B.E, III Semester, Electronics & Communication Engineering

Course Title	TRANSFORMS, FOURIER SERIES AND NUMERICAL METHODS	Semester	III
Course Code	MVJ20MEC31	CIE	50
Total No. of Contact Hours	40	SEE	50
No. of Contact Hours/week	3 (L : T : P :: 2 : 2: 0)	Total	100
Credits	3	Exam. Duration	3Hrs

Course objective is to:

- Solve the linear differential equations using Laplace transforms
- Apprehend and apply Fourier Series
- Realize and use of Fourier transforms and Z-Transforms
- Use of numerical methods to solve ordinary differential equation
- Use of statistical methods in curve fitting applications.

Module-1	RBT Level L1, L2, L3	8Hrs.

Laplace Transforms: Definition, Transforms of elementary functions, Properties, Periodic function, Unit step function.

Inverse Laplace Transforms: Inverse Laplace Transforms, Convolution theorem to find inverse Laplace transform. Solution of linear differential equations using Laplace transforms.

Experiential Learning: (Experiments which can be conducted on the concepts of contents

Applications: Analysis of electrical and electronic circuits, used in Signal processing and in control systems.

Video Link:

1. https://youtube/NFuwtTT7VPM

Module-2	RBT Level L1, L2, L3	8Hrs.
Fourier Series: Continuous and Discontinuous functions, Convergence and divergence of infinite series of positive terms, Periodic functions, Dirichlet's conditions, Fourier series of periodic functions of period 2π and arbitrary period. **Half Range Fourier Series:** Half range fourier sine series and cosine series of period π and arbitrary period. Practical harmonic analysis **Experiential Learning:** (Experiments which can be conducted on the concepts of contents **Applications:** Fourier series solution to differential equation, Digital signal processing, spectrum analyzer. **Video Link:** 1. https://youtu.be/r18Gi8lSkfM		
Module-3	**RBT Level L1, L2, L3**	**8Hrs.**
Fourier Transforms: Infinite Fourier transform, Fourier Sine and Cosine transforms, Properties, Inverse Fourier transforms. **Z-Transforms:** Definition, standard Z-transforms, damping rule, shifting rule, initial value and final value theorems. Inverse Z- transform.Application of Z-transforms to solve difference equations. **Experiential Learning:** (Experiments which can be conducted on the concepts of contents **Applications:** Fourier transforms used in image processing and Z-transforms in Digital signal processing. **Video Link:** 1. https://youtube/spUNpyF58BY		
Module-4	**RBT Level L1, L2, L3**	**8Hrs.**
Numerical solution of ordinary differential equations: Numerical solution of first order and first degree; Taylor's series method, modified Euler's method, Runge-Kutta method of fourth-order. Milne's and Adams- Bashforth predictor and corrector method. **Experiential Learning:** (Experiments which can be conducted on the concepts of contents **Applications:** To solve initial value problems **Video Link:**		

1. https://youtube/pbYn3MEZyms		
Module-5	RBT Level L1, L2, L3	8Hrs.
Statistical Methods: Correlation and regression-Karl Pearson's coefficient of correlation-problems. Regression analysis- lines of regression –problems. **Curve Fitting:** Curve fitting by the method of least squares, fitting of linear, quadratic and geometric curve. **Experiential Learning:** (Experiments which can be conducted on the concepts of contents **Applications:** Applications of Correlation in Signal Processing and application of regression analysis in business **Video Link:** 1. https://youtube/jwTvCxasICc		

Course Outcomes:	
CO1	Learn to solve linear differential equations using Laplace transforms
CO2	Learn to represent a periodic function in terms of sine and cosine functions.
CO3	Evaluate Fourier transforms and use Z-transform to solve difference equations.
CO4	Learn to solve algebraic, transcendental and ordinary differential equations numerically.
CO5	Make use of the correlation and regression analysis to fit a suitable mathematical model for the statistical data

Text Books:	
1.	B.S. Grewal, "Higher Engineering Mathematics" Khanna Publishers, 43rd Edition, 201
2.	Prof. G.B.Gururajachar, "Engineering Mathematics –III, Academic Excellent serie publications, 2016 – 17.
3.	Prof. G.B.Gururajachar, "Engineering Mathematics –IV, Academic Excellent serie publications, 2017 – 18.
Reference Books:	
1.	Erwin Kreyszig, "Advanced Engineering Mathematics", Wiley-India publishers, 10th edition, 2014.
2.	Ramana B. V., "Higher Engineering Mathematics", Tata Mc Graw-Hill, 2006.

3.	Bali N. P. & Manish Goyal, "A text book of Engineering Mathematics", Laxmi Publications, 8th Edition
4.	H K Dass:"Advanced Engineering Mathematics"- S Chand & Company Ltd. 12th edition.

CIE Assessment:
CIE is based on quizzes, tests, assignments/seminars and any other form of evaluation. Generally, there will be: Three Internal Assessment (IA) tests during the semester (30 marks each), the final IA marks to be awarded will be the average of three tests - Quizzes/mini tests (4 marks) - Mini Project / Case Studies (8 Marks) - Activities/Experimentations related to courses (8 Marks)
SEE Assessment:
i. Question paper for the SEE consists two parts i.e. Part A and Part B. Part A is compulsory and consists of objective type or short answer type questions of 1 or 2 marks each for total of 20 marks covering the whole syllabus. ii. Part B also covers the entire syllabus consisting of five questions having choices and may contain sub-divisions, each carrying 16 marks. Students have to answer five full questions. iii. One question must be set from each unit. The duration of examination is 3 hours.

CO-PO Mapping

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

High-3, Medium-2, Low-1

Course Title	NETWORK ANALYSIS	Semester	III
Course Code	MVJ20EC32	CIE	50
Total No. of Contact Hours	50	SEE	50
No. of Contact Hours/week	4 (L : T : P :: 3 : 2: 0)	Total	100
Credits	4	Exam. Duration	3Hrs

Course objective is to:

- Describe basic network concepts emphasizing source transformation source shifting, mesh and nodal techniques to solve for resistance/impedance, voltage, current and power.
- Study the graphical method of analyzing electrical networks.
- Explain network Thevenin's, Millman's, Superposition, Maximum Power transfer and Norton's Theorems and apply them in solving the problems related to Electrical Circuits.
- Explain the behaviour of networks subjected to transient conditions. Use applications of Laplace transform to solve network problems.
- Study two port network parameters like Z, Y, T and h and their inter-relationships.

Module-1	RBT Level L1,L2,L3,L4	10Hrs.

Prerequisites: Ohm's law, Kirchhoff's laws

Basic Concepts: Introduction, Practical sources, Source transformations, Star – Delta transformation, Loop and node analysis with linearly dependent and independent sources for DC and AC networks, Concepts of super node and super mesh.

Laboratory Sessions/ Experimental learning: Find the current through and voltage across the load in the given circuit.

