Semester: III		
Transforms, and Numerical Methods (Theory)		
Course Code:	MVJ21MA31D (For EC, EE and IOT)	CIE Marks: 50
Credits:	L: T:P 3:2:0	SEE Marks: 50
Hours:	50L	SEE Duration: 3 Hrs.
Course Learning Objectives: The students will be able to		
1	Solve the linear differential equations using Laplace transforms	
2	Apprehend and apply Fourier transform	
3	Realize and use of Z-Transforms	
4	Use of numerical methods to solve ordinary differential equation	
5	Use of statistical methods in curve fitting applications.	

UNIT-I	
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 **Self-study**: Solution of simultaneous first order differential equations. **Applications**: Analysis of electrical and electronic circuits, used in Signal processing and in control systems. Video Links: https://youtu.be/NFuwtTT7VPM	10 Hrs
UNIT-II	
Fourier Transforms: Infinite Fourier transform, Infinite Fourier sine and cosine transforms, Inverse Fourier transforms, Inverse. Fourier sine and cosine transforms, Convolution theorem. **Self-study**: Complex form of Fourier series. **Applications**: Fourier transforms used in image Video Links: https://youtu.be/r18Gi8lSkfM	10 Hrs
UNIT-III	
Z-Transforms: Definition, standard Z-transforms, properties of Z- transforms- Shifting property, Reversal property, Multiplication by n, initial value and final value theorems. Inverse Z- transform, convolution theorem (proof and problems) Application of Z-transforms to solve difference equations. **Self-study**: Damping rule and problems on them. **Applications**: Fourier transforms used in image processing and Z-transforms in Digital signal processing. Video Links: https://youtu.be/spUNpyF58BY	10 Hrs
UNIT-IV	
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 Quadratic Spline Method.	10 Hrs

Self-study: Adams Bash-Method. **Applications**: To solve initial value problems Video Links: https://youtu.be/pbYn3MEZyms	
UNIT-V	
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. **Self-study**: A study of rank correlation. **Applications**: Applications of Correlation in Signal Processing and application of regression analysis in business Video Links: https://youtu.be/jwTvCxasICc	10 Hrs

Course Outcomes: After completing the course, the students will be able to	
C201.1	Learn to solve linear differential equations using Laplace transforms
C201.2	Demonstrate Fourier Transform as a tool for solving Integral equations
C201.3	Learn to evaluate Z-transform to solve difference equations.
C201.4	Learn to solve algebraic, transcendental and ordinary differential equations numerically.
C201.5	Make use of the correlation and regression analysis to fit a suitable mathematical model for the statistical data

Reference Books	
1.	B.S. Grewal, "Higher Engineering Mathematics" Khanna Publishers, 44th Edition, 2013.
2.	Erwin Kreyszig, "Advanced Engineering Mathematics", Wiley-India publishers, 10th edition, 2014.
3.	Prof G.B.Gururajachar "Engineering Mathematics-III , Academic Excellent series Publications, 2016-17
4.	Ramana B. V., "Higher Engineering Mathematics", Tata McGraw-Hill, 2006.

Continuous Internal Evaluation (CIE):

Theory for 50 Marks

CIE is executed by way of quizzes (Q), tests (T) and assignments. A minimum of three quizzes are conducted along with tests. Test portion is evaluated for 50 marks and quiz is evaluated for 10 marks. Faculty may adopt innovative methods for conducting quizzes effectively. The number of quizzes may be more than three (conduct additional quizzes and take best three). The three tests are conducted for 50 marks each and the average of all the tests are calculated for 50. The marks for the assignments are 20 (2 assignments for 10 marks each). The marks obtained in test, quiz and assignment are added to get marks out of 100 and report CIE for 50 marks.

Semester End Examination (SEE):

SEE for 50 marks is executed by means of an examination. The Question paper for each course contains two parts, Part – A and Part – B. Part – A consists of objective type questions for 20 marks covering the entire syllabus. Part – B Students have to answer five questions, one from each unit for 16 marks adding up to 80 marks. Each main question may have a maximum of three sub divisions. Each unit will have internal choice in which both questions cover entire unit having same complexity in terms of COs and Bloom's taxonomy level.

Total marks: 50+50=100

CO-PO Mapping												
CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
C201.1	3	3	0	3	0	0	0	0	0	0	1	0
C201.2	3	3	0	3	0	0	0	0	0	0	0	1
C201.3	2	3	0	3	0	0	0	0	0	0	1	0
C201.4	3	3	0	3	0	0	0	0	0	0	0	0
C201.5	3	3	0	2	0	0	0	0	0	0	0	1

Semester: III		
Electric Circuit Analysis with Pspice (Theory)		
Course Code:	MVJ21EE32	CIE Marks:50
Credits:	L:T:P: 3:2:0	SEE Marks: 50
Hours:	50L	SEE Duration: 3 Hrs
Course Learning Objectives: The students will be able to		
1	Solve the electrical circuits using different analytical methods.	
2	Apply various network theorems to solve circuits.	
3	Analyze the series and parallel resonance in RLC circuits.	
4	Analyze transient response in series circuits.	
5	Analyze complex circuits using network topology and two-port networks.	

