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

Curriculum Structure of B. Tech. (E&TC)

and

Syllabus of S.Y. B.Tech. Courses (Approved by BoS E&TC)

(Course 2020)

DEPARTMENT OF ELECTRONICS AND TELECOMMUNICATION ENGINEERING

With effect from academic year 2021-22

VISION AND MISSION OF INSTITUTE

Institute Vision

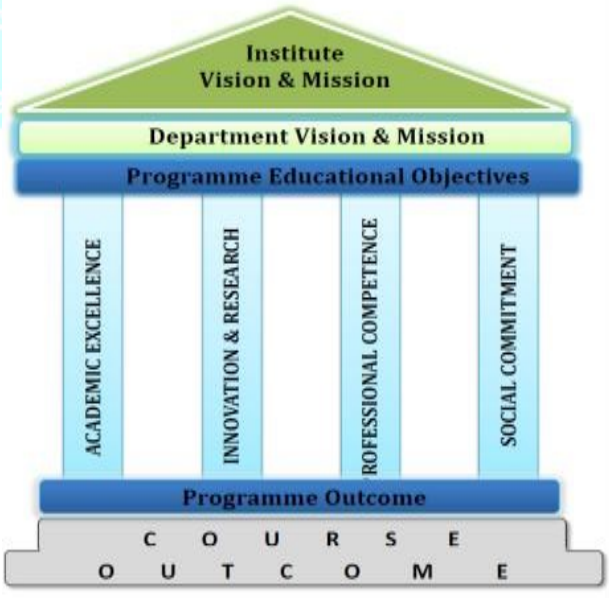
To Serve the Society, Industry and all the Stakeholders through the **Value-Added Quality Education.**

Institute Mission

To serve the needs of society at large by establishing State-of-the-Art Engineering, Management and Research Institute and impart attitude, knowledge and skills with quality education to develop individuals and teams with ability to think and analyze right values and self-reliance.

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.



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

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

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	-	1	2	2	30	-	20	-	-	-	50
BET49xx	PFC	Proficiency Courses	-	2	-	2	-	-	-	-	-	-	-	-
BHM4940	LS	Life Skills-IV	-	2	-	2	-	-	-	-	-	-	-	-
BHM996x	Audit	Audit Course	-	1	-	1	-	-	-	-	-	-	-	-
Total			**12**	**13**	**1**	**26**	**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	
BAS4603	Calculus of Variation	
BAS4604	Mathematical Modelling and Simulation	
BAS4605	Financial Mathematics	
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	

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	Tutorial	Credit	Hours	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 expertise in problem formation and problem solving 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 this course, students will be able to,

1. **Apply** the concepts of higher order linear differential equations to **analyze** Electrical circuit's problems.
2. **Analyze** analytical functions of complex variables and **evaluate** Complex Integration using different methods.
3. **Analyze** numerical data using descriptive statistical techniques.
4. **Apply** concepts related to probability theory and hypothesis tests to **analyze** the data.
5. **Evaluate** vector differentiation and apply the concepts to **analyze** the vector fields.
6. **Perform** line surface and volume vector integration to **analyze** the vector fields like Electro-Magnetic fields.

Detailed Syllabus:

Unit	Description	Duration [Hrs]
I	**Linear Differential Equations and Applications:** Introduction of Linear and Nonlinear differential equations, Linear differential equation of n^{th} order with constant coefficients, General method, Shortcut Methods, Method of Variation of Parameters and Application of Linear differential equation in Electrical Circuits.	6
II	**Calculus of Complex Functions:** Introduction, Functions of Complex Variables, Analytic Functions, Cauchy-Reimann equations, Cauchy's integral formula, Residue Theorem.	6
III	**Statistics:** Measures of central tendency, Standard deviation, Coefficient of variation, Moments, Skewness and Kurtosis, Curve fitting, Correlation and Regression.	6
IV	**Probability Distributions:** Probability, Theorems on Probability, Mathematical Expectation, Binomial, Poisson, and Normal Distributions. **Hypothesis Test**: p-Test, z-test, t-test, Chi-Square test, ANOVA Test.	6
V	**Vector Differentiation Calculus:** Introduction, Vector differential operators, Gradient, Divergent, Curl, Physical Interpretation of Vector Differentiation, Directional Derivatives, Solenoidal, Irrotational and conservative fields, Scalar Potential.	6

VI	**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.	**6**
	Total	**36**

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

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.

Course Outcomes:

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

1. Classify basic signals and perform operations on signals and classify the systems based on their properties
2. Analyze the signals in frequency domain using Fourier series and Fourier Transform
3. Resolve the signals in the complex frequency domain using Laplace Transform, and will be able to analyze the LTI systems using Laplace Transforms.
4. Analyzing discrete signals and systems by using 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.	**8**
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.	**6**
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	**5**

	Time Invariant (LTI) system analysis	
IV	**Z - Transform (ZT)**: Introduction, Definition, Standard properties, ZT of standard sequences and their inverses. Convolution Sum, Solution of difference equations.	**5**
	Total	**24**

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.

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:

1. Basic Electrical Engineering
2. Basic Electronics Engineering
3. Fundamentals of Programming Languages

is essential

Course Objectives:

1. Interpret fundamental methods and characteristics of measurement systems.
2. Introduction to various types of transducers with working principals
3. Need of computer aided process automation in industrial applications.
4. Develop the concepts of PLC ladder programming to design basic logic gates for various applications

Course Outcomes:

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

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

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	4
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.	6

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	**7**
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**.**	**6**
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**.**	**7**
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	**6**
	Total	**36**

Text Books:

1. K. Sawhney, "A course in Electrical and Electronic Measurements and Instrumentation", Dhanpat Rai and Sons, 1995.
2. D. Patranbis, "Sensor and Transducers", 2nd Edition, PHI publication, 2005.
3. Krishna Kant, "Computer - Based Industrial Control", 2nd Edition, Prentice Hall, New Delhi, 2011
4. Frank D. Petruzella, "Programmable Logic Controllers", 5th Edition, McGraw- Hill, New York, 2016.