Applications: Simplification and analysis of analog circuits, microwave circuit analysis

Video link / Additional online information :

1. https://www.youtube.com/watch?v=UMhBgyK8F0U

Module-2	RBT Level L1,L2,L3,L4	10Hrs.
Graph Theory and Network equations: Graph of a network, Trees, Co-trees and Loops, Incidence Matrix, Cut-set Matrix, Tie-set Matrix and loop currents, Number of possible trees of a graph, Analysis of networks, Duality. **Laboratory Sessions/ Experimental learning:** NA **Applications:** Simplification and analysis of analog circuits, microwave circuit analysis **Video link / Additional online information:** 1. https://www.youtube.com/watch?v=F8qiM3o0Jc0		
Module-3	**RBT Level L1,L2,L3,L4**	**10Hrs.**
Network Theorems: Superposition Theorem, Millman's theorem, Thevenin's theorem, Norton's theorem, Maximum Power transfer theorem. **Laboratory Sessions/ Experimental learning:** Verify superposition theorem for a given circuit. **Applications:** Simplification and analysis of analog circuits, microwave circuit analysis. **Video link / Additional online information:** 1. https://www.youtube.com/watch?v=bnjiLg4xfh8		
Module-4	**RBT Level L1,L2,L3,L4**	**10Hrs.**
Prerequisites: *Laplace Transforms, Properties of Laplace Transform and Inverse Laplace Transform using partial fraction method.* **Transient behaviour and initial conditions:** Behaviour of circuit elements under switching condition and their Representation, evaluation of initial and final conditions in RL, RC and RLC circuits for DC and AC excitations, Applications of Laplace Transforms in circuit analysis: Application to circuits. **Laboratory Sessions/ Experimental learning:** Plot the response of a series RLC circuit. **Applications:** In the analysis of transmission lines and waveguides. **Video link / Additional online information :** 1. https://www.youtube.com/watch?v=g-CGI7oUSCA		

Module-5	RBT Level L1,L2,L3,L4	10Hrs.

Two port network parameters: Introduction, open circuit impedance parameter, short circuit admittance parameter, hybrid parameters, transmission parameter, relationship between parameters.

Laboratory Sessions/ Experimental learning:

1. Measure two port parameters for a given network

Applications: For analysis of communication systems and antennas.

Video link / Additional online information:

1. https://www.youtube.com/watch?v=YLGrugmDvc0

Course outcomes:	
CO1	Determine currents and voltages in a circuit using network simplification techniques.
CO2	To solve the network problems using graphical methods.
CO3	To simplify the complex circuits using network theorems.
CO4	To analyze simple DC circuits and AC circuits and applies the concepts to transient conditions.
CO5	Solve the given network using specified two port network parameters like Z or Y

Text Books:	
1.	M.E. Van Valkenberg (2000), "Network analysis", Prentice Hall of India, 3rd edition, 2000, ISBN: 9780136110958.
2.	Roy Choudhury, "Networks and systems", 2nd edition, New Age International Publications, 2006, ISBN: 9788122427677.
Reference Books:	
1.	Hayt, Kemmerly and Durbin –Engineering Circuit Analysis", TMH 7th Edition, 2010.
2.	J. David Irwin /R. Mark Nelms, "Basic Engineering Circuit Analysis", John Wiley, 8th edition, 2006.
3.	Charles K Alexander and Mathew N O Sadiku, "Fundamentals of Electric Circuits", Tata McGraw-Hill, 3rd Ed, 2009.

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

High-3, Medium-2, Low-1

Course Title	ANALOG ELECTRONICS	Semester	III
Course Code	MVJ20EC33	CIE	50
Total No. of Contact Hours	40	SEE	50
No. of Contact Hours/week	3 (L : T : P :: 3 : 0: 0)	Total	100
Credits	3	Exam. Duration	3Hrs

Course objective is to:

- To know the biasing methods of BJT and its low frequency response for various configurations.
- Explain construction and characteristics of JFETs.
- Explain various types of FET biasing, and demonstrate the use of FET amplifiers.
- Understand the different topologies of feedback amplifiers and oscillators.
- Analyse the Power amplifier circuits in different modes of operation.

Module-1	RBT Level L1,L2,L3	8Hrs.

Prerequisites: Transistor basics

Transistor Biasing: Operating point, Fixed bias circuits, Emitter stabilized biased circuits, Voltage divider bias circuits, Collector feedback configuration, Transistor switching networks.

Transistor at Low Frequencies: The r_e transistor model, CE Fixed bias configuration, Voltage divider bias, Emitter follower, Analysis of CE configuration using h- parameter model-Fixed Bias Configuration.

Laboratory Sessions/ Experimental learning:

1. Simulate BJT Fixed Bias configuration using PSPICE.

Applications: Amplifier, Switch, Sensor and Display.

Video link/ Additional online information:

1. http://www.nptelvideos.in/2012/12/electronics.html

Module-2	RBT Level L1,L2,L3,L4	8Hrs.

Prerequisites: BJT,FET

BJT Small signal model and FET Amplifiers:

Transistor Frequency Response: General frequency considerations, low frequency response, Miller effect capacitance, High frequency response, multistage frequency effects.

Field Effect Transistors: Construction and Characteristics of JFETs, Transfer Characteristics, Depletion type MOSFET, Enhancement type MOSFET.

Laboratory Sessions/ Experimental learning:

1. Plot the transfer characteristics of n channel JFET using PSPICE.

Applications: Analog switches, Phase shift oscillator, chopper, current limiter

Video link/ Additional online information:

1. http://www.nptelvideos.in/2012/12/electronics.html

Module-3	RBT Level L1,L2,L3	8Hrs.

Prerequisites: FET

FET Amplifiers: JFET small signal model, Self-bias configuration-bypassed Rs, Common Gate configuration, Source-Follower Configuration.

General Amplifiers: Cascade connections, Cascode connections, Darlington connections.

Laboratory Sessions/ Experimental learning:

1. Design JFET Fixed Bias configuration using PSPICE.

Applications: Darlington Transistor finds applications in Power Regulators, Audio Amplifier output stages, Controlling of Motors and light and touch sensors

Video link/ Additional online information:

1. http://www.nptelvideos.in/2012/12/electronics-for-analog-signal.html

Module-4	RBT Level L1,L2,L3	8Hrs.

Prerequisites: Feedback Amplifier, Oscillators

Feedback Amplifier: The Four Basic Feedback Topologies, The series-shunt, series-series, shunt-shunt and shunt-series amplifiers, Practical feedback circuits.

Oscillators: Oscillator operation, FET based Phase shift oscillator, Wien bridge oscillator, LC and Crystal Oscillators, UJT construction, UJT oscillators.

Laboratory Sessions/ Experimental learning:

1. Design and test the voltage-shunt feedback amplifier and calculate the parameters

using with and without feedback.

Applications: Radios, Televisions, Communication systems, Computers, Industrial controlled applications.

Video link/ Additional online information:

1. https://www.youtube.com/watch?v=xHNDrbB-iWY

Module-5	RBT Level L1,L2,L3	8Hrs.

Output Stages and Power Amplifiers: Introduction, Classification of output stages, Class A output stage, Class B output stage: Transfer Characteristics, Power Dissipation, Power Conversion efficiency, Class AB output stage, Class C tuned Amplifier.

Voltage Regulators: Discrete transistor voltage regulation -Series and Shunt Voltage regulators.

Laboratory Sessions/ Experimental learning:

1. Plot the frequency response using any classes of power amplifier

Applications: Audio power amplifiers, Switching type power amplifiers and Wireless Communication

Video link/ Additional online information:

1. http://www.nptelvideos.in/2012/12/electronics.html

Course outcomes:	
CO1	Describe the working principle and biasing methods of BJT,
CO2	Analyse the frequency response of BJT Amplifier and working principle of FET.
CO3	Describe the performance characteristics of FET amplifier and Darlington Amplifier
CO4	Design various Feedback amplifiers and oscillators using BJT/FET
CO5	Understand the classes of amplifiers and Voltage regulator

Text Books:	
1.	Robert L.Boylestad and louis Nashelsky, "Electronic Devices and circuit Theory", PHI/Pearson Education,11 TH Edition.