UNIT-I	
Basic circuit concepts: Ideal and Practical sources, Source Transformations, Loop and nodal analysis with linearly dependent and independent sources for DC circuits, Analysis of networks involving concepts of super node, Super mesh. **Laboratory Sessions/ Experimental learning**: Verification of Kirchhoff's Voltage law and current law using PSpice **Applications**: Analysis of electric circuits by reducing their complexity. **Video link**: https://nptel.ac.in/courses/108104139/	10Hrs
UNIT-II	
Network Theorems: Superposition Theorem, Thevenin's Theorem, Norton's theorems; Maximum power transfer theorem, Reciprocity Theorem, Millman's theorem. **Laboratory Sessions/ Experimental learning**: Verification of all network theorems using PSpice **Applications**: Analysis of complex electric circuits by reducing the complexity. **Video link**: http://www.digimat.in/nptel/courses/video/108105112/L20.html	10Hrs
UNIT-III	
Resonant Circuits: RLC Series and parallel resonance, the frequency response of series and parallel circuits, Q factor, Bandwidth. Application. **Laboratory Sessions/ Experimental learning**: Realization of Series/Parallel Resonance using Pspice. **Applications**: Network topology- to understand the networking concepts Resonant circuits- Oscillating circuit, Radio, and communication engineering **Video link**: https://nptel.ac.in/courses/108102097/	10Hrs
UNIT-IV	
Transient Analysis: Behaviour of circuit elements under switching condition and their representation, Evaluation of Initial and Final conditions in series RL, RC, and RLC circuits. **Laboratory Sessions/ Experimental learning**: Realization of the transient response of series/Parallel RL, RC circuits in Pspice.	10Hrs

Applications: Stability Analysis of systems containing energy storage elements **Video link**: https://nptel.ac.in/courses/108102097/	
UNIT-V	
Network topology: Graph of a network, Concept of tree and Co-tree, Incidence matrix, tie-set matrix, cut-set & cut set matrix, the concept of duality and dual networks. **Two port networks**: Definition of Z, Y, ABCD parameters, Relationship between parameter sets. **Laboratory Sessions/ Experimental learning**: Virtual lab experiment – Three-phase power measurement for balanced/unbalanced star-connected load **Applications**: Model of voltage, current characteristics of complex electrical networks, Modeling of the transmission line. Video link: • https://nptel.ac.in/courses/108104139	10Hrs

Course Outcomes: After completing the course, the students will be able to	
C202.1	Solve the electrical circuits using different analytical methods.
C202.2	Apply various network theorems to solve circuits.
C202.3	Analyze the series and parallel resonance in RLC circuits.
C202.4	Analyze transient response in series circuits.
C202.5	Analyze complex circuits using network topology and two-port networks.

Reference Books	
1	"Network Analysis", M. E. Van Valkenburg/T.S. Rathore, Third ,2019, Pearson Education, 978-9353433123.
2	"Network analysis and Synthesis", D. Anand Kumar, 2018, PHI Learning Pvt. Ltd., ISBN-13978-9388028103
3	"Circuit theory analysis and synthesis", A Chakrabarti, 2018, Dhanpat Rai Publishing Co Pvt Ltd, ISBN: 9788177000009
4	"Engineering Circuit Analysis" Hayt, Kemmerly and Durbin, 2005, Tata McGraw Hill Education,978-0070611054

Continuous Internal Evaluation (CIE):

Theory for 50 Marks

CIE is executed by way of quizzes (Q), tests (T) and assignments. A minimum of three quizzes are conducted along with tests. Test portion is evaluated for 50 marks and quiz is evaluated for 10 marks. Faculty may adopt innovative methods for conducting quizzes effectively. The number of quizzes may be more than three (conduct additional quizzes and take best three). The three tests are conducted for 50 marks each and the average of all the tests are calculated for 50. The marks for the assignments are 20 (2 assignments for 10 marks each). The marks obtained in test, quiz and assignment are added to get marks out of 100 and report CIE for 50 marks.

Semester End Examination (SEE):

SEE for 50 marks is executed by means of an examination. The Question paper for each course contains two parts, Part – A and Part – B. Part – A consists of objective type questions for 20 marks covering the entire syllabus. Part – B Students have to answer five questions, one from each unit for 16 marks adding up to 80 marks. Each main question may have a maximum of three sub divisions. Each unit will have internal choice in which both questions cover entire unit having same complexity in terms of COs and Bloom's taxonomy level.

