Vidyavardhaka Sangha ®, Mysuru

VIDYAVARDHAKA COLLEGE OF ENGINEERING

Autonomous Institute, Affillated to Visvesaraya Technological University, Belagavi

(Approved by AICTE, New Delhi & Government of Karnataka)
Accredited by NBA/NAAC with 'A' Grade
website: www.vvce.ac.in

Bachelor of Engineering (B.E)

III & IV Semester Scheme and Syllabus

(Autonomous Scheme: 2021)

2022-23

DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING

Vidyavardhaka Sangha®, Mysore
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Department of Electrical & Electronics Engineering
Phone: +91 821-4276240, Email: hodee@vvce.ac.in
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Scheme of Teaching and Examination for BE (Autonomous Scheme: 2021)

III SEMESTER - Electrical and Electronics Engineering

Sl. No.	Course Area	Course Code	Course Name	Teaching Department	Contact Hours / week			Examination				Credits
					L	T	P	Duration (Hrs.)	CIE Marks	SEE Marks	Total	
1	BS	21MA31-C	Advanced Mathematics – III	Mathematics	2	2	0	3	50	50	100	3
2	IPCC	21EE32	Analog Electronic Circuits	EE	3	0	2	3	50	50	100	4
3	IPCC	21EE33	Digital Electronics	EE	3	0	2	3	50	50	100	4
4	PC	21EE34	Electrical Circuit Analysis	EE	3	0	0	3	50	50	100	3
5	HS	21HS35	General Proficiency Enhancement Course - I	TAP	0	2	0	2	50	50	100	1
6	HS	21HS36	Universal Human Values	EE	2	0	0	2	50	50	100	2
7	AEC	21EE37	Technical Proficiency Enhancement Course-I	EE	If offered as lab			2	50	50	100	1
					0	0	2					
8	HS	21HS38A	Constitution of India, Professional Ethics & Cyber Law	HS	1	0	0	2	50	50	100	1
TOTAL					**14**	**4**	**6**	**-**	**400**	**400**	**800**	**19**

9	Scheduled activities for III to VIII semesters	21NS39 / 21PE39 / 21YO39	NSS/ PE / Yoga *	NSS/ PE / Yoga	All students have to register for any one of the courses namely National Service Scheme, Physical Education (PE)(Sports and Athletics), and Yoga with the concerned coordinator of the course during the first week of III semester. The activities shall be carried out between III semester to VIII semester (for 5 semesters). SEE in the above courses shall be conducted during VIII semester examinations and the accumulated CIE marks shall be added to the SEE marks. Successful completion of the registered course is mandatory for the award of the degree. The events shall be appropriately scheduled by the colleges and the same shall be reflected in the calendar prepared for the NSS, PE, and Yoga activities							
10	BS	21MADIP31	Additional Mathematics – I *#	Mathematics	3	0	0	-	100	-	100	-

*** Mandatory Non – Credit Course** **# Applicable to lateral entry students**

Non–credit mandatory courses (NCMC):

(A) Additional Mathematics I and II:

(1) These courses are prescribed for III and IV semesters respectively to lateral entry Diploma holders admitted to III semester of B.E./B.Tech., programs. They shall attend the classes during the respective semesters to complete all the formalities of the course and appear for the Continuous Internal Evaluation (CIE). In case, any student fails to register for the said course/fails to secure the minimum 40 % of the prescribed CIE marks, he/she shall be deemed to have secured an F grade. In such a case, the student must fulfill the course requirements during subsequent semester/s to earn the qualifying CIE marks. These courses are slated for CIE only and have no SEE.

(2) Additional Mathematics I and II shall not be considered for vertical progression as well as for the calculation of SGPA and CGPA, but completion of the courses shall be mandatory for the award of degree.

(3) Successful completion of the courses Additional Mathematics I and II shall be indicated as satisfactory in the grade card. Non-completion of the courses Additional Mathematics I and II shall be indicated as Unsatisfactory.

(B) National Service Scheme/Physical Education (Sport and Athletics)/ Yoga:

(1) Securing 40 % or more in CIE, 35 % or more marks in SEE and 40 % or more in the sum of CIE + SEE leads to successful completion of the registered course.

(2) In case, students fail to secure 35 % marks in SEE, they have to appear for SEE during the subsequent examinations conducted by the University.

(3) In case, any student fails to register for NSS, PE or Yoga/fails to secure the minimum 40 % of the prescribed CIE marks, he/she shall be deemed to have not completed the requirements of the course. In such a case, the student has to fulfill the course requirements during subsequent semester/s to earn the qualifying CIE marks.

(4) Successful completion of the course shall be indicated as satisfactory in the grade card. Non-completion of the course shall be indicated as Unsatisfactory.

(5) These courses shall not be considered for vertical progression as well as for the calculation of SGPA and CGPA, but completion of the courses shall be mandatory for the award of degree.

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Technical Proficiency Enhancement Course-I (Branch specific) (21EE37)
Electronic Product Development
Electrical Wiring and Installation
Fundamentals of MATLAB - Simulink for electrical Engineers

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Scheme of Teaching and Examination for BE (Autonomous Scheme: 2021)

IV SEMESTER - Electrical and Electronics Engineering

Sl. No.	Course Area	Course Code	Course Name	Teaching Department	Contact Hours / week			Examination				Credits
					L	T	P	Duration (Hrs.)	CIE Marks	SEE Marks	Total	
1	BS	21MA41-C	Advanced Mathematics – IV	Mathematics	2	2	0	3	50	50	100	3
2	IPCC	21EE42	Microcontrollers	EE	3	0	2	3	50	50	100	4
3	IPCC	21EE43	Power Electronics	EE	3	0	2	3	50	50	100	4
4	PC	21EE44	Generation, Transmission and Distribution	EE	3	0	0	3	50	50	100	3
5	HS	21HS45	General Proficiency Enhancement Course – II	TAP	0	2	0	2	50	50	100	1
6	AEC	21EE46	Biology for Electrical Engineers	EE	2	0	0	2	50	50	100	2
7	AEC	21EE47	Technical Proficiency Enhancement Course-II	EE	If offered as theory 1	0	0 If offered as lab 0	2	50	50	100	1
							0					
8	HS	21HS48 B/ 21HS48 C	Balake Kannada/ Samskruthika Kannada	HS	1	0	0	2	50	50	100	1
9	PRI	21INT49	Inter / Intra Institutional Internship	EE	Completed during the intervening period of II and III semesters by			-	100	-	100	2

					students admitted to first year of BE./B.Tech and during the intervening period of III and IV semesters by Lateral entry students admitted to III semester						
TOTAL					**14**	**4**	**6**	**-**	**500**	**400**	**900**	**21**
10	BS	21MADIP41	#Additional Mathematics – II *#	Mathematics	3	0	0	-	100	--	100	-

*** Mandatory Non – Credit Course** **# Applicable to lateral entry students**

Technical Proficiency Enhancement Course - II (Branch specific) (21EE47)
Electrical Circuit Analysis using PSpice
Analysis of Solar PV based module
IoT for Electrical Engineering

Summer Internship - I (21INT49): All the students admitted to engineering programmes shall have to undergo a mandatory summer internship of 03 weeks during the intervening vacation of II and III semesters. Summer Internship shall include Inter / Intra Institutional activities. A University Viva-voce examination (Presentation followed by question-answer session) shall be conducted during III semester and the prescribed credit shall be included in III semester. The internship shall be considered as a head of passing and shall be considered for the award of degree. Those, who do not take up / complete the internship shall be declared fail and shall have to complete during subsequent University examination after satisfying the internship requirements. (The faculty coordinator or mentor has to monitor the students' internship progress and interact to guide them for the successful completion of the internship.

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SEMESTER – III			
Course Name	**Advanced Mathematics-III**	**Course Code**	**21MA31-C**
Number of Lecture Hours / Week	**03**	**CIE Marks**	**50**
Number of Tutorial Hours / Week	**02**	**SEE Marks**	**50**
Total Number of Lecture Hours + Tutorial Hours	**40 + 10 = 50**	**SEE Duration**	**03 Hrs.**
L:T:P	**2:2:0**	**CREDITS**	**03**

COURSE OVERVIEW:

Advanced Mathematics-III is a course which provides mathematical techniques in the advanced areas of mathematics like Fourier, Z-transformation, numerical methods, partial differential equations, and calculus of variation/advanced linear algebra that are of at most relevance to the Engineering disciplines. The purpose of this course is to provide the skills and knowledge required to perform mathematical procedures and processes for solution of Engineering problems.

COURSE LEARNING OBJECTIVES (CLOs):

The objective is to enable the students to apply the knowledge of Mathematics in various fields of Engineering by the following means:

a. Explain the concept of Fourier, Z-Transformation, Numerical Methods, Partial Differential Equations and Calculus of Variation/Advanced Linear Algebra applying it appropriately in solving Engineering problems.

a. Explain how to analyze the Engineering problems by making use of the concepts of Fourier, Z-Transformation, Numerical Methods, Partial Differential Equations and Calculus of Variation/Advanced Linear Algebra.

c. Explain the usage of modern tools to understand the concepts of Fourier, Z-Transformation, Numerical Methods, Calculus of Variation and Partial Differential Equations.

MODULE 1: Fourier and Harmonic Series **Fourier Series**: Periodic functions, Dirichlet's condition. Fourier series of periodic functions. Half range Fourier series, deducing some important series. **Practical Harmonic Analysis:** Harmonic Analysis. **SLT: Half range harmonic series.**	**08**
MODULE 2: Fourier Transforms and Z –Transforms (I-C) **Fourier Transforms:** Fourier transforms, Fourier sine and cosine transforms, Inverse Fourier transforms (direct method). **Z-Transforms:** Basic definition, problems on Z-Transforms of standard functions (without proof), Damping and shifting rules (Problems only). Inverse Z-Transform and applications to solve difference equations. **SLT: Derivation Z-Transforms of standard functions.**	**08**
Module 3: Numerical Solutions of Ordinary Differential Equations	**08**

Numerical Solutions of First Order and First Degree ODE's - Taylor's series method, Runge- Kutta method of fourth order, Milne's predictor-corrector method (No derivations) -Problems. **Numerical Solutions of Second Order ODE's**: Runge-Kutta method of fourth order (No derivations)-Problems. **SLT: Picard's method to find solution of first order first degree ODE**	
MODULE 4: Partial Differential Equations (PDE's) and Numerical solution of PDE(I-C) Formation of PDE's by elimination of arbitrary functions. Solution of non-homogeneous PDE by direct integration, Solution of Linear PDE by Lagrange's multiplier method. **Numerical Methods to Solve PDE's:** Parabolic and Laplace equations. **SLT: Numerical methods to solve hyperbolic equation.**	**08**
MODULE 5(Branch Specific) **CSE+ISE+AIML+ECE+EEE** **Advanced Linear Algebra:** Orthogonalization (GS algorithm), QR-factorization, Singular value decomposition (SVD) (without proof). **SLT**: Singular value decomposition of square matrix (2 x 2)	**08**

Textbooks

1. **B. S. Grewal**, *Higher Engineering Mathematics*, Latest edition, Khanna Publishers.
2. **B. V. Ramana**, *Higher Engineering Mathematics*, Latest edition, Tata Mc. Graw Hill Publications
3. **E. Balaguruswamy**, *Numerical Methods*, Tata-McGraw-Hill Publication Limited
4. **David C. Lay**, *Linear Algebra and its Applications*, Third edition, Pearson Publication

REFERENCE BOOK

1. Erwin Kreyszig, *Advanced Engineering Mathematics*, Latest edition, Wiley Publications.
2. Peter V. O'Neil, Advanced *Engineering Mathematics*, 7th edition, CENGAGE Learning India Pvt. Ltd. Publishers.
3. V. N. Ghougule, M. T. Puranic, *Numerical Methods and Optimization*, Niralli Publication.
4. M. K. Jain, S. R. K. Iyengar, *Numerical Methods,* sixth ed., New Age, International, Pub.
5. Gilbert Strang, *Linear Algebra and its Application*, Fourth edition, Cengage learning.

COURSE OUTCOMES (COs): Upon completion of the course, students will be able to

CO1	**Understand** the basic concepts of Fourier, Z-Transforms, Partial Differential Equations, Numerical Solutions to ODE &PDE, Calculus of Variation/Advanced Linear Algebra (PO-1).

CO2	**Apply** the concept of Fourier, Z-Transforms, Partial Differential Equations, Numerical Solutions to ODE &PDE, Calculus of Variation/Advanced Linear Algebra to solve the problems arising in Engineering field (PO-1).
CO3	**Analyze** mathematical problems arising in Engineering, using the concepts of Fourier, Z-Transforms, Partial Differential Equations, Numerical Solutions to ODE &PDE, Calculus of Variation/Advanced Linear Algebra (PO-2).
CO4	Use **modern tool** to **solve/visualize** mathematical problems arising in Engineering (PO-5).