2.	Adel S Sedra, Kenneth C Smith "Microelectronic Circuits, Theory and Applications", 6th Edition, Oxford, 2015.ISBN:978-0-19-808913-1.
Reference Books:	
1.	Behzad Razavi, "Fundamentals of Microelectronics", John Weily ISBN 2013 978-81-265-2307-8,2nd Edition, 2013.
2.	K.A.Navas, "Electronics Lab Manual", Volume I, PHI, 5th Edition, 2015, ISBN: 9788120351424.
3.	J.Millman & .C.Halkia "Integrated Electronics", 2nd edition, 2010, TMH. ISBN 0-07-462245-5.

CIE Assessment:

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- Quizzes/mini tests (4 marks)
- Mini Project / Case Studies (8 Marks)
- Activities/Experimentations related to courses (8 Marks)

SEE Assessment:

i. Question paper for the SEE consists two parts i.e. Part A and Part B. Part A is compulsory and consists of objective type or short answer type questions of 1 or 2 marks each for total of 20 marks covering the whole syllabus.

ii. Part B also covers the entire syllabus consisting of five questions having choices and may contain sub-divisions, each carrying 16 marks. Students have to answer five full questions.

iii. One question must be set from each unit. The duration of examination is 3 hours.

CO-PO Mapping

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

High-3, Medium-2, Low-1

Course Title	DIGITAL SYSTEM DESIGN & VERILOG	Semester	III
Course Code	MVJ20EC34	CIE	50
Total No. of Contact Hours	40	SEE	50
No. of Contact Hours/week	3 (L : T : P :: 3 : 0: 0)	Total	100
Credits	3	Exam. Duration	3Hrs

Course objective is to:

- Familiarize with the simplification techniques & design various combinational digital circuits using logic gates.
- Introduce the analysis and design procedures for synchronous and asynchronous sequential circuits.
- Familiarize with Modern EDA tool such as Verilog.
- Acquire knowledge on different types of description in Verilog.
- Know the importance of Synthesis & programmable devices used for designing digital circuits.

Module-1	RBT Level L1,L2,L3	8Hrs.

Prerequisites: *Number systems, Boolean Algebra, Logic Gates, Comparison of Combinational & Sequential Circuits.*

Principles of combinational logic: Introduction, Canonical forms, Karnaugh maps-3, 4 variables, Quine- McClusky techniques- 3 & 4 variables.

Laboratory Sessions/ Experimental learning:

1. Study of Logic Gates – NOT, OR, AND, NOR, NAND, XOR and XNOR.
2. Design a 4-bit Binary to Gray code converter using Pspice, a simulation tool.

Applications: OR gate in detecting exceed of threshold values and producing command signal for the system and AND gate in frequency measurement.

Video link / Additional online information:

1. https://www.youtube.com/watch?v=FT03XrQ8Bi4

Module-2	RBT Level L1,L2,L3,L4	8Hrs.

Prerequisites: *Decoder, Encoders, Multiplexers & Demultiplexer*

Design and Analysis of combinational logic: Full Adder & Subtractors, Parallel Adder and Subtractor, Look ahead carry Adder, Binary comparators, Decoders & Multiplexers as minterm/maxterm Generator.

Introduction to HDL: Structure of HDL Module, Operators, Data types, Units and ports, Verilog constructs.

Laboratory Sessions/ Experimental learning:

1. Design a full adder using two half adders in Pspice tool.
2. Design an Adder cum Subtractor circuit which adds when input bit operation=1 or subtract if 0, using Pspice.
3. Design 4-bit comparator using IC7485.
4. Realize a Boolean expression using decoder IC74139.

Applications: Communication systems, Speed synchronization of multiple motors in industries.

Video link / Additional online information:

1. https://www.youtube.com/watch?v=RZQTTfU9TNA,
2. https://www.youtube.com/watch?v=36hCizOk4PA,
3. https://www.youtube.com/watch?v=397DDnkBm8A

Module-3	RBT Level L1,L2,L3	8Hrs.

Prerequisites: *SR, JK, D, T flipflops*

Flip-Flops and its Applications: Latches and Flip Flops, Master-slave JK flip-flop, Timing concerns in sequential circuits, Shift Registers – SISO, SIPO, PISO PIPO, Universal shift register, Counters – Synchronous and Asynchronous.

HDL Concepts: Verilog statements- assign, if-else, case, loops, always.

Laboratory Sessions/ Experimental learning:

1. Develop the Verilog code for the following flip-flops SR, D, JK &T.
2. Design a 6-bit Register using D-Flipflop using Verilog which stores every bit for each clock cycle.

Applications: Frequency divider circuit, frequency counter.

Video link / Additional online information: 1. https://www.youtube.com/watch?v=Nxpei7Kp4Vs		
Module-4	RBT Level L1,L2,L3, L4	8Hrs.
Sequential Circuit Design: Characteristic equations, Design of a synchronous mod-n counter using clocked JK, D, T and SR flip-flops, Melay & Moore Models. **Programmable Logic Devices**: PLA, PAL, FPGA. Laboratory Sessions/ Experimental learning: 1. Design a Synchronous Counter for a given sequence- 0, 2, 4, 6, 0 using Verilog. 2. Design a 4-bit Asynchronous up/down counter using Pspice tool (D,T,JK,SR flipflops) 3. Design a 4-bit binary Synchronous up/down counter using Pspice tool. (D,T, JK, SR flipflops) 4. Implement ALU operations on FPGA **Applications**: Data synchronizer, Counter. Video link / Additional online information: 1. https://www.youtube.com/watch?v=O3If0Nr9to0		
Module-5	RBT Level L1,L2,L3	8Hrs.
Synthesis Basics: Introduction, Synthesis information from Entity and Module, Mapping Process and Always in the Hardware Domain. Laboratory Sessions/ Experimental learning: 1. VHDL code for weather forecast Entity. 2. Mapping logic operators. **Applications**: Timing verification, test documentation. Video link / Additional online information: 1. https://nptel.ac.in/courses/117108040/		

Course outcomes:	
CO1	Illustrate simplification of Algebraic equations using K-map & Quine-McCluskey Technique.
CO2	Use the modern engineering tools such as verilog, necessary for engineering practice.

CO3	Analyse& design different applications of Combinational & Sequential Circuits to meet desired need within realistic constraints.
CO4	Write code & verify the functionality of digital circuit/system using test benches to solve engineering problems in digital circuits.
CO5	Know the importance of Synthesis & programmable devices used for designing digital circuits.

Text Books:	
1.	John M Yarbrough, "Digital Logic Applications and Design", Thomson Learning, 20
2.	Donald D. Givone, "Digital Principles and Design", McGraw Hill, 2002.
3.	NazeihM.Botros- "HDL Programming (VHDL and Verilog)"- John Weily India Pvt. Ltd. 2008
Reference Books:	
1.	Samir Palnitkar "Verilog HDL: A Guide to Digital Design and Synthesis", Pearson Education, Second Edition
2.	Charles H Roth Jr., Larry L. Kinney "Fundamentals of Logic Design", Cengage Learning, 7th Edition

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CO3	1	2	3	-	1	-	-	-	-	-	-	2
CO4	1	2	2	2	-	-	-	-	-	-	-	1
CO5	1	1	1	-	2	-	-	-	-	-	-	1

High-3, Medium-2, Low-1

Course Title	ELECTROMAGNETICS & TRANSMISSION LINES	Semester	III
Course Code	MVJ20EC35	CIE	50
Total No. of Contact Hours	40	SEE	50
No. of Contact Hours/week	3 (L : T : P :: 3: 0: 0)	Total	100
Credits	3	Exam. Duration	3Hrs

Course objective is to:

- Understand the applications of Coulomb's law and Gauss law to different charge Distributions.
- Understand the physical significance of Biot-Savart's Law, Amperes' Circuital Law and Stokes' theorem for different current distributions.
- Know the physical interpretation of Maxwell's equations and its applications in plane waves.
- Understand wave propagation in lossless and in lossy media.
- Study the concepts of transmission line parameters and its applications.