Total marks: 50+50=100

CO-PO Mapping												
CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
C202.1	3	3	1	1	1	-	-	-	1	-	-	2
C202.2	3	3	1	2	1	-	-	-	1	-	-	2
C202.3	3	3	1	2	1	-	-	-	1	-	-	2
C202.4	3	3	1	2	1	-	-	-	1	-	-	2
C202.5	3	2	1	2	1	-	-	-	1	-	-	2

Semester: III		
DIGITAL ELECTRONICS		
Course Code:	MVJ21EE33	CIE Marks: 50
Credits:	L:T:P: 3:0:0	SEE Marks: 50
Hours:	40L	SEE Duration: 3 Hrs.
Course Learning Objectives: The students will be able to		
1	Understand the Digital fundamentals, Boolean algebra, and its applications in digital systems	
2	Design of various combinational digital circuits using logic gates	
3	Design procedures for synchronous and asynchronous sequential circuits	
4	Design counters and registers for the given circuits.	
5	Explain the electronic circuits involved in the making of logic gates	

UNIT-I	
DIGITAL FUNDAMENTALS: Boolean theorems, Logic gates, Universal gates, Sum of products and product of sums, Min-terms and Max-terms, Karnaugh map Minimization **Laboratory Sessions/ Experimental learning**: Design and implementation of code converters using logic gates (i) BCD to excess-3 code and vice versa (ii) Binary to gray and vice-versa **Applications**: Traffic Signals **Video link**: https://nptel.ac.in/courses/108105113	8 Hrs
UNIT-II	
COMBINATIONAL CIRCUIT DESIGN: Design of Half and Full Adders, Half and Full Subtractors, Binary Parallel Adder – Carry look ahead Adder, BCD Adder, Multiplexer, Demultiplexer, Magnitude Comparator, Decoder, Encoder, Priority Encoder. **Laboratory Sessions/ Experimental learning:** - To realize half/full adder and half/full subtractor. Using X-OR and basic gates Using only nand gates. **Applications:** Microcontrollers for arithmetic subtraction **Video link:** https://www.youtube.com/watch?v=85XxQZqBNlg	8 Hrs
UNIT-III	
SYNCHRONOUS SEQUENTIAL CIRCUITS: Flip flops – SR, JK, T, D, Master/Slave FF – operation and excitation tables. Design – Moore/Mealy models, state minimization, state assignment, **Laboratory Sessions/ Experimental learning:** Truth table verification of Flip-Flops: (i) JK Master Slave (ii) D- Type (iii) T- Type. **Applications:** Data Transfer, Counters **Video link:** 1. https://www.youtube.com/watch?v=EAhtV0H6z0Y 2. https://www.youtube.com/watch?v=j_NrUIwj1gc	8 Hrs
UNIT-IV	
Circuit implementation – Design of Counters- Ripple Counters, Ring Counters, Shift registers, Universal Shift Register. Application of shift registers.	8 Hrs

Laboratory Sessions/ Experimental learning: Applications: Realization of 3-bit counters as a sequential circuit and MOD – N counter design using 7476,7490,74193 Video link: 1.https://www.youtube.com/watch?v=Iecj9xmIfXM 2.https://www.youtube.com/watch?v=aGHpADG8Yo4	
UNIT-V	
MEMORY DEVICES AND DIGITAL INTEGRATED CIRCUITS: Basic memory structure – ROM -PROM – EPROM – EEPROM –EAPROM, RAM – Static and dynamic RAM – Programmable Logic Devices – Programmable Logic Array (PLA) – Programmable Array Logic (PAL) – Field Programmable Gate Arrays (FPGA. Laboratory Sessions/ Experimental learning: Design and testing of Monostable and Astable multivibrators using 555 timers. Applications: Video processor Video link: https://www.youtube.com/watch?v=2aRwFWhLk0o0	8 Hrs

Course Outcomes: After completing the course, the students will be able to	
C203.1	Solve different logic equations using K map and compare different logic families
C203.2	Develop combinational circuit for given circuits.
C203.3	Develop state diagrams for given clocked sequential circuits.
C203.4	Develop counters and registers of circuits.
C203.5	Explain the various semiconductor memories and related technology

Reference Books	
1.	Electronic Devices and Circuit Theory, Robert L Boylestad Louis Nashelsky, Pearson, 11th Edition, Pearson India, 2015.
2.	Electronic Devices and Circuits, S.Salivahanan & N.Suresh, McGraw Hill, 3rd Edition, 2013.
3.	Fundamentals of Logic design, Charles H Roth and Larry L Kinney,Cengage Learning,2019.

Continuous Internal Evaluation (CIE):
Theory for 50 Marks

CIE is executed by way of quizzes (Q), tests (T) and assignments. A minimum of three quizzes are conducted along with tests. Test portion is evaluated for 50 marks and quiz is evaluated for 10 marks. Faculty may adopt innovative methods for conducting quizzes effectively. The number of quizzes may be more than three (conduct additional quizzes and take best three). The three tests are conducted for 50 marks each and the average of all the tests are calculated for 50. The marks for the assignments are 20 (2 assignments for 10 marks each). The marks obtained in test, quiz and assignment are added to get marks out of 100 and report CIE for 50 marks.