CO – PO Matrix

CO	PO											
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**
CO-1	**1**	-	-	-	-	-	-	-	-	-	-	-
CO-2	**2**	-	-	-	-	-	-	-	-	-	-	-
CO-3	-	**2**	-	-	-	-	-	-	-	-	-	-
CO-4	-	-	-	-	**2**	-	-	-	-	-	-	-
Final Relevance	**1.5**	**2**	-	-	**2**	-	-	-	-	-	-	-

SEMESTER – III			
Course Name	**: Analog Electronic Circuits**	**Course Code :**	**21EE32**
Teaching Hours/Week (L:T:P)	**: 3:0:2**	**CIE Marks :**	**50**
Total number of Hours	**: 40(L)+24(P)**	**SEE Marks :**	**50**
Credits	**: 4**	**SEE Duration :**	**3 Hours**

COURSE OVERVIEW: This course focuses on conceptualization, design, and development of analog electronic circuits for required applications.

COURSE LEARNING OBJECTIVES (CLO)

The objective this course is to

1. Make students understand the basics of Diode and BJT applications.
2. Make students understand the basics of op-amps, regulators, and timers.
3. Develop skills to design and analyze the analog electronic circuits for various applications.

MODULES	Teaching hours
MODULE-1: Diodes and Transistors **Diode Applications:** Diode Limiters and Diode Clampers. Voltage Multipliers - Voltage Doubler, Voltage Quadrupler. **Bipolar Junction Transistor Bias Circuits and Amplifiers:** Voltage-Divider Bias, Other Bias Methods – Emitter bias, Base Bias, Emitter-Feedback Bias. Multistage Amplifiers - Multistage Voltage Gain, Capacitively Coupled Multistage Amplifier, Direct-Coupled Multistage Amplifiers. The Differential Amplifier - Basic Operation, Modes of Signal Operation, Common-Mode Rejection Ratio. **SSC:** Voltage Tripler, Collector-Feedback Bias Textbook-1: 2.7, 2.8, 5.2, 5.3, 6.6, 6.7	**8**
MODULE-2: The Operational Amplifier Op-Amp Input Modes and Parameters, Effects of Negative Feedback on Op-Amp Impedances - Impedances of the Noninverting Amplifier, Voltage-Follower Impedances, Impedances of the Inverting Amplifier. Bias Current and Offset Voltage - Effect of Input Bias Current, Bias Current Compensation, Effect of Input Offset Voltage, Input Offset Voltage Compensation. Comparators - Zero-Level Detection, Nonzero-Level Detection, Effects of Input Noise on Comparator Operation. Instrumentation Amplifiers and its Applications (Specific Instrumentation Amplifier and Noise Effects are excluded). Converters and Other Integrated Circuits - Constant-Current Source, Current-to-Voltage Converter, Peak Detector, Audio Amplifiers. **SSC:** Comparator Applications, Voltage-to-Current Converter. Textbook-1: 12.2, 12.5, 12.6, 13.1, 14.1, 14.5	**8**
MODULE-3: Op-Amp based Active Filters The Decibel - 0 dB Reference, Critical Frequency, Power Measurement in dBm. Basic Filter Responses, Filter Response Characteristics - Butterworth, Chebyshev, or Bessel response, The Damping Factor, Critical Frequency and Roll-Off Rate. Active Low-Pass Filters - A Single-Pole Filter, The Sallen-Key Low-Pass Filter, Cascaded Low-Pass Filters. Active High-Pass Filters - A Single-Pole Filter, The Sallen-Key High-Pass Filter, Cascading High-Pass Filters. Active Band-Pass Filters - Cascaded Low-Pass and High-Pass Filters, Multiple-Feedback Band-Pass Filter, State-Variable Filter, The Biquad Filter. Filter	**8**

Response Measurements - Discrete-Point Measurement and Swept-Frequency Measurement. **SSC:** Active Band-Stop Filters - Multiple-Feedback Band-Stop Filter, State-Variable Band-Stop Filter. Textbook-1: 10.2, 15.1-15.7	
MODULE-4: Op-Amp based Oscillators The Oscillator, Feedback Oscillators - Positive Feedback, Conditions for Oscillation, Start-Up Conditions. Oscillators with *RC* Feedback Circuits - Twin-T Oscillator (The Wien-Bridge Oscillator and The Phase-Shift Oscillator are excluded). Oscillators with *LC* Feedback Circuits - The Colpitts Oscillator only. Relaxation Oscillators - A Triangular-Wave Oscillator, A Sawtooth Voltage-Controlled Oscillator (VCO). The 555 Timer as an Oscillator - Astable Operation, Operation as a Voltage-Controlled Oscillator (VCO). **SSC:** A Square-Wave Oscillator, The Phase-Locked Loop. Textbook-1: 16.1-16.6	**8**
MODULE-5: Voltage Regulators Power Supply Filters and Regulators - Capacitor-Input Filter, Voltage Regulators, Percent Regulation. Voltage Regulation - Line Regulation and Load Regulation. Basic Linear Series Regulators - Regulating Action, Short-Circuit or Overload Protection, Regulator with Fold-Back Current Limiting. Basic Linear Shunt Regulators. Basic Switching Regulators - Step-Down Configuration, Step-Up Configuration, Voltage-Inverter Configuration. Integrated Circuit Voltage Regulators - Fixed Positive Linear Voltage Regulators, Adjustable Positive Linear Voltage Regulators, Adjustable Negative Linear Voltage Regulators. (Integrated Circuit Voltage Regulator Configurations excluded) **SSC:** Fixed Negative Linear Voltage Regulators, Switching Voltage Regulators. Textbook-1: 2.6, 17.1-17.5	**8**
PRACTICAL MODULE **A. Demonstration experiments** 1. Usage of instruments (Regulated Power Supply, Function generator, Oscilloscope & Multimeter) and reading datasheets. **B. Exercise experiments** 1. Design and verify op-amp based (a) Inverting/Non-inverting amplifier (b) Adder/Subtractor. 2. Design and realize to analyse the frequency response of an op-amp amplifier under inverting and non-inverting configuration for a given gain. 3. Design and verify a precision full wave rectifier. Determine the performance parameters. 4. Design and verify the output waveform of an op – amp RC phase shift oscillator for a desired frequency. 5. Design DC power supply using fixed/adjustable voltage regulator IC. **C. Structured enquiry experiments** 1. Simulation of diode limiters and clampers. (Simulation only) 2. Verify the operation of an op-amp as (a) voltage comparator circuit and (b) zero crossing detector. 3. Design and realize Schmitt trigger circuit using an op – amp for desired upper trip point (UTP) and lower trip point (LTP). 4. 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. (Simulation only) 5. Generate Pulse using 555 timer IC.	**24**

D. Open ended experiment

1. Carryout simple analog electronics-based hardware projects on their own.

Textbooks

1. Thomas L. Floyd, "Electronic Devices (Conventional Current Version)", Pearson Education, 10th edition (Global edition), 2018.

Reference books

1. Albert Malvino | David Bates, "electronic principles", McGraw-Hill publication, 8th edition, 2016.
2. Ramakant A Gayakwad, "Op-Amps and Linear Integrated Circuits", Pearson 4th Edition 2015
3. Robert L Boylestad Louis Nashelsky, "Electronic Devices and Circuit Theory", Pearson 11th Edition, 2015
4. David A. Bell, "Operational Amplifiers and Linear ICs", Oxford 3rd Edition 2010
5. B.L. Theraja, A.K. Theraja, "A Textbook of Electrical Technology, Electronic Devices and Circuits", S. Chand Reprint, 2013
6. S.Salivahanan N.Suresh, "Electronic Devices and Circuits" McGraw Hill 3rd Edition, 2013
7. David A Bell, "Electronic Devices and Circuits", Oxford University Press 5th Edition, 2008

COURSE OUTCOMES (COs)

CO1	Explain the working of Diode, Transistor and Op-Amp based electronic circuits. [L2]
CO2	Apply the concepts to determine various parameters for a given analog electronic circuit. [L3]
CO3	Analyze the behavior/performance of a given analog electronic circuit. [L4]
CO4	Conduct experiments on analog electronic circuits and comment on results obtained. [L6]

CO – PO – PSO Matrix

CO	PO												PSO		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	2														
CO2	3														
CO3		2													
CO4				2	3					2				2	3
Avg.	**2.5**	**2**		**2**	**3**					**2**				**2**	**3**

SEMESTER – III			
Course Name	**: DIGITAL ELECTRONICS**	Course Code:	**21EE33**
Number of Lecture Hours / Week	**: 03**	CIE Marks:	**50**
Number of Tutorial / Practical Hours / Week	**: 02**	SEE Marks:	**50**
Total Number of Lecture + Tutorial/Practical Hours	**: 40+24=64**	SEE Duration:	**03 Hours**
L:T:P	**: 3:0:2**	CREDITS:	**04**

COURSE OVERVIEW:

The course covers the concepts related to design of combinational circuits and Sequential circuits**.**

COURSE LEARNING OBJECTIVES (CLO) :

The objectives of this course are to :

- Illustrate simplification of Algebraic equations using Karnaugh Maps and concepts of Encoders, Binary Comparators
- Describe Latches, Flip-flops, Registers and Counters.
- Explain the state diagrams, Synchronous Sequential Circuits .
- Discuss the concepts of Verilog.

MODULES	TEACHING HOURS
MODULE 1: Principles of combinational logic : Definition of combinational logic, canonical forms; Karnaugh maps-3,4 variables, Incompletely specified functions (Don't care terms) Simplifying Max term equations., General approach to combinational logic design, cascading MUX and DEMUX, Cascading full adders, Look ahead carry adders, Binary comparators. **SSC**: Additional Boolean Operations and Gates, Encoders and Decoders **Text Book** -1: 3.1-3.4, 4.1,4.3-4.4, 4.7	**8**
MODULE 2: Sequential Logic Circuits Basic bistable elements, Latches, SR flip-flops, JK flip-flops, D flip flops, T Flip-Flops, The master-slave flip-flops (pulse-triggered flip-flops) Positive edge triggered D Flip Flop, Characteristic equations. **SSC**: Application of SR Latch: A Switch Debouncer. **Text Book 2** : 6.1-6.6	**8**
MODULE 3: Design of Registers and Counters Registers, binary ripple counters, synchronous binary counters, Counters based on shift registers, Design of a synchronous counters, Design of a synchronous mod-n counter using clocked T, JK and D **flip-flops** **SSC**: Divide by 2, 4 and 8 Counters. **Text Book 2**: 6.7-6.9	**8**

MODULE 4: **Sequential Circuit Design using State Machines:** Mealy and Moore models, State machine notation, Synchronous Sequential circuit analysis, Construction of state diagrams, counter design. **SSC**: Sequence Generator **Text Book 1**: 6.1-6.5	**8**
MODULE 5: **Introduction to HDL**: Introduction, A brief history of HDL, Structure of HDL Module, Operators, Data types, Types of Descriptions (only VHDL), Simulation and synthesis, Brief comparison of VHDL and Verilog. **Data-Flow Descriptions**: Highlights of Data flow descriptions, Structure of data-flow description. **SSC:** Half adder and full adder using Verilog data flow description. **Text Book 3:** 1.1,1.2,22.3,3.3,3.4	**8**

PRACTICAL MODULE	
A - Demonstration:	24
1. Realization of a Boolean function. 2. Implementation of Full Subtractors using NAND gate, Parallel adder	
B – Exercise:	
1. To verify the various functions of IC 74153(mux) 2. To realize one & two bit comparator and study of 7485 magnitude comparator. 3. Realize the following flip-flops using NAND Gates. i) Master-Slave, JK, D & T Flip-Flop. 4. To realize and study Ring counter and Johnson counter 5. To realize a) BCD to Excess-3 code conversion and vice versa b) Binary to Gray code conversion and vice versa	
C – Structured Enquiry:	
1. Design a synchronous/ asynchronous counter using Logisim. **2.** Design a combinational logic circuit (Code converters) for the given input specification using Logisim. **3.** Design a 4-bit shift register using Logisim. **4.** Adder/Subtractor – Full/half using Verilog data flow description **5.** Multiplexers/decoders/encoder using Verilog Behavioral description - 8:1 mux, 3:8 decoder, 8:3 encoder, Priority encoder - 1:8 Demux and verify using test bench - 2-bit Comparator using behavioral description	
D – Open Ended Experiments:	
1. Design a suitable digital electronic circuit using Logisim software	

Text Books:

1. Digital Logic Application and Design by John M Yarbrough, Thomson Learning, 2001 ISBN 981-240-062-1.
2. Digital Principles and Design by Donald D.Givon, McGraw Hill, 2002 ISBN 978-0-07-052906-9.

