able to,

1. Identify the real-world problem through a rigorous literature survey and formulate / set relevant aim and objectives.
2. Choose a suitable solution based on the fundamentals of electronics and communication engineering by possibly the integration of previously acquired knowledge.
3. Illustrate the technology used in proposed work in oral and written form.

Guidelines:

Group Structure:

Working in supervisor/mentor –monitored groups. The students plan, manage and complete a task/project/activity which addresses the stated problem.

1. Create groups of maximum 3 (three) students in each class
2. A supervisor/mentor teacher assigned to 5-6 groups or one batch

Project Selection:

Survey through journals, patents or field visit (A problem can be theoretical, practical, social, technical, symbolic, cultural and/or scientific), check the feasibility of solution, analyze the problem, design and find the values of components. There are no commonly shared criteria for what constitutes an acceptable project. Projects vary greatly in the depth of the questions explored, the clarity of the learning goals, the content and structure of the activity.

The problem-based project-oriented model for learning is recommended. The model begins with the identifying of a problem, often growing out of a curiosity and interest. This formulated problem then stands as the starting point for learning. A problem can be theoretical, practical, social, technical, symbolic, cultural and/or scientific and grows out of students wondering within different disciplines and professional environments. As stated in the preamble as electronics is an important grounding for other disciplines (computer science, signal processing, and communications), the project topic can be Interdisciplinary in nature. However, the chosen problem must involve the application of electronics and communication engineering fundamentals. Out of the total developed system setup, the project must involve minimum 40% electronic components. Although in a genuine case 100% software-based project topic may be allowed.

Ethical Practices, team work and project management:

Use IEEE standards for project manufacturing, respect the time of others, attend the reviews, poster presentation and model exhibitions, strictly follow the deadline of project completion, comply with all legislation requirements that govern workplace health and safety practices.

Effective Documentation:

In order to make our engineering graduates capable to prepare effective documentation, it is required for the students to learn the effective writing skills. The PBL final report is expected to consist of the Literature Survey, Problem Statement, Aim and Objectives, System Block Diagram, System Implementation Details, Discussion and Analysis of Results, Conclusion, System Limitations and Future Scope. Many freely available software tools (for instance Medley (Elsevier), Grammarly) are expected to be used during the preparation of PBL synopsis and final report. It is expected that the PBL guides/mentors shall teach students about utilizing valid sources of information (such as reference papers, books, magazines, etc.) related to their PBL topic.

Evaluation & Continuous Assessment:

The institution/head/mentor is committed to assessing and evaluating both student performance and program effectiveness. Progress of PBL is monitored regularly on weekly basis. Weekly review of the work is necessary. During process of monitoring and continuous assessment and evaluation the individual and team performance is to be measured. PBL is monitored and continuous assessment is done by supervisor /mentor and authorities. Students must maintain an institutional culture of authentic collaboration, self-motivation, peer-learning and personal responsibility. The institution/department should support students in this regard through guidance/orientation programs and the provision of appropriate resources and services.

Supervisor/mentor and Students must actively participate in assessment and evaluation processes. It is recommended that the all activities are required to be recorded and regularly. A regular assessment of PBL work is required to be maintained at the department in PBL log book by students. It is expected that the PBL log book must include following:

1. Weekly monitoring by the PBL guide,
2. Assessment sheet for PBL work review by PBL guide and PBL Evaluation Committee (PEC).

The PEC structure shall consist of Head of the department, 1/2 senior faculties of the department and one industry expert (optional). Continuous Assessment Sheet (CAS) is to be maintained by the department.

Recommended parameters for assessment, evaluation and weightage:

1. Idea Inception (kind of survey). (10%)
2. Outcome (Participation/ publication, copyright, patent, product in market). (50%)
3. Documentation (Gathering requirements, design & modeling, implementation/execution, use of technology and final report, other documents). (15%)
4. Attended reviews, poster presentation and model exhibition. (10%)
5. Demonstration (Poster Presentation, Model Exhibition etc.) (10%).

Awareness /Consideration of - Environment/ Social /Ethics/ Safety measures/Legal aspects. (5%)**.**

Projected Schedule

Sr. No.	Description
1	Brainstorming on Ideas, Identification of Problem Statements, Groups Formation, Assigning project activity as per discussion
2	Project related survey through journals, patents or field visits, Feasibility check, Identification of innovation gaps, Preparation of concept diagram, gathering prerequisites for project development, Preparation of synopsis and survey report as per the guidelines

3	Getting started with Project development, Prototyping of project at model/simulation level, Model testing and validation
4	Physical implementation/deployment of a project, Physical testing and validation, Documentation of experimental results and test cases
5	Report preparation as per guidelines, Submission of final project report and other documents like posters, presentation copies and activity certificates, etc.
6	Project Assessment and evaluation as per guidelines

Reference Books:

1. John Larmer, John R. Mergendoller, and Suzie Boss, ―Setting the Standard for Project Based Learning‖, 1st edition
2. John Larmer and Suzie Boss, ―Project Based Teaching: How to Create Rigorous and Engaging Learning Experiences‖, 1st edition
3. Erin M. Murphy and Ross Cooper, ―Hacking Project Based Learning: 10 Easy Steps to PBL and Inquiry‖. M. Krašna, "Project based learning (PBL) in the teachers' education,"39th International Convention on Information and Communication Technology, Electronics and Microelectronics (MIPRO), Opatija, 2016, pp. 852-856, doi: 10.1109/MIPRO.2016.7522258.
4. J. Macias- Guarasa, J.M. Montero, R. San-Segundo, A. Araujo and O. Nieto-Taladriz, "A project-based learning approach to design electronic systems curricula", IEEE transactions on Education, vol.49, no. 3, pp. 389-397, Aug. 2006, doi: 10.1109/TE.2006.879784

Program:	**B. Tech. (Open Elective-I)**					**Semester :**	**IV**
Course :	Numerical Methods					**Code :** BAS4601	
Teaching Scheme				**Evaluation Scheme**			
Lecture	**Practical**	**Tutorial**	**Credit**	**Internal Evaluation**	**MTE**	**ETE**	**Total**
3	-	-	3	20	30	50	100

Prior Knowledge of:

1. Univariate Calculus
2. Multivariate Calculus is essential

Course Objectives:

This course aims at enabling students to get acquainted with,

1. Concepts and techniques of Numerical Methods to solve systems of linear equations.
2. Numerical techniques to solve differentiation, integration, ordinary and partial differential equations, and their applications.
3. Open-source software to perform numerical techniques.

Course Outcomes:

After learning the course, the students will be able to:

1. **Understand** and perform the numerical methods to **solve** the systems of linear equations
2. **Evaluate** differentiation and integration using different Numerical methods.
3. **Understand** basic operators, packages, syntax of open-source software and **develop a program** for systems of linear equations, differentiation and Integration using.
4. **Solve** ordinary differential equations of first order using single & multistep numerical methods..
5. **Apply** explicit and implicit methods to solve the partial differential equations viz One-dimensional Heat equation, Wave equation and Laplace equations.
6. **Analyze** the solution of ODE & PDE using open-source software.