Reference Books:

1. Jacob Milman, Christos Halkias, Chetan D. Parikh, "Millman's Integrated Electronics", McGraw Hill Education India Pvt. Ltd., Second edition, 2010.
2. Curtis D. Johnson, "Process Control Instrumentation Technology", 8th Edition, Pearson New International, 2013.
3. Lukas M.P, "Distributed Control Systems", Van Nostrand Reinhold Co., New York, 1986.
4. N. Viswanandham, Y. Narahari, "Performance Modeling of Automated Manufacturing Systems", 1st Edition, 2009

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. Comprehensive understanding of the fundamentals of electronic devices.
2. An understanding of how complex devices such as BJT, JFET and MOSFET are modeled and how the models are used in the design and analysis of useful circuits.
3. The capability to design and construct circuits, take measurements of circuit behavior and performance.
4. The ability of modeling the electronic circuits using simulation tools such as PSPICE, Multisim etc.

Course Outcomes:

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

1. Analyze and model BJT and FET for small signal.
2. Explain the characteristics of MOSFET and Analyze the DC biasing circuit of MOSFET.
3. Analyze and model MOSFET for small signal.
4. Illustrate the feedback concept and construct feedback amplifiers & oscillators.
5. Illustrate and analyze the different types of power amplifiers.
6. Analyze different circuits using semiconductor diodes.

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.	**06**
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 MOSFET configurations: DC Analysis.	**06**

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 in VLSI.	**06**
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	**06**
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.	**06**
VI.	**Applications of Semiconductor Devices:** Diode wave shaping circuits- Clippers and Clampers ,Voltage multipliers.DC Regulated power supply and it's performance parameters, Types:series regulator, shunt regulator, Protection circuits: overvoltage protection,over current protection	**06**
	Total	**36**

Text Books:

1. Boylestead &Nashelsky ,"Electronic devices and Circuits Theory", PHI, Eighth edition, 2009
2. Donald Neaman ,"Electronic Circuit Analysis and Design", Tata McGraw Hill , Third Edition, 2016
3. S. Salivahanan ,"Electronic Devices and Circuits" , Tata McGraw Hill , Second Edition, 2014
4. N.P. Deshpande, "Electronic Devices and Circuits Principles and Applications, Tata McGraw Hill ,First Edition , 2009

Reference Books:

1. David A. Bell ,"Electronic Device and Circuits", PHI , Fourth Edition, 2010
2. Jacob Millman, Christos C. Halkies, Chetan D. Parikh , "Integrated Electronics-Analog and Digital Circuits and Systems", Tata McGraw Hill , Second Edition, 2015
3. Floyd ,"Electronic Devices", Pearson , Seventh Edition, 2017
4. Anil K. Maini and Varsha Agarwal ,"Electronic Devices and Circuits", Wiley India , Second Edition,,2015

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

Course Objectives:

1. The knowledge of Designing, Building, Testing and Analyzing aspects of electronic circuits.
2. The capability to use simulation tools for performing various analysis of Electronic circuits.

Course Outcomes:

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

1. Identify and characterize basic devices such as BJT/JFET/MOSFET from their package information by referring to manufacturer's Data Sheet
2. Design, Build, Test and Analyze performance of Linear applications of above-mentioned active Devices.
3. Simulate a few of the circuit applications using appropriate circuit Simulation Package.

Guidelines:

Any 8 experiments from following list need to be completed.

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/MOSFET CS amplifier. (Effect of coupling and bypass capacitors.)
5	Design and Implement RC phase shift oscillator.
6	Simulate Hartley /Colpitts oscillator
7	Build and test Current Series Feedback amplifier.
8	Simulate Voltage Series Feedback Amplifier.
9	Simulate Class A/ Class AB complementary symmetry Power Amplifiers.

10	Build and Test diode as a clipper and clamper.
11	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, Eighth edition, 2009.
2. Donald Neaman ,"Electronic Circuit Analysis and Design", Tata McGraw Hill , Third Edition, 2016.
3. S. Salivahanan ,"Electronic Devices and Circuits" , Tata McGraw Hill , Second Edition, 2014.
4. N.P. Deshpande, "Electronic Devices and Circuits Principles and Applications, Tata McGraw Hill ,First Edition , 2009.
5. David A. Bell ,"Electronic Device and Circuits", PHI , Fourth Edition, 2010.
6. Jacob Millman, Christos C. Halkies, Chetan D. Parikh , "Integrated Electronics-Analog and Digital Circuits. Systems", Tata McGraw Hill , Second Edition, 2015.
7. Floyd ,"Electronic Devices", Pearson , Seventh Edition, 2017.
8. Anil K. Maini and Varsha Agarwal ,"Electronic Devices and Circuits", Wiley India , Second Edition, ,2015.

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 :

1. Basics of Electronics,
2. Basics of Electrical and Electronics

is essential

Course Objectives:

1. To explore the basic concepts of digital electronics and programmable devices, Number system, their inter-conversion and their implementation using logic gates.
2. To introduce the students with the fundamental principles of digital logic and implementation of combinational logic and sequential logical operations for basic digital applications.
3. 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. Design basic and modular combinational and sequential logic circuits.
2. Analyze combinational circuits, synchronous and asynchronous sequential logic circuits.
3. Design and implement digital applications with appropriate state machines, PLA, PAL or PLDs.
4. Select appropriate design principles for designing real time digital applications.
5. Apply knowledge of the digital logic family for the selection of ICs used in applications.
6. Design and simulate arithmetic and sequential circuit using HDL tool flow.