3. A VHDL Primer by J Bhasker,Third Edition.

Reference Books:

1. "Digital Design" by Morris Mano, Prentice Hall of India, Third Edition.
2. "Fundamentals of logic design", Charles H Roth, Jr., Cengage Learning, Fifth Edition.

3. "HDL Programming "(VHDL and Verilog) Nazeih M. Botros Cengage Learning 1 st Edition, 2011

COURSE OUTCOMES (COs) Upon completion of the course students will be able to:	
CO1	**Explain** the fundamental concepts of digital electronic circuits [L2]
CO2	**Apply** simplification methods of digital electronic circuits for the specified application [L3]
CO3	**Analyze** digital electronic circuit and arrive at suitable conclusions [L4]
CO4	**Conduct experiments** using appropriate techniques for a given application. [L4]
CO5	**Simulate** the digital electronic circuit using Logisim & make effective presentation.

CO – PO – PSO Matrix

CO	PO												PSO		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	1														
CO2	3													2	
CO3		2												2	
CO4				2										2	
CO5					1					1					1
Avg.	**2**	**2**		**2**	**1**					**1**				**2**	**1**

SEMESTER – III			
Course Name	**: Electric Circuit Analysis**	**Course Code:**	**21EE34**
Number of Lecture Hours / Week	**: 03**	**CIE Marks:**	**50**
Number of Practical Hours / Week	**: 00**	**SEE Marks:**	**50**
Total Number of Lecture Hours	**: 40**	**SEE Duration:**	**03 Hours**
L:T:P	**: 3:0:0**	**Credits:**	**03**

COURSE OVERVIEW:

The subject deals with analyzing different electrical circuits using various theorems and provides comprehensive knowledge regarding circuit behavior and helps in modeling networks.

COURSE LEARNING OBJECTIVES (CLO) :

1. To familiarize students with the basic circuit laws, theorems, behavior of circuits under transient conditions and application of Laplace Transform to different electrical circuits.
2. Explain the steps necessary to analyze two-port networks with the use of different network models.

MODULES	TEACHING HOURS
Module 1 **Basic Concepts:** Active and passive elements, Concept of ideal and practical sources. Source transformation, Concept of Supermesh and Supernode analysis. Analysis of networks by Mesh and Node voltage methods for ac and dc circuits with independent and dependent sources, star-delta transformation. **SSC:** Star-delta Transformation **Text Book:1-**1.1,1.3-1.6,2.2-2-7,3.1-3.7.	**8**
Module 2 **Network Theorems** Explanation, definition and steps to apply Superposition theorem. Definition, explanation of Thevenin's theorem for networks with dependent sources, problems. Definition, explanation and proof of Maximum power transfer theorem and Norton's theorem, problems. **SSC:-** Tellegans Theorem **Text Book:1-**Refer-4.1-4.9	**8**

Module 3 **Resonant Circuits:** Analysis of simple series RLC and parallel RLC circuits under resonances. Problems on Resonant frequency, Bandwidth and Quality factor at resonance. **Transient Analysis:** Transient analysis of RC circuits for DC Excitation. Behavior of circuit elements under switching action, Evaluation of initial conditions. **SSC:** AC Transients **Text Book:2-** Refer-8.1-8.10,11.1-11.7.	**8**
Module-4 **Laplace Transformation:** Laplace transformation (LT), LT of Impulse, Step, Ramp, Sinusoidal signals and shifted functions. Laplace transforms applied to Electrical Circuits, Waveform synthesis. **SSC**: Initial and Final value theorems **Text Book-2**: 13.1-13.6,14.1-14.2	**8**
Module 5 **Two Port networks:** Definition, Open circuit impedance parameters, short circuit admittance and Transmission parameters, H parameters and their evaluation for simple circuits. relationships between parameter sets. **SSC:** Interconnection of Two Ports. **Text Book-2:**16.1-16.9	**8**

Text Books

1. Charles K Alexander, Mathew N O Sadiku, 'Fundamentals of Electric Circuits, Tata McGrawHill, 2012.
2. Circuits and Networks Analysis and Synthesis Fifth Edition by A Sudhakar and Shyammohan S Palli

Reference Books

1. Network Analysis by M.E. Vanvalkenburg, Pearson, 3rd Edition, 2014
2. Network Theory by K Channa Venkatesh and D Ganesh Rao, Pearson,2012
3. "PSpice for Circuit Theory and Electronic Devices "Paul Tobin School of Electronic and Communications Engineering Dublin Institute of Technology Ireland

COURSE OUTCOMES (COs):At the end of this Course student will be able to:

CO1	Describe various methods, theorems and techniques to solve electric circuits[L2]
CO2	Apply the knowledge of mathematics and engineering to simplify the given electrical circuit using various methods and theorems [L3].
CO3	Analyze the given circuit for its performance in frequency domain and time domain [L4]
CO4	Simulate electrical circuits to find various parameters using PSpice[PO5,PO12].

CO-PO Mapping

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO 10	PO 11	PO 12	PS O1	PS O2	PS O3
CO1	2	-	-	-	-	-	-	-	-	-	-	-	-	-	-
CO2	3			-	-	-	-	-	-	-	-	-	2		-
CO3	-	3	-	-	-	-	-	-	-	-	-	-	2		-
CO4	-	-	-	-	2	-	-	-	-	-	-	2	2		-
CO Avg.	**2.5**	**3**	**-**	**-**	**2**	**-**	**-**	**-**	**-**	**-**	**-**	**2**	**2**	**-**	**-**

SEMESTER – III			
Course Name	**: General Proficiency Enhancement Course 1**	**Course Code :**	**21HS35**
Number of Lecture Hours / Week	**: 00**	**CIE Marks :**	**50**
Number of Tutorial / Practical Hours / Week	**: 02**	**SEE Marks :**	**50**
Total Number of Lecture + Tutorial/Practical Hours	**: 2**	**SEE Duration :**	**02 Hours**
L:T:P	**: 0:2:0**	**CREDITS :**	**01**

COURSE PREREQUISITES:
Communicative English I and II

MODULES	TEACHING HOURS
MODULE 1: **General Aptitude 1.1:** **Quantitative Aptitude:** Number System, HCF and LCM, Decimal Fractions and Simplification **Logical Reasoning:** Analogy Introduction and explanation of concepts with their applications. Focus on concepts and different methods and shortcuts to solve problems	**6**
MODULE 2: **Soft Skills** **Team Work –** Defining Teams, Benefits and Challenges of working in teams, Importance of Team Work, Stages of Team Building, Case Studies on Team Building **Verbal Ability –** Change of Speech and Voice Introduction and explanation of concepts with their applications. Focus on concepts and different methods and shortcuts to solve problems	**6**
MODULE 3: **General Aptitude 1.2:** **Quantitative Aptitude:** Ratios, Proportions and Variations, Partnership **Logical Reasoning:** Number and Letter Series	**6**

Introduction and explanation of concepts with their applications. Focus on concepts and different methods and shortcuts to solve problems	
MODULE 4: **Soft Skills** **Stress Management –** Understanding Stress, Identifying Sressors, Effects of Stress, Coping with Stress, Stress Management Techniques. **Time Management –** Principles of Time Management, Need for Time Management, Urgent vs Important Matrix **Verbal Ability** – Antonyms and Synonyms Introduction and explanation of concepts with their applications. Focus on concepts and different methods and shortcuts to solve problems	**6**
MODULE 5: **General Aptitude – 1.3** **Quantitative Aptitude:** Averages **Logical Reasoning:** Blood Relations **Verbal Ability**: Closet Test Introduction and explanation of concepts with their applications. Focus on concepts and different methods and shortcuts to solve problems	**6**

Textbooks:

1. Notes and Textbooks are part of learning methodology

Reference Books:

1. Bizotic Course Material, Text Bank and Hand outs
2. Quantitative Aptitude for Competitive Examinations by R.S Aggarwal
3. A Modern Approach to Verbal & Non-Verbal Reasoning by R.S. Aggarwal
4. AMCAT Preparation Guide

COURSE OUTCOMES (COs):

CO1	Understand the importance of continuous learning and implement it successfully Understand the basic concepts of the topics covered. Understand what conflict is and how it escalates within the workplace

CO2	Apply concepts of goal setting , interpersonal behaviors in life Appreciate team skills and dynamics. Identify Critical Thinking
CO3	Self-Analyze and develop self-confidence and a positive attitude Analyze common conflict resolution styles and use them effectively in teamwork
CO4	Compete in various competitive exams with positive mind set Practice Positive thinking and Attitude in walks of life

SEMESTER – III			
Course Name	**: Universal Human Values**	**Course Code :**	**21HS36**
No. of Lecture Hours / Week	**: 02**	**CIE Marks :**	**50**
No. of Tutorial / Practical Hours / Week	**: 00**	**SEE Marks :**	**50**
Total No. of Lecture + Tutorial / Practical Hours	**:25**	**SEE Duration :**	**02 Hrs**
L:T:P	**:02:00:00**	**CREDITS :**	**2**

COURSE OVERVIEW :

COURSE LEARNING OBJECTIVES (CLO) :

Development of a holistic perspective based on self-exploration about themselves (human being), family, society and nature/existence.
Understanding (or developing clarity) of the harmony in the human being, family, society and nature/existence
Strengthening of self-reflection.
Development of commitment and courage to act.

MODULES	TEACHING HOURS
MODULE 1: <u>Course Introduction - Need, Basic Guidelines, Content and Process for Value Education</u> Purpose and motivation for the course, recapitulation from Universal Human Values-I, Self-Exploration–what is it? - Its content and process; 'Natural Acceptance' and Experiential Validation- as the process for self-exploration, Continuous Happiness and Prosperity- A look at basic Human Aspirations, Right understanding, Relationship and Physical Facility- the basic requirements for fulfillment of aspirations of every human being with their correct priority. Understanding Happiness and Prosperity correctly- A critical appraisal of the current scenario, Method to fulfill the above human aspirations: understanding and living in harmony at various levels.	**5**
MODULE 2: <u>Understanding Harmony in the Human Being - Harmony in Myself</u> Understanding human being as a co-existence of the sentient 'I' and the material 'Body', Understanding the needs of Self ('I') and 'Body' - happiness and physical facility, Understanding the Body as an instrument of 'I' (I being the doer, seer and enjoyer), Understanding the characteristics and activities of 'I' and harmony in 'I', Understanding the harmony of I with the Body: Sanyam and Health; correct appraisal of Physical needs, meaning of Prosperity in detail, Programs to ensure Sanyam and Health.	**5**
MODULE 3: <u>Understanding Harmony in the Family and Society- Harmony in Human-Human Relationship</u> Understanding values in human-human relationship; meaning of Justice (nine universal values in relationships) and program for its fulfillment to ensure mutual happiness; Trust and Respect as the foundational values of relationship. Understanding the meaning of Trust; Difference between intention and competence. Understanding the meaning of Respect, Difference between respect and differentiation; the other salient values in	**5**

relationship. Understanding the harmony in the society (society being an extension of family): Resolution, Prosperity, fearlessness (trust) and co-existence as comprehensive Human Goals. Visualizing a universal harmonious order in society- Undivided Society, Universal Order- from family to world family.	
MODULE 4: <u>Understanding Harmony in the Nature and Existence - Whole existence as Coexistence</u> Understanding the harmony in the Nature, Interconnectedness and mutual fulfillment among the four orders of nature recyclability and self-regulation in nature. Understanding Existence as Co-existence of mutually interacting units in all pervasive space. Holistic perception of harmony at all levels of existence. Discussion on human being as cause of imbalance in nature, pollution, depletion of resources and role of technology etc.	**5**
MODULE 5: <u>Implications of the Holistic Understanding of Harmony on Professional Ethics</u> Natural acceptance of human values, Definitiveness of Ethical Human Conduct. Basis for Humanistic Education, Humanistic Constitution and Humanistic Universal Order. Competence in professional ethics: a. Ability to utilize the professional competence for augmenting universal human order b. Ability to identify the scope and characteristics of people friendly and eco-friendly production systems, c. Ability to identify and develop appropriate technologies and management patterns for above production systems. Case studies of typical holistic technologies, management models and production systems. Strategy for transition from the present state to Universal Human Order: a. At the level of individual: as socially and ecologically responsible engineers, technologists and managers. b. At the level of society: as mutually enriching institutions and organizations.	**5**

Text Books:

1. Human Values and Professional Ethics by R R Gaur, R Sangal, G P Bagaria, Excel Books, New Delhi, 2010.

Reference Books:

1. Jeevan Vidya: Ek Parichaya, A Nagaraj, Jeevan Vidya Prakashan, Amarkantak, 1999.
2. Human Values, A.N. Tripathi, New Age Intl. Publishers, New Delhi, 2004.
3. The Story of Stuff (Book).
4. The Story of My Experiments with Truth - by Mohandas Karamchand Gandhi
5. Small is Beautiful - E. F Schumacher.
6. Slow is Beautiful - Cecile Andrews
7. Economy of Permanence - J C Kumarappa
8. Bharat Mein Angreji Raj - PanditSunderlal
9. Rediscovering India - by Dharampal
10. Hind Swaraj or Indian Home Rule - by Mohandas K. Gandhi
11. India Wins Freedom - Maulana Abdul Kalam Azad
12. Vivekananda - Romain Rolland (English)
13. Gandhi - Romain Rolland (English)

COURSE OUTCOMES (COs):	
1	Understand the need of human values to become more aware of themselves, and their family, society, nature.
2	Identify the responsibilities in life, in handling problems with sustainable solutions keeping human relationships and nature in mind.
3	Inculcate critical ability and ethics towards human relationship and society.
4	Apply what they have learnt to their own self in different day-to-day scenarios in real life.