Module-1	RBT Level L1, L2, L3	8Hrs.

Prerequisites: Vector Algebra, Coordinate systems (Rectangular Coordinate System, Cylindrical Coordinate System and Spherical Coordinate System), gradient, divergence and curl

Electrostatics: Coulomb's Law, Electric Field Intensity, Flux density and potential:

Coulomb's law, Electric field intensity, Field due to line charge, Field due to Sheet of charge, Field due to continuous volume charge distribution, Electric flux, Electric flux density, Electric potential, Potential difference.

Laboratory Sessions/ Experimental learning:

1. Determine the electric field intensity at a point due to uniform linear charge (ρ L) and point charges using MATLAB.

Applications: The Van de Graaff generator, Xerography, Ink Jet Printers and Electrostatic Painting, Smoke Precipitators and Electrostatic Air Cleaning.

Video link / Additional online information:

1. https://youtu.be/ckAVB3_NP2Q
2. https://youtu.be/IH2fFNaR9YM
3. https://youtu.be/JhTT-wew-OE

Module-2	RBT Level L1, L2, L3, L4	8Hrs.

Gauss' law, Divergence, Poisson's and Laplace's Equations: Gauss law, Application of Gauss' law, Maxwell's First equation (Electrostatistics), Divergence theorem, Current, Current density, The continuity equation, Boundary conditions (dielectric-dielectric, conductor-dielectric, conductor-free space), Poisson's and Laplace's Equations, Uniqueness theorem.

Laboratory Sessions/ Experimental learning:

1. Evaluate the current flowing through a given surface using MATLAB.
2. Verify the Divergence theorem using MATLAB.

Applications: Used for calculation electrical field for a symmetrical distribution of charges

Video link / Additional online information:

1. https://youtu.be/N_jUbFnlqEg
2. https://youtu.be/XtH2WAhvYIM
3. https://youtu.be/gu934FBac6g
4. https://youtu.be/hp9Jito4vPE

Module-3	RBT Level L1, L2, L3, L4	8Hrs.

Magnetostatics: Steady Magnetic Field: Biot-Savart Law, Ampere's circuital law, Curl, Stoke's theorem, Gauss's law for magnetic fields, Magnetic flux and Magnetic flux density, Magnetic Scalar and Vector Potentials.

Magnetic Forces and magnetic materials: Force on a moving charge and differential current element, Force between differential current elements, Magnetization, magnetic susceptibility, permeability, Magnetic boundary conditions, Inductances, magnetic energy, magnetic circuit.

Laboratory Sessions/ Experimental learning:

1. Determine the magnetic field intensity at a point due to magnetic field using MATLAB.

Applications: Motors, Generators, Loudspeakers, MRI

Video link / Additional online information :

1. https://youtu.be/ebGM_q19gY0
2. https://youtu.be/uXQbYJVzlQ0
3. https://youtu.be/aYRBXI63Oqk

Module-4	RBT Level L1, L2, L3, L4	8Hrs.

Time varying Fields & Maxwell's Equation: Faraday's law, Displacement current, Maxwell's equation in differential and integral form, Time varying potentials.

Electromagnetic wave propagation: Derivation of wave equations from Maxwell's equations, Relation between E and H, Wave propagation in - lossy dielectrics, lossless dielectrics, free space and good conductor, skin-effect, Poynting theorem.

Laboratory Sessions/ Experimental learning:

1. Determine the parameters of wave using MATLAB.

Applications: Optoelectronics

Video link / Additional online information :

1. https://youtu.be/xxIb9Qv6t7E
2. https://youtu.be/_X061_y9Lqw
3. https://youtu.be/OoQS1ex4kJA

Module-5	RBT Level L1, L2, L3, L4	8Hrs.

Transmission lines: Introduction, Transmission line parameters, Transmission line equations, input impedance, standing wave ratio and power.

Applications of transmission line: Impedance matching and tuning: single stub tuning, double stub tuning, and the quarter wave transformer.

Laboratory Sessions/ Experimental learning:

1. Simulation of micro strip transmission line using FEKO software.

Applications: Telephone, Cable TV, Broadband network

Video link / Additional online information:

1. https://youtu.be/z9GbnMPDCVA
2. https://youtu.be/yk1Mu9fQ6mA
3. https://youtu.be/PO5ExHOKIJM

Course outcomes:	
CO1	Evaluate problems on electrostatic force, electric field due to point, linear, surface charge and volume charges.
CO2	Apply Gauss law to evaluate Electric fields due to different charge distributions by using Divergence Theorem. Determine potential and capacitance using Laplace equation and Poisson equation.
CO3	Apply Biot-Savart's and Ampere's laws for evaluating Magnetic field for different current configurations.
CO4	Apply Maxwell's equations for time varying fields and evaluate power associated with EM waves using Poynting theorem.
CO5	Determine the parameters of transmission lines for determining the impedance and admittance.

Text Books:	
1.	Matthew N. O. Sadiku, "Elements of Electromagnetics", Oxford University Press, Edition VII, 2018.
2.	David M Pozar, "Microwave Engineering", John Wiley & Sons, Inc., 4th edition, 2014.
Reference Books:	
1.	W.H. Hayt. J.A. Buck & M Jaleel Akhtar, "Engineering Electromagnetics", Tata McGraw – Hill, Edition VIII, 2014.

CIE Assessment:

CIE is based on quizzes, tests, assignments/seminars and any other form of evaluation. Generally, there will be: Three Internal Assessment (IA) tests during the semester (30 marks each), the final IA marks to be awarded will be the average of three tests

- Quizzes/mini tests (4 marks)
- Mini Project / Case Studies (8 Marks)
- Activities/Experimentations related to courses (8 Marks)

SEE Assessment:

i. Question paper for the SEE consists two parts i.e. Part A and Part B. Part A is compulsory and consists of objective type or short answer type questions of 1 or 2 marks each for total of 20 marks covering the whole syllabus.

ii. Part B also covers the entire syllabus consisting of five questions having choices and may contain sub-divisions, each carrying 16 marks. Students have to answer five full questions.

iii. One question must be set from each unit. The duration of examination is 3 hours.

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

High-3, Medium-2, Low-1

Course Title	COMPUTER ORGANIZATION & ARCHITECTURE	Semester	III
Course Code	MVJ20EC36	CIE	50
Total No. of Contact Hours	40	SEE	50
No. of Contact Hours/week	3 (L : T : P :: 3: 0: 0)	Total	100
Credits	3	Exam. Duration	3Hrs

Course objective is to:

- Explain the basic sub systems of a computer, their organization, structure and Operation.
- Illustrate the concept of programs as sequences of machine instructions.
- To understand the different ways of communicating with I/O devices and to introduce memory types including cache memories.
- Describe memory hierarchy and concept of virtual memory.
- To analyse concepts of Pipelining and other computing systems.

Module-1	RBT Level L1,L2,L3	8Hrs.

Basic Structure of Computers: Computer Types, Functional Units, Basic Operational Concepts, Bus Structures, Software, Performance – Processor Clock, Basic Performance Equation.

Machine Instructions and Programs: Numbers, Arithmetic Operations and Characters, IEEE standard for Floating point Numbers, Memory Location and Addresses, Memory Operations, Instructions and Instruction Sequencing.