Semester End Examination (SEE):

SEE for 50 marks is executed by means of an examination. The Question paper for each course contains two parts, Part – A and Part – B. Part – A consists of objective type questions for 20 marks covering the entire syllabus. Part – B Students have to answer five questions, one from each unit for 16 marks adding up to 80 marks. Each main question may have a maximum of three sub divisions. Each unit will have internal choice in which both questions cover entire unit having same complexity in terms of COs and Bloom's taxonomy level.

Total marks: 50+50=100

CO-PO Mapping												
CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
C203.1	2	2	2	1	2	-	-	-	-	-	-	-
C203.2	2	2	2	2	3	-	-	-	-	-	-	-
C203.3	2	2	2	2	3	-	-	-	-	-	-	-
C203.4	2	3	3	2	3	-	-	-	-	-	-	-
C203.5	2	2	3	2	3	-	-	-	-	-	-	-

ANALOG ELECTRONICS AND OPAMP WITH PSPICE (Theory and Practice)		
Course Code:	MVJ21EE34	CIE Marks:50+50
Credits:	L: T: P: 3:0:2	SEE Marks: 50 +50
Hours:	40 L+ 26 P	SEE Duration: 03+03 Hours

Course Learning Objectives: The students will be able to	
1	Understand the working of different diode circuits and characteristics of special diodes.
2	Use transistors as multistage amplifiers and feedback amplifiers.
3	Understand the basic operations of operational amplifier circuits.
4	Discuss about various active filters.
5	Discuss the specific applications of linear ICs.

UNIT-I	
Diode circuits: Diode clipping and clamping circuits, Special Diodes Schottky diodes, Tunnel diode, Varactor diode characteristics and applications. **Multistage Amplifiers**: Cascade and cascode connections, direct coupled and RC Coupled multi-stage amplifiers. **Laboratory Sessions / Experimental learning:** Formation of different waveforms by using clipper and clamper circuits in PSpice. **Applications**: Analysis of composite picture signals **Video link**: https://lake.videoken.com/nptel/category/698/search/clipping%20using%20diodes/video/tZE0-YcL0XM	8Hrs
UNIT-II	
Feedback amplifiers: Concepts of feedback – Classification of feedback amplifiers – General characteristics of Negative feedback amplifiers Effect of Feedback on Amplifier characteristics **Oscillators**: Principle of operation, Condition for Oscillations, analysis and derivation of frequency of oscillation of phase shift oscillator, working of crystal oscillator and LC Oscillators. **Laboratory Sessions/ Experimental learning**: Design and testing of BJT -RC phase shift oscillator for given frequency of oscillation in PSpice. **Applications**: Analysis of different pulse generations. **Video link**: 1. https://www.youtube.com/watch?v=0nXEUkFBd8A 2. https://www.youtube.com/watch?v=SVQutMsLKfQ	8Hrs

UNIT-III	
Operational Amplifiers: Introduction, Block diagram representation of a typical Op-amp, characteristics of an ideal and practical Op-amp, open loop and closed loop configuration of op-amp, differential amplifier, inverting & non –inverting amplifier, Op-amp with negative feedback. **General Linear Applications**: A.C. amplifier, summing, scaling & averaging amplifier. **Laboratory Sessions/ Experimental learning**: Analysis of inverting and non-inverting op-amp circuits using PSpice **Applications**: Analysis of audio mixer to add different signals with equal gains **Video link:** https://lake.videoken.com/nptel/search/AC%20Amplifiers/video/J92DIPyPnzY	8 Hrs
UNIT-IV	
Active Filters: First & Second order high pass & low pass Butterworth filters. Band pass filters, all pass filters. **DC Voltage Regulators**: voltage regulator basics, voltage follower regulator, adjustable output regulator, LM317 Integrated circuits regulators. **Laboratory Sessions/ Experimental learning**: Design and realize an op – amp based first order Butterworth (a) low pass (b) high pass and (c)band pass filters for a given cut off frequency/frequencies to verify the frequency response Characteristic. **Applications**: Analysis of constant power supply **Video link:** https://lake.videoken.com/nptel/search/ACTIVE%20FILTER/video/b37hZCpVnuc	8 Hrs
UNIT-V	
Signal Generators: Triangular / rectangular wave generator. **Comparators & Converters**: Basic comparator, zero crossing detector, Schmitt trigger circuit, voltage to current converter with grounded load, current to voltage converter and basics of voltage to frequency and frequency to voltage converters. **Laboratory Sessions/ Experimental learning**: Verify the operation of an op – amp as (a) voltage comparator circuit and (b) zero crossing detector. **Applications**: Generation of different signals	8 Hrs

Video link: https://www.youtube.com/watch?v=L5-a1y1wD8k	

LABORATORY EXPERIMENTS

1. Design of different clipping circuits.
2. Design of different clamping circuits.
3. Design and testing of BJT -RC phase shift oscillator for given frequency of oscillation.
4. Design and realize to analyze the frequency response of an op – amp amplifier under inverting and non - inverting configuration for a given gain.
5. Design and verify the operation of op – amp as an (a) adder (b) subtractor (c) integrator and (d) differentiator.
6. Design and realize Schmitt trigger circuit using an op – amp for desired upper trip point (UTP) and lower trip point (LTP).
7. Design and realize an op-amp based function generator to generate square and triangular waves of desired frequency.
8. Designing of Fixed voltage power supply (voltage regulator) using IC regulators 78 series and 79 series.