CO – PO – PSO Matrix

CO	**PO**												**PSO**		
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSO3**
C01	-	-	-	-	-	2	-	-	-	-	-	-			
C02	-	-	-	-	-	-	2	-	-	-	-	-			
C03	-	-	-	-	-	-	-	2	-	-	-	-			
CO 4	-	-	-	-	-	-	-	-	-	-	-	2			
CO Avg	**-**	**-**		**-**	**-**	**2**	**2**	**2**	**-**	**-**	**-**	**2**			

SEMESTER – III		
Course Name	**:** Technical Proficiency Enhancement Course-I **(Electronic Product Development)**	**Course Code: 21EE37**
Teaching Hours/Week (L:T:P)	**: 0:0:2**	**CIE Marks: 50**
Total number of practical hours	**: 24**	**SEE Marks: 50**
Credits	**: 1**	**SEE Duration: 2 Hours**

COURSE OVERVIEW: This course focuses on giving hands-on experience of developing electronic products.

COURSE LEARNING OBJECTIVES (CLO)

The objective of the course is to familiarize students with concepts and phases of electronic product development including

1. Simulation of circuits and breadboarding (Proof of concept).
2. Design, development and testing of Printed circuit board (PCB).

Sl. No.	Modules
1.	Simulation of voltage regulator, 555 timer, H-bridge, and clap switch circuit.
2.	Selection of hardware components and preparing bill of material.
3.	Breadboarding for functional testing of the circuit.
4.	Design of PCB and Gerber generation.
5.	Development of PCB (Etching, assembly, and soldering).
6.	Testing and troubleshooting the developed module.

SEMESTER – III		
Course Name	**:** Technical Proficiency Enhancement Course-I **(Electrical Wiring & Installation)**	**Course Code: 21EE37**
Teaching Hours/Week (L:T:P)	**: 0:0:2**	**CIE Marks: 50**
Total number of practical hours	**: 24**	**SEE Marks: 50**
Credits	**: 1**	**SEE Duration: 2 Hours**

COURSE OVERVIEW:

This course focuses on key concepts of Electrical wiring and safety precautions, study of various parts in electrical loads and their importance in the load operation.

COURSE LEARNING OBJECTIVES (CLO)

1. To familiarize students with concepts of Electrical safety, parts assembly of domestic loads & equipment earthing.

2. To acquaint the students with key concepts of Electrical wiring Estimation and Costing to develop a lighting control circuit and prepare an estimate of materials as per the requirement.	
Sl. No.	**Experiments**
1.	Safety Precautions to be followed while performing Electrical Installations & Introduction to standard symbols used in Electrical circuits
2.	Introduction to different tools & Protective devices used in Electrical wiring.
3.	Selection of right size of the cable for the circuit, Introduction to different types of Lamps used in Domestic Installation.
4.	Carry out the Rigid PVC surface conduit wiring to Control a) One Lamp from one location b) One Lamp from two locations
5.	Fabrication of an Extension board to connect Two loads.
6.	Carry out the Rigid PVC surface conduit wiring to study a) Godown wiring b) Hospital wiring
7.	Dismantle and assemble following domestic appliances and identification of parts and their importance. a) Iron box b) Mixer grinder c) Ceiling and table fans.
8.	Preparation of Electrical Wiring diagram and an estimate of materials for the give plan of a residential building using AutoCAD.
Text books: 1. "Electric Wiring" , S. Samaddar (Author), New Central Book Agency. **2.** "Electrical Wiring: An Introduction" , Satheesh Kumar, Ane Books Pvt. Ltd, 2nd edition	

SEMESTER – III			
Course Name	**:** Technical Proficiency Enhancement Course-I (Fundamentals of MATLAB - Simulink for electrical Engineers)	**Course Code :**	**21EE37**
No. of Lecture Hours / Week	**: 00**	**CIE Marks :**	**50**
No. of Practical Hours / Week	**: 02**	**SEE Marks :**	**50**
Total No. of Lecture/Practical Hours	**: 24**	**SEE Duration :**	**2 Hours**
L:T:P	**: 0:0:2**	**Credits :**	**1**
COURSE OVERVIEW: The course provides an overview to Simulink and its applications to electrical circuits			

COURSE LEARNING OBJECTIVES (CLO)

1. To demonstrate basic Simulink blocks and its functions.
2. To demonstrate the applications of Simulink in electrical circuits

	Syllabus
1	Introduction to Simulink
2	Solution of Series-Parallel Circuits, Solution of system with linear equations and Solution of First Order Differential Equation
3	Mesh and Nodal analysis and Experiments for Validation of Network Theorems
4	Study of Transients and AC Signal Waveform Analysis
5	Study of Resonance in AC Circuit and Frequency Response Waveform Analysis
6	Simulation of rectifier circuits
7	Simulation based small application development-1
8	Simulation based small application development-2

Text Books

1. "Modelling and Simulation using Matlab-Simulink", Dr Shailendra Jain, Willey India.

2. "Introduction to Simulink with Engineering Applications", Second Edition, Steven Karris, orchard publication.

COURSE OUTCOMES (COs)
At the end of course students will be able to

CO1	Effectively use electrical engineering tools to provide solutions/build models. [PO5]
CO2	Prepare effective reports for the developed solutions/models. [PO10]

CO – PO – PSO Matrix

CO	**PO**												**PSO**		
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSO3**
CO1					2										2
CO2										2					
Avg					**2**					**2**					**2**

Semester – III			
Course Name	: Constitution of India, Professional Ethics and Cyber Law	**Course Code :**	21HS38A
No. of Lecture Hours / Week	: 01	**CIE Marks :**	50
No. of Tutorial / Practical Hours / Week	: 00	**SEE Marks :**	50
Total No. of Lecture + Tutorial / Practical Hours	: 15	**SEE Duration :**	02 Hrs.
L:T:P	: 1:0:0	**Credits :**	01

Course Learning Objectives (CLO)

- Know the fundamental political codes, structure, procedures, powers and duties of Indian government institutions, fundamental rights, directive principles, and the duties of the citizens.
- Understand engineering ethics and their responsibilities; identify their individual roles and ethical responsibilities towards society.
- Know about the cybercrimes and cyber laws for safety measure.

Modules	Teaching Hours
Module 1 **Introduction to Indian Constitution:** The necessity of the Constitution, The societies before and after the Constitution adoption. Introduction to the Indian constitution, 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 significance in Nation building.	**08**
Module 2 **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 (Articles 370, 371, 371) for some states.	**08**
Module 3 **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, 91, 94, 95, 100, 101, 118 and some important Case studies. Emergency Provisions, types of Emergencies and its consequences. **Constitutional special provisions:**	**08**

Special Provisions for SC and ST, OBC, Women, Children and Backward Classes.	
Module 4 **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 on the website of Institution of Engineers (India): Profession, Professionalism and 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.	**08**
Module 5 **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.	**08**
Text Books 1. B.S. Grewal, Higher Engineering Mathematics, Latest edition, Khanna Publishers. 2. B.V. Ramana, Higher Engineering Mathematics, Latest edition, Tata Mc. Graw Hill Publications.	
Reference Books 1. Introduction to the Constitution of India, Durga Das Basu, Prentice – Hall 2008 2. Engineering Ethics, M. Govindarajan, s. Natarajan, V.S. SenthilKumar Prentice – Hall 2004	

COURSE OUTCOMES (COs) At the end of the 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 measures

CO – PO – PSO Matrix

CO	PO												PSO		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO 3
CO1								2							
CO2								2							
CO3								2							
Avg.								**2**							

SEMESTER – III			
Course Name:	**Additional Mathematics-I**	**Course Code**	**21MADIP31**
Number of Lecture Hours / Week	**03**	**CIE Marks**	**100**
Number of Tutorial / Hours / Week	**00**	**SEE Marks**	**-**
Total Number of Lecture Hours + Practical Hours	**40 + 0 =40**	**SEE Duration**	**-**
L:T:P	**3:0:0**	**CREDITS**	**00**

COURSE OVERVIEW:

Additional Mathematics-I is a course which provides mathematical techniques to support the lateral entry students that are of at most relevance to engineering disciplines. The major focus of the course are complex numbers, differential and partial derivative of real functions, probability theory, numerical methods, and ordinary differential equations. The purpose of this course is to provide the skills and knowledge required to perform mathematical procedures and processes for solution of engineering problems. The course aims to show the relevance of mathematics to engineering and applied science.

COURSE LEARNING OBJECTIVES (CLOs)

The objective is to enable the students to apply the knowledge of mathematics in various fields of Engineering by the following means:

a. Explain the concept of complex algebra, differential and partial derivative of real functions, numerical methods, and probability theory to back up the advanced mathematics in solving engineering problems.

a. Explain how to analyze the system in various engineering domain using complex algebra, differential and partial derivative of real function, numerical Methods, probability theory.

MODULES	TEACHING HOURS
MODULE-1 **Complex Numbers:** Definitions and operations. Modulus and amplitude of a complex number. **Basic Linear Algebra:** Introduction, Rank of matrix by elementary row operations - Echelon form. Consistency of system of linear equations, Gauss elimination method. Eigen values and Eigen vectors problems.	**08**
MODULE-2 **Differential Calculus:** Review of differentiation. Maclaurin's series expansions-Illustrative examples. Partial Differentiation: Euler's theorem (Problems on first order derivatives only). Total derivatives-Differentiation of composite functions. Jacobians of order two-Problems.	**08**

Module-3 **Probability:** Introduction, Sample space and events. Axioms of probability, Addition & multiplication theorems, conditional probability. Discrete random variable and Binomial distribution.	**08**
MODULE-4 **Numerical Methods:** Finite differences. Interpolation/extrapolation using Newton's forward and backward difference formulae (Only statement)-problems. Solution of polynomial and transcendental equations – Newton-Raphson method (only formula)- Illustrative examples. Numerical integration: Simpson's one third rule.	**08**
MODULE-5 **Ordinary Differential Equations (ODE's):** Introduction, Solutions of first order and first-degree differential equations: Exact, Equations reducible to exact (IF = $x^h y^k$) and Bernoulli's equation. Orthogonal Trajectory (Cartesian).	**08**

Text books
1. **B.S. Grewal**, *Higher Engineering Mathematics*, Latest edition, Khanna Publishers. **2.** **B.V. Ramana**, *Higher Engineering Mathematics*, Latest edition, Tata Mc. Graw Hill Publications.
REFERENCE BOOK
1**. Erwin Kreyszig**, *Advanced Engineering Mathematics*, Latest edition, Wiley Publications. 2. **Peter V. O'Neil**, *Engineering Mathematics*, CENGAGE Learning India Pvt Ltd. Publishers

COURSE OUTCOMES (COs):	
CO1	**Understand** the basic concepts of complex algebra, differential and partial derivative of real function, numerical methods, probability theory (PO-1).
CO2	**Apply** the concept of complex algebra, differential and partial derivative of real function, numerical methods, probability theory (PO-1).

CO – PO Matrix

CO	**PO**											
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**
CO1	2		-	-	-	-	-	-	-	-	-	-
CO2	2	-	-	-	-	-	-	-	-	-	-	-
C301	**2**	**-**	-	-	**-**	-	-	-	-	-	-	-

SEMESTER – IV			
Course Name:	**Advanced Mathematics-IV**	**Course Code**	**21MA41-C**
Number of Lecture Hours / Week	**03**	**CIE Marks**	**50**
Number of Tutorial / Hours / Week	**02**	**SEE Marks**	**50**
Total Number of Lecture Hours + Practical Hours	**40+ 10 = 50**	**SEE Duration**	**03 Hrs.**
L:T:P :	**2:2:0**	**CREDITS**	**03**

COURSE OVERVIEW:

Advanced Mathematics-IV is a course which provides mathematical techniques in the advanced areas of mathematics that are of at most relevance to engineering disciplines. The major focus of the course is complex analysis, statistical methods, probability distributions, sampling Theory, statistics, queueing theory and reliability engineering / optimization. The purpose of this course is to provide the skills and knowledge required to perform mathematical procedures and processes for solution of engineering problems. The course aims to show the relevance of mathematics to engineering and applied science.