Laboratory Sessions/ Experimental learning:

1. Understanding various parts of CPU of a PC.
2. Study of Microprocessor and understanding of its various instruction

Applications: Understand the functionality of the various units of computer.

Video link / Additional online information:

1. https://www.youtube.com/watch?v=K7fnDf-P6_c#action=share
2. https://www.youtube.com/watch?v=9-9z32T-5WU#action=share

3. https://www.youtube.com/watch?v=Szn_lwHal04#action=share		
Module-2	RBT Level L1,L2,L3	8Hrs.
Prerequisite :Number system **Addressing Modes:** Assembly Language, Basic Input and Output Operations, Stacks and Queues, Subroutines, Additional Instructions. Laboratory Sessions/ Experimental learning: 1. Write an ALP to find the sum of two numbers and verify if the sum is an even or odd number and simulate the output. 2. Write an ALP to transfer a block of data from one location to other and simulate the output. **Applications:** Project based on microprocessor. **Video link / Additional online information:** 1. https://www.youtube.com/watch?v=s4cVdsK3XiQ#action=share 2. https://www.youtube.com/watch?v=xKTNgA_ee58		
Module-3	RBT Level L1,L2,L3	8Hrs.
Input/Output Organization: Accessing I/O Devices, Interrupts – Interrupt Hardware, Enabling and Disabling Interrupts, Handling Multiple Devices, Controlling Device Requests, Direct Memory Access, and Buses. Laboratory Sessions/ Experimental learning: 1. Study any one input/output device and examine its various input output ports details. **Applications:** Interfacing of Peripheral devices **Video link / Additional online information:** 1. https://www.youtube.com/watch?v=Y17TLZCSe4M#action=share 2. https://www.youtube.com/watch?v=Zw79moR2gFs		
Module-4	RBT Level L1,L2,L3	8Hrs.
Memory System: Basic Concepts, Semiconductor RAM Memories-Internal organization of memory chips, Static memories, Asynchronous DRAMS, Read Only Memories, Cash		

Memories, Mapping Functions, Replacement Algorithm, Virtual Memories, Secondary Storage-Magnetic Hard Disks.

Laboratory Sessions/ Experimental learning:

1. Implement and simulate a simple memory unit which is capable of reading and writing data within a single clock cycle.

Applications: Understanding the various memories

Video link / Additional online information :

1. https://www.youtube.com/watch?v=lpVyGPNyjEs#action=
2. https://www.youtube.com/watch?v=NhyIUpOj5V8#action=share
3. https://www.youtube.com/watch?v=xXk3WiPGux8#action=share
4. https://www.youtube.com/watch?v=aeDyDIo-G44#action=share

Module-5	RBT Level L1,L2,L3	8Hrs.

Basic Processing Unit: Some Fundamental Concepts, Execution of a Complete Instruction, Multiple Bus Organization, Hardwired Control, Micro programmed Control, Pipelining, Basic concepts, Role of Cache memory, Pipeline Performance

Laboratory Sessions/ Experimental learning:

1. Evaluate the possible control sequence for implementing a multiplication instruction using registers for a single bus organization

Applications: Microprocessor

Video link / Additional online information:

1. https://www.youtube.com/watch?v=R41DfN3NpIM#action=share
2. https://www.youtube.com/watch?v=b5thcNYBrQc

Course outcomes:	
CO1	Identify the functional units of the processor and the factors affecting the performance of a computer
CO2	Demonstrate the ability to classify the addressing modes, instructions sets and design programs.
CO3	Understand the different ways of accessing an input / output device including interrupts.

CO4	Illustrate the organization of different types of semiconductor and other secondary storage memories.
CO5	Illustrate the simple processor organization based on hardwired control and micro programmed control.

Text Books:	
1.	Carl Hamacher, ZvonkoVranesic, SafwatZaky: "Computer Organization", 6th Edition, Tata McGraw Hill, 2011.
Reference Books:	
1.	Andrew S. Tanenbaum, Todd Austin, "Structured Computer Organization", 6th Edition, Pearson, 2013.
2.	David A. Patterson, John L. Hennessy: "Computer Organization and Design – The Hardware / Software Interface ARM Edition", 4th Edition, Elsevier, 2009.
3.	William Stallings: "Computer Organization & Architecture", 7th Edition, PHI, 2006.
4.	Vincent P. Heuring& Harry F. Jordan: "Computer Systems Design and Architecture", 2nd Edition, Pearson Education, 2004.

CIE Assessment:

CIE is based on quizzes, tests, assignments/seminars and any other form of evaluation. Generally, there will be: Three Internal Assessment (IA) tests during the semester (30 marks each), the final IA marks to be awarded will be the average of three tests

- Quizzes/mini tests (4 marks)
- Mini Project / Case Studies (8 Marks)
- Activities/Experimentations related to courses (8 Marks)

SEE Assessment:

i. Question paper for the SEE consists two parts i.e. Part A and Part B. Part A is compulsory and consists of objective type or short answer type questions of 1 or 2 marks each for total of 20 marks covering the whole syllabus.

ii. Part B also covers the entire syllabus consisting of five questions having choices and may contain sub-divisions, each carrying 16 marks. Students have to answer five full questions.

iii. One question must be set from each unit. The duration of examination is 3 hours.

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

High-3, Medium-2, Low-1

Course Title	ANALOG ELECTRONICS LAB	Semester	III
Course Code	MVJ20ECL37	CIE	50
Total No. of Contact Hours	30	SEE	50
No. of Contact Hours/week	3 (L : T : P :: 0: 2: 2)	Total	100
Credits	2	Exam. Duration	3Hrs

Course objective is to:

- Understand the circuit schematic and its working.
- Study the characteristics of different electronic devices.
- Design and test simple electronic circuits as per the specifications using discrete Electronic components.
- Familiarize with EDA /PSPSICE software which can be used for electronic circuit Simulation.

Laboratory Sessions

Sl No	Experiment Name	RBT Level	Hours
Hardware Experiments			
1	Wiring of RC coupled Single stage FET & BJT amplifier and determine the gain-frequency response, input and output impedances	L3	3
2	Wiring of BJT Darlington Emitter follower with and without bootstrapping and determination of the gain, input and output impedances.	L3	3
3	Design an oscillator with tank circuit having two inductances and one capacitance and compare the practical frequency with theoretical frequency.	L4	3
4	Design an oscillator with tank circuit having two capacitance and one inductance and compare the practical frequency with theoretical frequency.	L4	3
5	Conduct experiment to test diode clipping (single/double ended) and clamping circuits (positive/negative).	L3	2

6	Design an Oscillator using FET whose tank circuit produces a total phase shit of 180, and calculate the frequency of output waveform.	L4	3
7	Design an oscillator whose frequency is 2MHZ and compare with the theoretical frequency.	L4	2
8	Find a suitable power amplifier that removes the cross over distortion and calculate the efficiency	L3	3
Simulation using EDA software (EDWinXP, PSpice, MultiSim, Proteus, Circuit Lab or any other equivalent tool can be used)			
9	RC Phase Shift Ocsillator	L3	2
10	Colpitts And Hartley Oscillator	L3	2
11	Crystal Oscillator	L3	2
12	Half and Full wave Rectifier	L3	2

Course outcomes:	
CO1	Design and compare the impedance effect in BJT Darlington Emitter follower circuit
CO2	Design analog circuits using BJT/FETs and evaluate their performance characteristics.
CO3	Design of diode clipper and clamper circuits.
CO4	Compare the hardware and software results for different oscillator and filter circuits.
CO5	Simulate and analyse electronic Circuits for different applications.

