Sharnbasva University, Kalaburgi

Scheme of Teaching and Examination2021-22

[As per Nep, Outcome Based Education (OBE) and Choice Based Credit System (CBCS) Scheme-1]

(Effectivefromtheacademicyear2021-22)

Programme :B.Tech :Electronics and Communication Engineering

III SEMESTER

Sl. No.	Course Code		Course Title	Teaching Department	Teaching Hours/week			Examination				Credits
					Theory Lecture	Tutorial	Practical/Dra	Duration in Hours	CIE Marks	SEE Marks	Total Marks	
					L	T	P					
1	BS	21MAT31	Engineering Mathematics-III	Mathematics	3			3	50	50	100	03
2	PCC	21EC32	Analog Circuits	ECE	3	1		3	50	50	100	04
3	PCC	21EC33	Digital System Design	ECE	3			3	50	50	100	03
4	PCC	21EC34	Network Analysis	ECE	3			3	50	50	100	03
5	PCC	21EC35	Sensors and Actuators	ECE	2			3	50	50	100	02
6	PCC	21ECL36	Analog Circuits Laboratory	ECE			2	3	50	50	100	01
7	PCC	21ECL37	Digital System Design Laboratory	ECE			2	3	50	50	100	01
8	PCC	21ECL38	Network Analysis Laboratory oratory	ECE			2	3	50	50	100	01
9	PW	21PRJ39	Project-III	ECE			2	3	50	50	100	01
10	HSS	18KANKK310 /20KANAK310	KannadaKali-III/ AydaKategalu	Humanities	1			3	50	50	100	01
11	AEC	21AEC311X	Ability Enhancement Course-III	ECE			2	3	50	50	100	01
Total					**15**	**1**	**10**	**33**	**550**	**550**	**1100**	**21**

Note: BS-Basic Science, PCC- Programme Core Course, PW-Project Work, AEC- Ability Enhancement Course, HSS-Humanity and Social Science, NCMC-Non Credit Mandatory Course

21KANKK310 Kannada Kali-III is for non Kannada speaking, reading and writing students and 21KANAK310 Ayda Kategalu is for the students who speak, read and write Kannada. Project(PRJ):Based on the ability/abilities of the student/s and recommendations of the mentor, a single discipline or multi disciplinary mini project can be Assigned to an individual students or to a group having not more than 4students.

Ability Enhancement Course-3												
Course code under 21AEC311X			**Course Title**									
21AEC3111			Analog Electronics Laboratory oratory using Pspice/Mutlisim/LTspice									
21AEC3112			Digital System Design using Pspice/Multisim/LTspice									
Courses prescribed to lateral entry Diploma holders admitted to III semester of Engineering programs												
12	NCMC	21MATDIP31	Additional Mathematics– I	Mathematics	3	0	-	00	100	00	100	00
1) Non Credit Mandatory Courses (NCMC) Additional Mathematics-I and II prescribed for III and IV semesters respectively, to the lateral entry Diploma holders admitted to III semester of B. Tech. programs, shall attend the classes during the respective semesters to complete all the formalities of the course and appear for the university examination. In case any student fails to secure the minimum 50% of the prescribed CIE marks, he/she shall be deemed to have secured F grade. In such a case, the students have to fulfill the requirements during subsequent semester/s. 2) These courses shall not be mandatory for vertical progression, but completion of the course shall be mandatory for the award of degree.												
Courses prescribed to lateral entry B.Sc. degree holders admitted to III semester of Engineering programs												
Lateral entry students from B.Sc. stream, shall clear the non-credit courses Computer Aided Engineering Drawing, Elements of Civil Engineering of First Year Engineering Programme. These Courses shall not be considered for vertical progression, but completion of the courses shall be mandatory For the award of degree.												
AICTE Activity Points to be earned by students admitted to B.Tech. programme(For more details refer to Chapter 6,AICTE Activity Point Programme, Model Internship Guidelines): Over and above the academic grades, every regular student admitted to the 4 years Degree programme and every student entering 4 years Degree programme through lateral entry, shall earn 100 and 75 Activity points respectively for the award of degree through AICTE Activity Point Programme. Students transferred from other universities to fifth semester are required to earn 50 activity points from the year of entry to Sharnbasva University. The Activity Points earned shall be reflected on the students eighth semester Grade card. The activities can be spread over the years, anytime during the semester weekend holidays, as per the liking and convenience of the student from the year of entry to the programme. However, minimum hours requirement should be fulfilled. Activity Points(non credit) have no effect on SGPA/CGPA and shall not be considered for vertical progression. Incase students fail to earn the prescribed activity points, Eighth semesterGradeCardshallbeissuedonlyafterearningtherequiredactivitypoints. Student shall be admitted for the award of the degree only after the release of the Eighth semester Grade Card.												

Sharnbasva University, Kalaboratory uragi
Scheme of Teaching and Examination2021-22
[As per NEP, Outcome Based Education (OBE) and Choice Based Credit System (CBCS) Scheme]
(Effectivefromtheacademicyear2021-22)

Programme: B.Tech: Electronics and Communication Engineering

IVSEMESTER

Sl. No.	Course Code		Course Title	Teaching Department	Teaching Hours/week			Examination				Credit
					Theory Lecture	Tutorial	Practical /Drawing	Duration in Hours	CIE Marks	SEE Marks	Total Marks	
					L	T	P					
1	BS	21MAT41	Engineering Mathematics-IV	Mathematics	3			3	50	50	100	03
2	PCC	21EC42	Analog and Digital Communication	ECE	3	1		3	50	50	100	04
3	PCC	21EC43	Microcontroller	ECE	3			3	50	50	100	03
4	PCC	21EC44	Signals and Systems	ECE	3			3	50	50	100	03
5	PCC	21EC45	Information Theory and Coding	ECE	2			3	50	50	100	02
6	PCC	21ECL46	Analog and Digital Communication Laboratory	ECE			2	3	50	50	100	01
7	PCC	21ECL47	Microcontroller Laboratory	ECE			2	3	50	50	100	01
8	PCC	21ECL48	Signals and Systems Laboratory	ECE			2	3	50	50	100	01
9	PW	21PRJ49	Project-IV	ECE			2	3	50	50	100	01
10	HSS	18KANKK410 /20 KANMD410	KannadaKali-IV/ Mahadasohigalu	Humanities	1			3	50	50	100	01
11	AEC	21AEC411X	Ability Enhancement Course-IV	ECE			2	3	50	50	100	01
Total					**15**	**1**	**10**	**33**	**550**	**550**	**1100**	**21**

Note: BS-Basic Science, PCC- Programme Core Course, PW-Project Work, AEC- Ability Enhancement Course,HSS-HumanityandSocialScience,NCMC-NonCreditMandatoryCourse

21KANKK410KannadaKali-IV is for non Kannada speaking, reading and writing students and 21KANMD410 Mahadasohigalu is for the students who speak, Read and write Kannada.

Project (PRJ): Based on the ability/abilities of the students/and recommendations of the mentor, a single discipline or multidisciplinary mini project can be Assigned to an individual students or to a group having not more than 4students

Ability Enhancement Course-4

Course code under 21AEC411X	**Course Title**
21AEC4111	Embedded C Basics
21AEC4112	PCB Design and Fabrication

Courses prescribed to lateral entry Diploma holders admitted to III semester of Engineering programs

12	NCMC	21MATDIP41	Additional Mathematics–II	Mathematics	3	0	-	00	100	00	100	00

1) Non Credit Mandatory Courses (NCMC) Additional Mathematics-I and II prescribed for III and IV semesters respectively, to the lateral entry Diploma holders admitted to III semester of B. Tech. programs, shall attend the classes during the respective semesters to complete all the formalities of the course and appear for the university examination. In case any student fails to secure the minimum 50% of the prescribed CIE marks, he/she shall be deemed to have secured F grade. In such a case, the students have to fulfill the requirements during subsequent semester/s.
2) These courses shall not be mandatory for vertical progression, but completion of the courses shall be mandatory for the award of degree.

Courses prescribed to lateral entry B.Sc. degree holders admitted to III semester of Engineering programs

Lateral entry students from B.Sc. stream, shall clear the non credit courses Computer Aided Engineering Drawing, Elements of Civil Engineering of First Year Engineering Programme. These Courses shall not be considered for vertical progression, but completion of the courses shall be mandatory
For the award of degree.

AICTE Activity Points to be earned by students admitted to B.Tech. programme(For more details refer to Chapter 6,AICTE Activity Point Programme, Model Internship Guidelines):

Over and above the academic grades, every regular student admitted to the 4 years Degree programme and every student entering 4 years Degree programme through lateral entry, shall earn 100 and 75 Activity points respectively for the award of degree through AICTE Activity Point Programme. Students transferred from other universities to fifth semester are required to earn 50 activity points from the year of entry to Sharnbasva University. The Activity Points earned shall be reflected on the students eighth semester Grade card.

The activities can be spread over the years, anytime during the semester weekends holidays, as per the liking and convenience of the student from the year of entry to the programme. However, minimum hours requirement should be fulfilled. Activity Points (non credit) have no effect on SGPA/CGPA and shall not be considered for vertical progression.

In case students fail to earn the prescribed activity points, Eighth semester Grade Card shall be issued only after earning the required activity points.
Student shall be admitted for the award of the degree only after the release of the Eighth semester Grade Card.