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, Quine Mc-cluskey Minimization Method . 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. Study of working principle of IC-74LS83.	**07**
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, De-multiplexer trees. Study of working principle of IC-74LS85, IC-74LS153 as a Multiplexer and IC-74LS138 as a Demultiplexer / Decoder.	**05**

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. Study of working principle of IC-74LS90, IC74HC191/ IC74HC193 and 74HC194/74LS95.	**06**
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.	**07**
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.	**05**
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, Arrays, VHDL operators, VHDL functions, VHDL procedures, Packages and libraries, VHDL model for a counter, Modeling a sequential machine.	**06**
	Total	**36**

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. 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. 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

Course Objectives:

1. To introduce Basic Digital ICs and their working principles.
2. To deliver concepts related to designing of 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 completion of this course, students will be able to,

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

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 and 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. b. Design and Implement 4-bit Binary subtractor using IC-74LS83.
4	Study of IC-74LS85 as a magnitude comparator: a. Design and Implement 5-bit comparator. b. Design and Implement 8-bit comparator.
	Part B: Sequential Logic Circuit Implementation
5.	Study of Counters 1: a. Design and Implement 4-bit up and down counter using JK- Flip flop. b. Design and Implement MOD-N and MOD-NN using IC-74LS90 and draw a Timing diagram.
6.	Study of Counters 2: Design & Implement 4-bit Up/Down Counter and 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. 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. Gothman, "Digital Electronics-An introduction to theory and practice", Pearson Education,1982
2. Charles Roth, "Digital System Design using VHDL", 3rd Edition, CENGAGE Learning, 2016
3. J.F. Wakerly, "Digital Design: Principles and Practices", 3e, Pearson Education, 2010
4. Anand Kumar, "Fundamentals of digital circuits", 4e, Prentice Hall of India Learning, 2016
5. S. Brown and Z. Vranesic, "Fundamentals of Digital Logic with VHDL Design" 3rd Addition, McGraw Hill Publication, 2017
6. L. Perry, "VHDL Programming by Example" 4th Edition, McGraw Hill Publication, 2002.
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. Basic electrical concepts like voltage, current, power, basic laws, Circuit/Network, etc.
2. Basic elements like Resistor, Capacitor and Inductor.
3. Basic circuit simplification techniques like series, parallel, star-delta conversation, etc.
4. Mathematics concepts like Cramer's rule, Integration, Derivative, Matrix, Laplace transform, etc**.**

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 completing the course, the students should be able to:

1. Analyze the linear circuits for current, voltage or power using circuit simplification techniques and network theorems.
2. Solve the given resistive network using graph theory for current, voltage or power.
3. Analyze the responses of series RL, RC, RLC circuits using time domain and frequency domain methods.
4. Determine the network parameters of two port networks and driving point, transfer functions for one port & two port networks.
5. Analyze any given circuits/networks from syllabus using any EDA tools like MULTISIM, PSIM, FALSTAD, TINKERCAD, LTSpice, PSICE, etc.

Detailed Syllabus

Unit	Description	Duration (H)
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 Super node analysis, Source transformation and source shifting.	**07**
II	**Network Theorems** Superposition theorem, Thevenin's theorem, Norton's theorem, maximum power transfer theorem, reciprocity theorem and Millers Theorem.	**06**
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.	**05**

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.	**06**
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.	**05**
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 driving point & transfer functions, Time domain behavior from Pole-Zero plot and Stability of network.	**07**
	Total	**36**

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 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 given one port or two port network using Laplace Transform and **sketch the** pole-zero plot to **find** network stability.
7	**Analyze** a given circuits using any EDA tools like MULTISIM, PSIM, FALSTAD, TINKERCAD, LTSpice, PSICE, etc. **(Course Activity)**

Text Books:

1. Ravish Singh, Network Analysis and Synthesis, TMH, 2nd edition,2015.
2. William H Hayt, Jack E Kimmerly and Steven M.Durbin, Engineering Circuit Analysis, Tata McGraw Hill, 9th edition,2018.

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,2005
3. A.K. Chakraborty, S.P. Ghosh, Network Analysis and Synthesis, Tata McGraw Hill, 1st edition, 2008.
4. Franklin F. Kuo, Network analysis and Synthesis, Wiley International Edition, 2nd edition.2004.

NPTEL/MOOC Courses: https://nptel.ac.in/courses/108/105/108105159/

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

Course Objectives:

1. Introduction to various hardware & software tools used for circuit simulation and PCB design.
2. Learning the basics of electronics, including reading and implementation of schematics.
3. Development of practical skills required for designing electronics projects.

Course Outcomes:

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

1. Identify Electronic Components Symbols & Footprints
2. Simulate a schematic of an analog and digital circuit and design a PCB for it.
3. Enhance practical knowledge and skills by the development of electronic circuits/systems.

Detailed Syllabus

Unit	Description	Duration(H)
I	**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 ● PSpice tools and working ● Simulation of analog and digital circuits	**08**
II	**Introduction to PCB Design software** Schematic Entry, Netlist Creation, working with component libraries, Design of Boards, Layout of Parts, Optimizing Parts Placements, Pads and Via, Manual and Auto Routing, Handling Multiple Layers, Gerber files, Gerber View **Activity Assignment 2:** ● Implementing PCB Layout in PCB Design tool. ● Fabrication of PCB ● Assembling components and Soldering on PCB.	**08**

III	**Exploring MATLAB software for Design of Electronics Systems** Write simple program scripts and functions in MATLAB, Use MATLAB for applications in electrical & computer engineering, Use Spice to simulate a circuit. 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 Simulation and Analysis of circuits in MATLAB	**08**
	Total	**24**

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
10. https://in.mathworks.com/help/matlab/

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

Prior knowledge: Nil

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. Develop more awareness of their surroundings, society, social problems and their sustainable solutions, while keeping human relationships and human nature in mind.
2. Develop better critical ability by developing the right understanding of reality
3. Understand and become sensitive to their commitment towards what they believe in (humane values. humane relationships and humane society).
4. Apply what they have learnt to their own self in differ

Detailed Syllabus:

Unit	Description	Duration (H)
I.	**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 fulfil the Basic Human Aspirations	06
	Practice Session: Sharing about Oneself, Exploring Human Consciousness, Exploring Natural Acceptance	02
II.	**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	02
III.	**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	02
IV.	**Harmony in Society:** Understanding Harmony in the Society, Vision for the Universal Human Order**,** Human Order Five Dimensions	03
	Practice Session: Exploring Systems to fulfil Human Goal	01
V.	**Harmony in the Nature/Existence:** Understanding Harmony in the Nature, Interconnectedness, self-regulation and Mutual Fulfilment among the Four Orders of Nature, Realizing Existence as Co-existence at All Levels, The Holistic Perception of Harmony in Existence	03
	Practice Session: Exploring the Four Orders of Nature, Exploring Co-existence in Existence	01
VI.	**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	02
	Total	**36**

Text Books

1. A Foundation Course in Human Values and Professional Ethics, R R Gaur, R Asthana, G P Bagaria, 2nd Revised Edition, Excel Books, New Delhi, 2019. ISBN 978-93-87034-47-1
2. Teachers' Manual for A Foundation Course in Human Values and Professional Ethics, R R Gaur, R Asthana, G P Bagaria, 2nd Revised Edition, Excel Books, New Delhi, 2019. ISBN 978-93-87034-53-2

Reference Books

1. Jeevan Vidya: Ek Parichaya, A Nagaraj, Jeevan Vidya Prakashan, Amarkantak, 1999.
2. Human Values, A.N. Tripathi, New Age Intl. Publishers, New Delhi, 2004.
3. The Story of My Experiments with Truth - by Mohandas Karamchand Gandhi
4. On Education - J Krishnamurthy
5. Rediscovering India - by Dharampal
6.Hind Swaraj or Indian Home Rule - by Mohandas K. Gandhi

Links for additional learning

http://madhyasth-darshan.info/postulations/knowledge/knowledge-of-humane-conduct/

https://www.youtube.com/channel/UCQxWr5QB_eZUnwxSwxXEkQw

https://youtu.be/OgdNx0X923I

Program: B. Tech. (All branches)				Semester: III			
Course :Life Skills-III				Code :BHM3939			
Teaching Scheme				Evaluation Scheme			
Practical	**Tutorial**	**Credit**	**Hours**	**IE**	**MTE**	**ETE**	**Total**
2	0	0	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 (H)
I.	**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**
II.	**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	7
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	5
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.	6
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	6
	Total	**24**

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 5 experiments from following list need to be completed using Code Blocks /Turbo C / Online GDB.

Detailed Syllabus

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

4	Implementation of Queue using Linked List
5	Implement Binary search tree with operations Create, Search, and Recursive traversal.
6	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	7
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	7
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.	7

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.	**5**
V	**Noise** Sources of Noise, Types of Noise, White Noise, SNR, 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.	**5**
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.	**5**
	Total	**36**

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

Course Objectives:

1. To demonstrate AM and FM generation to students.
2. To introduce to basic sampling and pulse modulation through experimentation.
3. To make to use 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 6 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

Simulation Practical (Group B)	
8.	Generate AM and FM waveform for given modulation index, signal frequency, and carrier Frequency using suitable software.
9.	Prove sampling Theorem. Reconstruct the analog signal from its samples. Observe the aliasing effect by varying sampling frequency.
10.	The behavior of the DSBFC (AM) in 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.
4. Frenzel, "Principles of Electronic Communication Systems", Tata McGraw-Hill,3rd Edition,2008.

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 use in various 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 and Analyse linear applications of Op-Amp.
3. Design and Analyse non- linear applications of Op-amp.
4. Illustrate working of data converters using op-amp.
5. Illustrate the working of timers, PLL and its applications.
6. Illustrate 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.	**06**
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.	**06**
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.	**06**
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 configuration of ADC and DAC.	**06**
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.	**06**

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.	**06**
	Total	**36**

Text Books:

1. Ramakant A. Gayakwad, "Op Amps and Linear Integrated Circuits", Prentice Hall of India Pvt Ltd., 3rd edition,2008.
2. Salivahanan and Kanchana Bhaskaran, "Linear Integrated Circuits", Tata McGraw Hill, India 2008.

Reference Books:

1. George Clayton and Steve Winder, "Operational Amplifiers", Newnes 5th Edition,2015
2. Sergio Franco, "Design with Operational Amplifiers and Analog Integrated 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, 5th Edition 2017.

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 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 use in various applications.

Course Outcomes:

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

1. Comprehend the parameters of op-amp and select the correct op-amp as per application.
2. Design and test linear and nonlinear applications of Op-Amp.
3. Exhibit the use analog ICs in various real life applications.

Guidelines:

1. Perform any 8 experiments from Experiment 1 to 11.
2. Experiment 12 is compulsory and has to be performed in group of 2 to 3 students.

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.	Build and test precision half & full wave precision rectifier.
5.	Design, build and test Schmitt trigger and plot transfer characteristics.
6.	Design, build and test PLL for typical centre frequency
7.	Implement and verify working of 2-bit DAC (R-2R Ladder).
8.	Implement and verify working of 2-bit ADC. (Flash type)
9.	Design, build and test square & triangular wave generator.
10.	Design, build and test variable power supply
11.	Design, built and test astable and monostable multivibrator using IC555.
12.	Mini project: Design, built and test any application using Analog IC.

Reference Books:

1. Ramakant A. Gayakwad, "Op Amps and Linear Integrated Circuits", Prentice Hall of India Pvt Ltd. , 3rd edition,2008
2. Salivahanan and Kanchana Bhaskaran, "Linear Integrated Circuits", Tata McGraw Hill,India 2008
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. Introduction to architecture and features of microprocessors and microcontrollers.
2. Need of microcontrollers in real-life applications.
3. Learning the interfacing of real-world peripheral devices.
4. Study of various hardware and software tools for developing applications.

Course Outcomes:

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

1. Learn microprocessor and microcontroller architecture
2. Develop interfacing of microcontroller with real-world devices
3. Program microcontroller in assembly and embedded C
4. Apply a combination of hardware and software tools to design an application

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	**6**
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.	**6**
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)	**6**
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	**6**
	Total	**24**

Text Books:

1. Ramesh Gaonkar, "Microprocessor Architecture, Programming and Applications with the 8085", Prentice Hall, 6th edition,2010.
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,2012.