COURSE LEARNING OBJECTIVES (CLO)

The objective is to enable the students to apply the knowledge of mathematics in various fields of Engineering by the following means:

a. Explain the concept of Complex Analysis, Statistical Methods, Probability Distributions, Sampling Theory, Statistics, Queueing Theory and Reliability Engineering / Optimization in solving Engineering problems.

a. Explain how to analyze the system in various Engineering domain using Complex Analysis, Statistical Methods, Probability Distributions, Sampling Theory, Statistics, Queueing Theory and Reliability Engineering / Optimization.

b. Explain the usage of modern tools to understand the concepts Complex Analysis, Statistical Methods, Probability Distributions, Sampling Theory, Statistics, Queueing Theory and Reliability Engineering / Optimization.

MODULES	TEACHING HOURS
MODULE 1: Complex Analysis (I-C) **Complex Differentiation**: Analytic functions, Cauchy-Riemann equations in cartesian and polar forms (without proof). Construction of analytic functions, Problems on Harmonic conjugate. **Complex Integration**: Cauchy's theorem (no proof), Residue, poles, Problems on Cauchy's Residue theorem (without proof). **Conformal transformations**: Discussion of transformations: $w=z^2$, $w=ez$ and $w=z+1z$, $z\neq0$. Bilinear transformations-problems. **SLT: Derivation of C-R Equations (Cartesian and Polar)**.	**08**
MODULE 2: Statistical Methods	**08**

Correlation and Regression-Karl Pearson's coefficient of correlation and rank correlation(with-out repetitions) -Problems. Regression analysis- lines of regression –Problems. **Curve Fitting**: Curve fitting by the method of least squares- fitting the curves of the form y=ax2+bx+c and y=axb. **SLT: Fitting the curve** y=ax+b and y=abx.	
Module 3: Probability Distribution and Joint Probability Distribution(I-C) **Probability Distribution:** Review of basic probability theory. Random variables (discrete), Probability mass function, Statistical values (Mean and Variance). Poisson and Normal distributions- Problems (No derivation for mean and standard deviation). **Joint Probability Distribution**: Joint probability distribution for two discrete random variables, Marginal distribution, Covariance, and Coefficient of correlation. **SLT: Problems on exponential distribution.**	**08**
MODULE 4: Stochastic Process and Sampling Theory **Stochastic Theory:** Stochastic process, Markov chain, Transition matrix, Steady state analysis. **Sampling Theory:** Introduction to sampling distributions, Standard error, Type-I and Type-II errors. Test of hypothesis, Z-test (proportions), Chi-square distribution as a test of goodness of fit (Uniform, Poisson's distribution, ratio and proportion). **SLT: Student's t-distribution (both one and two samples).**	**08**
MODULE 5: **CSE+ ISE+ AI-ML+ ECE+ EEE** **Optimization Technique:** Basics of optimization, formulation of the problems, maxima and minima, convex function, global solution. Linear programming, simplex algorithm, degeneracy, Big-M method, Two phase method. **SLT**: Duality of LPP (no solving)	**08**

Textbooks
1. **B. S. Grewal**, *Higher Engineering Mathematics*, 43 Edition, Khanna Publishers. 2. **B. V. Ramana**, *Higher Engineering Mathematics*, Latest edition, Tata Mc. Graw Hill Publications. 3. **G. Haribhaskaran,** *Probability, Queueing Theory & Reliability Engineering***,** Lakshmi Publication 4. Taha Hamdy A**, Operational Research, 6th edition, Prentice Hall of India.**
REFERENCE BOOK

1. **Erwin Kreyszig**, *Advanced Engineering Mathematics*, Latest edition, Wiley Publications.
2. **Peter V. O'Neil**, Advanced *Engineering Mathematics*, 7th edition CENGAGE Learning India Pvt. Ltd. Publishers.
3. **A M Natarajan**, *Probability, Random Processes and Queueing Theory,* New Age International, 2005
4. **Kishore S Trivedi**, *Probability and Statistics with Reliability, Queuing, and Computer Science Applications,* 2nd Edition, Kindle Edition
0. ***V. Sundarapandian***, *Probability, Statistics and Queueing Theory, Sultan Chand & Sons Pub,.*
0. **S. D. Sharma**, *Operation Research*, Kedarnath Ramnath & Co.

COURSE OUTCOMES (COs):	
CO 1	**Understand** the basic concepts of Complex Analysis, Statistical Methods, Probability Distributions, Sampling Theory, Statistics, Queueing Theory and Reliability Engineering / Optimization (PO-1)
CO 2	**Apply** the concept of Complex Analysis, Statistical Methods, Probability Distributions, Sampling Theory, Statistics, Queueing Theory and Reliability Engineering / Optimization to solve the problems arising in Engineering field. (PO-1)
CO 3	**Analyze** mathematical problems arising in Engineering using the Complex Analysis, Statistical Methods, Probability Distributions, Sampling Theory, Statistics, Queueing Theory and Reliability Engineering / Optimization (PO-2).
C04	Use **modern tools** to **solve/visualize** mathematical problems arising in Engineering (PO-5).

CO – PO Matrix

CO	**PO**											
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**
CO1	1	-	-	-	-	-	-	-	-	-	-	-
CO1	2		-	-	-	-	-	-	-	-	-	-
CO2	-	2	-	-	-	-	-	-	-	-	-	-
C03	-	-	-	-	-	-	-	-	-	-	-	-
C04	-	-	-	-	2	-	-	-	-	-	-	-
C401	**1.5**	**2**	-	-	**2**	-	-	-	-	-	-	-

SEMESTER – IV			
Course Name	**: Microcontrollers**	**Course Code :**	**21EE42**
Teaching Hours/Week (L:T:P)	**: 3:0:2**	**CIE Marks :**	**50**
Total number of Hours	**: 40(L)+24(P)**	**SEE Marks :**	**50**
Credits	**: 4**	**SEE Duration :**	**3 Hours**

COURSE OVERVIEW: This course gives the knowledge about the architecture of 8051 Microcontroller with all its instruction sets and programming for different applications using ALP and C. The ARM controller fundamentals covered. Also, the practical module gives the hands-on experience of developing Embedded System applications. Basics of Electrical and Electronics Engineering, Analog and Digital Electronic Circuits are the prerequisites.

COURSE LEARNING OBJECTIVES (CLO)

The objective of this course is to

1. Describe the architecture, registers, instructions set of 8051 microcontrollers.
2. Inculcate programming skills in Assembly language and Embedded C for various applications.
3. Inculcate Embedded system application development skills.

MODULES	Teaching hours
Module-1: 8051 microcontroller assembly language programming Overview of the 8051 family. Inside the 8051, Introduction to 8051 Assembly programming, Assembling, and running an 8051 program, the program counter and ROM space in the 8051, 8051 data types and directives, 8051 flag bits and the PSW register. 8051 register banks and stack. SSC: Microcontrollers and embedded processors. Textbook-1: 1.1, 1.2, 2.1-2.7	**8**
Module-2: 8051 I/O port programming and addressing modes 8051 I/O programming, I/O bit manipulation programming, Immediate and register addressing modes, accessing memory using various addressing modes, Bit addresses for I/O and RAM. SSC: Extra 128-byte on-chip RAM in 8052. Textbook-1: 4.1,4.2,5.1-5.4	**8**
Module-3: 8051 programming in C and Timer programming in assembly and C Data types and time delay in 8051 C, I/O programming in 8051 C, Logic operations in 8051 C, Data conversion programs in 8051 C, Accessing code ROM space in 8051 C. Programming 8051 timers, Counter programming, Programming timers 0 and 1 in 8051 C SSC: Data serialization using 8051 C. Textbook-1: 7.1-7.6, 9.1-9.3	**8**
Module-4: 8051 serial port and interrupt programming in assembly and C 8051 serial port programming in Assembly, Programming the second serial port, Serial port programming in C. 8051 interrupts, Programming timer interrupts, Programming external hardware interrupts, Programming the serial communication interrupt, Interrupt priority in the 8051/52, Interrupt programming in C.	**8**

SSC: Basics of serial communication, 8051 connections to RS232. Textbook-1: 10.1-10.5, 11.1-11.6	
Module-5: ARM Embedded Systems and ARM Processor Fundamentals ARM Embedded Systems: Introduction, RISC design philosophy, ARM design philosophy, Embedded system hardware – AMBA bus protocol, ARM bus technology, Memory, Peripherals, Embedded system software – Initialization (BOOT) code, Operating System, Applications. ARM Processor Fundamentals: ARM core dataflow model, registers, current program status register, Pipeline, Exceptions, Interrupts and Vector Table. SSC: Core extensions. Textbook-2: 1.1-1.4, 2.1-2.5	**8**
PRACTICAL MODULE **A. Demonstration experiments** 1. Basics of Embedded systems and Embedded C programming. Introduction to IDEs (Integrated Development Environment). Exercise: Toggle a pin/port of 8051/AVR microcontroller. **B. Exercise experiments** 1. Digital clock. 2. Waveform generation using DAC. 3. Temperature sensing using ADC. 4. LCD interface. 5. Blinking LED using ARM controller. **C. Structured enquiry experiments** 1. Traffic light system. 2. DC motor speed and direction control using PWM. 3. Stepper motor speed and direction control. 4. Keypad interface. 5. Serial Communication interface. **D. Open ended experiment** 1. Carryout microcontroller-based hardware projects on their own. ***Note: 8051/AVR/ARM controllers can be used suitably for all the experiments wherever not specified. Use a suitable IDE.***	**20**
Textbooks 1. "The 8051 Microcontroller and Embedded Systems – using assembly and C"-, Muhammad Ali Mazidi and Janice Gillespie Mazidi and Rollin D. McKinlay; PHI, 2006 / Pearson 2. "ARM System Developer's Guide", Andrew N Sloss, Dominic System and Chris Wright, Elsevier, Morgan Kaufmann publisher, 1st Edition, 2008, ISBN:1758608745.	
Reference books "The 8051 Microcontroller Architecture, Programming & Applications", 2e Kenneth J. Ayala;, Penram International, 1996 / Thomson Learning 2005. "The 8051 Microcontroller", V.Udayashankar and MalikarjunaSwamy, TMH, 2009 "Embedded Systems – Architecture, Programming and Design", - Raj Kamal, Third Edition, McGraw Hill Education "ARM System on chip Architecture", Furber S, Addison Wiley, 2nd Edition, 2008	

COURSE OUTCOMES (COs)

At the end of course students will be able to

CO1	Understand the basics of Microcontrollers [L2]
CO2	Apply the knowledge of Microcontrollers to write Assembly Language or C Program [L3]
CO3	Analyze Assembly Language or C Program for 8051 Microcontrollers [L4]
CO4	Design and implement Microcontroller based applications. [L6]

CO – PO – PSO Matrix

CO	PO												PSO		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	2														
CO2	3														
CO3		3													
CO4			2		3					2				2	3
Avg.	**2.5**	**3**	**2**		**3**					**2**				**2**	**3**

SEMESTER – IV			
Course Name	**: Power Electronics**	**Course Code :**	**21EE43**
No. of Lecture Hours / Week	**: 03**	**CIE Marks :**	**50**
No. of Tutorial / Practical Hours / Week	**: 00**	**SEE Marks :**	**50**
Total No. of Lecture + Tutorial / Practical Hours	**: 40**	**SEE Duration :**	**03 Hrs**
L:T:P	**:03:00:00**	**CREDITS :**	**4**

COURSE OVERVIEW: The course deals with the principle of operation, characteristics of various power switching devices both classical and emerging and analysis of operation of power conversion systems such as controlled rectifier circuits, inverters and DC choppers

COURSE LEARNING OBJECTIVES (CLO)

The objectives of the course is

To give an overview of applications power electronics, different types of power semiconductor devices, their switching characteristics.

To acquaint the students with the key concepts of various types of power converters and their applications.