Detailed Syllabus:

Unit	**Description**	**Duration [Hrs]**
I	**System of linear equations:** Gauss elimination method by pivoting, Gauss-Jordan method, LU decomposition, Cholesky method, Relaxation method: Jacobi and Gauss-Seidel iterative methods.	**7**
II	**Numerical Integration**: Difference formulae for numerical differentiation, Boole's rule, Romberg integration and Gauss quadrature for double & triple integration.	**8**
III	**Problem Solving-I:** Solutions of systems of linear equations, Differentiation and Integration using open source software.	**8**
IV	**Ordinary differential equations:** Euler's method, Modified Euler's method, Runge-Kutta 4^{th} order methods, predictor corrector method.	**7**
V	**Partial Differential Equations:** Explicit and Implicit method, Stability of finite difference method, Applications of finite difference analysis in boundary value problems: one dimensional diffusion equation, Wave equation, Laplace equation.	**7**
VI	**Problem Solving-II:** Solutions of ordinary and partial differential equations using open source	**8**

	software.	
	Total	**45**

Text Books:

1. S.S. Sastry, "Introductory Methods of Numerical Analysis", PHI learning Pvt Ltd, 5th Edition, ISBN 10: 9788120345928
2. B. S. Grewal, "Numerical Methods in Engineering & Science", Khanna Publishers, 43rd Edition, ISBN 13: 9788174092489

Reference Books:

1. S.R.K. Iyengar, Rajendra K. Jain, "Advanced Engineering Mathematics", Alpha Science International, Ltd,4th Edition, ISBN 13: 9781842658468
2. B.V. Ramana, "Higher Engineering Mathematics", Tata McGraw-Hill, 34 edition, ISBN 13:9780070634190.
3. Abhishek K Gupta," Numerical Methods using MATLAB", Springer, First Edition, ISBN 13: 9781484201541
4. Victor A. Bloomfield, "Using R for Numerical Analysis in Science and Engineering", CRC Press, First Edition, ISBN: 9781315360492

e-sources:

1. **NPTEL Course lectures links:**
   https://nptel.ac.in/courses/127/106/127106019/ (Methods of root finding)
   https://nptel.ac.in/courses/115/103/115103114/ (NM & Simulation)
   https://nptel.ac.in/courses/122/106/122106033/ (N.M. with programming)

2. **V-lab (IIT-Bombay) link**: http://vlabs.iitb.ac.in/vlabs-dev/labs/numerical_lab/labs/explist.php


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Program:	**B.Tech.(All branches)**			Semester:	**IV**		
Course:	**Mathematical Optimization**			Code**:BAS4602**			
TeachingScheme				**Evaluation Scheme**			
Lecture	**Practical**	**Tutorial**	**Credit**	**Internal Evaluation**	**MTE**	**ETE**	**Total**
3	-	-	3	20	30	50	100

Prior Knowledge: Linear Algebra & Univariate Calculus, Multivariate Calculus, Applied Mathematics

Course Objectives: This course aims at enabling students to

1. Develop a practical approach to mathematical problem solving.
2. Get familiar with many commonly used tools and techniques in numerical work.
3. Understand the different mathematical approaches for optimization

Course Outcomes:

After learning the course, the students will be able to:

1. **Formulate** and **solve** linear programming models using basic theoretical principles.
2. **Apply** variants of Simplex methods and duality to find optimal solutions for constrained and unconstrained problems.
3. **Understand** basic operators, packages, syntax of software to **develop** programs to optimize Linear Programming Problems.
4. **Solve** transportation and assignment problems **using** optimization techniques.
5. **Analyze** the project network and nonlinear problems using different methods to optimize models.
6. **Develop** programs for transportation and assignment problems and Nonlinear Programming problems

Detailed Syllabus:

Unit	Description	Duration [Hrs]
I	**Linear Programming(LP)-I:**Introduction,formulation of Linear Programming problems,Graphical solution method, alternative or multiple optimal solutions, Unbounded solutions, Infeasible solutions,Maximization–Simplex Method,	**7**
II	**Linear Programming (LP)-II:** Minimization – Simplex method, Simplex Algorithm using Big-M method, Two phase method, Unrestricted variables, Degeneracy, Types of linear programming solutions.	**8**
III	**Duality:** Duality in linear programming, Formulation of Dual Linear programming problems. **Problem Solving-I:**SolutionsofLPP using software**..**	**8**
IV	**Transportation Problems:** Introduction, Mathematical model of transportation problem, transportation algorithm, Methods of finding initial solutions: North-west Corner rule, Least cost method, VOGEL"s approximation method, Optimality of initial solution using MODI Method. **Assignment Problems:** Introduction, Mathematical model of Assignment problem, solutionstoAssignmentproblemsusingHungarianmethod,variationsinAssignment problems	**7**
V	**NetworkAnalysis:**Network diagram, Project management: PERT and CPM,Critical path analysis, Project scheduling with uncertain activity time, Project time-cost, trade-off.	**8**

VI	**Nonlinear programming :**Introduction, General non linear programming problem,Graphical solution method, Quadratic programming: Kuhn-Tucker conditions**.** **ProblemSolving-II:**Solutions of Assignments and Transportation problems and	**7**
	nonlinear optimization problems using software.	
	Total	**45**

Text Books:

1. Rao S S,Engineering Optimization theory and Practice,WillyEasterLtd.4thEdition,ISBN: 978-0-470-18352-6
2. Taha Hamdy, Operation Research: An Introduction, Pearson Education, 9th Edition, ISBN:0134444019

Reference Books:

1. Sharma S.D., Operation Research, KadarNath RamNath & Co.Edition, ISBN: 9380803389
2. MatteoFischetti,"Introduction to mathematical optimization",FirstEdition,ISBN:9781692792022
3. JudithL.Gersting,"MathematicalStructuresforComputerScience",FreemanCo,4th Edition,ISBN: 9780716783060
4. PeterV.O'Neil,"Advanced Engineering Mathematics",ThomsonLearning, 7th Edition,ISBN13: 9781337274524
5. Hira and Gupta,"Operation research",S.Chand publication,ISBN(13): 9788121909686.
6. Sharma J.K."OperationsResearch-TheoryandApplications",Trinity Press, 6 Edition,ISBN:9789385935145

e-sources:

1.**NPTELCourselectureslinks:**
https://nptel.ac.in/courses/111/102/111102012/(LPP)
https://nptel.ac.in/courses/110/106/110106059/(Transportation&AssignmentsProblems)

Program:	**B. Tech. (All branches)**	Semester :	**IV**
Course : **Neural Network and Fuzzy Logic Control**		Code : **BAS4606**	

Teaching Scheme				**Evaluation Scheme**			
Lecture	**Practical**	**Tutorial**	**Credit**	**Internal Evaluation**	**MTE**	**ETE**	**Total**
3	-	-	3	20	30	50	100

Course Objectives:

This course aims at enabling students to get acquainted with,

1. Knowledge of Neural Networks and its use for controlling real time systems.
2. Knowledge about fuzzy set theory to solve various engineering problems.
3. Open-source software to perform NN toolbox and Fuzzy Logic Toolbox

Course Outcomes:

After learning the course, the students will be able to:

1. **Understand** the architecture of Neural networks and types of Neural Networks.
2. **Apply** backpropagation and optimizers algorithms to update weights of Neural Network.
3. Understand basic operators, packages, syntax of software and **Train** the neural networks using MATLAB toolbox.
4. **Understand** the various fuzzification and defuzzification methods.
5. **Apply** a fuzzy logic control system to handle uncertainty and solve engineering problems.
6. **Implement** a fuzzy logic toolbox in a fuzzy control system.