Reference Books:

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

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

Course Objectives:

1. Interpretation of architecture and programming of microprocessors and microcontrollers.
2. Learning of the microcontroller interfacing with real-world peripheral devices.
3. Study of various hardware and software tools for developing applications.

Course Outcomes:

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

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

Guidelines:

Any 8 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 - To find smallest number from given array of numbers - To find largest number from given array of numbers
2	Write an assembly program for 8051: -To arrange block of ten numbers in ascending and descending order -To transfer a block of data from internal memory to external memory -To convert decimal number to hexadecimal
3	Write an embedded c program for Parallel port interfacing of LEDS—Different programs (flashing, BCD/ HEX counter)
4	Write an embedded c program to generate square wave using timer with interrupt
5	Write an embedded c program for both side serial communication between 8051 and computer.
6	Develop a data acquisition system using ADC chip and 8051 Microcontroller
7	Write an embedded c program for triangular waveform Generation using DAC Interfacing to 8051
8	Write an embedded c program for 16x2 LCD interfacing with 8051. (8-bit mode)

9	Write an embedded c program for interfacing of Stepper motor to 8051
10	Write an embedded c program for interfacing of DC motor/servo motor to 8051

Reference Books:

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

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. Emphasis on project-based learning activities that is long-term, interdisciplinary and student-centric.
2. Independent and group learning with the help of available resources.
3. Ability to develop application based on the fundamentals of electronics and communication engineering by possibly the integration of previously acquired knowledge.
4. Gain of practical experience in all steps in the life cycle of the development of electronic systems: specification, design, implementation, and testing.
5. Integrate knowledge and skills from various areas through more complex and multidisciplinary projects
6. Selection and utilization of appropriate hardware and software tools to design and analyze the proposed system.
7. Provision of opportunity for every student to get involved either individually or as a group so as to develop team skills and learn professionalism.

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. Propose a suitable solution based on the fundamentals of electronics and communication engineering by possibly the integration of previously acquired knowledge.
3. Use technology in proposed work and demonstrate learning in oral and written form.
4. Develop ability to work as an individual and as a team member.

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. (All branches)				Semester :IV			
Course : Numerical Methods				Code :BAS4601			
Teaching Scheme				Evaluation Scheme			
Lecture	Tutorial	Credit	Hours	IE	MTE	ETE	Total
3	-	3	3	20	30	50	100

Prior Knowledge of:

1. Univariate Calculus
2. Multivariate Calculus is essential

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 integration, ordinary and partial differential equations, and their applications.
3. Open-source software to perform numerical techniques.

Course Outcomes:

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

1. **Apply** numerical methods to **solve** the systems of linear equations.
2. **Perform** different numerical methods to **solve** differentiation and integration.
3. **Understand** basic operators, packages, syntax of software to **develop** programs for systems of linear equations, differentiation and Integration.
4. **Apply** single & multistep numerical methods to ordinary differential equations of first order for analyzing engineering problems.
5. **Apply** Explicit and Implicit methods to partial differential equations for **analyzing** heat, wave and Laplace equations.
6. **Develop** programs for Numerical Methods using open-source software.

Detailed Syllabus:

Unit	Description	Duration [H]
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.	6
II	**Numerical Integration**: Difference formulae for numerical differentiation, Boole's rule, Romberg integration and Gauss quadrature for double & triple integration.	6
III	**Problem Solving-I:** Solutions of systems of linear equations, Differentiation and Integration using open source software.	6
IV	**Ordinary differential equations:** Euler's method, Modified Euler's method, Runge-Kutta 4^{th} order methods, predictor corrector method.	4
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.	8
VI	**Problem Solving-II:** Solutions of ordinary and partial differential equations using open source software.	6
	Total	**36**

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,4 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

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

Prior Knowledge: NIL

Course Objectives:

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 completion of this course, students will be able to,

1. **Apply** basic theoretical principles for formulation of optimization models and **solve** using graphical method.
2. **Apply** Simplex methods and duality to find optimal solutions for constrained and unconstrained problems.
3. **Understand** basic operators, packages, syntax of software to **develop** programs for Linear Programming Problems.
4. **Apply** optimization techniques to **solve** transportation and assignment problems.
5. **Apply** different optimization models for real time projects of transport problems to analyse networks.
6. **Develop** programs for transportation and assignment problems and Nonlinear Programming problems.

Detailed Syllabus:

Unit	Description	Duration [H]
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 Algorithm,	6
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, Duality in linear programming, Formulation of Dual Linear programming problems.	6
III	**Problem Solving-I:** Solutions of LPP using open source software, use of solver in MS-Excel to solve Optimization problem.	6
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, Variations in Transportation problems. **Assignment Problems:** Introduction, Mathematical model of Assignment problem and it's solutions, variations in Assignment problems.	6
V	**Nonlinear programming:** Unconstrained optimization techniques, Constrained optimization techniques. **Network Analysis:** Network definition and Network diagram, probability in PERT analysis, project time cost trade off, introduction to resource smoothing and allocation.	6
VI	**Problem Solving-II:** Solutions of Assignments and Transportation problems and nonlinear optimization problems using open source software, use of solver in MS-	6

	Excel to solve Optimization problem.	
	Total	**36**

Text Books:

1. Rao S S, Engineering Optimization theory and Practice, Willy Easter Ltd. 4th Edition, 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, Kadar Nath Ram Nath & Co. Edition, ISBN: 9380803389
2. Matteo Fischetti, "Introduction to mathematical optimization", First Edition, ISBN: 9781692792022
3. Judith L. Gersting, "Mathematical Structures for Computer Science", Freeman Co, 4 Edition, ISBN: 9780716783060
4. Peter V. O'Neil, "Advanced Engineering Mathematics", Thomson Learning ,7 Edition, ISBN 13: 9781337274524
5. Hira and Gupta, "Operation research", S. Chand publication, ISBN (13): 9788121909686.
6. Abhishek K Gupta," Numerical Methods using MATLAB", Springer, First Edition, ISBN 13: 9781484201541
7. 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/111/102/111102012/ (LPP)
   https://nptel.ac.in/courses/110/106/110106059/ (Transportation & Assignments Problems)

Program: B. Tech. (All branches)				Semester : IV			
Course : Calculus of Variation				Code : BAS4603			
Teaching Scheme				Evaluation Scheme			
Lecture	**Tutorial**	**Credit**	**Hours**	**IE**	**MTE**	**ETE**	**Total**
3	-	3	3	20	30	50	100

Prior knowledge of

1. Linear Algebra & Univariate Calculus
2. Multivariate Calculus

is essential.