ENGINEERING MATHEMATICS –III FOR ECE & EEE Branch			
Course Code	21MAT31	CIE Marks	50
Contact Hours/Week	03	SEE Marks	50
Total Hours	40	Exam Hours	03
Semester	III	Credits	03

Course Learning Objectives:

This course will enable students to:

- Introduce most commonly used analytical and numerical methods in the different engineering fields.
- Learn Laplace transform and Z-transforms to solve ODE and PDE's.
- Understanding the statistical methods, numerical methods.
- Solve the problem related to Interpolation.
- To discuss the random variable and associated probability distributions.
- Understand the vector space and associated results.

MODULE-1: LAPLACE TRANSFORMS	
Laplace Transforms: Definition, Laplace transforms of Elementary functions, properties(without proof) periodic function, Unit step function, Unit impulse function. **Inverse Laplace Transforms:** Definition, Convolution Theorem (without proof) and Finding Inverse Laplace transform by convolution Theorem. Solution of Linear Differential equations using Laplace Transforms and Applications (5 Assignment Problem). **Self Study : Solution of first order simultaneous differential equation** **(RBT Levels: L1, L2 and L3)**	**8 Hours**
Teaching – Learning Process	Chalk and talk method / Power Point Presentation

MODULE-2: PROBABILITY DISTRIBUTION-1	
Probability Distribution: Random variables (discrete and continuous) probability mass/density functions. Binomial distribution, Poisson distribution. Exponential and Normal distributions. Problems. (5 Assignment Problem). **Self Study : Definition of probability , addition and multiplication rule, Bay's theorem.** **(RBT Levels: L1, L2 and L3)**	**8 Hours**
Teaching – Learning Process	Chalk and talk method / Power Point Presentation

MODULE-3: STATISTICAL METHODS	
Statistical Methods: Correlation-karl Pearson's co-efficient of correlation problems. Regression analysislines of regression, Rank correlation (without proof)-problems. **Curve Fitting:** Curve fitting by the method of least square. Fitting of the curves of the form$y = ax + b$, $y = ax^2 + bx + c$ & $y = ae^{bx}$. **Numerical Methods:** Numerical solution of algebraic and transcendental equations by Regula-Falsi Method and Newton-Raphson method. (5 Assignment Problem). **Self Study : Secent method, mean, mode, median, variance and standard deviation.** **(RBT Levels: L1, L2 and L3)**	**8 Hours**
Teaching – Learning Process	Chalk and talk method / Power Point Presentation

MODULE-4: FINITE DIFFERENCES	
Finite Difference: Forward and Backward differences, Newton's forward and backward interpolation formulae. Divided difference-Newton's divided difference formulae. Lagrange's-interpolation formula and inverse interpolation formula (all formula without proof) problems. **Numerical Integration:** Simpsons $\left(\frac{1}{3}\right)^{rd}$, $\left(\frac{3}{8}\right)^{th}$ rules, Weddle's rule (without proof) problems (5 Assignment Problems). **Self Study :** Numerical differentiation, Trapezoidal rule **(RBT Levels: L1, L2 and L3)**	**8 Hours**

Teaching – Learning Process	Chalk and talk method / Power Point Presentation

MODULE-5: Z-TRANSFORMS AND LINEAR ALGEBRA

Z- Transforms: Difference Equations, Basic definitions, Damping rule, Shifting rule, Initial and FinalValue theorems (without proof) and problems. Inverse Z-transforms. Applications of Z-transforms to solve difference equation. **Linear Algebra:** Introduction to Vector space and sub space, definitions, illustrative examples and simple problems, Basis and dimensions, Linear independent and linear dependent vectors **Self Study : Two dimensional and three dimensional vectors, convergent and divergent series (RBT Levels: L1, L2 and L3)**	**8 Hours**

Teaching – Learning Process	Chalk and talk method / Power Point Presentation

Question Paper Pattern:

• The SEE question paper will be set for 100 marks and the marks scored will be proportionately reduced to 50.
• The question paper will have ten full questions carrying equal marks.
• Each full question carries 20 marks.
• There will be two full questions (with a maximum of four sub questions) from each module.
• Each full question will have sub questions covering all the topics under a module.
• The students will have to answer five full questions, selecting one full question from each module.

CIE + Assignments: 15+35=50 Marks

There will be a 3 CIE's, the average of best of 2 CIE's will be considered and there will be a 35 marks for Assignments

Course Outcomes(COs): After completion of course, the student will able to

- **CO1 -** Apply the knowledge of Laplace transform from time domain to frequency domain in Signal and image processing and to find inverse Laplace transform.
- **CO2 -** Learn to solve the random variable in both discrete and continuous and their probability distribution, Mass on various engineering problems.
- **CO3 -** Make the use of the concept of correlation and regression lines for solving the problems and numerical techniques to solve engineering problems.
- **CO4 -** Understanding the concepts of Finite differences to solve the problems on interpolation.
- **CO5 -** Apply the knowledge of Z-transforms in solving the difference equation arising in the time signals and digital processing. And understanding the vector and sub space and also linear dependent and independent vectors

Bloom's level of the course outcomes:

CO#	Bloom's Level					
	Remember (L1)	**Understand (L2)**	**Apply (L3)**	**Analyze (L4)**	**Evaluate (L5)**	**Create (L6)**
CO1	√	√	√			
CO2	√	√	√			
CO3	√	√	√			
CO4	√	√	√			
CO5	√	√	√			

Course Articulation Matrix / Course mapping :

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

Text Books:

1. B.S. Grewal : Higher Engineering Mathematics, Khanna Publishers, 43rd Ed., 2015.
2. E. Kreyszig : Advanced Engineering Mathematics, John Wiley & Sons, 10th Ed.(Reprint), 2016.

Reference books:

1. C.Ray Wylie, Louis C.Barrett : “Advanced Engineering Mathematics", 6th Edition,
2. McGraw-Hill Book Co., New York, 1995.
2. James Stewart : “Calculus –Early Transcendentals”, Cengage Learning India Private Ltd.,2017.
3. B.V.Ramana : "Higher Engineering Mathematics" 11th Edition, Tata McGraw-Hill, 2010.
4. Srimanta Pal & Subobh C Bhunia:“Engineering Mathematics”, Oxford UniversityPress,3rd Reprint,2016.
5. Gupta C.B., Singh S.R. and Mukesh Kumar : “Engineering Mathematics for Semester I & II”, Mc-Graw Hill Education (India) Pvt.Ltd., 2015.

Web links and Video Lectures:

1. http://nptel.ac.in/courses.php?disciplineID=111
2. http://www.class-central.com/subject/math
3. http://academicearth.org.

ANALOG CIRCUITS

[As per NEP, Outcome Based Education (OBE) and Choice Based Credit System (CBCS) Scheme]

SEMESTER-III

Subject Code	21EC32	CIE Marks	50
Number of Lecture Hour/Week	3L+1T	SEE Marks	50
Number of Lecture Hours	50	Exam Hours	03

CREDITS-04

Course Objectives: This course will enable students to:

- Understand and analyze the AC and DC operation of BJT & FET.
- Understand the basic concepts of operational amplifier.
- Understand and analyze the AC and DC operation of Op-Amp.
- Study and design the various Op-Amp applications.

Module -1	**Teaching Hours**
BJT Biasing: Introduction, Operating point, Fixed bias configuration, Voltage divider bias configuration. (**Text1: 4.1-4.3, 4.5**) **BJT AC analysis:** Introduction, BJT transistor modeling, The re transistor model: Common emitter fixed bias configuration, Voltage divider bias configuration. The Hybrid Equivalent model, Approximate hybrid equivalent circuit: Fixed bias configuration, Voltage divider bias configuration. (**Text1: 5.1, 5.3, 5.4-5.6, 5.19, 5.20**) **Field effect transistors:** Introduction, Construction and Characteristics of JFETs, Transfer characteristics, Depletion type MOSFET, Enhancement type MOSFET. (**Text1: 6.1-6.3, 6.7, 6.8**) **JFET biasing:** Fixed bias configuration, Voltage divider bias configuration. (**Text1: 7.2, 7.4)** **JFET small signal model**: Introduction, JFET small signal model, Fixed bias configuration, Voltage divider configuration. (**Text1: 8.1-8.3, 8.5**)	**10 Hours**
Module -2	
Operational amplifier parameters and performance: Introduction, Ideal and practical operational amplifiers, Basic Op-Amp internal circuitry, Input, output & supply voltages, offset voltages and currents, Input and output impedances, Slew rate and Frequency limitations. (**Text2: 2.1-2.6)** **Op-Amps as DC/AC amplifiers: Introduction**, Biasing Op-Amps, Direct coupled voltage follower, non-inverting amplifiers, inverting amplifiers, Summing amplifiers and Difference amplifier, Instrumentation amplifier, Capacitor-coupled voltage follower, Capacitor-coupled noninverting amplifier, Capacitor-coupled inverting amplifier. (**Text2: 3.1-3.4, 3.6-3.8, 4.1,4.3,4.5**)	**10 Hours**
Module -3	
Op-Amp applications: Voltage sources, Current sources and current sinks, Zero Crossing detector**,** Inverting Schmitt trigger circuit, Differentiating Circuit, Integrator Circuit, Precision rectifiers. (**Text2:7.1, 7.2, 8.2, 8.3, 8.6, 8.7, 9.1, 9.2**)	**10 Hours**
Module -4	
More applications: Limiting circuits, clamping circuits, Sample and hold circuits. **(Text2:9.3, 9.4, 9.6**) Sinusoidal oscillators: Feedback concepts, Phase shift oscillator, Colpitts and Hartley Oscillators, Wein bridge oscillator. (**Text1: 14.1 Text2: 11.1-11.3)** **Active Filters:** Filter types and characteristics, First order and Second order active low-pass and High pass filters, Band-pass filters and Notch filters. (**Text2: 12.1-12.3, 12.5, 12.6**)	**10 Hours**
Module -5	
Voltage Regulator: Introduction, Series Op-Amp regulator, IC voltage regulators, 723 general purpose regulators. (**Text3: 6.1-6.4**) **555 timers**: Introduction, Description of functional diagram, Monostable operation and	**10 Hours**

Astable operation. (**Text3: 8.1-8.4**) **Phase locked loop:** Introduction**,** Basic Principles, Phase detector/comparator, Voltage Controlled Oscillator (VCO). (**Text3**: **9.1-9.4**) **D-A and A-D converters**: Introduction, Weighted resistor DAC, R-2R ladder DAC, ADC using Successive approximation. (**Text3: 10.1, 10.2.1, 10.2.2, 10.3.4**)	

Course Outcomes: After studying this course, students will be able to:

CO1-Analyze DC and AC operation of BJT and JFET biasing circuits.