MODULES	TEACHING HOURS
MODULE 1 : Introduction Introduction - Applications of Power Electronics, Power Semiconductor Devices, types of Power Electronic Circuits, peripheral Effects. Power Diodes, Types: Reverse Recovery characteristics, Rectifier: single phase full wave diode rectifier. Power BJTs: Steady state characteristics. Power MOSFETs: device operation, switching characteristics, steady state characteristics IGBTs: device operation, output, and transfer characteristics. Thyristors: Characteristics, and modes of operation, two transistor model of thyristor, thyristor types. di/dt and dv/dt protection of thyristors. **SSC: Applications of Power Electronics** **Textbook 1:** 1.1,1.2,1.5,1.8,2.1,2.4,2.5,3.4,4.2,4.3,4.6,7.1,7.2,7.3,7.6,7.9	**8**
MODULE 2: **Controlled rectifiers** Controlled rectifiers - Introduction, principle of phase-controlled converter operation, Single phase fully controlled converters with R and RL load, Single phase semi-converters, Single phase dual converter, principle of operation of Three phase dual converter. **SSC: Single phase semi-converters** **Textbook 1: 10.1,10.2,10.3,10.4,10.7,10.9.**	**8**
MODULE 3: **AC Voltage Controllers:** Introduction, Principle of phase control and integral cycle control, single phase bidirectional controllers with R load, single phase full wave controllers with R load and single phase full wave controllers with RL load, Three phase full converters. Introduction to cycloconverters. Single phase cycloconverters.	**8**

SSC: Three phase full controllers. **Textbook 2:** 11.1,11.2,11.3,11.4,11.5,11.6,11.9	
MODULE 4: DC-DC Converters DC-DC Converters - Introduction, principle of step-down operation and it's analysis with R and RL load (only CCM mode of operation), and principle of step-up chopper with R load, performance parameters, Chopper/Converter classification (Quadrant classification). **SSC: performance parameters** **Textbook 1:** 5.1,5.2,5.3,5.4,5.7	**8**
MODULE5: DC-AC Inverters Introduction, principle of operation, performance parameters, Single phase bridge inverters with R and RL load, three phase inverters 180-degree conduction,120-degree conduction. Introduction to multilevel inverters, cascaded multilevel inverter. SSC: Performance parameters **Textbook 1: 6.1,6.2,6.3,6.4,6.5, 9.1-9.6**	**8**

Text Books:

1. Power Electronics – Circuits, Devices and Applications - Muhammad H Rashid, Pearson edition pvt ltd , Third Edition,2004

Reference Books:

1. Power Electronics – Converters, Applications and Design - Ned Mohan, Tore M. Undeland and William P Robbins, John Wiley &sons , 3rd Edition,2002
2. Power Electronics Essentials and Applications-L.Umanand,Wiley India Pvt. Ltd.2009
3. Power Electronics – Principles and Applications - Joseph Vithayathil, TATA McGraw-hillEdition,2010
4. Power Electronics - M.D.Singh, K B Khanchandani, TMH ,Second edition, 2008

Exercise
1. Experimental determination of Static V-I Characteristics of SCR
2.Experimental determination of Static V-I Characteristics of MOSFET
3.Experimental determination of Static V-I Characteristics of IGBT
4.Experiment on Digital Triggering of SCR
5.Experiment of Speed control of Universal motor using single phase AC voltage controller.
6.Speed control of DC motor using single semi converter.
7.Speed control of DC motor using MOSFET/IGBT chopper.
8.Single Phase fully controlled Bridge rectifier with R load, R-L load with and without freewheeling diode
Structured Enquiry
9.Simulation and realization of Controlled rectifier circuits with R load.
10.Simulation and realization of Step up DC-DC converter with R-Load.
Demonstration
1.Speed control of stepper motor
2.AC voltage controller using TRIAC and DIAC combination connected R and RL loads.
Open Ended Experiment
1.Simulation of Power Electronic Circuits using Modern Software tools

1	Explain the operation of power semiconductor devices and power converters. **[L2]**
2	Apply relevant equations to determine the parameters for a given power semiconductor device/converter**. [L3]**
3	Analyze the performance of power conversion systems using relevant mathematical expressions. **[L4]**
4	Conduct experiments on power converters/power semiconductor devices and interpret to provide valid conclusions

CO – PO – PSO Matrix

CO	PO												PSO		
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSO3**
C01	2	-	-	-	-	-	-	-	-	-	-	-	-	-	-
C02	3	-	-	-	-	-	-	-	-	-	-	-	2	-	-
C03	-	2	-	-	-	-	-	-	-	-	-	-	-	2	-
C04	-	-	2	2	2	-	-	-	-	-	-	-	-	-	2
CO Avg	**2.5**	**2**	**2**	**2**	**2**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**2**	**2**	**2**

SEMESTER – IV			
Course Name	**: Generation, Transmission and Distribution**	**Course Code:**	**21EE44**
No. of Lecture Hours / Week	**: 03**	**CIE Marks :**	**50**
No. of Tutorial / Practical Hours / Week	**: 00**	**SEE Marks :**	**50**
Total No. of Lecture + Tutorial / Practical Hours	**: 40**	**SEE Duration:**	**03 Hrs**
L:T:P	**:03:00:00**	**CREDITS :**	**3**

COURSE OVERVIEW: This course gives a brief idea of an electric power system and different types of power plants. It also gives an introduction to different types of conductors and insulators and importance of sag in a transmission line. It imparts the idea of computing various parameters deciding the performance in a transmission line. It explains the concept of electrical corona, underground cables & distribution system.

COURSE LEARNING OBJECTIVES (CLO) :

To understand the structure of an electric power system & different types of power plants.
To explain different types of supporting structures and calculate the sag and string efficiency in a transmission line.
To analyse different parameters and explain the effect of corona in a transmission line.
To explain different types of grading in an underground cable and understand the importance of distribution systems in electric power system.

MODULES	TEACHING HOURS
MODULE 1 : GENERATING STATIONS Introduction to power scenario in India, Single line diagram of a typical power system, Selection of site, Types , Typical Block diagram and explanation, Advantages and Disadvantages of different power plants (Thermal, Hydro, Nuclear, Solar, Windmill, Tidal) SSC: Single line diagram of a typical power system Textbook 1: 1.1-1.7	**8**
MODULE 2: OVERHEAD TRANSMISSION LINE CONDUCTORS INSULATORS AND LINE PARAMETERS Advantages of higher voltage transmission: Introduction to types of supporting structures and line conductors; Aluminum Conductor steel reinforced (ACSR). Sag calculation – supports at same and different levels, effect of wind and ice. Introduction to types of insulators, Potential distribution over a string of suspension insulators. String efficiency (Numerical Problems included) Flux linkages due to internal flux and external flux, calculation of inductance and capacitance of single phase and three phase lines with equilateral spacing, unsymmetrical spacing, and transposition of transmission lines. SSC: Introduction to types of supporting structures, Introduction to types of insulators Textbook 1: 4.1-4.6, 5.1-5.3	**8**

MODULE 3: MODELING & PERFORMANCE OF TRANSMISSION LINES: Classification of lines, short, medium and long. Current and voltage relations, line regulation and Transmission line efficiency in short and medium transmission lines, Ferranti effect, Generalized ABCD constants (Numerical Problems included) SSC: Generalized ABCD constants Textbook 2: 10.1-10.5	**8**
MODULE 4: CORONA: Phenomena, disruptive and visual critical voltages, corona loss. Advantages and disadvantages of corona. Methods of reducing corona. **UNDERGROUND CABLES:** Types & constructional features, Overhead lines versus Underground cables insulation resistance, grading of cables – capacitance and intersheath**.** SSC: Overhead lines versus Underground cables Textbook 2: 10.1-10.5	**8**
MODULE 5: DISTRIBUTION SYSTEMS DC distribution System: DC Distributor with concentrated and uniform loading, Three wire DC system, Types of connection schemes-radial and ring main. Primary AC distribution System: AC distribution calculations SSC: Types of connection schemes-radial and ring main Textbook 2: 8.1- 8.3, 9.1-9.3	**8**
Text Books: **1.** A Course in Electrical Power, Soni Gupta & Bhatnagar, Dhanpat Rai Publications, Edition 2013 **2.** Principles of Power System V.K. Mehta, Rohit Mehta S. Chand First Edition 2013	
Reference Books: **1.** Electrical Power System, C.L. Wadhwa, New Age International Pvt. Ltd., 2007.	
COURSE OUTCOMES (COs): At the end of course students will be able to	
1	**Understand the basic definition and structure of an electric power system and different power plants.** [L2][understand]
2	**Apply the knowledge of transmission and distribution to compute various parameters of transmission line and AC distribution systems. [L3]**.[Apply]
3	**Analyze various network models for different configurations of transmission line [L4]**.[Analysis]
4	**Communicate and engage in independent study as an individual or team by conducting survey on the recent areas of transmission and distribution [PO9 and PO10].**

CO – PO – PSO Matrix

CO	PO												PSO		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	2														
CO2	2												2		
CO3		2											2		
CO4									1	1		1			
CO	2	2							1	1		1	2		

SEMESTER – IV			
Course Name	**: General Proficiency Enhancement Course 2**	**Course Code :**	**21HS45**
Number of Lecture Hours / Week	**: 00**	**CIE Marks :**	**50**
Number of Tutorial / Practical Hours / Week	**: 02**	**SEE Marks :**	**50**
Total Number of Lecture + Tutorial/Practical Hours	**: 2**	**SEE Duration :**	**02 Hours**
L:T:P	**: 0:2:0**	**CREDITS :**	**01**

COURSE PREREQUISITES:
Communicative English I and II

MODULES	TEACHING HOURS
MODULE 1: **General Aptitude 2.1:** **Quantitative Aptitude:** Percentages, Profit & Loss **Logical Reasoning:** Direction Sense Test Introduction and explanation of concepts with their applications. Focus on concepts and different methods and shortcuts to solve problems	**6**
MODULE 2: **Soft Skills** **Conflict Management –** Understanding Conflict, Common causes of workplace conflict, Importance of Interpersonal Relationships at Workplace, Cases Studies on Conflict Management **Verbal Ability –** Sentence Completion Introduction and explanation of concepts with their applications. Focus on concepts and different methods and shortcuts to solve problems	**6**
MODULE 3: **General Aptitude 2.2:** **Quantitative Aptitude:** Time and Work, Problems on Ages **Logical Reasoning:** Seating and Data Arrangement Introduction and explanation of concepts with their applications. Focus on concepts and different methods and shortcuts to solve problems	**6**
MODULE 4:	**6**

Soft Skills **Business Etiquette –** Business Introductions, The art of Small Talk, Dressing Etiquette, Corporate Grooming, Telephone, Cubicle and Dining Etiquette **Leadership Skills –** Defining Leadership, Leadership Values, Key Leadership Skills, Various Styles of Leadership, Functions and Qualities of Good Leaders **Verbal Ability** – Ordering of Sentences Introduction and explanation of concepts with their applications. Focus on concepts and different methods and shortcuts to solve problems	
MODULE 5: **General Aptitude – 2.3** **Quantitative Aptitude:** Simple and Compound Interest, Alligation and Mixtures **Logical Reasoning:** Syllogisms Introduction and explanation of concepts with their applications. Focus on concepts and different methods and shortcuts to solve problems	**6**

Textbooks:

1. Notes and Textbooks are part of learning methodology

Reference Books:

1. Bizotic Course Material, Text Bank and Hand outs
2. Quantitative Aptitude for Competitive Examinations by R.S Aggarwal
3. A Modern Approach to Verbal & Non-Verbal Reasoning by R.S. Aggarwal
4. AMCAT Preparation Guide

COURSE OUTCOMES (COs):

CO1	Understand the importance of continuous learning and implement it successfully Understand the basic concepts of the topics covered. Understand what conflict is and how it escalates within the workplace
CO2	Apply concepts of goal setting , interpersonal behaviors in life Appreciate team skills and dynamics. Identify Critical Thinking
CO3	Self-Analyze and develop self-confidence and a positive attitude Analyze common conflict resolution styles and use them effectively in teamwork
CO4	Compete in various competitive exams with positive mind set Practice Positive thinking and Attitude in walks of life

SEMESTER – IV			
Course Name	**: Biology for Electrical Engineers**	**Course Code :**	**21EE46**
Number of Lecture Hours / Week	**: 02**	**CIE Marks :**	**50**
Number of Tutorial / Practical Hours / Week	**: 00**	**SEE Marks :**	**50**
Total Number of Lecture + Tutorial/Practical Hours	**: 25**	**SEE Duration :**	**02 Hours**
L:T:P	**: 2:0:0**	**CREDITS :**	**02**

COURSE PREREQUISITES: Knowledge of basic science.

COURSE OVERVIEW: The purpose of this course is to provide a basic understanding of the biological mechanisms of living organisms from the perspective of engineers. In addition, the course is expected to encourage engineering students to think about solving biological problems with engineering tools and vice-versa.

COURSE LEARNING OBJECTIVES (CLO) :

- To familiarize the students with the basic biological concepts and their engineering applications.
- To enable the students with an understanding of bio design principles to create novel devices and structures.
- To provide the students an appreciation of how biological systems can be re-designed as substitute products for natural systems.
- To motivate the students, develop the interdisciplinary vision of biological engineering.