Along with mandatory experiments students are advised to complete two open ended experiments. The following are some suggestions for open ended experiments.

9. Design and Testing of Full wave – center tapped transformer type and Bridge type rectifier circuits with and without Capacitor filter. Determination of ripple factor, regulation, and efficiency.
10. Design and realize an op – amp based function generator to generate sine, square and triangular waves of desired frequency.

Course Outcomes: After completing the course, the students will be able to	
C204.1	Explain the working of different diode circuits and characteristics of special diodes.
C204.2	Explain the concept of multistage amplifiers and feedback amplifiers.
C204.3	Explain basic operations of operational amplifier circuits.
C204.4	Describe the working of various active filters.
C204.5	Discuss the specific applications of linear ICs.

Reference Books	
1	Electronic Devices and Circuit Theory, Robert L Boylestad Louis Nashelsky, Pearson, 11th Edition, 2015.
2	Electronic Devices and Circuits, S.Salivahanan & N.Suresh, McGraw Hill, 3rd Edition, 2013
3.	Operational Amplifiers and Linear ICs, David A. Bell Oxford 3rd Edition 2011
4.	Linear Integrated Circuits, S. Salivahanan, et al McGraw Hill 2nd Edition,2014

Continuous Internal Evaluation (CIE):

Theory for 50 Marks

CIE is executed by way of quizzes (Q), tests (T) and assignments. A minimum of three quizzes are conducted along with tests. Test portion is evaluated for 50 marks and quiz is

evaluated for 10 marks. Faculty may adopt innovative methods for conducting quizzes effectively. The number of quizzes may be more than three (conduct additional quizzes and take best three). The three tests are conducted for 50 marks each and the average of all the tests are calculated for 50. The marks for the self -study are 20 (2 presentations are be held for 10 marks each). The marks obtained in test, quiz and self -studies are added to get marks out of 100 and report CIE for 50 marks.

Laboratory- 50 Marks

The laboratory session is held every week as per the timetable and the performance of the student is evaluated in every session. The average of the marks over number of weeks is considered for 30 marks. At the end of the semester a test is conducted for 10 marks. The students are encouraged to implement additional innovative experiments in the lab and are awarded 10 marks. Total marks for the laboratory is 50.

Semester End Examination (SEE):

Total marks: 50+50=100

SEE for 50 marks are executed by means of an examination.

The Question paper for each course contains two parts, Part – A and Part – B. Part – A consists of objective type questions for 20 marks covering the complete syllabus. Part – B Students have to answer five questions, one from each unit for 16 marks adding up to 80 marks. Each main question may have a maximum of three subdivisions. Each unit will have internal choice in which both questions cover entire unit having same complexity in terms of COs and Bloom's taxonomy level.

Laboratory- 50 Marks

Experiment Conduction with proper results is evaluated for 40 marks and Viva is for 10 marks. Total SEE for laboratory is 50 marks.

CO-PO Mapping												
CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
C204.1	3	3	2	-	-	-	-	-	-	-	-	-
C204.2	3	2	1	-	-	-	-	-	-	-	-	1
C204.3	3	3	2	-	-	-	-	-	-	-	-	-
C204.4	3	3	1	1	2	-	-	-	-	-	-	1
C204.5	3	3	1	1	2	-	-	-	-	-	-	1

Electrical Machines-I (Theory and Practice)		
Course Code:	MVJ21EE35	CIE Marks:50+50
Credits:	L:T:P:S: 3:0:2:Y	SEE Marks: 50 +50
Hours:	40 L+ 26 P	SEE Duration: 03+03 Hours

Course Learning Objectives: The students will be able to	
1	Understand the concepts of transformers and suggest a suitable three phase transformer connection.
2	Discuss the various methods for testing and parallel operation of a transformer.
3	Explain the detailed working of three phase induction motor.
4	Explain the performance characteristics of induction machines.
5	Explain the starting and speed control of induction motor.

UNIT-I	
Single phase Transformers: Operation of practical transformer under no-load and on-load with phasor diagrams. calculation of equivalent circuit parameters and predetermination of efficiency-commercial and all-day efficiency. Voltage regulation and its significance. **Three-phase Transformers:** Introduction, Constructional features of three-phase transformers (self-study) Transformer connection for three phase operation– star/star, delta/delta, star/delta, zigzag/star and V/V, comparative features. Phase conversion-Scott connection for three-phase to two-phase conversion. **Laboratory Sessions/ Experimental learning:** Plotting B-H curve/hysteresis loop of different core material specimen for comparative study. **Applications:** R&D in transformer core manufacture **Video link / Additional online information:** https://nptel.ac.in/content/storage2/courses/112108150/pdf/PPTs/MTS_16_m.pdf	8 Hrs
UNIT-II	
Testing of Transformers: Open circuit and short circuit tests, Polarity test, Sumpner's test, separation of hysteresis and eddy current losses **Parallel Operation of Transformers:** Necessity of Parallel operation, conditions for parallel operation– Single phase and three phase. Load sharing in case of similar and dissimilar transformers. **Auto transformers and tap changing transformers:** Introduction to autotransformer-copper economy, equivalent circuit, no load and on load tap changing transformers. Cooling of transformers. **Laboratory Sessions/ Experimental learning:** Computer simulation of plotting efficiency and regulation curves of a single-phase transformer using OC and SC test data. **Applications:** Countercheck for manufacturer's load test data **Video link / Additional online information:** https://nptel.ac.in/courses/108/105/108105017/	8Hrs
UNIT-III	