CO2-Explain the characteristics of Op-Amp and design the AC and DC amplifiers using Op-Amp.

CO3-Develop linear applications and Switching circuits.

CO4-Develop the signal processing circuits, sinusoidal oscillators and active filters using Op-Amp.

CO5- Build voltage regulator, 555 timer- based applications, phase locked loop and data Converters using Op-Amp.

Text Books:

1. Robert L. Boylestad and Louis Nashelsky, "Electronics Devices and Circuit Theory", Pearson, 10th Edition, 2012, ISBN: 978-81-317-6459-6.
2. David A. Bell, "Operational Amplifiers and Linear ICs", Oxford University Press, 3rd Edition, 2011.
3. D. Roy Choudhury and Shail B. Jain, "Linear Integrated Circuits", New Age International Publishers, 4th Edition, 2010, ISBN 978-81-224-3098-1.

Reference Books:

1. David A. Bell, "Electronic Devices and Circuits", Oxford University Press, 5th Edition, 2008.
2. Jacob Millman, Christos C Halkias, SatyabrataJit, "Electronic Devices and Circuits", McGraw-Hill Education, 2nd Edition, 2007.
3. Ramakant A Gayakwad, "Op-Amps and Linear Integrated Circuits", Pearson, 4th Edition, 2015.

COURSE OUTCOME AND REVISED BLOOM'S TAXONOMY LEVEL MAPPING (Y/N)						
COURSE OUTCOME	**Remember L1**	**Understand L2**	**Apply L3**	**Analyze L4**	**Evaluate L5**	**Create L6**
CO1	Y	Y	N	Y	N	N
CO2	Y	Y	Y	N	N	N
CO3	Y	Y	Y	N	N	N
CO4	Y	Y	Y	N	N	N
CO5	Y	Y	Y	N	N	N

COURSE OUTCOME AND PROGRAMME OUTCOME MAPPING(1/2/3):

Note:1-Low, 2-Medium, 3-High

CO/PO	PO.1	PO.2	PO.3	PO.4	PO.5	PO.6	PO.7	PO.8	PO.9	PO.10	PO.11	PO.12	PSO.1	PSO.2	PSO.3
CO1	**3**	**3**	**-**	**-**	**-**	**-**	**1**	**-**	**-**	**-**	**-**	**-**	**3**	**-**	**-**
CO2	**3**	**3**	**2**	**-**	**-**	**-**	**1**	**-**	**-**	**-**	**-**	**-**	**3**	**-**	**-**
CO3	**3**	**3**	**2**	**-**	**-**	**-**	**1**	**-**	**-**	**-**	**-**	**-**	**3**	**-**	**-**
CO4	**3**	**3**	**2**	**-**	**-**	**-**	**1**	**-**	**-**	**-**	**-**	**-**	**3**	**-**	**-**
CO5	**3**	**3**	**2**	**-**	**-**	**-**	**1**	**-**	**-**	**-**	**-**	**-**	**3**	**-**	**-**

DIGITAL SYSTEM DESIGN

[As per NEP, Outcome Based Education (OBE), and Choice Based Credit System (CBCS) Scheme

SEMESTER-III

Subject Code	21EC33	CIE Marks	50
Number of Lecture Hour/Week	3L	SEE Marks	50
Number of Lecture Hours	40	Exam Hours	03

CREDITS-03

Course Objectives:

This course will enable students to:

- Illustrate Boolean laws & systematic technique for minimization of Boolean expressions.
- Demonstrate the methods for simplifying Boolean expressions.
- Introduce the basic concepts of Combinational logic & Sequential logic.
- Present real-world examples for making the learner attuned to logic concepts.
- Highlight the formal procedures for the analysis and design of combinational logic & sequential logic.

Module1	**Teaching Hours**
Principles of Combination logic: Introduction, Generation of switching equations from truth tables, Karnaugh maps-3,4 variables, incompletely specified functions (Don't care terms) Simplifying Max term equations, General approach to combinational logic design **(Text 1- Chapter 3)**	**8Hours**
Module2	
Applications of Combination logic: Decoders, Encoders, Digital multiplexers, Design of Boolean function using Multiplexers, Adders and Subtractors, Parallel Adder, Comparators **(Text 1- Chapter 4)**	**8Hours**
Module3	
Principles of Sequential Circuits: Introduction, BasicBi-stable elements, Latches,The Master-S-lave flip-flops (pulse-triggered flip-flops): SR flip-flops,JKflip-flops, Characteristic equations. **(Text 2- Chapter 6)**	**8Hours**
Module4	
ApplicationsofSequentialCircuits: Registers,Binaryripplecounters,Synchronousbinarycounters, Counters based on shift registers, Design of synchronous counters, Design of asynchronousmod-n counterusing clocked T, JK, D and SR flip-flops.**(Text 2- Chapter 6)**	**8Hours**
Module5	
Applications of Digital circuits: Design of Sequence Detector, Guidelines for construction of State graphs, Design Example- Code converter, Design of Iterative Circuits, Design of Sequential Circuits using ROMs and PALs, Serial Adder with Accumulator.**(Text 3 – 14.1,14.3, 16.2-16.4, 18.1)**	**8Hours**
Course Outcomes: After studying the course students will be able to: CO1- Apply the Karnaugh map method to derive minimal forms of Boolean expressions in digital systems. CO2- Design and implement various combinational circuits. CO3- Analyze the various latches and flip-flops using their characteristic equations. CO4- Design and develop sequential counters and shift registers using flip-flops. CO5- Design Mealy and Moore models along with state diagrams to analyze clocked sequential circuit.	

Text Books: 1. DigitalLogicApplicationsandDesign,JohnMYarbrough,ThomsonLearning,2001.ISBN 981-240-062-1. 2. DonaldD.Givone,―DigitalPrinciplesandDesign‖,McGrawHill,2002.ISBN978-0-07-052906-9. 3. Charles H Roth Jr., Larry L.Kinney – Fundamentals of Logic Design, Cengage Learning, 7th Edition.	
Reference Books: 1. D.P.KothariandJ.SDhillon,DigitalCircuitsandDesign‖,Pearson,2016,ISBN:9789332543539 2. Morris Mano, ―Digital Design, Prentice Hall of India, Third Edition.	

COURSE OUTCOME AND REVISED BLOOM'S TAXONOMY LEVEL MAPPING						
COURSE OUTCOME	**Remember L1**	**Understand L2**	**Apply L3**	**Analyze L4**	**Evaluate L5**	**Create L6**
CO1	Y	Y	Y	N	N	N
CO2	Y	Y	Y	N	N	N
CO3	Y	Y	N	Y	N	N
CO4	Y	Y	Y	Y	N	N
CO5	Y	Y	Y	Y	N	N

COURSE OUTCOME AND PROGRAMME OUTCOME MAPPING (1/2/3):
Note: 1-Low, 2-Medium, 3-High

CO/PO	**PO.1**	**PO.2**	**PO.3**	**PO.4**	**PO.5**	**PO.6**	**PO.7**	**PO.8**	**PO.9**	**PO.10**	**PO.11**	**PO.12**	**PSO.1**	**PSO.2**	**PSO.3**
CO1	**3**	**3**	**3**	**-**	**-**	**-**	**2**	**-**	**-**	**-**	**-**	**-**	**3**	**-**	**-**
CO2	**3**	**3**	**2**	**-**	**-**	**-**	**2**	**-**	**-**	**-**	**-**	**-**	**3**	**-**	**-**
CO3	**2**	**3**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**3**	**-**	**-**
CO4	**3**	**3**	**3**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**3**	**-**	**-**
CO5	**3**	**3**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**3**	**-**	**-**

NETWORK ANALYSIS

[As per NEP, Outcome Based Education (OBE) and Choice Based Credit System (CBCS) Scheme]

SEMESTER-III

Subject Code	21EC34	CIE Marks	50
Number of Lecture Hour/Week	3L	SEE Marks	50
Number of Lecture Hours	40	Exam Hours	03

CREDITS-03

Course Objectives: This course will enable students to:

- Understand the concepts of transformation techniques, mesh and Nodal analysis of DC circuits.
- Apply the knowledge of basic circuit law to simplify the networks using network theorems and explain design concept of attenuators and filters
- Explain importance of series and parallel resonance circuits.
- Impart the basic knowledge of network analysis using Laplace transforms.
- Understand the basic knowledge of two port networks.