Detailed Syllabus:

Unit	**Description**	**Duration [Hrs]**
I	**Architecture of Neural Network:** Introduction,Biological neuron, Artificial neuron, Neuron modeling, Activation Function, Learning Techniques, Basic learning rules, Types of Neural Network: Single layer feedforward, Multi-layer feed forward network, Recurrent Neural Network.	**7**
II	**Neural Networks For Control:** Loss function, Weight initialization, Back propagation Neural Network, Optimizers algorithms, Feedback networks, Associative Memory Network and it‟ types, Discrete time hop field networks.	**8**
III	**Problem Solving-I: :** Neural Network (NN) Toolbox, NN Simulink Demos, Neural Network (ANN) implementation, NN Tool Artificial Neural Network (ANN) implementation, Case studies-	**7**

IV	**Fundamental of Fuzzy Logic: Fundamental of Fuzzy Logic:** Classical sets, Fuzzy Sets, Membership function, Cardinality of fuzzy set, Fuzzy complement, Fuzzy Composition, properties and operation on Fuzzy sets, Fuzzy Relation, Fuzzification, Defuzzification	**8**
V	**Fuzzy Logic Control:** Fuzzy Rule, Decision making Logic, Linguistic variables, Inferences, Fuzzy Inference system: Mamdani FIS, Sugeno FIS, Designing Fuzzy Controller, Fuzzy optimization, Introduction to generate a genetic algorithm, Applications of FIS.	**7**
VI	**Problem Solving-II:** Fuzzy Logic Toolbox, Fuzzy Logic Simulink Demos, Fuzzy Logic Controller (FLC) implementation, Simulink Fuzzy Logic Controller (FLC) implementation, Applications of FLC to Control System.	**8**
	Total	**45**

Text Books:

1. Kosko, B, "Neural Networks and Fuzzy Systems: A Dynamical Approach to Machine Intelligence", PrenticeHall, NewDelhi, 2004.
2. Ross T. J. , "Fuzzy logic with engineering applications (Vol. 2)", New York: Wiley, 2004, ISBN: 9783030375478

Reference Books:

1. Jack M. Zurada, "Introduction to Artificial Neural Systems", PWS Publishing Co., Boston, 2002.
2. Zimmerman H.J., "Fuzzy set theory and its Applications", Kluwer Academic Publishers Dordrecht, 2001.
3. Driankov,Hellendroonb, "Introduction to fuzzy control", Narosa Publishers,2001.
4. G Klir, B Yuan, "Fuzzy sets and fuzzy logic : Theory and application", PHI, ISBN:
5. LauranceFausett, Englewood cliffs, N.J., "Fundamentals of Neural Networks", PearsonEducation, New Delhi, 2008
6. B Yegnanarayana : Artificial Neural Networks for pattern recognition ,PHI Learning Pvt. Ltd., 14-Jan-2009

E-source:

Online course "Fuzzy logic and Neural Network" by Prof. Dilip Kumar Pratihar, IIT Kharagpur.
https://nptel.ac.in/courses/127/105/127105006/

Program:	S.Y.B. Tech. (All Branches)			Semester:		IV	
Course :	Professional skills for Engineers			Code:		BHM4101	
Teaching Scheme				Evaluation Scheme			
Lecture	Practical	Tutorial	Credit	Internal Evaluation	MTE	ETE	Total
1	2	-	2	30	-	20	50

Prior knowledge of

2. Basic Language Skills

Course Objectives:

This course aims at enabling students:

5. To introduce students to the fundamentals of effective communication
6. To introduce students to the skills to prepare and deliver effective presentations and learn techniques of mastering group discussions.
7. To introduce students to interview skills and corporate etiquettes
8. To introduce students to professional ethics and organizational skills

Course Outcomes:

After learning the course, the students will be able to

5. **Understand** the nuances of effective communication skills at the workplace.
6. **Demonstrate** presentation skills and group discussions skills to excel in the professional environment.
7. **Apply** interview skills and corporate etiquettes effectively to hone the opportunities of employability.
8. **Analyze** career management skills that can lead to improved employment.

Detailed Syllabus:

Unit	Description	Duration (Hrs)
I	**Introduction and Fundamentals of Communication:** Need for effective communication, Functions of Communication, Organizational Communication, Verbal-Oral and Written communication, Non-verbal communication, Barriers to Effective Communication	11
II	**Presentation Skills:** 4Ps (Planning, Preparation, Practice, Presentation), guidelines for developing PPT, Outlining, Effective use of A/V aids and Modes of Delivery **Mastering Group Discussion skills:** Skills evaluated in Group discussion, Types of Group discussion- Factual, Abstract, Controversial and Case studies, Do's and Don'ts in Group Discussion	12
III	**Interview Skills:** Interview Process, Types of Interview: Job interview, Appraisal Interview, Exit, Interview, Panel Interview; Self Introduction, Pre and Post interview activities, Skills evaluated in interview, Do's and Don'ts during Interview **Cover letter & Resume**: Job Application letter, Difference between CV and Resume Writing skills, Resume writing, Writing SOPs **Corporate Etiquettes:** Dressing Etiquettes, Dining Etiquettes, Telephonic etiquette, Business card Etiquettes, Email etiquettes	11
IV	**Professional Ethics:** Integrity, Objectivity, Professional competence and due care, Confidentiality Professional behavior. **Organizational Skills:** Physical Organization, Digital Organization, Planning, Time management & Communication	11
	Total	45

Text Books:

2. R.Gajendra Singh Chauhan and Sangeeta Sharma, Soft Skills-An Integrated Approach to Maximize Personality, Wiley Publication, ISBN: 987-81-265-5639-7

Reference Books:

6. Muralikrishna C., Sunita Mishra, Communication Skills for Engineers 2nd edition, Pearson, 2. New Delhi 2010
7. Indrajit Bhattacharya, An Approach to Communication Skills, DhanpatRai, Delhi, 2008 4.
8. Simon Sweeney, English for Business Communication, Cambridge University Press.
9. Sanjay Kumar and Pushpa Lata, Communication Skills, Oxford University Press.
10. Barun K.Mitra, Personality Development & Soft Skills, Oxford University Press, 2012 New Delhi.