Three Phase Induction Motors: Review of concept and generation of rotating magnetic field, Principle of operation, construction, classification and types; squirrel-cage, slip-ring (self-study). Slip, Torque equation, torque-slip characteristic covering motoring, generating, and braking regions of operation, Maximum torque, significance of slip. **Laboratory Sessions/ Experimental learning**: Assembling of poly-phase induction machines. **Applications**: Understanding the detailed analysis of poly-phase induction motors. **Web Link and Video Lectures**: https://www.youtube.com/watch?v=dZyO5gcWP-o https://youtu.be/leXNHZM-CZE	8Hrs
UNIT-IV	
Performance of Three-Phase Induction Motor: Phasor diagram of induction motor on no-load and on load, equivalent circuit, losses, efficiency, No-load and blocked rotor tests. Performance of the motor from the circle diagram and equivalent circuit. Cogging and crawling. Induction motor working as induction generator. **Laboratory Sessions/ Experimental learning**: Brake test on slipring induction motor. **Applications**: Induction motor drives. **Web Link and Video Lectures**: https://www.youtube.com/watch?v=ze8LY4yq9Wk https://youtu.be/eMq9j0KY2Ak	8Hrs
UNIT-V	
Starting and Speed Control of Three-Phase Induction Motors: Need for starter. Direct on line, Star-Delta, and autotransformer starting. Rotor resistance starting. Speed control by voltage, frequency, and rotor resistance methods. **Single-Phase Induction Motor**: Double revolving field theory and principle of operation. Construction and operation of split-phase, capacitor start, capacitor run, and shaded pole motors. Comparison of single-phase motors and applications. **Laboratory Sessions/ Experimental learning**: Assembling of poly-phase induction machines. **Applications**: Understanding the detailed analysis of poly-phase induction motors. **Web Link and Video Lectures**: https://www.youtube.com/watch?v=dZyO5gcWP-o https://youtu.be/leXNHZM-CZE	8Hrs
LABORATORY EXPERIMENTS	
1. Open Circuit Characteristics of DC shunt generator. 2. Hopkinson's test on identical DC shunt machines. 3. Fields test on DC series machines. 4. Swinburne's test on a DC shunt motor and speed control of DC shunt motor.	

5. Brake test on DC shunt motor.
6. O.C. & S.C. Tests on Single phase Transformer-Predetermination of efficiency and regulation.
7. Sumpner's test on identical single-phase transformers.
8. Scott Connection of two single phase transformers.

Along with mandatory experiments students are advised to complete two open ended experiments. The following are some suggestions for open ended experiments.

9. Parallel operation of Single-phase Transformers.
10. Separation of core losses in a single-phase transformer.
11. Load test on DC compound generator.

Course Outcomes: After completing the course, the students will be able to	
C205.1	Understand the construction and operation of 1-phase, 3-Phase transformers.
C205.2	Analyze the performance of transformers by polarity test, Sumpner's Test, phase conversion, 3-phase connection, and parallel operation.
C205.3	Understand the working of three phase induction motors and applications.
C205.4	Analyze performance characteristics of induction machines.
C205.5	Understand the starting and speed control of induction motor.

Reference Books	
1.	Electric Machines, D. P. Kothari, et al, 4th Edition, 2011.
2.	Principals of Electrical Machines, V.K Mehta, Rohit Mehta, S Chand, 2nd edition, 2009
3.	Electric Machines, MulukuntlaS.Sarma,at el, Cengage, 1st Edition, 2009
4.	Electrical Technology, B.L Theraja, Volume2, S. Chand, 22nd Edition

Continuous Internal Evaluation (CIE):

Theory for 50 Marks

CIE is executed by way of quizzes (Q), tests (T) and assignments. A minimum of three quizzes are conducted along with tests. Test portion is evaluated for 50 marks and quiz is evaluated for 10 marks. Faculty may adopt innovative methods for conducting quizzes effectively. The number of quizzes may be more than three (conduct additional quizzes and take best three). The three tests are conducted for 50 marks each and the average of all the tests are calculated for 50. The marks for the self -study are 20 (2 presentations are be held for 10 marks each). The marks obtained in test, quiz and self -studies are added to get marks out of 100 and report CIE for 50 marks.