Module-1	Teaching Hours
Network Analysis Techniques: Sources and its types, Source Transformation and Source Shifting, Network Reduction using Star Delta Transformation, Mesh Analysis, Node Analysis, Concept of Supermesh and Supernode. (only DC circuits with independent and dependent sources)	**08Hours**
Module-2	
Network theorems Superposition Theorem, Reciprocity Theorem, Milliam's Theorem, Thevenin's and Norton's Theorem, Maximum Power Transfer Theorem.	**08Hours**
Module-3	
Attenuators and Conventional Filters: Nepers, Decibles, lattice attenuator, T-type attenuator, π-type attenuator, L-type attenuator, ladder type attenuator, insertion loss.Filter fundamentals	**08Hours**
Module-4	
Resonant Circuit: Introduction to Series and Parallel Resonance, properties, derivation and numericals on Resonant Frequency, Bandwidth and Quality Factor. **Laplace Transform:** Solution of Networks, Step, Ramp and Impulse Responses Waveform Synthesis	**08 Hours**
Module-5	
Two Port Network: Definition of Z, Y, h and Transmission Parameters, Modeling with these Parameters, Relationship between Parameters sets.	**08Hours**

Course Outcomes: After studying this course, students will be able to:

CO1- Analyze the basic concepts, laws, and methods for DC network analysis. Simplify the network using transformation and shifting techniques.

CO2- Apply network theorems to solve complex electrical circuits.

CO3- Develop simple passive filters and attenuators for given specifications.

CO4- Design series and parallel resonance circuits, and synthesize typical waveforms using the Laplace transform.

CO5- Determine the performance parameters of a two-port network.

Text Books:

1. M.E.VanValkenberg(2000),—Network analysis, Prentice Hall of India, 3rd edition, 2000.
2. Roy Choudhury, — Networks and systems, 2nd edition, New Age International Publications, 2006.

Reference Books:

1. Hayt, Kemmerly and Durbin—Engineering Circuit Analysis ǁ,TMH 7th Edition, 2010
2. J.David Irwin, R. Mark N elms,—Basic Engineering Circuit Analysisǁ, JohnWiley, 8thed, 2006.
3. Charles K Alexander and Mathew NO Sadiku,— Fundamentals of Electric Circuits, Tata McGraw-Hill,3rdEd, 2009

COURSE OUTCOME AND REVISED BLOOM'S TAXONOMY LEVEL MAPPING (Y/N)						
COURSE OUTCOME	**Remember L1**	**Understand L2**	**Apply L3**	**Analyze L4**	**Evaluate L5**	**Create L6**
CO1	Y	Y	Y	N	N	N
CO2	Y	Y	N	Y	N	N
CO3	Y	Y	Y	N	N	N
CO4	Y	Y	N	Y	N	N
CO5	Y	Y	N	N	Y	N

COURSE OUTCOME AND PROGRAMME OUTCOME MAPPING (1/2/3):

Note: 1-Low, 2-Medium, 3-High

CO/PO	PO.1	PO.2	PO.3	PO.4	PO.5	PO.6	PO.7	PO.8	PO.9	PO.10	PO.11	PO.12	PSO.1	PSO.2	PSO.3
CO1	**3**	**3**	**-**	**-**	**-**	**-**	**2**	**-**	**-**	**-**	**-**	**-**	**3**	**-**	**-**
CO2	**3**	**3**	**-**	**-**	**-**	**-**	**2**	**-**	**-**	**-**	**-**	**-**	**3**	**-**	**-**
CO3	**3**	**3**	**3**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**3**	**-**	**-**
CO4	**3**	**3**	**3**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**3**	**-**	**-**
CO5	**3**	**3**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**3**	**-**	**-**

SENSORS AND ACTUATORS

[As per NEP, Outcome Based Education (OBE) and Choice Based Credit System (CBCS) Scheme]

SEMESTER-III

Subject Code	21EC35	CIE Marks	50
Number Lecture Hour/Week	2L	SEE Marks	50
Number of Lecture Hours	30	Exam Hours	03

CREDITS-02

Course Objectives: This course will enable students to:

- Provide the fundamental knowledge about sensors and measurement system.
- Factors in selection of instruments for measurement. To discuss the principle, design and working of transducers for the measurement of physical time.
- Know usage of different transducers in the measurement of temperature, displacement and level measurement applications.
- Varying quantities. Understand the working of various actuators suitable in industrial process control systems.
- Understand the principle and application of smart sensors.

Module -1	**Teaching Hours**
Sensors and measurement system: Sensors and transducers, Classifications of transducers-primary & secondary, active & passive, analog and digital transducers. Smart sensors. Measurement: Definition, significance of measurement, instruments and measurement systems. mechanical, electrical and electronic instruments. Elements of generalized measurement system with example. Input-output configuration of measuring instruments and measurement systems, methods of correction for interfering and modifying inputs.	**6 Hours**
Module -2	
Measurement of Displacement: Introduction, Principles of Transduction, Variable resistance devices, variable Inductance Transducer, Variable Capacitance Transducer, Hall Effect Devices, Proximity Devices, Digital Transducer,	**6 Hours**
Module -3	
Measurement of Temperature: RTD, Thermistor, Thermocouple, laws of thermocouple, Thermopile, AD590. Measurement of Force & Torque: Introduction, Force measuring sensor –Load cells – column types devices, proving rings, cantilever beam, pressductor. Hydraulic load cell, electronic weighing system.	**6 Hours**
Module -4	
Actuators and process control system: Introduction. Block diagram and description of process control system with an example. Introduction, Block diagram of Final control operation, Signal conversions analog, digital, pneumatic signal. Actuators, Control elements. Pneumatic Actuators: Principle and working of pneumatic actuators. (Numerical problems on the topic).	**6 Hours**
Module -5	
Electrical actuating systems: Solid-state switches, Solenoids, Electric Motors- Principle of operation and its application: D.C motors, AC motors, Synchronous Motor, Stepper motors. Hydraulic Actuators: Principle and working of Hydraulic actuators. (Numerical problems on the topic).	**6 Hours**

Course outcomes: After studying this course, students will be able to:

CO1-Discuss the fundamental concepts related to sensors and measurements and apply them for characterizing measurement systems.

CO2-Apply the suitable transducers for measurement of displacement.

CO3-Apply the suitable transducers for measurement of temperature, force & torque

CO4-Discuss the fundamental concepts of process control system and analyze the process control systems.

CO5-Analyze actuators operation in control systems.

Reference Books:

1. Electrical and Electronic Measurements and Instrumentation, A K Sawhney, 17th Edition, (Reprint 2004), Dhanpat Rai & Co. Pvt. Ltd., 2004.
2. Instrumentation: Devices and Systems, C S Rangan, G R Sarma, V S V Mani, 2nd Edition (32 Reprint), McGraw Hill Education (India), 2014.
3. Process Control Instrumentation Technology by C D Johnson, 7th Edition, Pearson Education Private Limited, New Delhi 2002.

COURSE OUTCOME AND REVISED BLOOM'S TAXONOMY LEVEL MAPPING (Y/N)						
COURSE OUTCOME	**Remember L1**	**Understand L2**	**Apply L3**	**Analyze L4**	**Evaluate L5**	**Create L6**
CO1	Y	Y	Y	N	N	N
CO2	Y	Y	Y	N	N	N
CO3	Y	Y	Y	N	N	N
CO4	Y	Y	Y	Y	N	N
CO5	Y	Y	Y	Y	N	N

COURSE OUTCOME AND PROGRAMME OUTCOME MAPPING(1/2/3):
Note:1-Low, 2-Medium, 3-High

CO/PO	PO.1	PO.2	PO.3	PO.4	PO.5	PO.6	PO.7	PO.8	PO.9	PO.10	PO.11	PO.12	PSO.1	PSO.2	PSO.3
CO1	**3**	**-**	**-**	**-**	**-**	**-**	**1**	**-**	**-**	**-**	**-**	**-**	**3**	**-**	**-**
CO2	**3**	**-**	**-**	**-**	**-**	**-**	**1**	**-**	**-**	**-**	**-**	**-**	**3**	**-**	**-**
CO3	**3**	**-**	**-**	**-**	**-**	**-**	**1**	**-**	**-**	**-**	**-**	**-**	**3**	**-**	**-**
CO4	**3**	**2**	**-**	**-**	**-**	**-**	**1**	**-**	**-**	**-**	**-**	**-**	**3**	**-**	**-**
CO5	**3**	**2**	**-**	**-**	**-**	**-**	**1**	**-**	**-**	**-**	**-**	**-**	**3**	**-**	**-**

ANALOG CIRCUITS LABORATORY

[As per NEP, Outcome Based Education (OBE) and Choice Based Credit System (CBCS) Scheme]

SEMESTER-III

Subject Code	21ECL36	CIE Marks	50
Number of Practical Hour/Week	2P	SEE Marks	50
Total Number of Practical Hours	20	Exam Hours	03

CREDITS-01

Course Objectives: This laboratory oratory course will enable students to:

- Characterize the JFET and MOSFET.
- Design and evaluate the BJT amplifier.
- Design and realize the various Op-Amp applications.
- Design and realize Monostable and Astable multivibrator using 555 Timer.
- Design and realize the fixed voltage power supply using IC regulator.

List of Experiments:

1. Verify JFET/MOSFET characteristics.
2. Design and test the BJT amplifier circuit and obtain the frequency response characteristics.
3. Design and testing of Inverting and Non inverting amplifier using Op-Amp.
4. Design an instrumentation amplifier of a differential mode gain of 'A' using three amplifiers.
5. Design and testing of RC phase shift oscillator using Op-Amp.
6. Design and testing of Wein bridge oscillator using Op-Amp.
7. Design and verify the operation of Op – Amp as a (a) Adder (b) Integrator and (c) Differentiator.
8. Design and realize Schmitt trigger circuit using an Op – Amp for desired upper trigger point (UTP) and lower trigger point (LTP).
9. Design and verify a Precision full wave rectifier.
10. Design of Monostable and Astablemultivibrator using 555 Timer.
11. Design and realization of R – 2R ladder DAC.
12. Design of Fixed voltage power supply (voltage regulator) using IC regulator 78 series.