E-sources:

3. https://nptel.ac.in/courses/109107121
4. https://nptel.ac.in/courses/122106031https://www.coursera.org/learn/principles-of-management (Ethics)

Program: B. Tech. (E&TC)				**Semester : IV**			
Course : MATLAB Certifications				**Code : BET4911**			
Teaching Scheme				**Evaluation Scheme**			
Practical	**Tutorial**	**Credit**	**Hours**	**TW**	**OR**	**PR**	**Total**
2	-	-	2	-	-	-	-

Course Objectives:

1. To impart the knowledge to the students about the MATLAB environment.
2. To provide a working introduction to the MATLAB technical environment with data analysis, visualization and programming.
3. Being able to carry out simple numerical computations and analyze using MATLAB.
4. To improve employability skills of engineering students.
5. To bridge the skill gaps and make students industry ready.

Course Outcomes:

After completion of this course, students will be able to,

1. Understand the main features of the MATLAB development environment.
2. Design simple functions/algorithms to solve problems.
3. Write simple programs in MATLAB to solve scientific and mathematical problems.
4. Apply the knowledge to solve various societal and Industrial issues in their careers.

Detailed Syllabus

Unit	**Description**	**Duration (H)**
I	**MATLAB Onramp:** MATLAB Commands, MATLAB Desktop and Editor, Vectors and Matrices, indexing into and Modifying Arrays, Array Calculations, Calling Functions, Obtaining Help, Plotting Data, Review Problems, Importing Data, Logical Arrays, Programming, Final Project.	**12**
II	**MATLAB Fundamentals:** Working with the MATLAB User Interface, Variables and Commands, Analysis and Visualization with Vectors, Analysis and Visualization with Matrices, Tables of Data, Conditional Data Selection, Organizing Data, Analyzing Data, Increasing Automation with Programming Constructs, Increasing Automation with Functions.	**18**
	Total	**30**

Reference Books:

1. Delores M Etter, ―Introduction to MATLAB‖, 4th edition, Pearson Edition,
2. Misza Kalechman, ―Practical MATLAB: Basics for Engineers‖, CRC Press, Taylor & Francis Group.
3. Peter I. Kattan, ―MATLAB for Beginners: A gentle approach", Smashwords Edition, Petra books 2010
4. Sulaymon Eshkabilov,―Beginning MATLAB and Simulink‖ eBook ISBN: 978-1-4842-5061-7, Apress 2019.
5. Craig S. Lent ―Learning to program with MATLAB: Building GUI Tool‖, Wiley Publications 2013, ISBN: 978-0- 470-93644-3
6. Brian R. Hunt, Ronald L. Lipsman, Jonathan M. Rosenberg ―A Guide to MATLAB: For beginners and experienced users‖, Third edition,
7. https://www.mathworks.com/help/releases/R2014b/pdf_doc/matlab/getstart.pdf

Program:	B. Tech. (E&TC)			Semester: IV			
Course:	Basics of LabVIEW			Code: BET4912			
Teaching Scheme				Evaluation Scheme			
Practical	Tutorial	Credit	Hours	TW	OR	PR	Total
2	-	-	2	-	-	-	-

Course Objectives:

1. To introduce to students the fundamental components of LabVIEW Virtual Instruments
2. To demonstrate features of LabVIEW with implementation of basic application.

Course Outcomes:

After completion of this course, the students will be able to,

1. Understand the applications of LabVIEW Virtual Instrument
2. Build basic Virtual Instrument for an application.

Detailed Syllabus

Unit	Description	Duration (H)
1	**Introduction** Features of Virtual Instrumentation with LabVIEW, LabVIEW Installation, LabVIEW Environment Basics, Fundamental Tools, Debugging tools, Graphical Programming, Execution Structures	10
2	**Programming Components in LabVIEW** Data Structures in LabVIEW, Passing Data Between Loop Iterations in LabVIEW Loops and Charts – For, While, Charts, Multiplots, Wiring Data into Charts Building LabVIEW VI application for parameter conversion.	10
3	**Introduction to Data Acquisition in VI** VI Application- Implementation of Data Acquisition System for Temperature measurement	10
	Total	30

Reference Books:

1. Jeffrey Travis, Jim Kring, ―LabVIEW for Everyone‖, Pearson Education, Third edition-2006
2. Gary W. Johnson, Richard Jennings, ―LabVIEW Graphical Programming‖, McGraw-Hill Education, Forth Edition-2006
3. Behzad Ehsani, ―Data Acquisition using LabVIEW‖, Packt Publishing, First edition- 2016
4. Marco Schwartz, Oliver Manickum, ―Programming Arduino with LabVIEW‖, Packt Publishing,First edition-2015

Program: B. Tech. (E&TC)				Semester : IV			
Course : Compliance Testing				Code: BET 4913			
Teaching Scheme				Evaluation Scheme			
Lecture	Tutorial	Credit	Hours	IE	MTE	ETE	Total
2	-	-	2	-	-	-	-

Prior Knowledge of:

1. Basic knowledge of Electronics Products and its working**.**

is essential

Course Objectives:

1. To check the reliability of Electronics/ Electrical Product
2. To study the different standard for compliance testing
3. To study the different types of compliance testing.

Course Outcomes:

After Completion of this course, the students will be able to,

1. To understand the need of compliance Testing related with electronics product.
2. To understand the standards used in Industries for compliance testing.
3. To analyze the different types of compliance testing

Detailed Syllabus

Unit	Description	Duration
1	Awareness of compliance testing	6
2	Federal Communications Commission, International Electrotechnical Commission standards for different industries	6
3	Electrical(Electronics Products) - Safety Tests, Conducted Emission, Radiated Emission tests	6
4	Mechanical – Vibration, Drop, Ingress Protection etc	6
5	Information on Testing Labs in India/Worldwide – UL, SAMEER, ERTL, ETDC, TUV, AUTOCLUSTER	6
	Total	**30**

Text Books:

1. Steli Loznen, Constantin Bolintineanu , Jan Swart , ―Electrical Product Compliance and Safety Engineering‖ Artech House, Edition:2017

Reference Books:

1. Dave Lohbeck ,‖CE Marking Handbook (Test and Measurement World Series)‖ , Newnes (1998).
2. Mark I. Montrose, Edward M. Nakauchi ―Testing for EMC Compliance: Approaches and Techniques‖ Print ISBN:9780471433088 |Online ISBN:9780471644651 |DOI:10.1002/047164465X , Wiley Publication

Program: B. Tech. (E&TC)				**Semester : IV**			
Course : Introduction to Data Science using Python				**Code : BET4914**			
Teaching Scheme				**Evaluation Scheme**			
Practical	**Tutorial**	**Credit**	**Hours**	**TW**	**OR**	**PR**	**Total**
2	-	-	2	-	-	-	-

Course Objectives:

1. To provide the fundamentals of the data science field and develop the problem solving skill using python programming with various python packages.
2. To impart the knowledge of data analysis and visualization in python

Course Outcomes:

After completion of this course, students will be able to,
1. Understand process and analyze the dataset using different Python packages.
2. Visualize and analysis of data by applying different methods of data plotting and charting.