MODULES	TEACHING HOURS

MODULE 1: INTRODUCTION Why should Engineers study biology? What is life? The hierarchy of life, Evolution, Taxonomy, Interaction of living things with the environment, Brief history of life, Basic organic chemical structure. Textbook 2: 1.1, 2.1 to 2.6, 3.1	**5**
MODULE 2: COMMUNICATION SYSTEM IN HUMAN BODY Nervous System: Nerve Signal Transmission, Synaptic Transmission, Nervous System Organization, Cardiovascular System, Immunity and Lymphatic System, Respiratory System. Textbook 2: 9.4(9.4.1 to 9.4.3), 9.6, 9.7, 9.8	**5**
MODULE 3: SCIENCE AND ENGINEERING Phylogeny, Motivation, Methods, Synthesis, Scientific Method, The Value of Models, Types of Models, Steps in the Modeling Process, Models and Empirical Observations, Biological Engineering, Expectations for Biological Engineers Textbook 1: 1.2 to 1.6	**5**
MODULE 4: CONTROL SYSTEM IN HUMAN BODY Controls involved in Human Body: Sensors, Actuators, communications, closed loop feedback systems, open loop systems, Closed loop feedforward systems, Adaptive control systems, Fuzzy Control systems. Textbook 1: 4.4 (4.4.1 to 4.4.8)	**5**
MODULE 5: BIOLOGICAL ENGINEERING SOLUTIONS Systems Approach, Relationships between Engineering and Biology, Living Things as the Solution (Bionics, or Hybrid Systems), Living Things as Models (Biomimetics), Biological	**5**

Solutions to Biological Problems (Biotechnology). Living Things as Recipients (Biomedical Engineering), Living Things Inadvertently Affected, The Completed Design. Textbook 2: 8.1 to 8.3	

Textbooks:

1. Biology for Engineers, Arthur T. Johnson, , Second Edition, CRC Press 2019.
2. Environmental Biology for Engineers and Scientists, David A. Vaccari, Peter F. Strom, and James E. Alleman, Wiley Inter-science, 2006.

COURSE OUTCOMES (COs): Upon completion of the course , students will be able to

CO1	Explain basic biological concepts in an engineering perspective.
CO2	Apply biological concepts to provide solutions for engineering problems.
CO3	Analyze the problems in electrical network and prepare a detailed report on solutions derived from biological concepts.

CO – PO – PSO Matrix

CO	PO												PSO		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO 1	PSO 2	PSO 3
CO 1	2														
CO 2	2														
CO 3		1							1	1					
CO 4	2	1							1	1					

SEMESTER – IV		
Course Name	**:** Technical Proficiency Enhancement Course-II **(Electrical Circuit Analysis using PSpice)**	**Course Code: 21EE47**
Teaching Hours/Week (L:T:P)	**: 0:0:2**	**CIE Marks: 50**
Total number of practical hours	**: 24**	**SEE Marks: 50**
Credits	**: 1**	**SEE Duration: 2 Hours**

COURSE OVERVIEW:

This course focuses on key concepts of Electrical circuits and analysis of networks.

COURSE LEARNING OBJECTIVES (CLO)

1. To provide opportunity to perform the experiments/programmes at their own time, at their own pace, at any place as per their convenience and repeat any number of times to understand the concept.
2. To acquaint the students with key concepts of basic circuit laws.

Sl. No.	Experiments
1.	Getting started with PSpice
2.	Introduction to PSPICE
3.	Syntax for Electrical Elements
4.	Develop a program for an electrical circuit
5.	Analyze the response of DC circuits
6.	Analyze the response of AC circuits
7.	Perform Network Theorems
8.	Exercise Problems

Text books:

1. "Spice for circuits and Electronics using PSPICE" by MH Rashid.
2. "Fundamentals of Electric Circuits" by CK Alexander and MNO sadiku.

SEMESTER – IV		
Course Name	**:** Technical Proficiency Enhancement Course-II **(Analysis of Solar PV based module)**	**Course Code: 21EE47**
Teaching Hours/Week (L:T:P)	**: 0:0:2**	**CIE Marks: 50**
Total number of practical hours	**: 24**	**SEE Marks: 50**
Credits	**: 1**	**SEE Duration: 2 Hours**

COURSE OVERVIEW: With this working and operation of a Standalone PV system, a student can understand underlying principles of solar PV, sizing of system, MPPT, and installations.

COURSE LEARNING OBJECTIVES (CLO)

1. To familiarize students with measuring and monitoring electrical parameters using a Standalone PV system.
2. To acquaint the students with model Standalone PV system, on characteristics and power flow calculations

Sl. No.	Experiments
1.	Study of I-V and P-V characteristics of PV module with varying radiation and temperature level
2.	Study of I-V and P-V characteristics of series and parallel combination of PV modules.
3.	Study the effect of variation in tilt angle on PV module power.
4.	Study the effect of shading on module output power.
5.	Power flow calculations of standalone PV system of DC load with battery.
6.	Power flow calculations of standalone PV system of AC load with battery.
7.	Power flow calculations of standalone PV system of DC and AC load with battery.

SEMESTER – IV		
Course Name	**:** Technical Proficiency Enhancement Course-II **(IoT for Electrical Engineering)**	**Course Code: 21EE47**
Teaching Hours/Week (L:T:P)	**: 0:0:2**	**CIE Marks: 50**
Total number of practical hours	**: 24**	**SEE Marks: 50**
Credits	**: 1**	**SEE Duration: 2 Hours**

COURSE OVERVIEW: This course focuses on key concepts of applications of IoT in Electrical engineering

COURSE LEARNING OBJECTIVES (CLO)

1. To familiarize students with measuring and monitoring electrical parameters using the idea of IoT.
2. To acquaint the students with models of IoT circuits for protection and control of Electrical loads.

Sl. No.	Experiments

1.	Basics of IoT programming in Electrical engineering, buzzer, led glow etc.
2.	Measurement of power, energy, phase shift and power factor
3.	Implement Traffic signal control
4.	Over/under voltage protection of home appliances, three phase induction motor
5.	Implementation of over current relay
6.	Railway gate control by stepper motors, Direction and Speed control of DC motor
7.	Develop a solution for a given application using IoT.

BALAKE KANNADA SYLLABUS	
SEMESTER-IV	
Course Name: Balake Kannada	**Course Code: 21HS48B**
No. of Lecture hours / week: 01	**CIE Marks: 50**
No. of Tutorial hours / week: 00	**SEE Marks: 50**
Total No. of Lecture Hours : 15	**SEE Duration: 2Hrs**
L: T: P: 1:0:0	**Credits: 01**

PART-1 Lessons to teach and Learn Kannada Language
Lesson-1 ವೈಯಕ್ತಿಕ, ಸ್ವಾಮ್ಯಸೂಚಕ/ ಸಂಬಂಧಿತ ಸರ್ವನಾಮಗಳು ಮತ್ತು ಪ್ರಶ್ನಾರ್ಥಕ ಪದಗಳು- Personal Pronouns, Possessive Forms, Interrogative Words.
Lesson-2 ನಾಮಪದಗಳ ಸಂಬಂಧಾರ್ಥಕ ರೂಪಗಳು, ಸಂದೇಹಾಸ್ಪದ ಪ್ರಶ್ನೆಗಳು ಮತ್ತು ಸಂಬಂಧವಾಚಕ ನಾಮಪದಗಳು- Possessive forms of nouns, dubitive question and Relative nouns.
Lesson-3 ಗುಣ, ಪರಿಮಾಣ ಮತ್ತು ವರ್ಣಬಣ್ಣ ವಿಶೇಷಣಗಳು, ಸಂಖ್ಯಾವಾಚಕಗಳು Qualitative, Quantitative and colour Adjectives, Numerals.
Lesson-4 ಕಾರಕ ರೂಪಗಳು ಮತ್ತು ವಿಭಕ್ತಿ ಪ್ರತ್ಯಯಗಳು- ಸಪ್ತಮಿ ವಿಭಕ್ತಿ ಪ್ರತ್ಯಯ- (ಆ, ಅದು, ಅವು, ಅಲ್ಲಿ) Predictive Forms, Locative Case.
PART-2
Lesson-1 ಚತುರ್ಥಿ ವಿಭಕ್ತಿ ಪ್ರತ್ಯಯದ ಬಳಕೆ ಮತ್ತು ಸಂಖ್ಯಾವಾಚಕಗಳು- Dative Cases, and Numerals.
Lesson-2 ಸಂಖ್ಯಾಗುಣವಾಚಕಗಳು ಮತ್ತು ಬಹುವಚನ ನಾಮರೂಪಗಳು - Ordinal Numerals and Plural Markers.
Lesson-3 ನ್ಯೂನ/ ನಿಷೇಧಾರ್ಥಕ ಕ್ರಿಯಾಪದಗಳು ಮತ್ತು ಗುಣವಾಚಕಗಳು - Defective / Negative Verbs and Colour Adjectives.
Lesson-4 ಅಪ್ಪಣೆ / ಒಪ್ಪಿಗೆ, ನಿರ್ದೇಶನ, ಪ್ರೋತ್ಸಾಹ ಮತ್ತು ಒತ್ತಾಯ ಅರ್ಥರೂಪ ಪದಗಳು ಮತ್ತು ವಾಕ್ಯಗಳು - Permission, Commands, Encouraging and Urging words (Imperative words and sentences).
PART-3
Lesson-1 “ಇರು ಮತ್ತು ಇರಲ್ಲ” ಸಹಾಯಕ ಕ್ರಿಯಾಪದಗಳು, ಸಂಭಾವ್ಯಸೂಚಕ ಮತ್ತು ನಿಷೇಧಾರ್ಥಕ ಕ್ರಿಯಾಪದಗಳು - Helping Verbs “iru and iralla”, Corresponding Future and Negation Verbs.
Lesson-2 ಹೋಲಿಕೆ (ತರತಮ), ಸಂಬಂಧ ಸೂಚಕ ಮತ್ತು ವಸ್ತು ಸೂಚಕ ಪ್ರತ್ಯಯಗಳು ಮತ್ತು ನಿಷೇಧಾರ್ಥಕ ಪದಗಳ ಬಳಕೆ - Comparitive, Relationship, Identification and Negation Words.
Lesson-3 ಕಾಲ ಮತ್ತು ಸಮಯದ ಹಾಗೂ ಕ್ರಿಯಾಪದಗಳ ವಿವಿಧ ಪ್ರಕಾರಗಳು - Different types of forms of Tense, Time and Verbs

Lesson-4 ದ್, ತ್, ತು, ಇತು, ಆಗಿ, ಅಲ್ಲ, ಗ್, ಕ್, ಇದೆ,ಕ್ರಿಯಾ ಪ್ರತ್ಯಯಗಳೊಂದಿಗೆ ಭೂತ, ಭವಿಷ್ಯತ್ ಮತ್ತು ವರ್ತಮಾನ ಕಾಲ ವಾಕ್ಯ ರಚನೆ - Formation of Past, Future and Present Tense Sentences with Verb Forms
PART-4
Lesson-1 ಕರ್ನಾಟಕ ರಾಜ್ಯ ಮತ್ತು ರಾಜ್ಯದ ಬಗ್ಗೆ ಕುರಿತಾದ ಇತರೆ ಮಾಹಿತಿಗಳು - Karnataka State and General Information about the State
Lesson-2 ಭಾಷೆ ಕಲಿಯಲು ಏನನ್ನು ಮಾಡಬೇಕು ಮತ್ತು ಮಾಡಬಾರದು - Do's and Don'ts in Learning a Language
Lesson-3 Kannada Language Script Part-1
Lesson-4 Kannada Vocabulary List: ಸಂಭಾಷಣೆಯಲ್ಲಿ ದಿನೋಪಯೋಗಿ ಕನ್ನಡ ಪದಗಳು - Kannada Words in Conversation
Text Book: ಬಳಕೆ ಕನ್ನಡ: ಪ್ರಸಾರಾಂಗ, ವಿಶ್ವೇಶ್ವರಯ್ಯ ತಾಂತ್ರಿಕ ವಿಶ್ವವಿದ್ಯಾಲಯ
Reference Books: ಪರಾಮರ್ಶನ ಗ್ರಂಥಗಳು **1.** ಸಂಕ್ಷಿಪ್ತ ಕನ್ನಡ ನಿಘಂಟು, ಕನ್ನಡ ಸಾಹಿತ್ಯ ಪರಿಷತ್, ಬೆಂಗಳೂರು. **2.** ಇಂಗ್ಲೀಷ್- ಕನ್ನಡ ನಿಘಂಟು – ಮೈಸೂರು ವಿಶ್ವವಿದ್ಯಾಲಯ. **3.** ಆಡಳಿತ ಪದಕೋಶ, ಕನ್ನಡ ಅಭಿವೃದ್ಧಿ ಪ್ರಾಧಿಕಾರ, ಬೆಂಗಳೂರು.