Course Outcomes: After studying this course, the students will be able to:

CO1- Develop a strong foundation in applying theoretical concepts by designing /simulating the experiment.

CO2- Utilize laboratory oratory instruments/simulation tools to build and test experiments.

CO3- Analyse experimental data/simulation results and interpret findings to draw meaningful conclusions.

CO4- Learn to work effectively in teams while identifying and correcting faults in electronic circuits/programs.

CO5- Manage time effectively in a simulation/laboratory oratory environment, balancing experimental work, data collection, and report writing within specified deadlines.

COURSE OUTCOME AND REVISED BLOOM'S TAXONOMY LEVEL MAPPING						
COURSE OUTCOME	**Remember L1**	**Understand L2**	**Apply L3**	**Analyze L4**	**Evaluate L5**	**Create L6**
CO1	Y	Y	Y	N	N	N
CO2	Y	Y	N	N	N	Y
CO3	Y	Y	N	Y	N	N
CO4	Y	Y	N	N	N	N
CO5	Y	Y	N	N	N	N

COURSE OUTCOME AND PROGRAMME OUTCOME MAPPING(1/2/3):
Note:1-Low, 2-Medium, 3-High

CO/PO	**PO.1**	**PO.2**	**PO.3**	**PO.4**	**PO.5**	**PO.6**	**PO.7**	**PO.8**	**PO.9**	**PO.10**	**PO.11**	**PO.12**	**PSO.1**	**PSO.2**	**PSO.3**
CO1	**3**	**2**	**3**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**3**	**-**
CO2	**2**	**3**	**1**	**-**	**3**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**3**	**-**
CO3	**2**	**3**	**2**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**3**	**-**
CO4	**2**	**3**	**2**	**-**	**-**	**-**	**-**	**3**	**3**	**2**	**-**	**-**	**-**	**3**	**-**
CO5	**2**	**2**	**2**	**-**	**-**	**-**	**-**	**3**	**-**	**3**	**3**	**-**	**-**	**3**	**-**

DIGITAL SYSTEM DESIGN LABORATORY

[As per NEP, Outcome Based Education (OBE) and Choice Based Credit System (CBCS) Scheme]

SEMESTER-III

Subject Code	21ECL37	CIE Marks	50
Number of Practical Hour/Week	2P	SEE Marks	50
Total Number of Practical Hours	20	Exam Hours	03

CREDITS-01

Course Objectives: This laboratory oratory course enables students to get practical experience in design, realization and verification of

- Demorgan's Theorem, SOP, POS forms
- Full/Parallel Adders, Subtractors and Magnitude Comparator
- Multiplexer, Demultiplexers, encoder and Decoders applications
- Flip-Flops, Shift registers and Counters

Note: Use discrete components to test and verify the logic gates. The IC numbers given are suggestive. Any equivalent IC can be used.

- For experiment No. 11any open source or licensed simulation tool may be used.

List of Experiments:

1. Verify
   a. Demorgan's Theorem for 2 variables
   b. The sum-of product and product-of-sum expressions using universal gates
2. Design and implement
   a. Half Adder
   b. Full Adder
   c. Full subtractor
3. Design and implement 4-bit Parallel Adder/Subtractorusing IC7483
4. Design and implement 3-bit Binary to Gray code converter
5. Realize a 4-variable function using IC 74151 (8:1 MUX)
6. Realize Adder/Subtractor using IC 74139
7. Design and Implementation of 4-bit Magnitude Comparator using IC7485
8. Realize the following shift registers using IC7474/IC7495
   a. SISO (b) SIPO (c) PISO (d) PIPO
9. Realize Ring and Johnson counter
10. Realize Mod-N Asynchronous/Synchronous counter
11. Simulate Full-Adder and Mod-8 Synchronous UP/DOWN Counter using simulation tool

Course Outcomes: After studying this course, the students will be able to:

CO1-Develop a strong foundation in applying theoretical concepts by designing /simulating the experiment.

CO2- Utilize laboratory oratory instruments/simulation tools to build and test experiments.

CO3- Analyse experimental data/simulation results and interpret findings to draw meaningful conclusions.

CO4- Learn to work effectively in teams while identifying and correcting faults in electronic circuits/programs.

CO5- Manage time effectively in a simulation/laboratory oratory environment, balancing experimental work, data collection, and report writing within specified deadlines.

COURSE OUTCOME AND REVISED BLOOM'S TAXONOMY LEVEL MAPPING						
COURSE OUTCOME	**Remember L1**	**Understand L2**	**Apply L3**	**Analyze L4**	**Evaluate L5**	**Create L6**
CO1	Y	Y	Y	N	N	N
CO2	Y	Y	N	N	N	Y
CO3	N	N	N	N	N	Y
CO4	Y	Y	N	N	N	N
CO5	Y	Y	N	N	N	N

COURSE OUTCOME AND PROGRAMME OUTCOME MAPPING (1/2/3):

Note: 1-Low, 2-Medium, 3-High

CO/PO	**PO.1**	**PO.2**	**PO.3**	**PO.4**	**PO.5**	**PO.6**	**PO.7**	**PO.8**	**PO.9**	**PO.10**	**PO.11**	**PO.12**	**PSO.1**	**PSO.2**	**PSO.3**
CO1	**3**	**2**	**3**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**3**	**-**
CO2	**2**	**3**	**1**	**-**	**3**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**3**	**-**
CO3	**2**	**3**	**2**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**3**	**-**
CO4	**2**	**3**	**2**	**-**	**-**	**-**	**-**	**3**	**3**	**2**	**-**	**-**	**-**	**3**	**-**
CO5	**2**	**2**	**2**	**-**	**-**	**-**	**-**	**3**	**-**	**3**	**3**	**-**	**-**	**3**	**-**

NETWORK ANALYSIS LABORATORY

[As per NEP, Outcome Based Education (OBE) and Choice Based Credit System (CBCS) Scheme]

SEMESTER-III

Subject Code	21ECL38	CIE Marks	50
Number of practical Hour/Week	2P	SEE Marks	50
Total Number of Practical Hours	20	Exam Hours	03

CREDITS-01

Course Objectives: This course will enable students to:

- Realize the basic laws, KVL and KCL.
- Realize the network theorems.
- Calculation of frequency response, Quality, bandwidth for both series & parallel resonant circuits.
- Analysis and understand locus diagram.
- Calculate the networks parameters for different two port networks.

NOTE: The experiments are to be carried out using discrete components, out of which three experiments are to be carried out through simulation

List of Experiments:

1. Measurements of DC circuits.
2. Study of Mesh Analysis & Node Analysis.
3. Realization & verification of Superposition theorem
4. Realization & verification of Reciprocity theorem
5. Realization & verification of Thevenin's& Norton's theorem
6. Realization & verification of Maximum power transfer theorem
7. Realization & verification of Milliman's theorem
8. Analysis of series resonance.
9. Analysis of parallel resonance.
10. Locus Diagrams of RL and RC Series Circuits
11. Study of Z &Y parameters of two port network parameters.
12. Transmission and hybrid parameters.

Course Outcomes: After studying this course, the students will be able to:

CO1- Develop a strong foundation in applying theoretical concepts by designing /simulating the experiment.

CO2- Utilize laboratory oratory instruments/simulation tools to build and test experiments.

CO3- Analyse experimental data/simulation results and interpret findings to draw meaningful conclusions.

CO4- Learn to work effectively in teams while identifying and correcting faults in electronic circuits/programs.

CO5- Manage time effectively in a simulation/laboratory oratory environment, balancing experimental work, data collection, and report writing within specified deadlines.

COURSE OUTCOME AND REVISED BLOOM'S TAXONOMY LEVEL MAPPING						
COURSE OUTCOME	**Remember L1**	**Understand L2**	**Apply L3**	**Analyze L4**	**Evaluate L5**	**Create L6**
CO1	Y	Y	Y	N	N	N
CO2	Y	Y	N	N	N	Y
CO3	Y	Y	N	Y	N	N
CO4	Y	Y	N	N	N	N
CO5	Y	Y	N	N	N	N

COURSE OUTCOME AND PROGRAMME OUTCOME MAPPING (1/2/3):
Note: 1-Low, 2-Medium, 3-High

CO/PO	PO.1	PO.2	PO.3	PO.4	PO.5	PO.6	PO.7	PO.8	PO.9	PO.10	PO.11	PO.12	PSO.1	PSO.2	PSO.3
CO1	**3**	**2**	**3**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**3**	**-**
CO2	**2**	**3**	**1**	**-**	**3**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**3**	**-**
CO3	**2**	**3**	**2**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**3**	**-**
CO4	**2**	**3**	**2**	**-**	**-**	**-**	**-**	**3**	**3**	**2**	**-**	**-**	**-**	**3**	**-**
CO5	**2**	**2**	**2**	**-**	**-**	**-**	**-**	**3**	**-**	**3**	**3**	**-**	**-**	**3**	**-**

PROJECT-III [As per NEP, Outcome Based Education (OBE) and Choice Based Credit System (CBCS) Scheme] SEMESTER-III			
Subject Code	21PRJ39	CIE Marks	50
Number Lecture Hour/Week	2P	SEE Marks	50
Total Number of Practical Hours	20	Exam Hours	03
CREDITS-01			

Course Objectives: This course will enable students to:

- Get exposure about the electronics hardware and various software tools.
- Design the working model of the open ended problem.
- Understand concepts of Packaging.
- Understand the latest technology trends in the PCB design.
- Prepare technical documentation of the project.