Detailed Syllabus

Unit	**Description**	**Duration (H)**
1.	**IIntroduction to data science and Python Packages:** Understanding the data and data science, Python Packages for Data Science NumPy: understanding data types in Python, Basics of NumPy array creations, computation on NumPy array - Universal functions, arithmetic function, aggregate function, etc., Indexing and sorting NumPy array. Pandas: Pandas data structures, introducing Pandas object, Importing and Exporting datasets in Pandas data frame. Data attributes, indexing and selecting data, combining datasets - concatenation, append, merge and join. Aggregation and grouping. Data Wrangling: Pre-processing Data in Python, Data Formatting in Python, Data Normalization in Python, Dealing with Missing Values in Python, Binning in Python.	**17**
2.	**Data Visualization in Python:** Matplotlib & Seaborn: Basic Plotting with Matplotlib & Seaborn, simple line plots, simple Scatterplots, density and contour plots, Histograms binning and density, customizing color bars, multiple subplots. Introduction to exploratory data analysis	**13**
	Total	**30**

Reference Books:

1. Wes McKinney O'Reilly, ―Python for Data Analysis: Data Wrangling with Pandas, NumPy, and IPython", 2nd edition, Media 2017
2. Jake Vander Plas and O'Reilly, ―Python Data Science Handbook: Essential Tools for Working with Data,1st edition, 2016.
3. Joel Grus and O'Reilly, ―Data Science from Scratch: First Principles with Python,2nd edition,2019..
4. S P Gupta, ―Statistical method‖, Sultan Chand & Sons, 46th Edition,2022.
5. https://www.coursera.org/learn/python-plotting#syllabus

Program: B. Tech. (E&TC)				Semester : III			
Course : EDA Introduction				Code: BET4914			
Teaching Scheme				Evaluation Scheme			
Lecture	Tutorial	Credit	Hours	IE	MTE	ETE	Total
2	-	-	2	-	-	-	-

Prior Knowledge of:

1. Introduction to IC Design
2. Programming Languages

is essential

Course Objectives:

1. To introduce students to Electronic Design Automation flow.
2. To make students aware of basic tools and practicle skills required for EDA.

Course Outcomes:

After Completion of this course, the students will be able to,

1. Understand levels of design process, phases and their capabilities.
2. Focuse on IC design data formats and tools.
3. Understand presentation of Synopsys' design and verification platforms' structure.
4. Practical skills of using basic tools are gained.

Detailed Syllabus

Unit	Description	Duration
1	**Topic 1.1 (1 hour) – Introduction** IC Design Cycle. IC Design hierarchy and abstraction. IC design hierarchy. Most important entities of IC design. Design domains. Review of the design process. Synthesis. Verification. Design actions and tools. Design description. Structured design strategy. Design options. Sample problems in EDA industry. IC design cycle. History and evolution of the EDA. Future trends. Strong forces for consolidation in IP. Key power management areas. Improving test quality. Via reliability - major issue. Advanced silicon process rules. Exploding verification state space. Mixed simulation and formal verification. Blocks getting bigger and more complex. System on chip (SoC). Layout and technology. Image correction. Synopsys' design and verification continum platform. **Topic 1.2 (1 hour) – EDA Tools and IC Design Data Formats** Components of Electronic Design. Technical support. Structure of technical support. Types of data networks. Topologies of local area network. The structure of corporate network. Design Issues and Tools. Electronic design methodology. Databases for EDA. Linguistic approach. HDLs. Verilog example. Gate-level netlist. Transistor-level netlist. Spice netlist. File formats. SDF example. PDEF – physical design exchange format. PDEF example. SPEF - standard parasitic exchange format. LEF - library exchange format. DEF - design exchange format. EDA software. Systems software. Application software.	4
2	**Topic 1.3 (1 hour) – Electronic Design Methodology** Electronic design methodology. Design levels. Problems solved in one level of design. Overview of IC simulation. Strategy of design process. Design as a synthesis problem. Synthesis. Optimization. Design phases and automation problems. IC as a design object. Hierarchy of electronic design methodology. Classification of EDA mathematical models. Requirements to EDA mathematical models. Accuracy of mathematical models of EDA. Abstraction levels. Decomposition. Costs. Costs simplify problem. Coping with NP-hard problems. Not a solved problem. Big challenge. Toolkit. **Topic 1.4 (1 hour) – IC Synthesis** Synthesis problem. Synthesis steps. Synthesis flow. Flattening. Structuring. Summarizing synthesis process. Requirements to synthesis tools. Characteristics of synthesis tools. Concept-to-silicon design flow.	4

	High-level synthesis. Logic synthesis steps. Circuit level design flow . Circuit Level Analysis and Synthesis Problems. Physical synthesis steps. New Trends in Physical Design Cycle.	
3	**Topic 1.5 (1 hour) – Databases for EDA** Databases for EDA. Requirements. Integration of DB and EDA. Organization of central and auxiliary DB. Data models. The simple flow of supply with information. Double-sided independence of information support. Organization of design library in the environment of Milkyway database. Databases for design planning flow in the environment of Synopsys EDA. Databases for physical design in the environment of Synopsys' IC Compiler. Databases for placement tool in the environment of Synopsys EDA. Reading gate-level netlists from synthesis. Logical and physical libraries. Reference libraries. **Topic 1.6 (1 hour) – IC Design Approaches and Flows** IC design levels. Levels of abstraction in IC design. Architectural design. Logic design. Physical design. Design options. Full custom design cycle. Full custom layout. Semi custom design cycle. Cell based design cycle. Cell based design. Standard cell layout. Design flow of digital standard cell libraries. Characterization flow of digital standard cells. Gate array layout. FPGAs. Physical design cycle. Simplified cycle of physical IC design. Physical design strategies. Design approaches. Digital EDA tools. Analog EDA tools. IC design flow. Participants. Digital IC simple design flow. Simplified chip design flow. Digital IC simple design flow. IC design steps. IC design methods. Optimization: Levels of abstraction. IC design flow. Detailed digital design IC flow.	4
	Topic 1.7 (1 hour) – EDA Tools EDA tools. Requirements to EDA tools. Structure of operating systems. EDA tool flows. EDA and testing tools. Capabilities of EDA tools. Tools and design methodology. History of EDA tools. Tour of EDA tools. System level simulation tools. Synthesis tools. Graphical entry. Hardware software co-design. Structural and logic design. Logic synthesis tools. Transistor-level design. RTL simulation tools. Layout verification at transistor level. Physical synthesis tools. Layout editor. System verification tools. Design management tools. **Topic 1.8 (1 hour) – Overview of Synopsys EDA Tools** EDA Synopsys design platforms. System-level design and analysis. Galaxy Design Platform. Design solutions. Problem of synthesis in Design Compiler. Extending design Compiler topographical to congestion. DC topographical layout viewer. IC Compiler II. Galaxy Sign-Off. Custom Compiler. HSPICE. IC Validator physical verification solution. Milkyway. Synopsys PrimeTime SI. PrimeTime product suite. StarRC sensitivity-based extraction single extraction for multi-corner or statistical flows. Discovery verification platform. Languages, the power of SystemVerilog and SystemC. SystemVerilog. Comprehensive RTL verification solution. Formality. NanoSim - high-performance circuit simulation. Multi-language support. Design for manufacturing product family. TCAD.	4
4	Topic 2.1 (2 hours) – Working with Custom Compiler (CC) Topic 2.2 (2 hours) – Custom Compiler Schematic Editor (SE). Basic schematic cell creation Topic 2.3 (2 hours) – Custom Compiler Layout Editor (LE). Basic Layout Cell Creation Topic 2.4 (1 hour) – Study of logic synthesis flow by Synopsys tools Topic 2.5 (1 hour) – Synthesis of simplest projects using Design Vision graphical interface.	14
	Total	**30**