Course Objectives:

After completion of the course, students will have adequate background, conceptual clarity and knowledge of mathematical principles related to:

1. Formulation of variational problems and analysis of key properties of system behavior.
2. Construction of variational problem for multivariate functional and it's solution
3. Application of mathematical methods of calculus of variation to construct finite element structure for several engineering problems

Course Outcomes:

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

1. **Construct** variational problems to **optimize** constrained and unconstrained functional.
2. **Apply** Euler-Lagrange's equation to **determine** stationary paths of a multivariable functional.
3. **Understand** basic operators, packages, syntax of software to **develop** programs for optimization of functional.
4. **Apply** theory & techniques of calculus of variation to solve boundary value problems.
5. **Analyze** given problem to construct finite element structure and **apply** theory of calculus of variation to solve it
6. **Develop** programs for approximate and FEM models using open source software.

Detailed Syllabus:

Unit	Description	Duration (H)
I	**The foundations of calculus of variations** Introduction, The Euler-Lagrange differential equation, Minimal path problems, open boundary variational problems. **Constrained variational problems.** Algebraic boundary conditions, Lagrange's solution, Isoperimetric problems, Closed-loop integrals,	6
II	**Multivariate functional** Variational problems in parametric form, Functional with two independent variables, Minimal surfaces, Functionals with three independent variables (only conversion). **Higher order derivatives** The Euler-Poisson equation, The Euler-Poisson system of equations, Algebraic constraints on the derivative.	6
III	**Problem Solving-I:** Solutions of constrained and unconstrained variational problems using open source software.	6
IV	**Approximate methods** Euler's method, Rayleigh-Ritz method, Galerkin's method	6
V	**Finite Element Methods**	6

	Boundary integral method, Finite element method, Case Studies.	
VI	**Problem Solving-II:** Solutions of Approximate and FEM models using open source software.	6
	Total	**36**

Text Books:

1. Mark Kot, "A First Course in the Calculus of Variations", AMS, ISBN: **978-1-4704-1495-5**
2. A.S. Gupta , "Calculus of Variation with applications" , PHI Learning PVT LTD, ISBN: 978-8120311206

Reference Books:

1. L.Elsgolts, "Differential equations and calculus of variations", MIR Publications, ISBN 13: 978-1410210678
2. B. S. Grewal , "Higher Engineering Mathematics", Khanna Publication, 42 Edition, ISBN 13: .9788174091955
3. Krishnamoorthy C. S., "Finite element analysis: theory and programming", Mcgraw hill education (india) pvt. Ltd., 2 Edition, ISBN 13: 9780074622100
4. Moaveni, Saeed, "Finite element analysis : theory and application with ansys" Pearson education pvt.. ltd, 2 Edition, ISBN: 0137850980

e-sources:

1. **NPTEL Course lectures links:**
   https://nptel.ac.in/courses/111/104/111104025/ **(Functional)**
   https://nptel.ac.in/courses/112/104/112104193/ **(FEM)**

Program: B. Tech. (All branches)				Semester :IV			
Course : Mathematical Modeling and Simulation				Code :BAS4604			
Teaching Scheme				Evaluation Scheme			
Lecture	**Tutorial**	**Credit**	**Hours**	**IE**	**MTE**	**ETE**	**Total**
3	-	3	3	20	30	50	100

Prior knowledge of

1. Linear Algebra & Univariate Calculus
2. Multivariate Calculus
3. Higher order of differential equations.

is essential.

Course Objectives:

After completion of the course, students will have adequate background, conceptual clarity and knowledge of mathematical principles related to:

1. Mathematical Modeling and its uses in different engineering disciplines.
2. Mathematical techniques that can be used to build a proper mathematical model for a given engineering problem.
3. Simulation of mathematical models using open source software.

Course Outcomes:

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

1. **Identify** the types of mathematical modeling according to the real life problem.
2. **Build** a simple mathematical model.
3. **Understand** basic operators, packages, syntax of software to develop programs for analytical solutions of ordinary and partial differential equations.
4. **Apply** Explicit and Implicit methods to partial differential equations for **analyzing** heat, wave and Laplace equations.
5. **Predict** the performance of the mathematical model.
6. **Develop** programs for Numerical Solutions of ordinary and partial differential equations using open-source software.

Detailed Syllabus:

Unit	Description	Duration (H)
I	**Basics of Mathematical Modeling:**: Introduction, open and closed systems, advantages and limitations, properties, needs and techniques used, discussion on non-uniqueness of models. Classification of mathematical models: Classical and Continuous models, Deterministic, Probabilistic and Stochastic models, Areas of applications.	6
II	**Procedure and Techniques of Mathematical Modeling:** Procedure: Introduction, Identification of parameters, significant parameters, reduction of an open problem to a closed form, Techniques: Analytical Methods, Numerical Methods, Computer simulation, physical interpretation, case studies.	6
III	**Problem Solving-I:** Analytical Solutions of ordinary and partial differential equations using open source software.	6
IV	**Numerical Methods:** Explicit and Implicit finite difference scheme, Stability of finite difference method, Applications of finite difference analysis in boundary value problems: one dimensional diffusion equation, Wave equation, Laplace equation.	6
V	**Prediction of Performance:** Steps involved in a computer model, predict performance of an experimental system, Numerical Simulation and its Validation, Multiscale modeling,	6