Scheme of Evaluation	
Regular Lab work and Writing Lab records	(20+15) = 35 marks
Lab test and Viva-voce at the end of the semester	(10+5) = 15 marks
Total	50 marks

CO-PO Mapping

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

High-3, Medium-2, Low-1

Course Title	DIGITAL SYSTEM DESIGN & VERILOG LAB	Semester	III
Course Code	MVJ20ECL38	CIE	50
Total No. of Contact Hours	30	SEE	50
No. of Contact Hours/week	3 (L : T : P :: 0: 2: 2)	Total	100
Credits	2	Exam. Duration	3Hrs

Course objective is to:

- Demorgan's Theorem, SOP, POS forms
- Full/Parallel Adders, Subtractors and code converter BCD to Excess-3 &vice versa.
- Flip-Flops, Shift registers and Counters.
- Familiarize with the CAD tool to write HDL programs.
- Understand simulation and synthesis of digital design.

Laboratory Sessions

Sl No	Experiment Name	RBT Level	Hours
Rig up the circuit for the following and verify on IC Trainer Kit.			
1	Verify (a) Demorgan's Theorem for 2 variables. (b) The sum-of product and product-of-sum expressions using universal gates.	L3	3
2	Design and implement (a) Full Adder using basic logic gates. (b) Full subtractor using basic logic gates.	L4	3
3	(a) Design and implement (i) 4-bitParallelAdder/ Subtractor using IC 7483. (ii) BCD to Excess-3 code conversion and vice-versa. (b) Realize (i) Adder & Subtractors using IC 74153(ii) 4-variable function using IC 74151(8:1MUX)	L4	3
4	Realize the following flip-flops using NAND Gates.(a) Clocked SR Flip-Flop (b) JK Flip-Flop (c) D-Flip-Flop	L3	3

5	Realize the following shift registers using IC7474 a.SISO (b) SIPO (c) PISO (d) PIPO (e) Ring Counter (f) Johnson Counter.	L3	3
6	Realize (i) Design Mod – N Synchronous Up Counter & Down Counter using 7476 JK Flip-flop (ii) Mod-N Counter using IC7490 / 7476.	L3	3
Simulate the following using Verilog Code and Implement on FPGA			
7	Write a Verilog program for the following combinational designs a) 2 to 4 decoder b) 8 to 3 (encoder without priority & with priority) c). 8 to 1 multiplexer d) 4 bit binary to gray converter e) Multiplexer, De-multiplexer, Comparator.	L3	2
8	Design 4 bit binary, BCD counters with Synchronous reset and asynchronous reset and "any sequence"counters using Verilog code.	L4	2
9	Write HDL code to display messages on alpha numeric LCD display.	L3	2
10	Write a HDL code to control speed, direction of DC and Stepper motor	L3	2
11	Write HDL code to interface Hex key pad and display the key code on seven segment display.	L3	2
12	Write a HDL code to accept Analog signal, Temperature sensor and display the data on LCD or Seven Segment Display.	L3	2
Virtual Lab Links: http://vlabs.iitkgp.ernet.in/dec/			

Course outcomes:	
CO1	Demonstrate the truth table of various expressions and combinational circuits using logic gates.
CO2	Design and test various combinational circuits such as adders, subtractors, comparators, multiplexers and demultiplexers.
CO3	Construct and test flips-flops, counters, shift registers and Counters.

CO4	Write the Verilog/VHDL programs to simulate Combinational circuits in Dataflow, Behavioural and Gate level Abstractions.
CO5	Describe sequential circuits like flip flops and counters in Behavioural description and obtain simulation waveforms.

Scheme of Evaluation	
Regular Lab work and Writing Lab records	(20+15) = 35 marks
Lab test and Viva-voce at the end of the semester	(10+5) = 15 marks
Total	50 marks

CO-PO Mapping

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

High-3, Medium-2, Low-1

Course Title	SAMSKRUTHIKA KANNADA	Semester	III/IV
Course Code	MVJ20SK39/49	CIE	50
Total No. of Contact Hours	15	SEE	50
No. of Contact Hours/week	1 (L : T : P :: 1 :0 : 0)	Total	100
Credits	1	Exam. Duration	2Hrs

Course objective :This course will enable students to understand Kannada and communicate in Kannada language

- Samskruthika Kannada –Parichaya (Introduction to Adalitha kannada)
- Kannada Kavyagala parichaya (Kannada D Ra Bendre, Siddalingaiha)
- Adalithdalli Kannada Padagalu (Kannada Kagunitha Balake, Patra Lekhana, Prabhandha)
- Kannada Computer Gnyana (Kannada Shabdha Sangraha, Computer Paribashika padagalu)
- Activities in Kannada.

Module - 1	L1	3 Hrs
೧. ಕನ್ನಡ ಭಾಷೆ-ಸಂಕ್ಷಿಪ್ತ ವಿವರಣೆ. ೨. ಭಾಷಾ ಪ್ರಯೋಗಲ್ಲಾಗುವ ಲೋಪದೋಷಗಳು ಮತ್ತು ಅವುಗಳ ನಿವಾರಣೆ		
Module - 2	L1	3 Hrs
೧. ಲೇಖನ ಚಿಹ್ನೆಗಳು ಮತ್ತು ಅವುಗಳ ಉಪಯೋಗ ೨. ಪತ್ರ ವ್ಯವಹಾರ.		
Module - 3	L1	3 Hrs
೧. ಆಡಳಿತ ಪತ್ರಗಳು. ೨. ಸರ್ಕಾರದಆದೇಶ ಪತ್ರಗಳು		
Module - 4	L1	3 Hrs
೧. ಸಂಕೀಪ್ತ ಪ್ರಬಂಧರಚನೆ, ಪ್ರಬಂಧ ಮತ್ತು ಭಾಷಾಂತರ ೨. ಕನ್ನಡ ಶಬ್ದಸಂಗ್ರಹ		
Module - 5	L1	3 Hrs

೧. ಕಂಪ್ಯೂಟರ್ ಹಾಗೂ ಮಾಹಿತಿತಂತ್ರಜ್ಞಾನ ೨. ಪಾರಿಭಾಷಿಕ ಆಡಳಿತ ಕನ್ನಡ ಪದಗಳು ಮತ್ತು ತಾಂತ್ರಿಕ/ಕಂಪ್ಯೂಟರ್ ಪಾರಿಭಾಷಿಕ ಪದಗಳು.

Scheme of Evaluation:		
Details		Marks
Average of three Internal Assessment (IA) Tests of 30 Marks each i.e. Σ (Marks Obtained in each test) / 3	CIE(50)	30
Assignment / Case Studies / Quiz		20
Semester End Examination	SEE (50)	50
Total		100

Textbooks:	
1.	Adalitha Kannada – Dr. L Thimmesh, Prof. V Keshav Murthy

Course Title	BALAKE KANNADA	Semester	III/IV
Course Code	MVJ20BK39/49	CIE	50
Total No. of Contact Hours	15	SEE	50
No. of Contact Hours/week	1 (L : T : P :: 1 :0 : 0)	Total	100
Credits	1	Exam. Duration	2Hrs

Course objective :

This course will enable students to understand Kannada and communicate in Kannada language

- Vyavharika Kannada –Parichaya (Introduction to Vyavharika kannada)
- Kannada Aksharamaale haagu uchcharane(Kannada Alphabets and Pronounciation.
- Sambhashanegaagi Kannada Padagalu (Kannada Vocubulary for Communication).
- Kannada Grammer in Conversations(Sambhasaneyalli Kannada Vyakarana)
- Activities in Kannada