STUDENTS WILL BE GIVEN A OPEN ENDED PROBLEM OF THE SOCIETY AND ASKED TO SOLVE BY DESIGNING AND IMPLEMENTING THE SYSTEM IN A TEAM.

Course outcomes: After studying this course, students will be able to:

CO1-Apply the knowledge of electronics hardware and software components to solve the real time problems of the society.

CO2-Analyze the various existing solutions avail laboratory le to solve the real time problem and propose the best solution.

CO3-Design and implement the system to solve the real time problem of the society.

CO4-Conduct investigations on the output and prepare the technical documentation of the designed system in a team.

CO5-Use the modern tool avail laboratory le like advanced hardware and software tools.

COURSE OUTCOME AND REVISED BLOOM'S TAXONOMY LEVEL MAPPING						
COURSE OUTCOME	**Remember L1**	**Understand L2**	**Apply L3**	**Analyze L4**	**Evaluate L5**	**Create L6**
CO1	Y	Y	Y	N	N	N
CO2	Y	Y	N	Y	N	N
CO3	Y	Y	N	N	N	Y
CO4	Y	Y	N	N	Y	N
CO5	Y	Y	Y	N	N	N

COURSE OUTCOME AND PROGRAMME OUTCOME MAPPING(1/2/3):
Note:1-Low, 2-Medium, 3-High

CO/PO	PO.1	PO.2	PO.3	PO.4	PO.5	PO.6	PO.7	PO.8	PO.9	PO.10	PO.11	PO.12	PSO.1	PSO.2	PSO.3
CO1	**3**	**2**	**-**	**-**	**2**	**2**	**-**	**-**	**3**	3	**-**	**3**	**-**	**3**	**-**
CO2	**3**	**3**	**1**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**3**	**-**	**3**	**-**
CO3	**3**	**3**	**3**	**2**	**3**	**2**	**2**	**-**	**3**	**3**	**2**	**3**	**-**	**3**	**-**
CO4	**3**	**3**	**3**	**2**	**-**	**-**	**-**	**3**	**3**	**3**	**3**	**3**	**-**	**3**	**-**
CO5	**-**	**-**	**-**	**-**	**3**	**-**	**-**	**3**	**3**	**3**	**3**	**3**	**-**	**3**	**-**

KANNADA KALI-III

[As per Choice Based Credit System (CBCS) Scheme]

SEMESTER-III

Subject Code	18KANKK310	CIE Marks	50
Number of Lecture Hour/Week	1L	SEE Marks	50
Number of Lecture Hours	14	Exam Hours	03

CREDITS-01

Course Objectives:

- ಅನ್ಯಭಾಷಿಕ ವಿದ್ಯಾರ್ಥಿಗಳಿಗೆ ಕನ್ನಡ ಮಾತನಾಡುವುದು ಬರೆಯುವ ಕೌಶಲ್ಯ ಕಲಿಸುವುದು.
- ಕನ್ನಡ ಭಾಷಾಜ್ಞಾನದ ಅರಿವು ಮೂಡಿಸುವುದು.
- ಕನ್ನಡ ಬರವಣಿಗೆ ಕುರಿತು ತಿಳುವಳಿಕೆ ಮೂಡಿಸುವುದು.
- ಕನ್ನಡ ನಾಡು ನುಡಿ, ಸಂಸ್ಕೃತಿಯ ಬಗ್ಗೆ ತಿಳಿಸುವುದು.
- ಕನ್ನಡ ಭಾಷಾ ಪ್ರೇಮವನ್ನು ಬೆಳೆಸುವುವುದು.

Module -1	**Teaching Hours**
Lesson 1: Conversation 1, Conversation 2, Conversation 3,Vocabulary,Exercises. **Lesson 2:**Conversation 1, Conversation 2, Conversation 3,Vocabulary, Exercises.	03 Hours
Module -2	
Lesson 3: Conversation 1, Conversation 2, Conversation 3,Vocabulary, Exercises. **Lesson 4:** Conversation 1, Conversation 2, Conversation 3,Vocabulary, Exercises.	03 Hours
Module -3	
Lesson 5: Conversation 1, Conversation 2, Conversation 3,Vocabulary, Exercises. **Lesson 6:** Conversation 1, Conversation 2, Conversation 3,Vocabulary, Exercises..	03 Hours
Module -4	
Lesson 7: Conversation 1, Conversation 2, Conversation 3,Vocabulary, Exercises. **Lesson8:** Conversation 1, Conversation 2, Conversation 3,Vocabulary, Exercises.	03 Hours
Module -5	
Lesson 9: Conversation 1, Conversation 2, Conversation 3,Vocabulary, Exercises. **Lesson 10:** Conversation 1, Conversation 2, Conversation 3,Vocabulary, Exercises.	02 Hours

ಬಳಕೆ ಕನ್ನಡ ಪತ್ಯ, ಕಲಿಕೆಯಿಂದ ವಿದ್ಯಾರ್ಥಿಗಳಿಗೆ ಆಗುವ ಅನುಕೂಲಗಳು ಮತ್ತು ಫಲಿತಾಂಶಗಳು:

Course outcome : At the end of the course the student will be able to:

CO1-To understand the necessity of local language for comfortable life.

CO2-To speak, read write kannada language as per requirement.

CO3-To communicate [converse] in kannada language in their daily life with kannada speakers.

CO4-To listen and understand the kannada language properly.

CO5-To speak in polite conservation.

ಆಧಾರ ಗ್ರಂಥಗಳು:

1) ಕನ್ನಡ ಕಲಿ – ಪ್ರೊ.ನಾನಾಸಾಹೇಬ ಹಚ್ಚಡದ ಪ್ರಸಾರಾಂಗ ಶರಣಬಸವ ವಿಶ್ವವಿದ್ಯಾಲಯ ಕಲಬುರಗಿ

2) ಮಾತಾಡುಕನ್ನಡ – ಕನ್ನಡ ಸಾಹಿತ್ಯ ಪರಿಷತ್ತು – ಬೆಂಗಳೂರು

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COURSE OUTCOME AND PROGRAMME OUTCOME MAPPING (1/2/3):
Note:1-Low, 2-Medium, 3-High

CO/PO	PO.1	PO.2	PO.3	PO.4	PO.5	PO.6	PO.7	PO.8	PO.9	PO.10	PO.11	PO.12	PSO.1	PSO.2	PSO.3
CO1	-	-	-	-	-	-	-	1	-	-	-	-	-	-	3
CO2	-	-	-	-	-	-	-	-	-	3	-	-	-	-	3
CO3	-	-	-	-	-	-	-	-	-	3	-	-	-	-	3
CO4	-	-	-	-	-	-	-	1	-	-	-	-	-	-	3
CO5	-	-	-	-	-	-	-	1	-	-	-	-	-	-	3

AAYDAKATEGALU

[As per Choice Based Credit System (CBCS) Scheme]

SEMESTER-III

Subject Code	20KANKK310	CIE Marks	50
Number of Lecture Hour/Week	1L	SEE Marks	50
Number of Lecture Hours	14	Exam Hours	03

CREDITS-01

Course Objectives:

- ಕನ್ನಡ ಭಾಷಾಜ್ಞಾನದ ಅರಿವು ಮೂಡಿಸುವುದು.
- ಕನ್ನಡ ಬರವಣಿಗೆ ಕುರಿತು ತಿಳುವಳಿಕೆ ಮೂಡಿಸುವುದು.
- ಕನ್ನಡ ನಾಡು ನುಡಿ, ಸಂಸ್ಕೃತಿಯ ಬಗ್ಗೆ ತಿಳಿಸುವುದು.
- ಕನ್ನಡ ಭಾಷಾ ಪ್ರೇಮವನ್ನು ಬೆಳೆಸುವುವುದು.

ಘಟಕ1 (Module 1)	**ಉಪನ್ಯಾಸ ಅವಧಿ Teaching Hours**
೧) ಮೊಸರಿನ ಮಂಗಮ್ಮ– ಮಾಸ್ತಿ ವೆಂಕಟೇಶಐಯ್ಯಂಗಾರ (ಶ್ರೀನಿವಾಸ) ೨) ಕೊನೆಯಗಿರಾಕಿ – ನಿರಂಜನ	03 Hours
ಘಟಕ2 (Module 2)	
೧) ದಾರಿ–ಚಿತ್ರಶೇಖರಕಂಠಿ ೨) ಮಾಗಿ– ಕೇಶವ ಮಳಗಿ.	03 Hours
ಘಟಕ3 (Module 3)	
೩) ಕಾಡು – ಸಿದ್ದರಾಮ ಹೊನ್ಕಲ್ ೪) ಆಸೆಯೆಂಬ ತಥಾಗತನ ವೈರಿ–ಚಿದಾನಂದ ಸಾಲಿ	03 Hours
ಘಟಕ4 (Module 4)	
೫) ತಬ್ಬಲಿಗಳು –ರಾಘವೇಂದ್ರ ಖಾಸನೀಸ ೬) ನಿವೃತ್ತರು – ಪಿ.ಲಂಕೇಶ	03 Hours
ಘಟಕ5 (Module 5)	
೭) ಅಬಚೂರಿನ ಪೋಸ್ಟಾಫೀಸು–ಕೆ.ಪಿ ಪೂರ್ಣಚಂದ್ರ ತೇಜಸ್ವಿ ೮) ಹಂಗಿನರಮನೆಯ ಹೊರಗೆ–ರಾಜಶೇಖರ ನೀರಮಾನ್ವಿ	02 Hours