	Sensitivity analysis.	
VI	**Problem Solving-II:** Numerical Solutions of ordinary and partial differential equations using open source software.	6
	Total	**36**

Text Books:

1. Frank Severance,System Modeling and Simulation: An Introduction", John Wiley & Sons limited,2001, ISBN:978-8126519606
2. S.S. Sastry, "Introductory Methods of Numerical Analysis", PHI learning Pvt Ltd, 5th Edition, ISBN 10: 9788120345928
3. Erwin Kreyszig, "Advanced Engineering Mathematics" Wiley Eastern Ltd.,10 Edition, ISBN 13: 9780470458365

Reference Books:

1. Averill Law, "Simulation modeling and analysis" , Mc-graw Hill Publication, 5 Edition, ISBN: 9780073294414
2. Abhishek K "Gupta, Numerical Methods using MATLAB", Springer, First Edition, ISBN 13: 9781484201541
3. John A Sokolowski and Catherine M Banks ,"Principles of Modeling and Simulation", John Wiley, First Edition, ISBN:9780470289433

e-sources:

1. **NPTEL Course lectures links:**
   https://nptel.ac.in/courses/111/107/111107113/ (Mathematical Modelling)
   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

Program: B. Tech.(All Branches)				Semester: III			
Course :Financial Mathematics				Code:BAS4605			
Teaching Scheme				Evaluation Scheme			
Lecture	**Tutorial**	**Credit**	**Hours**	**IE**	**MTE**	**ETE**	**Total**
3	-	3	3	20	30	50	100

Prior knowledge of:

1. Basic Mathematics
2. Probability

is essential.

Course Objectives:

The course aims at:

1. Address issues related to globalization of financial markets,
2. Development and Feasibility of financial transactions,
3. Provide the students with knowledge of a range of mathematical and computational techniques that are required for a wide range of quantitative positions in the financial sector
4. Forecasting market developments.

Course Outcomes:

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

1. **Demonstrate** knowledge of the fundamental concepts of financial mathematics
2. **Identify** various types of cash flow patterns; Compute the future value and the present value of different cash flow streams.
3. **Understand** types of Options and **apply** it to hedge against risks in existing investments.
4. Understand the characteristics of different financial assets such as money market instruments, bonds, and stocks, and how to buy and sell these assets in financial markets.
5. **Describe** and to analyze the investment environment, different types of investment vehicles;
6. **Analyze** the degree of risk for its effective management

Detailed Syllabus:

Unit	Description	Duration (H)
I	**Fundamentals of Financial Mathematics I:** Introduction of Financial Mathematics and its application in real life, Sources of Finance; Short term finance and Long term Funds (basics), Rate of interest, simple interest, compound interest.	6
II	**Fundamentals of Financial Mathematics II:** The time value of money, annuities and cash flows, loans, general cash flows and portfolios, derivatives, swaps, and hedging.	6
III	**Basics of Options :**Options; (call option and put options), payoffs call and put options, speculation (call or put) and its application (option).	6
IV	**Stocks and bonds:** Stocks and bonds, Valuation of stocks and bonds, Mutual funds, Cost of capital and ratio analysis.	6
V	**Basics of Investment:** Investment return. Uneven cash flows Compounding frequency of interest, Economic equivalence. Portfolio diversification	6
VI	**Risk & uncertainty:** Decision under risk & uncertainty, Risk premium, Portfolio diversification, Life Insurance, Endowment	6
	Total	**36**

Text Books:

1. Marek Capinski and Tomasz Zastawniak, "Mathematics for Finance", Springer 2nd Edition, ISBN 13:978-0857290816.
2. Ambad Nazri Wahidudin, "Financial Mathematics and its Applications", Ventus Publishing ApS, ISBN 978-8776819286

Reference Book:

3. Giuseppe Campolieti Roma M. Makarov "Financial mathematics a Comprehensive treatment", CRC Press Taylor and francis Group, 1st Edition, ISBN 978-1439892428

e-sources:

1. **NPTEL Course lectures links:**
   https://nptel.ac.in/courses/112/107/112107260/

Program: B. Tech. (All branches)				Semester :IV			
Course : Neural Network and Fuzzy Logic Control				Code : BAS4606			
Teaching Scheme				Evaluation Scheme			
Lecture	**Tutorial**	**Credit**	**Hours**	**IE**	**MTE**	**ETE**	**Total**
3	-	3	3	20	30	50	100

Prior Knowledge: Nil

Course Objectives:

This course aims at enabling students to get acquainted with,

1. Knowledge of Neural Networks and Fuzzy Logic Control and their use for controlling real time systems.
2. Knowledge about fuzzy set theory to solve various engineering problems.

Course Outcomes:

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

1. Model a Neuron and Express Neural Network.
2. Apply feedback networks to study Inverted Pendulum, Articulation Control.
3. Implement an artificial neural network using the NN simulation toolbox.
4. Apply concepts of fuzzy logics in Fuzzification and Defuzzification.
5. Appl fuzzy logic control in Pattern recognition and Home Heating system.
6. Implement Fuzzy Logic Toolbox in fuzzy logic control.

Detailed Syllabus:

Unit	Description	Duration [H]
I	**Architecture of Neural Network:** Introduction, Biological neuron, Artificial neuron, Neuron modeling, Basic learning rules, Single layer, Multi layer feed forward network, Back propagation, Learning factors.	6
II	**Neural Networks For Control:** Feedback networks, Discrete time hop field networks, Schemes of neuro-control, Identification and control of dynamical systems, Case studies- Inverted Pendulum, Articulation Control.	6
III	**Problem Solving-I:** Neural Network (NN) Toolbox, NN Simulink Demos, Neural Network (ANN) implementation, NN Tool Artificial Neural Network (ANN) implementation, Application of NN to Control System.	6
IV	**Fundamental of Fuzzy Logic:** Classical sets, Fuzzy Sets, Membership function, Cardinality of fuzzy set, Fuzzy complement, Fuzzy union & intersection, Fuzzy Relation, Fuzzification, Defuzzification, Fuzzy Rule.	6
V	**Fuzzy Logic Control:** Introduction, Knowledge based system, Decision making Logic, Fuzzy optimization, Adaptive fuzzy systems, Introduction to generate a genetic algorithm, Applications to Pattern recognition, Home Heating system.	6
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.	6
	Total	**36**

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.