Module - 1
Vyavharika Kannada –Parichaya (Introduction to Vyavharika kannada)
Module - 2
Kannada Aksharamaale haagu uchcharane(Kannada Alphabets and Pronounciation
Module - 3
Sambhashanegaagi Kannada Padagalu (Kannada Vocubulary for Communication).
Module - 4
Kannada Grammer in Conversations(Sambhasaneyalli Kannada Vyakarana)
Module - 5
Activities in Kannada

Scheme of Evaluation:

Details		Marks
Average of three Internal Assessment (IA) Tests of 30 Marks each i.e. Σ (Marks Obtained in each test) / 3	CIE(50)	30
Assignment / Case Studies / Quiz		20
Semester End Examination	SEE (50)	50
Total		100

Course Title	CONSTITUTION OF INDIA, PROFESSIONAL ETHICS AND CYBER LAW	Semester	III/IV
Course Code	MVJ20CPH39/49	CIE	50
Total No. of Contact Hours	15	SEE	50
No. of Contact Hours/week	1 (L : T : P :: 1 :0 : 0)	Total	100
Credits	1	Exam. Duration	2 Hrs

Course objective is to:

- To know the fundamental political codes, structure, procedures, powers, and duties of Indian constitution, Indian government institutions, fundamental rights, directive principles and the duties of the citizens.
- To provide overall legal literacy to the young technograts to manage complex societal issues in the present scenario.
- To understand engineering ethics & their responsibilities, identify their individual roles and ethical responsibilities towards society.

Module-1	RBT Level L1,L2,L3	3Hrs.

Introduction to Indian Constitution: The Necessity of the Constitution, The Societies before and after the Constitution adoption. Introduction to the Indian Constitution, The Making of the Constitution, The role of the Constituent Assembly – Preamble and Salient features of the Constitution of India. Fundamental Rights and its Restriction and Limitations in different Complex Situations. Directive Principles of State Policy (DPSP) and its present relevance in our society with examples. Fundamental Duties and its Scope and Significance in Nation Building.

Module – II	RBT Level L1,L2,L3	3Hrs.

Union Executive and State Executive: Parliamentary System, Federal System, Centre-State Relations. Union Executive – President, Prime Minister, Union Cabinet, Parliament - LS and RS, Parliamentary Committees, Important Parliamentary Terminologies. Supreme Court of India, Judicial Reviews and Judicial Activism. State Executives –

Governor, Chief Minister, State Cabinet, State Legislature, High Court and Subordinate Courts, Special Provisions (Article 370, 371, 371J) for some States.		
Module – III	**RBT Level L1,L2,L3**	3Hrs.
Elections, Amendments and Emergency Provisions: Elections, Electoral Process, and Election Commission of India, Election Laws. Amendments - Methods in Constitutional Amendments (How and Why) and Important Constitutional Amendments. Amendments – 7,9,10,12,42,44,61,73,74,75,86, and 91,94,95,100,101,118 and some important Case Studies. Recent Amendments with explanation. Important Judgements with Explanation and its impact on society (from the list of Supreme Court Judgements). Emergency Provisions, types of Emergencies and it's consequences. **Constitutional Special Provisions:** Special Constitutional Provisions for SC & ST, OBC, Special Provision for Women, Children & Backward Classes.		
Module – IV	**RBT Level L1,L2,L3**	3Hrs.
Professional / Engineering Ethics: Scope & Aims of Engineering & Professional Ethics - Business Ethics, Corporate Ethics, Personal Ethics. Engineering and Professionalism, Positive and Negative Faces of Engineering Ethics, Code of Ethics as defined in the website of Institution of Engineers (India): Profession, Professionalism, Professional Responsibility. Clash of Ethics, Conflicts of Interest. **Responsibilities in Engineering** - Responsibilities in Engineering and Engineering Standards, the impediments to Responsibility. Trust and Reliability in Engineering, IPRs (Intellectual Property Rights), Risks, Safety and liability in Engineering.		
Module – V	**RBT Level L1,L2,L3**	3Hrs.
Internet Laws, Cyber Crimes and Cyber Laws: Internet and Need for Cyber Laws, Modes of Regulation of Internet, Types of cyber terror capability, Net neutrality, Types of Cyber Crimes, India and cyber law, Cyber Crimes and the information Technology Act 2000, Internet Censorship, Cybercrimes and enforcement agencies.		

Course Outcomes: On completion of this course, students will be able to	
CO1	Have constitutional knowledge and legal literacy
CO2	Understand Engineering and Professional ethics and responsibilities of Engineers.

CO3	Understand the cybercrimes and cyber laws for cyber safety measure.

Text Books:	
1.	Constitution of India and Professional Ethics, T.S. Anupama, Sunstar Publisher
Reference Books:	
1.	Durga Das Basu (DD Basu): "Introduction to the Constitution on India", (Students Edition.) Prentice –Hall EEE, 19th/20th Edn., (Latest Edition) or 2008.
2.	Shubham Singles, Charles E. Haries, and Et al : "Constitution of India and Professional Ethics" by Cengage Learning India Private Limited, Latest Edition – 2018.
3	M.Govindarajan, S.Natarajan, V.S.Senthilkumar, "Engineering Ethics", Prentice – Hall of India Pvt. Ltd. New Delhi, 2004.
4.	M.V.Pylee, "An Introduction to Constitution of India", Vikas Publishing, 2002.
5.	Latest Publications of NHRC - Indian Institute of Human Rights, New Delhi.

Course Title	UNIVERSAL HUMAN VALUES I	Semester	III
Course Code	MVJ20UHV310	CIE	50
Total No. of Contact Hours	15	SEE	50
No. of Contact Hours/week	1 (L: T: P: 1 : 0 :0)	Total	100
Credits	1	Exam. Duration	2 Hrs.

Course objective is to: This course will enable the students to

- Perceive the need for developing a holistic perspective of life
- Sensitise the scope of life – individual, family (inter-personal relationship), society and nature/existence, Strengthening self-reflection
- Develop more confidence and commitment to understand, learn and act accordingly

Module-1	RBT Level L1,L2	3 Hrs

Welcome and Introductions: Getting to know each other (Self-exploration)

Aspirations and Concerns: Individual academic, career, Expectations of family, peers, society, nation, Fixing one's goals (Basic human aspirations Need for a holistic perspective Role of UHV)

Self-Management: Self-confidence, peer pressure, time management, anger, stress, Personality development, self-improvement (Harmony in the human Being)

Health: Health issues, healthy diet, healthy lifestyle, Hostel life (Harmony of the Self and Body Mental and physical health)

Relationships: Home sickness, gratitude, towards parents, teachers and, others Ragging and interaction, Competition and cooperation, Peer pressure (Harmony in relationship Feelings of trust, respect, gratitude, glory, love)

Society: Participation in society (Harmony in the society)

Natural Environment: Participation in nature (Harmony in nature/existence) **Video link:** 1. https://youtube.com/playlist?list=PLYwzG2fd7hzc4HerTNkc3pS_IvcCfKznV 2. https://youtube.com/playlist?list=PLYwzG2fd7hzcZz1DkrAegkKF4TseekPFv **Presentation:** https://fdp-si.aicte-india.org/AicteSipUHV_download.php		
Module-2	RBT Level L1,L2	3 Hrs
Introduction to Value Education: Right Understanding, Relationship and Physical Facility (Holistic Development and the Role of Education), Self-exploration as the Process for Value Education, Happiness and Prosperity – Current Scenario. **Video link:** 1. https://www.youtube.com/watch?v=85XCw8SU084 2. https://www.youtube.com/watch?v=E1STJoXCXUU&list=PLWDeKF97v9SP_Kt6jqzA3pZ3yA7g_OAQz 3. https://www.youtube.com/channel/UCQxWr5QB_eZUnwxSwxXEkQw		
Module-3	RBT Level L1,L2	3 Hrs
Introduction to Harmony in the Human Being: Understanding Human being as the Co-existence of the Self and the Body, The Body as an Instrument of the Self, Harmony of the Self with the Body. **Video link:** 1. https://www.youtube.com/watch?v=GpuZo495F24 2. https://www.youtube.com/channel/UCQxWr5QB_eZUnwxSwxXEkQw		
Module-4	RBT Level L1,L2	3 Hrs
Introduction to Harmony in the Family and Society: Harmony in the Family – the Basic Unit of Human Interaction, Other Feelings, Justice in Human-to-Human Relationship, Understanding Harmony in the Society.		