Course Outcomes:

CO1	ಕನ್ನಡ ಭಾಷೆಯ ಮಹತ್ವವನ್ನು ಅರಿಯುವುದು. Understanding the importance of kannada language.
CO2	ಕನ್ನಡ ಭಾಷೆಯನ್ನು ಬರೆಯುವ, ಓದುವ ಮತ್ತು ಸಂವಹಿಸುವ ಕೌಶಲವನ್ನು ಬೆಳೆಸಿಕೊಳ್ಳುವರು. They will develop the skills of reading and communication in kannada language.

SAMSKUTHIKA KANNADA SYLLABUS
SEMESTER-1V

Course Name: Samskruthika Kannada	**Course Code: 21HS48C**
No. of Lecture hours / week: 01	**CIE Marks: 50**
No. of Tutorial hours / week: 00	**SEE Marks: 50**
Total No. of Lecture Hours : 15	**SEE Duration: 2Hrs**
L: T: P: 1:0:0	**Credits: 01**

ಭಾಗ-**1,** ಲೇಖನಗಳು

ಕನ್ನಡ ನಾಡು**,** ನುಡಿ ಮತ್ತು ಸಂಸ್ಕೃತಿಗೆ ಸಂಬಂಧಿಸಿದ ಲೇಖನಗಳು

1. ಕರ್ನಾಟಕ ಸಂಸ್ಕೃತಿ : ಹಂಪ ನಾಗರಾಜಯ್ಯ
2. ಕರ್ನಾಟಕದ ಏಕೀಕರಣ : ಒಂದು ಅಪೂರ್ವ ಚರಿತ್ರೆ- ಜಿ. ವೆಂಕಟಸುಬ್ಬಯ್ಯ
3. ಆಡಳಿತ ಭಾಷೆಯಾಗಿ ಕನ್ನಡ: - ಡಾ. ಎಲ್. ತಿಮ್ಮೇಶ ಮತ್ತು ಪ್ರೊ. ವಿ. ಕೇಶವಮೂರ್ತಿ

ಭಾಗ-**2,** ಕಾವ್ಯ ಭಾಗ **(**ಆಧುನಿಕ ಪೂರ್ವ**)**

1. ವಚನಗಳು : ಜೇಡರದಾಸಿಮಯ್ಯ, ಅಲ್ಲಮಪ್ರಭು, ಬಸವಣ್ಣ, ಅಕ್ಕಮಹಾದೇವಿ.
2. ಕೀರ್ತನೆಗಳು : ಅದರಿಂದೇನು ಫಲ ಇದರಿಂದೇನು ಫಲ - ಪುರಂದರದಾಸ
3. ತತ್ವಪದಗಳು : ಸಾವಿರ ಕೊಡಗಳ ಸುಟ್ಟು – ಶಿಶುನಾಳ ಷರೀಫ
4. ಜನಪದ ಗೀತೆ : ಬೀಸುವ ಪದ

ಭಾಗ **– 3,** ಕಾವ್ಯ ಭಾಗ **(**ಆಧುನಿಕ**)**

1. ಮಂಕುತಿಮ್ಮನ ಕಗ್ಗ : ಡಿ.ವಿ.ಜಿ
2. ಹೊಸಬಾಳಿನ ಗೀತೆ : ಕುವೆಂಪು
3. ಹೆಂಡತಿಯ ಕಾಗದ : ಕೆ. ಎಸ್. ನರಸಿಂಹಸ್ವಾಮಿ
4. ಮಬ್ಬಿನಿಂದ ಮಬ್ಬಿಗೆ : ಜಿ.ಎಸ್. ಶಿವರುದ್ರಪ್ಪ
5. ಚೋಮನ ಮಕ್ಕಳ ಹಾಡು : ಸಿದ್ಧಲಿಂಗಯ್ಯ

ಭಾಗ-**4,** ತಾಂತ್ರಿಕ ವ್ಯಕ್ತಿ ಪರಿಚಯ**,** ಕಥೆ ಮತ್ತು ಪ್ರವಾಸ ಕಥನ

1. ಡಾ. ಸರ್ ಎಂ ವಿಶ್ವೇಶ್ವರಯ್ಯ- ವ್ಯಕ್ತಿ ಮತ್ತು ಐತಿಯ್ಯ : ಎ ಎನ್ ಮೂರ್ತಿರಾವ್
2. ಯುಗಾದಿ : ವಸುಧೇಂದ್ರ
3. ಮೆಗಾನೆ ಎಂಬ ಗಿರಿಜನ ಪರ್ವತ : ಹಿ. ಚಿ. ಬೋರಲಿಂಗಯ್ಯ

ಭಾಗ-**5,** ವಿಜ್ಞಾನ ಮತ್ತು ತಂತ್ರಜ್ಞಾನ

1. ಕರಕುಶಲ ಕಲೆಗಳು ಮತ್ತು ಪರಂಪರೆಯ ವಿಜ್ಞಾನ : ಕರೀಗೌಡ ಬೀಚನಹಳ್ಳಿ
2. ತಾಂತ್ರಿಕ ಪದಕೋಶ : ತಾಂತ್ರಿಕ ಹಾಗೂ ಪಾರಿಭಾಷಿಕ ಕನ್ನಡ ಪದಗಳು.

Text Book:

ಸಾಂಸ್ಕೃತಿಕ ಕನ್ನಡ: ಪ್ರಸಾರಾಂಗ, ವಿಶ್ವೇಶ್ವರಯ್ಯ ತಾಂತ್ರಿಕ ವಿಶ್ವವಿದ್ಯಾಲಯ

Reference Books: ಪರಾಮರ್ಶನ ಗ್ರಂಥಗಳು

1. ವಿಷಯ ವಿಶ್ವಕೋಶ: ಕರ್ನಾಟಕ – ಮೈಸೂರು ವಿಶ್ವವಿದ್ಯಾಲಯ
2. ಕರ್ನಾಟಕ ಸಂಸ್ಕೃತಿ ಸಮೀಕ್ಷೆ- ಎಚ್. ತಿಪ್ಪೇರುದ್ರಸ್ವಾಮಿ
3. ಕರ್ನಾಟಕ ಸಂಸ್ಕೃತಿ –ಎಂ ಚಿದಾನಂದಮೂರ್ತಿ
4. ಕರ್ನಾಟಕ ಗತ ವೈಭವ- ಆಲೂರು ವೆಂಕಟರಾಯರು
5. ಆಡಳಿತ ಪದಕೋಶ, ಕನ್ನಡ ಅಭಿವೃದ್ಧಿ ಪ್ರಾಧಿಕಾರ, ಬೆಂಗಳೂರು.
6. ಶಿಶುನಾಳ ಷರೀಫ ಅವರ 'ದುಡ್ಡು ಕೆಟ್ಟದ್ದು ನೋಡಣ್ಣಾ'.
7. ಕೋಗಿಲೆ ಮತ್ತು ಸೋವಿಯತ್ ರಷ್ಯಾ- ಕುವೆಂಪು
8. ಮೈಸೂರು ಮಲ್ಲಿಗೆ – ಕೆ.ಎಸ್.ನರಸಿಂಹಸ್ವಾಮಿ
9. ಚೋಮನ ದುಡಿ - ಶಿವರಾಮ ಕಾರಂತರ
10. ಕೆ. ಎಂ. ವೆಂಕಟಕೃಷ್ಣರಾವ್ ರವರು ಬರದಿರುವ 'ಶತಮಾನದ ಪುರುಷ- ವಿಶ್ವೇಶ್ವರಯ್ಯ', ಪ್ರಕಟಣೆ ಪ್ರಸಾರಾಂಗ ವಿಶ್ವೇಶ್ವರಯ್ಯ ತಾಂತ್ರಿಕ ವಿಶ್ವವಿದ್ಯಾನಿಲಯ.
11. ಗಿರಿಜನ ನಾಡಿಗೆ ಪಯಣ- ಡಾ. ಹಿ.ಚಿ.ಬೋರಲಿಂಗಯ್ಯ
12. ಕರಿಮಣ್ಣಿನ ಗೊಂಬೆಗಳು- ಕರೀಗೌಡ ಬೀಚನಹಳ್ಳಿ

Course Outcomes:

CO1	ಕನ್ನಡ ಸಾಹಿತ್ಯ – ಸಂಸ್ಕೃತಿ ಮತ್ತು ನಾಡು ನುಡಿಯ ಪರಿಚಯ ಮಾಡಿಕೊಡುವುದು
CO2	ತಾಂತ್ರಿಕ ಪದಗಳನ್ನು ಕನ್ನಡ ಭಾಷೆಗೆ ಭಾಷಾಂತರಿಸುವ ಪ್ರಕ್ರಿಯೆಯನ್ನು ವಿಶ್ಲೇಷಿಸುವರು.
CO3	ಗಣಕ ಯಂತ್ರದ ಬಳಕೆ ಮತ್ತು ಮಾಹಿತಿ ತಂತ್ರಜ್ಞಾನವನ್ನು ಬಳಸಿ ಕನ್ನಡ ಭಾಷೆಗೆ ಸಂಬಂಧಿಸಿದಂತೆ ಕೌಶಲಗಳನ್ನು ಬೆಳೆಸಿಕೊಳ್ಳುವುದು.

SEMESTER-IV			
Course Name:	**Additional Mathematics-II**	**Course Code**	**21MADIP41**
Number of Lecture Hours / Week	**03**	**CIE Marks**	**100**
Number of Tutorial / Hours / Week	**00**	**SEE Marks**	**-**
Total Number of Lecture Hours + Practical Hours	**40 + 0 =40**	**SEE Duration**	**-**
L:T:P	**3:0:0**	**CREDITS**	**00**

COURSE OVERVIEW:

Additional Mathematics-II is a course which provides mathematical techniques to support the lateral entry students that are of at most relevance to engineering disciplines. The major focus of the course are Linear algebra, Multiple integral, Higher order ODE, Laplace Transformation and Vector Calculus. The purpose of this course is to provide the skills and knowledge required to perform mathematical procedures and processes for solution of engineering problems. The course aims to show the relevance of mathematics to engineering and applied science.

COURSE LEARNING OBJECTIVES (CLOs)

The objective is to enable the students to apply the knowledge of mathematics in various fields of Engineering by the following means:

a. Explain the concept of Linear algebra, Multiple integral, Higher order ODE, Laplace Transformation and Vector Calculus to back up the advanced mathematics in solving engineering problems.

a. Explain how to analyze the system in various engineering domain using Linear algebra, Multiple integral, Higher order ODE, Laplace Transformation and Vector Calculus.

MODULES	TEACHING HOURS
Module-I **Linear Algebra**: Vectors-Linearly dependent and independent. Vector space: - Span, Basis. Linear Transformation: - Matrix representation, Rank-Nullity	**08**
Module-II **Special Functions**: Gamma and Beta functions, Properties of gamma. Relation between gamma and beta (no proof). Problems on gamma and beta leading to reduction formula. **Multiple Integral:** Double Integration-application on area (Simple examples).	**08**
Module-III **Higher Order ODE's:** Linear differential equations of second and third order equations with constant coefficients (Homogeneous, Non-homogeneous equations). Inverse differential operators. (Particular Integral restricted to Rx=Constant,eax, sinax/cosax, polynomial. (2^{nd} order only))	**08**

Module-IV **Laplace Transforms**: Laplace transforms of elementary functions (without proof). Properties: First and second shifting, multiplication, and division by t (only problems). **Inverse Laplace Transforms**: Definition of inverse Laplace transforms. Evaluation of inverse transforms by partial fraction method, Application to solve linear differential equations.	**08**
Module-V **Vector Calculus:** Differentiation of vector functions. Scalar and vector point functions. Gradient, Divergence, Curl (Simple problems). Solenoidal and irrotational vector field (Problems). **Vector Integration:** Only line integral (Simple problems).	**08**

Text books
1. **B. S. Grewal**, *Higher Engineering Mathematics*, Latest edition, Khanna Publishers. 2. **B.V.Ramana**, *Higher Engineering Mathematics*, Latest edition, Tata Mc. Graw Hill Publications. 3. **David C. Lay**, *Linear Algebra and its Applications*, Third edition, Pearson Publication
REFERENCE BOOK
Reference Books: **1. Erwin Kreyszig**, *Advanced Engineering Mathematics*, Latest edition, Wiley Publications. 2. **Peter V. O'Neil**, *Engineering Mathematics*, CENGAGE Learning India Pvt Ltd. Publishers 3. **Gilbert Strang**, *Linear Algebra and its Application*, Fourth edition, Cengage learning

COURSE OUTCOMES (COs):	
CO1	**Understand** the basic concepts of Linear algebra, Special function, Higher order differential equations, Vector calculus (PO-1).
CO2	**Apply** the concept of Linear algebra, Special function, Higher order differential equations, Vector calculus (PO-2).

CO – PO Matrix

CO	**PO**											
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**
CO1	2		-	-	-	-	-	-	-	-	-	-
CO2	2	-	-	-	-	-	-	-	-	-	-	-
C301	**2**	**-**	-	-	**-**	-	-	-	-	-	-	-