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:B. Tech. (All branches)				Semester :IV			
Course : Professional skills for Engineers				Code : BHM4101			
Teaching Scheme				Evaluation Scheme			
Lecture	Tutorial	Credit	Hours	IE	MTE	ETE	Total
2		2	2	30	-	20	50

Pre-requisite: Nil

Course Objectives:

1. To introduce to students the fundamentals of effective communication and barriers in communication.
2. To introduce them to the concept of verbal and non-verbal communication and importance of Body language
3. To introduce to students the skills to prepare and deliver effective presentations and learn tricks of mastering group discussions.
4. To sensitize students to their behaviour in corporates by allowing them to understand the basics of corporate etiquettes.

Course Outcomes:

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

1. Evaluate the barriers in communication and accordingly master the skills of communication across culture at workplace.
2. Demonstrate effective verbal as well as non-verbal communication skills in both social and professional contexts
3. Develop practically deployable skill set involving effective presentations and handling group discussions to hone the opportunities of employability and excel in the professional environment.
4. Demonstrate skills for effectively handling the interviews and and ability to handle casual and formal situations in terms of personal grooming, dining and other corporate etiquettes

Detailed Syllabus:

Unit	Description	Duration
1	**Introduction and Fundamentals of Communication**: Need for effective communication, Functions of Communication, Communication Cycle, Levels of communication; Flow of communication **Barriers to Effective Communication:** Miscommunication; Noise; Types of barriers; Communication across Culture	**06**
2	**Verbal, Nonverbal communication and Body language:** Forms of Communication- Verbal and Non-verbal, their role and composition in overall communication; Effective use of body language, Listening Vs Hearing	**06**
3	**Presentation Skills:** 4Ps (Planning, Preparation, Practice, Presentation), Outlining; Effective use of A/V aids and Modes of Delivery **Mastering Group Discussion skills:** Skills evaluated in Group discussion, Types of Group discussion, Do's and Don'ts in Group Discussion	**06**

4	**Interview Skills:** Self Introduction, Do's and Don'ts during Interview **Corporate Etiquettes:** Definition and importance of Etiquette, Dressing Etiquettes, Dining Etiquettes, Telephonic etiquette, Business card Etiquette, Email etiquette	**06**
	Total	**24**

Text Book:

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, New Delhi 2010
2. Indrajit Bhattacharya, "An Approach to Communication Skills", Dhanpat Rai, Delhi, 2008
3. Simon Sweeney, "English for Business Communication", Cambridge University Press.
4. Sanjay Kumar and Pushpa Lata, "Communication Skills", Oxford University Press.

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.	06
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	**24**

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	08
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.	08
3	**Introduction to Data Acquisition in VI** VI Application- Implementation of Data Acquisition System for Temperature measurement	08
	Total	24

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	5
2	Federal Communications Commission, International Electrotechnical Commission standards for different industries	5
3	Electrical(Electronics Products) - Safety Tests, Conducted Emission, Radiated Emission tests	5
4	Mechanical – Vibration, Drop, Ingress Protection etc	5
5	Information on Testing Labs in India/Worldwide – UL, SAMEER, ERTL, ETDC, TUV, AUTOCLUSTER	4
	Total	**24**

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.	**Introduction 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.	15
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	09
	Total	24

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"
3. Joel Grus and O'Reilly, "Data Science from Scratch: First Principles with Python".
4. S P Gupta, "Statistical method", Sultan Chand & Sons
5. https://www.coursera.org/learn/python-plotting#syllabus
6. https://www.coursera.org/learn/python-data-analysis#syllabus

Program: B. Tech. (All branches)				Semester:IV			
Course : Life Skills-IV				Code :BHM4940			
Teaching Scheme				Evaluation Scheme			
Lecture	Practical	Credit	Hours	TW	PR	OR	Total
0	2	0	2	-	-	-	-

Prior knowledge: Nil

Objectives:

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

Outcomes:

After completion of this 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 behavioural patterns eliminating their unhelpful thoughts, feelings and actions.
4. Develop skills which are necessary to initiate ideas and pursue them for holistic development of the individual.

Detailed Syllabus:

Unit	Description	Duration (H)
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 based on societal projects / Project Exhibitions etc. **Cultural Awareness** Divisions of Indian classical music: Hindustani and Carnatic, Dances of India, Various Dance forms: 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 Analysis, Giles Barrow, Emma Bradshaw, Trudi Newton, David Fulton Publishers, 1 October 2001.
7. Transactional Analysis, 100 Key Points and Techniques, Mark Widdowson, 8 September 2009.
8. Benjamin Colodzin, "Helping ourselves by Helping Others", 3 August 2020.
9. Smith Mark K. "The Art of Helping Others", Jessica Kingsley Publishers,15 April 2008.
10. 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 analyse 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 it's 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 analyse consumption of resources
3. Identify key threats to biodiversity and develop appropriate policy options for it's conservation.
4. Analyse the impact of environmental pollution and the science behind those problems and potential solutions.

Detailed Syllabus:

Unit	Description	Duration (H)
I.	**Multidisciplinary nature of environmental studies:**Definition, scope and importance, Need for Public awareness, **Natural Resources**: Renewable and non-renewable resources: Natural resourcesandassociated problemsa) Forestb)Waterc)Minerald)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, Ecologicalsuccession, 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, Biogeographical 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 oneHotspot 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 (H)
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- Centre & 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, ConstitutionalAmendmentsandpowers, 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 relationshipsat work and at home
3. Articulate emotions using the right verbal and non-verbal language
4. Use tools to regulate their emotions and recognise 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 analyse 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 (H)
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 Modelling 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, Crowdfunding, 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 analyse 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 (H)
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