Video link: 1. https://www.youtube.com/watch?v=F2KVW4WNnS8 2. https://www.youtube.com/channel/UCQxWr5QB_eZUnwxSwxXEkQw		
Module-5	RBT Level L1,L2	3 Hrs
Introduction to Implications of the Holistic Understanding: Natural Acceptance of Human Values, Basis for Humanistic Education, Humanistic Constitution and Universal Human Order, Holistic Technologies, Production Systems and Management Models-Typical Case Studies. Video link: 1. https://www.youtube.com/watch?v=BikdYub6RY0 2. https://www.youtube.com/channel/UCQxWr5QB_eZUnwxSwxXEkQw		
Course outcomes: On completion of the course, students would be able to		

CO1	Develop a holistic perspective about life
CO2	Explore his/her role (value) in all aspects of living – as an individual, as a member of a family, as a part of the society as an unit in nature
CO3	Become more responsible in life, and in handling problems with sustainable solutions
CO4	Have better critical ability
CO5	Become sensitive to their commitment

Scheme of Evaluation

Details		Marks
Assessment by Faculty mentor (Class Room Evaluation)	CIE(50)	10
Self-Assessment + Assessment by peers		20

Activities / Experimentations related to courses/Assignment		10
Mini Projects / Case Studies		10
Semester End Examination	SEE (50)	50
	Total	100

Text Books:

1.	AICTE SIP UHV-I Teaching Material, https://fdp-si.aicte india.org/ AicteSipUHV _download.php
2.	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
3.	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.	Human Values and Professional Ethics by R R Gaur, R Sangal, G P Bagaria, Excel Books, New Delhi, 2010
2.	Jeevan Vidya: Ek Parichaya, A Nagaraj, Jeevan Vidya Prakashan, Amarkantak, 1999.
3.	Human Values, A.N. Tripathi, New Age Intl. Publishers, New Delhi, 2004.
4.	The Story of Stuff (Book).
5.	The Story of My Experiments with Truth - by Mohandas Karamchand Gandhi

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

High-3, Medium-2, Low-1

Course Title	ADDITIONAL MATHEMATICS-I (COMMON TO ALL BRANCHES)	Semester	III
Course Code	MVJ20MATDIP31	CIE	50
Total No. of Contact Hours	40	SEE	50
No. of Contact Hours/week	3 (L: T: P: 2 : 2 :0)	Total	100
Credits	-	Exam. Duration	3Hrs

Course objective is to: This course viz., aims to prepare the students:

- To familiarize the important and basic concepts of Differential calculus and Differential

  Equation, ordinary/partial differential equations and Vector calculus and analyse the engineering problems.

Module-1	RBT Level L1,L2	8Hrs.

Differential calculus: Recapitulations of successive differentiations -n^{th} derivative - Leibnitz theorem and Problems, Mean value theorem -Rolle's theorem, Lagrange's Mean value theorem , Cauchy's theorem and Taylor's theorem for function of one variables.

Video Link:

1. https://users.math.msu.edu/users/gnagy/teaching/ode.pdf

Module-2	RBT Level L1,L2	8 Hrs.

Integral Calculus:

Review of elementary Integral calculus, Reduction formula

$\int_0^{\frac{\pi}{2}} sin^m x\, dx$, $\int_0^{\frac{\pi}{2}} cos^m x\, dx$, $\int_0^{\frac{\pi}{2}} sin^m cos^n x\, dx$ and problems.

Evaluation of double and triple integrals and Simples Problems.

Video Link:

1. https://www.youtube.com/watch?v=rCWOdfQ3cwQ
2. https://nptel.ac.in/courses/111/105/111105122/

Module-3	RBT Level L1,L2	8Hrs.
Vector Calculus: Derivative of vector valued functions, Velocity, Acceleration and related problems, Scalar and Vector point functions, Gradient, Divergence, Curl, Solenoidal and Irrotational vector fields. Vector identities - div (ϕA), curl (ϕA), curl (grad ϕ), div (curl A). Video Link: 1. https://www.whitman.edu/mathematics/calculus_online/chapter16.html		
Module-4	**RBT Level L1,L2,L3**	**8 Hrs.**
Probability: Introduction-Conditional Probability, Multiplication theorem, Independent events ,Baye's theorem and Problems. Video Link: 1. https://www.khanacademy.org/math/statistics-probability/probability-library 2. https://nptel.ac.in/courses/111/105/111105041/		
Module-5	**RBT Level L1,L2,L3**	**8 Hrs.**
Differential equation: Homogenous differential equation, Linear differential equation, Bernoulli's differential equation and Exact differential equation. Video Link: 1. https://www.mathsisfun.com/calculus/differential-equations.html		

Course outcomes:	
CO1	Apply the knowledge of Differential calculus in the modeling of various physical and engineering phenomena
CO2	Apply the concept of change of order of integration and variables to evaluate multiple integrals and their usage in computing the area and volumes.
CO3	Study on Vector calculus to understand the various solution to Application to Engineering problems.
CO4	Understand the basic Concepts of Probability
CO5	Solve first order linear differential equation analytically using standard methods.

Text Books:	
1.	B.S. Grewal, "Higher Engineering Mathematics" Khanna Publishers, 43rd Edition, 2013.
2.	Ramana B. V., "Higher Engineering Mathematics", Tata Mc Graw-Hill, 2006.
Reference Books:	
1.	Erwin Kreyszig, "Advanced Engineering Mathematics", Wiley-India publishers, 10th edition,2014.
2.	G. B. Gururajachar: Calculus and Linear Algebra, Academic Excellent Series Publication, 2018-19

CIE Assessment:

CIE is based on quizzes, tests, assignments/seminars and any other form of evaluation. Generally, there will be: Three Internal Assessment (IA) tests during the semester (30 marks each), the final IA marks to be awarded will be the average of three tests

- Quizzes/mini tests (4 marks)
- Mini Project / Case Studies (8 Marks)
- Activities/Experimentations related to courses (8 Marks)

SEE Assessment:

i. Question paper for the SEE consists two parts i.e. Part A and Part B. Part A is compulsory and consists of objective type or short answer type questions of 1 or 2 marks each for total of 20 marks covering the whole syllabus.

ii. Part B also covers the entire syllabus consisting of five questions having choices and may contain sub-divisions, each carrying 16 marks. Students have to answer five full questions.

iii. One question must be set from each unit. The duration of examination is 3 hours.

CO-PO Mapping

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	0	3	0	0	0	0	0	0	1	1
CO2	2	3	0	3	0	0	0	0	0	0	1	1
CO3	2	2	0	2	0	0	0	0	0	0	1	0
CO4	3	2	0	3	0	0	0	0	0	0	0	1
CO5	3	3	0	2	0	0	0	0	0	0	0	0

High-3, Medium-2, Low-1