Reference Books:

1. D S. Badel, C. Baltaci, A. Cevrero, Y. Leblebici. Design Automation for Differential MOS Current-Mode Logic Circuits. Springer; 2019
2. L. Lavagno, I. L. Markov, G. Martin, L. K. Scheffer. Electronic Design Automation for IC Implementation, Circuit Design, and Process Technology. CRC Press; 2016
3. L. Lavagno, I. L. Markov, G. Martin, L. K. Scheffer. Electronic Design Automation for Integrated Circuits, Second Edition - Two Volume Set. CRC Press; 2016
4. Th. Dillinger. VLSI Design Methodology Development. Prentice Hall; 2019
5. B. Summerfield. Facility and Process Design with Layout 3P: A Proven Approach to Creating Innovative Layout Solutions Fast. Independently published; 2018

Program:	B. Tech. (All branches)									
Course :	Life Skills-IV							Semester: IV		
								Code : BHM4940		
Teaching Scheme					Evaluation Scheme					
Lecture	Practical	Hours	Credit	IE	MTE	ETE	TW	PR	OR	Total
-	2	-	-	-	-	-	-	-	-	-

Prior knowledge: Nil

Course Objectives:

1. To learn about the social functioning and diverse culture in the country.
2. To be aware and improve interpersonal behavioral patterns.
3. To inculcate caring and serving qualities towards family, society and environment at large.

Course Outcomes:

After Successfully completing the course the students should be able to:

1. Apply social work practices in the context of diverse cultures.
2. Develop a broad understanding of Indian culture through various art forms.
3. Apply effective ways of interpersonal behavioral patterns eliminating their unhelpful thoughts, feelings andactions.
4. Develop skills which are necessary to initiate ideas and pursue them for holistic development of the individual.

Detailed Syllabus:

Unit	Description	Duration (Hrs)
1.	**Social Welfare** Environment awareness such as Tree Plantation, Natural resources awareness etc, Donation Camp, Visit to Orphanage, Old Age home and Villages, Contribution in social activity like Pani Foundation, Swaccha Bharat Abhiyan, Save Girl Child/Animals/Birds/Trees etc., Activity basedon societal projects / Project Exhibitions etc. **Cultural Awareness** Divisions of Indian classical music: Hindustani and Carnatic, Dances of India, Various Danceforms: Classical and Regional, Rise of modern theatre and Indian cinema. or **Transaction Analysis** Introduction to TA, Basic Assumptions of TA, Theory of Personality Ego States, Strucural and Functional, Ego States Diagnosis, Egogram, Structural Pathology, Contamination, Theory of Communication, Types of Transactions, Strokes, Stroke Economy, Theory of Life Positions, Injunctions	**12**
2.	**Caring and service** Hospital Caring, Personal Safety, First Aid, Disaster Management Gardening, Organic farming, Cooking, etc	**12**
	Total	**24**

Reference Books:

1. K. Singh, “An introduction to Social Work”, 14 April 2011.
2. Bishnu Mohan Dash, Mithilesh Kumar, D. P. Singh, Siddheshwar Shukla, “Indian Social Work”, 1 October 2020.
3. Martin Davies, “Social work with Children and Families”, 20 March 2012.
4. Anita Kainthla, “Baba Amte – A Biography”, 1 January 2006.
5. Aroup Chatterjee , “Mother Teresa – The untold story”, 1 January 2006.
6. Improving Behaviour and Raising Self-Esteem in the Classroom, A Practical Guide to Using Transactional
7. Analysis, Giles Barrow, Emma Bradshaw, Trudi Newton, David Fulton Publishers, 1 October 2001.
8. Transactional Analysis, 100 Key Points and Techniques, Mark Widdowson, 8 September 2009.
9. Benjamin Colodzin, “Helping ourselves by Helping Others”, 3 August 2020.
10. Smith Mark K. “The Art of Helping Others”, Jessica Kingsley Publishers,15 April 2008.
11. Chip Heath, “Decisive: How to Make Better Choices in Life and Work”, March 26, 2013.

Program: B. Tech. (All branches)				Semester: IV			
Course : Environmental Sciences				Code :BHM9961			
Teaching Scheme				Evaluation Scheme			
Lecture	Tutorial	Credit	Hours	IE	MTE	ETE	Total
1	-	-	1	-	-	-	-

Prior knowledge : Nil

Course Objectives:

1. To gain an understanding on the concepts and strategies related to sustainable development and identify and analyze various conservation methods for renewable and non-renewable resources.
2. To examine biotic and abiotic factors within an ecosystem and to identify energy flow in ecosystem.
3. To understand the value of biodiversity and identify current efforts for its conservation at national and local level
4. To provide comprehensive overview of environmental pollution and technology associated with monitoring and control.

Course Outcomes:

After completion of this course, the students will be able to,

1. Demonstrate an integrative approach to environmental issues with a focus on sustainability and identify the role of organism in energy transfer in different ecosystem.
2. Distinguish between renewable and non-renewable resources and analyze consumption of resources
3. Identify key threats to biodiversity and develop appropriate policy options for its conservation.
4. Analyze the impact of environmental pollution and the science behind those problems and potential solutions.