Laboratory- 50 Marks

The laboratory session is held every week as per the time table and the performance of the student is evaluated in every session. The average of the marks over number of weeks is considered for 30 marks. At the end of the semester a test is conducted for 10 marks. The

students are encouraged to implement additional innovative experiments in the lab and are awarded 10 marks. Total marks for the laboratory is 50.

Semester End Examination (SEE):

Total marks: 50+50=100

SEE for 50 marks are executed by means of an examination.

The Question paper for each course contains two parts, Part – A and Part – B. Part – A consists of objective type questions for 20 marks covering the complete syllabus. Part – B Students have to answer five questions, one from each unit for 16 marks adding up to 80 marks. Each main question may have a maximum of three sub divisions. Each unit will have internal choice in which both questions cover entire unit having same complexity in terms of COs and Bloom's taxonomy level.

Laboratory- 50 Marks

Experiment Conduction with proper results is evaluated for 40 marks and Viva is for 10 marks. Total SEE for laboratory is 50 marks.

CO-PO Mapping												
CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
C205.1	3	3	-	1	2	-	-	-	-	-	-	1
C205.2	3	3	-	1	2	-	-	-	-	-	-	1
C205.3	3	3	-	1	2	-	-	-	-	-	-	1
C205.4	3	3	-	1	2	-	-	-		-	-	1
C205.5	3	3	-	1	2	-	-	-	-	-	-	1

Semester: III		
CONSTITUTION OF INDIA AND PROFESSIONAL ETHICS AND CYBER LAW (Theory)		
Course Code:	MVJ21CPH36	CIE Marks: 50
Credits:	L:T:P: 1:0:0	SEE Marks: 50
Hours:	15L	SEE Duration: 2 Hrs.
Course Learning Objectives: The students will be able to		
1	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.	
2	To provide overall legal literacy to the young technograts to manage complex societal issues in the present scenario.	
3	To understand engineering ethics & their responsibilities, identify their individual roles and ethical responsibilities towards society.	

UNIT-I	
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.	3 Hrs
UNIT-II	
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.	3 Hrs
UNIT-III	
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 –	3 Hrs

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.	
UNIT-IV	
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	3 Hrs
UNIT-V	
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.	3 Hrs

Course Outcomes: After completing the course, the students will be able to	
C206.1	Have constitutional knowledge and legal literacy
C206.2	Understand Engineering and Professional ethics and responsibilities of Engineers.
C206.3	Understand the cyber-crimes and cyber laws for cyber safety measure.

Reference Books	
1.	Durga Das Basu (DD Basu): "Introduction to the Constitution on India", (Students Edition.) Prentice –Hall EEE, 19th/20thEdn., (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.

Semester: III		
Domestic Wiring (Theory and Practice)		
Course Code:	MVJ21EEA37	CIE Marks:50
Credits:	L:T:P:: 1:0:2	SEE Marks: 50
Hours:	5L+10P	SEE Duration: 02 Hours

Course Learning Objectives: The students will be able to	
1	Understand the working principles of different household domestic appliances.
2	Understand the various tools and equipments used for domestic wiring.
3	Acquire necessary knowledge on identifying parts of various electrical appliances.
4	Acquire necessary skills/hand on experience/ working knowledge on single-phase and three-phase connections, basics of electrical wiring.
5	Acquire the electrical connections layout diagrams for various lighting system.

UNIT-I	
Introduction to wiring a house: Flow of electricity, wiring cables and Wire gauges, Calculating Amps, Choosing cables, Connecting meter base to panel, Connecting the number of lamps in series and parallel circuits, Elements in main panel, identifying phase, neutral, and earthing in AC supply.	3 Hrs
UNIT-II	
Tools and Equipment used for domestic wiring: Insulated and Grounded tools, AC powered tools, Cordless tools, Specialised tools: Multimeters, Tung Tester, Manual and Digital Megger, Switches boxes, types of switches and dimmers.	3 Hrs
UNIT-III	
Grounding and Protection Methods of grounding, Choosing grounding materials, art of grounding, Fuses and circuit breaker selection and installation.	3 Hrs
UNIT-IV	
Room by Room Wiring Estimation and cost of wiring, Stocking Up, Outlet box selection, Planning Outlet box and switch location, Pulling cable in new construction, Draw, wire up & test different types of domestic wiring.	3 Hrs
UNIT-V	
Introduction to wiring fixtures Choosing the right box for wiring connection, Lighting, Ceiling Fan, Water heater, standby generators.	3 Hrs

Course Outcomes: After completing the course, the students will be able to	
C207.1	Understand basic concept of residential wiring
C207.2	Explain tools and equipment used for domestic wiring.
C207.3	Illustrate the grounding process of a residential building and identify different protection devices.
C207.4	Plan a residential wiring room by room.