Course Outcome

1) ಕನ್ನಡ ಸಾಹಿತ್ಯ ಬಗ್ಗೆ ಅರಿತುಕೊಳ್ಳುತ್ತಾರೆ.
2) ಕನ್ನಡ ಭಾಷಾಜ್ಞಾನದ ಮಹತ್ವವನ್ನು ತಿಳಿದುಕೊಳ್ಳುತ್ತಾರೆ.
3) ಭಾಷಾಭಿಮಾನವನ್ನು ಬೆಳೆಸಿಕೊಳ್ಳುತ್ತಾರೆ.
4) ಕನ್ನಡ ಸಾಹಿತ್ಯ ಕೃತಿಗಳ ಬಗ್ಗೆ ಆಸಕ್ತಿ ಮೂಡುತ್ತದೆ.
5) ಕನ್ನಡ ಕಥೆಗಳ ಬಗ್ಗೆ ಅರಿತುಕೊಳುತ್ತಾರೆ

ಪರಾಮರ್ಶನ ಗ್ರಂಥಗಳು :

1) ಆಯ್ದ ಕಥೆಗಳು : ಪ್ರೊ. ನಾನಾಸಾಹೇಬ ಎಸ್, ಹಚ್ಚಡದ ಪ್ರಸಾರಾಂಗ ಶರಣಬಸವ ವಿಶ್ವವಿದ್ಯಾಲಯ ಕಲಬುರಗಿ

COURSE OUTCOME AND PROGRAMME OUTCOME MAPPING (1/2/3):
Note:1-Low, 2-Medium, 3-High

CO/PO	PO.1	PO.2	PO.3	PO.4	PO.5	PO.6	PO.7	PO.8	PO.9	PO.10	PO.11	PO.12	PSO.1	PSO.2	PSO.3
CO1	-	-	-	-	-	-	-	1	-	-	-	-	-	-	3
CO2	-	-	-	-	-	-	-	-	-	3	-	-	-	-	3
CO3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	3
CO4	-	-	-	-	-	-	-	1	-	-	-	-	-	-	3
CO5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	3

ANALOG ELECTRONICS LABORATORY USING PSPICE/MULTISIM/LTSPICE

[As per NEP, Outcome Based Education (OBE) and Choice Based Credit System (CBCS) Scheme]

SEMESTER-III

Subject Code	21AEC311	CIE Marks	50
Number of Lecture Hour/Week	2P	SEE Marks	50
Total Number of Practical Hours	20	Exam Hours	03

CREDITS-01

Course Objectives: This laboratory oratory course will enable students to:

- To provide practical exposure on designing, setting up, executing and debugging various electronic circuits.
- Use open source simulation software to analyze the circuits.

Experiments using Pspice/Multisim/LTspice software

List of Experiments:

13. Realize JFET/MOSFET characteristics.
14. Realize BJT amplifier circuit and obtain the frequency response characteristics.
15. Design and realize Inverting and Non inverting amplifier using Op-Amp.
16. Realize RC phase shift oscillator using Op-Amp.
17. Realize Wein bridge oscillator using Op-Amp.
18. Realize the operation of Op – Amp as a (a) Adder (b) Integrator and (c) Differentiator.
19. Realize Schmitt trigger circuit using an Op – Amp for desired upper trigger point (UTP) and lower trigger point (LTP).
20. Design and verify a Precision full wave rectifier.
21. Design and realize Monostable and Astable multivibrator using 555 Timer.
22. Realize R – 2R ladder DAC.

Course Outcomes: After studying this course, the students will be able to:

CO1- Develop a strong foundation in applying theoretical concepts by designing /simulating the experiment.

CO2- Utilize laboratory oratory instruments/simulation tools to build and test experiments.

CO3- Analyze experimental data/simulation results and interpret findings to draw meaningful conclusions.

CO4- Learn to work effectively in teams while identifying and correcting faults in electronic circuits/programs.

CO5- Manage time effectively in a simulation/laboratory oratory environment, balancing experimental work, data collection, and report writing within specified deadlines.

COURSE OUTCOME AND REVISED BLOOM'S TAXONOMY LEVEL MAPPING (Y/N)

COURSE OUTCOME	Remember L1	Understand L2	Apply L3	Analyze L4	Evaluate L5	Create L6
CO1	Y	Y	Y	N	N	N
CO2	Y	Y	Y	N	N	Y
CO3	Y	Y	N	Y	N	N
CO4	Y	Y	Y	N	N	N
CO5	Y	Y	N	N	N	N

COURSE OUTCOME AND PROGRAMME OUTCOME MAPPING(1/2/3):
Note:1-Low, 2-Medium, 3-High

CO/PO	PO.1	PO.2	PO.3	PO.4	PO.5	PO.6	PO.7	PO.8	PO.9	PO.10	PO.11	PO.12	PSO.1	PSO.2	PSO.3
CO1	3	2	3	-	-	-	-	-	-	-	-	-	-	3	-
CO2	2	3	1	-	3	-	-	-	-	-	-	-	-	3	-
CO3	2	3	2	-	-	-	-	-	-	-	-	-	-	3	-
CO4	2	3	2	-	-	-	-	3	3	2	-	-	-	3	-
CO5	2	2	2	-	-	-	-	3	-	3	3	-	-	3	-

DIGITAL SYSTEM DESIGN LABORATORY USING PSPICE/MULTISIM/LTSPICE

[As per NEP, Outcome Based Education (OBE) and Choice Based Credit System (CBCS) Scheme]

SEMESTER-III

Subject Code	21AEC312	CIE Marks	50
Number of Lecture Hour/Week	2P	SEE Marks	50
		Exam Hours	03

CREDITS-01

Course Objectives: This laboratory oratory course will enable students to:

- Provide practical exposure to the students on designing, setting up, executing and debugging various electronic circuits using simulation software.
- Give the knowledge and practical exposure on simple applications of digital electronic circuits.
- Analyze and design sequential and combinational logic circuits.
- Use open source software like Pspice/Multisim/LTspice

Experiments using Pspice/Multisim/LTspice software

List of Experiments:

1. Verify
(a) DeMorgan'sTheoremfor two variables.
(b) Thesum-ofproductandproduct-of-sumexpressionsusinguniversalgates.

2. Design and implement
(a) Half Adder.
(b) Full Adder.
(c) Full Subtractor.

3. Designandimplement4-bitParallelAdder/Subtractor using IC7483.

4. Designandimplement3-bit Binary to Gray code converter.

5. Realize a 4-variable function using IC 74151 (8:1 MUX)

6. Realize Adder/Subtractorusing IC 74139

7. Design and Implementationof4-bitMagnitudeComparatorusing IC7485.

8. Realize the following shiftregistersusingIC7474/IC7495
(a) SISO(b)SIPO(c)PISO(d)PIPO

9. Realize Ring and Johnson counter.

10. Realize Mod-N Asynchronous/Synchronous counter.

Course Outcomes: After studying this course, the students will be able to:

CO1- Develop a strong foundation in applying theoretical concepts by designing /simulating the experiment.

CO2- Utilize laboratory oratory instruments/simulation tools to build and test experiments.

CO3- Analyze experimental data/simulation results and interpret findings to draw meaningful conclusions.

CO4- Learn to work effectively in teams while identifying and correcting faults in electronic circuits/programs.

CO5- Manage time effectively in a simulation/laboratory oratory environment, balancing experimental work, data collection, and report writing within specified deadlines.

COURSE OUTCOME AND REVISED BLOOM'S TAXONOMY LEVEL MAPPING (Y/N)						
COURSE OUTCOME	**Remember L1**	**Understand L2**	**Apply L3**	**Analyze L4**	**Evaluate L5**	**Create L6**
CO1	Y	Y	Y	N	N	N
CO2	Y	Y	N	N	N	Y
CO3	N	N	N	N	N	Y
CO4	Y	Y	Y	N	N	N
CO5	Y	Y	N	N	N	N

COURSE OUTCOME AND PROGRAMME OUTCOME MAPPING(1/2/3):
Note:1-Low, 2-Medium, 3-High

CO/PO	PO.1	PO.2	PO.3	PO.4	PO.5	PO.6	PO.7	PO.8	PO.9	PO.10	PO.11	PO.12	PSO.1	PSO.2	PSO.3
CO1	**3**	**2**	**3**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**3**	**-**
CO2	**2**	**3**	**1**	**-**	**3**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**3**	**-**
CO3	**2**	**3**	**2**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**3**	**-**
CO4	**2**	**3**	**2**	**-**	**-**	**-**	**-**	**3**	**3**	**2**	**-**	**-**	**-**	**3**	**-**
CO5	**2**	**2**	**2**	**-**	**-**	**-**	**-**	**3**	**-**	**3**	**3**	**-**	**-**	**3**	**-**

ADDITIONAL MATHEMATICS – I

[As per Choice Based Credit System (CBCS) Scheme]

SEMESTER-III

Subject Code	21MATDIP31	CIE Marks	00
Number of Lecture Hour/Week	4L	SEE Marks	100
Number of Lecture Hours	40	Exam Hours	03

CREDITS-00

Course Objectives: This course will enable students to:

- Acquire basic concepts of complex trigonometry, vector algebra, differential & integral calculus and vector differentiation.
- Evaluation of double and triple integrals.
- Know the basic concepts of partial differential equations.
- To develop the knowledge of matrices and linear algebra in compressive manner.
- To understand the essential concept of linear algebra.