Detailed Syllabus:

Unit	Description	Duration (Hrs)
I.	**Multidisciplinary nature of environmental studies:** Definition, scope and importance, Need for Public awareness, **Natural Resources**: Renewable and non- renewable resources: Natural resources and associated problems a) Forest b)Water c) Mineral d)Food e) Land f) Energy, Role of an individual in conservation of natural resources, Use of resources for sustainable lifestyle.	3
II.	**Ecosystems**: Concept of an ecosystem, Structure and function of an ecosystem, Producers, consumers and decomposer, Energy flow in the ecosystem, Ecological succession, Food chains, food webs and ecological pyramids, Characteristic features, Case study on Forest ecosystem, Aquatic ecosystem.	3
III.	**Biodiversity and its conservation:** Introduction – Definition: genetic, species and	3

	ecosystem diversity, Biogeographically classification of India, Value of biodiversity: consumptive use, productive use, social, ethical, aesthetic values, Biodiversity at global, national and local levels, India as a mega-diversity nation, Hotspots of biodiversity, Threats to biodiversity, Conservation of biodiversity, Case study on any one Hotspot of biodiversity.	
IV.	**Environmental Pollution:** Definition, Cause, effects and control measures of different pollution: a. Air b. Water c. Soil d. Noise e. Thermal f. Nuclear hazards, Solid waste management, Relevance of environmental ethics for environmental protection, **Social Issues and the Environment :** From Unsustainable to Sustainable development ,Urban problems related to energy ,Water conservation, Impact of Climate change, Innovative ideas for creating public environmental awareness.	3
	Total	**12**

Text Books:

1. Cunningham, W.P. Cooper, T.H. Gorhani, E & Hepworth, M.T., ―Environmental Encyclopedia, Jaico Publications House, 1st edition, 2000, ISBN-13: 978-8172247867

2. Agarwal, K.C, ―Environmental Biology‖, Nidhi Publishers, 2nd edition ,2008, ISBN-13978-8189153021

Reference Books:

1.BharuchaErach, ―The Biodiversity of India‖, Mapin Publishing Pvt. Ltd., 1st edition, 20021, ISBN-108188204064

Program: B. Tech. (All branches)				Semester: IV			
Course : Constitution of India				Code :BHM9962			
Teaching Scheme				Evaluation Scheme			
Lecture	**Tutorial**	**Credit**	**Hours**	**IE**	**MTE**	**ETE**	**Total**
1	-	-	1	-	-	-	-

Prior knowledge: Nil

Course Objectives:

1. To enable the student to understand the importance of constitution
2. To identify individual role and ethical responsibility towards nation.
3. To understand human rights and its implications
4. To know about central and state government functionalities in India.

Course Outcomes:

After learning the course, the students will be able to:

1. Understand the functions of the Indian government and get acquainted with knowledge of Constitutional Amendments.
2. Identify and explore the basic features, modalities about Indian constitution and assessment of the Parliamentary System in India.
3. Differentiate and relate the functioning of Indian Political system at the Central and State level.
4. Comprehend the fundamental rights and abide the rules of the Indian constitution.

Detailed Syllabus:

Unit	Description	Duration (Hrs)
I.	**Introduction to Constitution:** Meaning of the constitution law and constitutionalism, making of constitution, Salient features and characteristics of the Constitution of India, Preamble, Fundamental Rights, Directive Principles of State Policy, Fundamental Duties and it‘s legal status, Citizenship.	3
II.	**System of Government- Center & State level and local level** Structure and Function of Central Government, President, Vice President, Prime Minister, Cabinet, Parliament, Supreme Court of India, Judicial Review, Federal structure and distribution of legislative and financial powers between the Union and the States, local self-government	3
III.	**Judiciary:** Governor, Chief Minister, Cabinet, State Legislature Judicial System in States, High Courts and other Subordinate Courts, Parliamentary Form of Government in India.	3
IV.	**Constitution Functions:** Indian Federal System and it‘s characteristics, Center& State Relations, President‘s Rule, Constitutional Amendments and powers, Constitutional Functionaries, Emergency Provisions, Assessment of working of the Parliamentary System	3

	in India	
	Total	**12**

Text Books:

1. Durga Das Basu, ―Introduction to the Constitution of India ―, Prentice Hall of India, New Delhi,24th edition, 2020, ISBN-109388548868
2. Clarendon Press, Subhash C, Kashyap, ―Our Constitution: An Introduction to India‘s Constitution and constitutional Law‖, NBT, 5th edition, 2014, ISBN-9781107034624

Reference Books:

1. Maciver and Page, ―Society: An Introduction Analysis ―, Laxmi Publications, 4th edition, 2007, ISBN-100333916166
2. PM Bhakshi, ―The constitution of India‖, Universal Law Publishing - An imprint of Lexis Nexis, 14th edition, 2017, ISBN-108131262375

Program: B. Tech. (All branches)				Semester: IV			
Course : Emotional Intelligence				**Code :BHM9963**			
Teaching Scheme				**Evaluation Scheme**			
Lecture	**Tutorial**	**Credit**	**Hours**	**IE**	**MTE**	**ETE**	**Total**
1	-	-	1	-	-	-	-

Prior knowledge: Nil

Course Objectives:

1. To develop an awareness of Emotional Intelligence models
2. To understand intelligence and develop emotional competence
3. To understand how you use emotion to facilitate thought and behaviour
4. To know and utilize the difference between reaction and considered response

Course Outcomes:

After completion of this course, the students will be able to,

1. Understand how to manage emotions, behaviour and self-control in any situation resulting in better productivity
2. Employ emotional intelligence competencies to effectively interact with people, colleagues and employees in building stronger relationships at work and at home
3. Articulate emotions using the right verbal and non-verbal language
4. Use tools to regulate their emotions and recognize and respond appropriately to emotions in self and others.

Detailed Syllabus:

Unit	Description	Duration (H)
I.	**Introduction to Emotional Intelligence (EI):** What is Emotional Intelligence, Emotional Intelligence and various EI models, The EQ competencies of self-regulation, motivation, empathy and interpersonal skills, Understand EQ and its importance in life.	**3**
II.	**Self-awareness (SA):** Seeing the other side, giving in without giving up. **Tools** : Think, Feel, Act Cards, Plutchik's Wheel of Emotions& Emotional intelligence test **Self-Regulation/Managing Emotions:** The science of Emotions, Self-emotional quotient	**3**
III.	**Gaining Control:** Use of Coping Thoughts and Relaxation Techniques to manage emotions**, Activities:** Be the Fog, Temperament Analysis. **Emotion recognition in others:** The universality of emotional expression, perceiving emotions accurately in others to build empathy **Activities :** Mindful Listening, Perceptual Positions	**3**

IV.	**Emotional Intelligence at Work place:**Importance of Emotional Intelligence at Work place, role of empathy and trust in relationships, building effective work relationships,conflict resolution strategy, Cohesive team building, **Tests** : My Colored Hat, ―I Am‖ Circle, Empathy Cards	**3**
	Total	**12**

Text Books:

1. Daniel Goleman, ―Emotional Intelligence – Why It Matters More Than IQ,‖, Bantam, 10th Anniversary edition, 2005, ISBN: 978-0553383713
2. Steven C. Hayes, Spencer Smith, ―Get Out Of Your Mind And Into Your Life: The New Acceptance and Commitment Therapy‖, Read How You Want, [Large Print] edition, 2009, ISBN-13 : 978-1458717108

Reference Books:

1. Steven Stein, ―The EQ Edge‖, Jossey-Bass, 3rd edition, 2011, ISBN-13: 978-0470681619
2. Drew Bird , ―The Leader‘s Guide to Emotional Intelligence‖, Createspace Independent Pub, Kindle Edition, 2016, ISBN-13 : 978-1535176002

Program: B. Tech. (All branches)				Semester :IV			
Course: Entrepreneurship Development				**Code :BHM9964**			
Teaching Scheme				**Evaluation Scheme**			
Lecture	**Tutorial**	**Credit**	**Hours**	**IE**	**MTE**	**ETE**	**Total**
1	-	-	1	-	-	-	-

Prior knowledge : Nil

Course Objectives:

1. To inspire students and help them imbibe an entrepreneurial and start-up mind-set
2. To develop and strengthen entrepreneurial quality among students.
3. To understand the abilities to become an Entrepreneur.
4. To acquaint with legalities in product development, IPR, Trademarks, Copyright and patenting
5. To know the facets of Business plans, Entrepreneurial Finance

Course Outcomes:

After learning the course, the students will be able to:

1. Develop an entrepreneurial mind-set by learning key skills such as product design, salesmanship, marketing and interpersonal skills.
2. Interpret their own business plan and analyze factors that contributed to the failure of a start-up
3. understand how to determine the best source of capital for a company and how to find revenue and expense assumptions
4. Understand the legalities in product development, IPR, Trademarks, Copyright and patenting

Detailed Syllabus:

Unit	Description	Duration (Hrs)
I.	**Concept and Scope:** Entrepreneurship as a career, Traits of Successful Intrapreneur/ Entrepreneur, Why to become entrepreneur, Entrepreneurship Development Phases, Problem Solving and Ideation Process, Design Validation, Types of Start-ups	**3**
II.	**Creating Entrepreneurial Venture** : Sources of Innovation, methods of generating ideas, Prototype preparation and validation, Legal Issue, Private/Public Limited Company formation requirements, Intellectual Property Protection: Patents Trademarks and Copyrights, **Entrepreneurial Failure** : Case study of patterns, Early failures: Good idea bad planning, False start , False positive, Late-stage failures: Speed trap, Cascading miracle , False confidence	**3**
III.	**Business Plan Preparation:** Sources of product for business: Feasible study, Ownership, capital, budgeting, Marketing plan for the new venture, steps in preparing	**3**

	marketing plan, Business Model Canvas (BMC), Financial plan- proforma income statements, Ratio Analysis.	
IV.	**Financial Modeling and Metrics:** Spreadsheets, Benchmarks, Revenue assumptions, expense assumptions, Metrics customer Acquisition cost and life time model, Metrics viral coefficient, Funnel Analysis, **Entrepreneurial Finance:** venture capital, financial institutions supporting entrepreneurs, Lease Financing; Funding opportunities for Start-ups in India, Crowd funding, Angel investing	**3**
	Total	**12**

Text Books:

1. Kumar Arya, ―Entrepreneurship: Creating and Leading an Entrepreneurial Organization, Pearson Education India, First edition, 2012, ISBN-10: 8131765784; ISBN-13: 978-8131765784
2. S. S .Khanka, ―Entrepreneurial Development, S Chand and Company Limited, Revised 2012th edition, 2012, ISBN : 81-219-1801-4

Reference Books:

1. Taneja, Gupta, Entrepreneur Development New Venture Creation‖, Galgotia Publishing Company, 2nd edition. 2017, ISBN: 9788185989594
2. Charantimath, Poornima, ―Entrepreneurship Development and Small Business Enterprises‖ Pearson Education, 3rd edition, 2018, ISBN: 8177582607, 9788177582604
3. Blake Masters and Peter Thiel, ―Zero to One‖, Plata Publishing, 2nd edition,2014, ISBN-10 : 9780804139298 - ISBN-13 : 978-0804139298

Program: B. Tech. (All branches)				Semester: IV			
Course: Research Article Writing				Code: BHM9965			
Teaching Scheme				Evaluation Scheme			
Lecture	Tutorial	Credit	Hours	IE	MTE	ETE	Total
1	-	-	1	-	-	-	-

Prior knowledge: Nil

Course Objectives:

1. To understand about how to write effective research article
2. To create awareness about grammar, lexical choices, citations in the text
3. To develop a full-length article, proposal or conference presentation
4. To familiarize the basic methods and techniques of research writing

Course Outcomes:

After completion of this course, the students will be able to,

1. Understand necessary traits to write effective research article with appropriate grammatical and lexical choices in text
2. Comprehend the importance of citations, indexing, indexed articles and plagiarism
3. Develop an ability of critical thinking necessary to analyze a research reports
4. Write a research article, review article, thesis chapter and other related academic research text effectively and demonstrate importance of revising and proofreading for writing research article

Detailed Syllabus:

Unit	Description	Duration (Hrs)
I.	**Introduction to Research Writing:** What is a research article? Understanding what is _Research Writing', Qualities and skills required in a Research writer, Types of Research writing, choosing a suitable journal/conference/book chapter, How to conduct an effective Research, Abstract Writing, Selection of keywords, defining problem statement.	3
II.	**Sources of citations**: Understanding of giving citation to other works, Identifying relevant citations, Understanding impact factor, Importance of Indexing and Indexed articles, learning to scan research articles quickly and effortlessly, Using Your Sources Wisely**:** what to cite, where to find good sources and how to use them, avoiding plagiarism **Plagiarism tools**: iThenticate, Grammarly **Citation Tools :**Mendeley, ,BibMe, Citefast, APA, MLA	3

III.	**Drafting**: Structure of a basic research paper, stages of writing and research, learn to write the first draft, Understanding the components of an article: Abstract, Introduction, Preliminary concepts, proposed system, Experimental section, result analysis and discussion, Conclusion, Reference.	**3**
IV.	**Revising and Editing:** Importance of revision, Understanding the comments of reviewer, Point-to-Point address of reviewer comments, What/Whatnot to revise, Emphasis on Journal formats, Proper usage of Grammar and sentence formatting, Steps for submitting the revised manuscript/article	**3**
	Total	**12**

Text Books:

1. Charles A. MacArthur , ―Handbook of Writing Research‖, The Guilford Press; 2nd edition, 2016, ISBN- 10: 1462529313, ISBN-13: 978-1462529315
2. Margaret Cargill, Patrick O'Connor, ―Writing Scientific Research Articles‖, Wiley-Blackwell, 2nd Edition, 2013, ISBN: 978-1-118-57070-8

Reference Books:

1. Booth W., Colomb G. and Williams J., ―The Craft of Research‖, University of Chicago Press,4th edition, 2016, ISBN-13: 978-0226239736
2. Jennifer Peat, Elizabeth Elliott, Louise Baur, Victoria Keena ,―Scientific Writing Easy when you know how‖, Wiley & Sons, Inc, 2nd edition, 2013, ISBN:9780727916259