C207.5	Illustrate a complete residential wiring
Reference Books	
1.	Practical guide to inspection, testing, and certification of electrical installations, Kitcher C., Routledge. Newnes; 3rd edition, 2009. ISBN: 0080969070
2.	Electric wiring: domestic, Scaddan, Brian, Routledge, 2003. ISBN 9780367023348
3.	Handbook of Repair & Maintenance of domestic electronics appliances, Shashi Bhushan Sinha, BPB Publications, 2016, ISBN: 9788183335027.
4.	Wiring a house, Rex cauldwell, Taunton press, 5th edition, 2014, ISBN:162710674X

Semester: III		
Additional Mathematics-I (Common to all branches)		
Course Code:	MVJ21MATDIP-1	CIE Marks:50
Credits:	L:T:P:S: 1:2:0:0	SEE Marks: 50
Hours:	40L	SEE Duration: 3 Hrs

Course Learning Objectives: The students will be able to	
1	Familiarize the important and introductory concepts of Differential calculus
2	Provide essential concepts integral calculus
3	Gain knowledge of vector differentiation
4	Learn basics of probability
5	Ordinary differential equations of first order and analyze the engineering problems.

UNIT-I	
Differential calculus: Recapitulation of successive differentiation -nth derivative -Leibnitz theorem (without proof) and Problems, Polar curves - angle between the radius vector and tangent, angle between two curves, pedal equation, Taylor's and Maclaurin's series expansions- Illustrative examples. **Video Link**: 1. http://nptel.ac.in/courses.php?disciplineID=111	8 Hrs
UNIT-II	
Integral Calculus: Statement of reduction formulae for the integrals of $\sin^n(x)$, $\cos^n(x)$, $\sin^n(x)\cos^n(n)$ and evaluation of these integrals with standard limits-problems. Double and triple integrals-Simple examples. **Video Link**: 1. http://nptel.ac.in/courses.php?disciplineID=111	8 Hrs
UNIT-III	
Vector Differentiation: Scalar and Vector point functions, Gradient, Divergence, Curl, Solenoidal and Irrotational vector fields. Vector identities - $div(\phi\vec{A}), curl(\phi\vec{A}), curl(grad(\phi)), div(curl\vec{A})$. **Video Link**: 1. http://nptel.ac.in/courses.php?disciplineID=111	8 Hrs
UNIT-IV	
Probability: Basic terminology, Sample space and events. Axioms of probability. Conditional probability – illustrative examples. Bayes theorem-examples. **Video Link**: 1. http://nptel.ac.in/courses.php?disciplineID=111	8 Hrs
UNIT-V	
Ordinary Differential Equations of First Order: Introduction – Formation of differential equation, solutions of first order and first-degree differential	8 Hrs

equations: variable separable form, homogeneous, exact, linear differential equations. **Video Link**: 1. http://nptel.ac.in/courses.php?disciplineID=111	

Course Outcomes: After completing the course, the students will be able to	
C208.1	Apply the knowledge of calculus to solve problems related to polar curves and its applications
C208.2	Apply the concept of integration and variables to evaluate multiple integrals and their usage in computing the area and volumes.
C208.3	Illustrate the applications of multivariate calculus to understand the solenoidal and irrotational vectors and also exhibit the inter dependence of line, surface and volume integrals.
C208.4	Understand the basic Concepts of Probability
C208.5	Recognize and solve first-order ordinary differential equations occurring in different branches of engineering.

Reference Books	
1.	B.S. Grewal, Higher Engineering Mathematics, Khanna Publishers, 43rd Edition, 2013, .
2.	G. B. Gururajachar, Calculus and Linear Algebra, Academic Excellent Serie Publication, 2018-19
3.	Chandrashekar K. S, Engineering Mathematics-I, Sudha Publications, 2010.

Continuous Internal Evaluation (CIE):

Theory for 50 Marks

CIE is executed by way of quizzes (Q), tests (T) and assignments. A minimum of three quizzes are conducted along with tests. Test portion is evaluated for 50 marks and quiz is evaluated for 10 marks. Faculty may adopt innovative methods for conducting quizzes effectively. The number of quizzes may be more than three (conduct additional quizzes and take best three). The three tests are conducted for 50 marks each and the average of all the tests are calculated for 50. The marks for the assignments are 20 (2 assignments for 10 marks each). The marks obtained in test, quiz and assignment are added to get marks out of 100 and report CIE for 50 marks.

Semester End Examination (SEE):

Total marks: 50+50=100

SEE for 50 marks is executed by means of an examination. The Question paper for each course contains two parts, Part – A and Part – B. Part – A consists of objective type

questions for 20 marks covering the entire syllabus. Part – B Students have to answer five questions, one from each unit for 16 marks adding up to 80 marks. Each main question may have a maximum of three sub divisions. Each unit will have internal choice in which both questions cover entire unit having same complexity in terms of COs and Bloom's taxonomy level.

CO-PO Mapping												
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C208.2	3	3	0	2	0	0	0	0	0	0	1	1
C208.3	3	3	0	3	0	0	0	0	0	0	1	1
C208.4	2	2	0	3	0	0	0	0	0	0	1	1
C208.5	2	2	0	2	0	0	0	0	0	0	0	1