Module -1	**Teaching Hours**
Complex Trigonometry-1: Complex Numbers: Definition and Properties. Modulus and Amplitude of complex number, Argand's diagram , De-Moivre's theorem (without proof) Vector Analysis: Scalar and Vectors. Vector addition and subtraction. Multiplication of vectors (Dot and Cross products) Scalar and vector triple products- simple problems, Vector Differentiation : Gradient, Divergence and Curl.	08 Hours
Module -2	
Differential Calculus: Review of successive differentiation. Formulae of N^{th} derivatives of standard functions- Leibnitz's theorem (without proof). Polar Curves: Expression for Angle between radius vector and tangent, length of perpendicular from pole to the tangent, angle between two polar curves, Pedal Equation of polar curves and problems. Taylor' and Maclaurin'sseires expansions.	08 Hours
Module -3	
Partial Differentiation : Definitions of Partial Differentiation, Direct and Indirect partial derivatives, Symmetric functions, Homogeneous function and Euler's theorem on homogeneous function. Total Derivative of composite and implicit function. Jacobian.	08 Hours
Module -4	
Integral Calculus: Reduction Formulae of $\int_0^{\pi/2} Sin^n x dx$, $\int_0^{\pi/2} Cos^n x dx$, and Statement of Reduction formulae $\int_0^{\pi/2} Sin^m x Cos^n x dx$ and Problems. Double and Triple integral- simple problems.	08 Hours
Module -5	
Linear Algebra: Basic concepts of matrices- Rank of matrix by elementary row transformations- Echelon form. Consistency of system of Linear equations. Solution of system linear equations by Gauss Elimination method, Linear Transformation, Cayley-Hamilton theorem to compute inverse of matrix. Eigen values and Eigen vector, Largest Eigen value and corresponding Eigen vector by Reyleigh's Power method.	08 Hours

Course Outcomes: After studying this course, students will be able to:

CO1-Apply derivatives and partial derivatives to calculate rates of change of multivariate functions.

CO2-Apply techniques of integration including double and triple integrals to find area, volume, mass and moment of inertia of plane and solid region.

CO3-Analyze position, velocity and acceleration in two or three dimensions using the calculus of vector valued functions.

CO4-Recognize and solve first-order ordinary differential equations occurring in different branches of engineering.

CO5-Solve systems of linear equations in the different areas of linear algebra.

Text Books:

1. B.S. Grewal: Higher Engineering Mathematics, Khanna Publishers, New Delhi, 43rd Ed., 2015

Reference Books:

1. E. Kreyszig: Advanced Engineering Mathematics, John Wiley & Sons, 10th Ed., 2015.

2. N.P.Bali and Manish Goyal: Engineering Mathematics, Laxmi Publishers, 7th Ed., 2007.

COURSE OUTCOME AND PROGRAMME OUTCOME MAPPING (1/2/3):
Note: 1-Low, 2-Medium, 3-High

CO/PO	PO.1	PO.2	PO.3	PO.4	PO.5	PO.6	PO.7	PO.8	PO.9	PO.10	PO.11	PO.12
CO1	**3**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**2**
CO2	**3**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**2**
CO3	**-**	**3**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**2**
CO4	**3**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**2**
CO5	**3**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**2**

ENGINEERING MATHEMATICS – IV			
FOR ECE &EEE BRANCH			
Course Code	21MAT41	**CIE Marks**	50
Contact Hours/Week	03	**SEE Marks**	50
Total Hours	40	**Exam Hours**	03
Semester	IV	**Credits**	03

Course Learning Objectives:

This course will enable students to:

- Learn Fourier series and Fourier transforms.
- Conversant with numerical methods to solve ordinary differential equations.
- Understand Joint probability distribution and stochastic processes arising in science and engineering.
- Understand the definition of sequence, series and its importance.
- Know the finite difference method and use in solving partial differential equation.

MODULE-1: FOURIER SERIES	
Fourier Series: Periodic functions, Dirichlet's condition, Fourier Series of periodic functions wit period 2π and with arbitrary period 2c. Fourier series of even and odd functionsHalf range Fourier Series, practical harmonic analysis (5 Assignment Problem). **Self-Study: Sequence and series of a function, convergent series.** **(RBT Levels: L1, L2 and L3)**	**8 Hours**
Teaching – Learning Process	Chalk and talk method / Power Point Presentation

MODULE-2: PROBABILITY DISTRIBUTIONS-2	
Joint probability distribution: Joint Probability distribution for two discrete random variables, expectation, covariance, correlation coefficient. **Stochastic process:** Stochastic processes, probability vector, stochastic matrices, fixed points, regular stochastic matrices, Markov chains, higher transition probability-simple problems. (5 Assignment Problem). **Self Study : Joint probability distribution for continuous random variable** **(RBT Levels: L1, L2 and L3)**	**8 Hours**
Teaching – Learning Process	Chalk and talk method / Power Point Presentation

MODULE-3: NUMERICAL METHODS-1	
Numerical Methods: Numerical solution of ordinary differential equations of first order and first degree, Taylor's series method, modified Euler's-method Runge - Kutta method of fourth order. Milne's and Adams- Bashforth predictor and corrector methods (No derivations of formulae). (5 Assignment Problem). **Self Study : Picards method** **(RBT Levels: L1, L2 and L3)**	**8 Hours**
Teaching – Learning Process	Chalk and talk method / Power Point Presentation

MODULE-4: NUMERICAL METHODS-2	
Numerical Methods: Numerical solution of second order ordinary differential equations, Runge-Kutta Method and Milne's Method, Numerical solution of P.D.E: Numerical solution of Heat equation, Wave equation, problems. (5 Assignment Problem). **Self Study : Picard's method, Numerical solution of Laplace's equation** **(RBT Levels: L1, L2 and L3)**	**8 Hours**
Teaching – Learning Process	Chalk and talk method / Power Point Presentation

MODULE-5: Fourier Transforms and complex variable

Fourier Transforms: Infinite Fourier transforms, Fourier sine and cosine transforms. Inverse Fourier-transform (5 Assignment Problem). **Complex line Integrals:** Cauchy's Integration theorem, Cauchy integral formula, Laurent's Series, typesof singularities. Residue, Poles, Cauchy's Residue theorem (without proof) and Problems. **Transformations:** Bilinear transformations and problems. **Self Study : Initial value and boundary value problems** **(RBT Levels: L1, L2 and L3)**	**8 Hours**
Teaching – Learning Process	Chalk and talk method / Power Point Presentation

Question Paper Pattern:

- The SEE question paper will be set for 100 marks and the marks scored will be proportionately reducedto 50.
- The question paper will have ten full questions carrying equal marks.
- Each full question carries 20 marks.

- There will be two full questions (with a maximum of four sub questions) from each module.
- Each full question will have sub questions covering all the topics under a module.
- The students will have to answer five full questions, selecting one full question from each module.

CIE =Internal Assessment + Assignments: 15+35=50 Marks

There will be a 3 CIE's, the average of best of 2 CIE's will be considered and there will be a 35 marks for Assignments

Course Outcomes(Cos) : After completion of course, the student will able to

CO1- Understanding the Periodic function and Fourier series expansion of different functions and its application to analyze circuits.

CO2- Learn to solve the problems on Joint probability distribution and to know the concept of stochastic processes and Markov's chains in discrete time.

CO3- Solving the first order first degree ordinary differential equations arising in flow problems by numerical methods.

CO4- Make the use of second order ordinary and partial differential equations arising in heat and wave equations by numerical methods.

CO5- Apply the knowledge of Fourier transform and Understand the complex potentials in different engineering fields.

Bloom's level of the course outcomes:

CO#	Bloom's Level					
	Remember (L1)	Understand (L2)	Apply (L3)	Analyze (L4)	Evaluate (L5)	Create (L6)
CO1	√	√	√			
CO2	√	√	√			
CO3	√	√	√			
CO4	√	√	√			
CO5	√	√	√			

Course Articulation Matrix / Course mapping :

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

Text Books:

1. B.S. Grewal : Higher Engineering Mathematics, Khanna Publishers, 43rd Ed., 2015.
2. E. Kreyszig : Advanced Engineering Mathematics, John Wiley & Sons, 10th Ed.(Reprint), 2016.

Reference books:

1. C.Ray Wylie, Louis C.Barrett : “Advanced Engineering Mathematics", 6th Edition,
2. McGraw-Hill Book Co., New York, 1995.
2. James Stewart : “Calculus –Early Transcendentals”, Cengage Learning India Private Ltd., 2017.
3. B.V.Ramana : "Higher Engineering Mathematics" 11th Edition, Tata McGraw-Hill, 2010.
4. Srimanta Pal & Subobh C Bhunia:“Engineering Mathematics”, Oxford University Press,3rd Reprint,2016.
5. Gupta C.B., Singh S.R. and Mukesh Kumar : “Engineering Mathematics for Semester I & II”, Mc-Graw Hill Education (India) Pvt.Ltd., 2015.

Web links and Video Lectures:

1. http://nptel.ac.in/courses.php?disciplineID=111
2. http://www.class-central.com/subject/math
3. http://academicearth.org.

ANALOG AND DIGITAL COMMUNICATION

[As per NEP, Outcome Based Education (OBE) and Choice Based Credit System (CBCS) Scheme]

SEMESTER-IV

Subject Code	21EC42	CIE Marks	50
Number Lecture Hour/Week	4L	SEE Marks	50
Number of Lecture Hours	50	Exam Hours	03

CREDITS-04

Course Objectives: The objectives of the course is to enable students to:

- Design simple systems for generating and demodulating AM, DSB, SSB and VSB signals.
- Understand the concepts in Angle modulation for the design of communication systems.
- Design simple systems for generating and demodulating frequency modulated signals.
- Analyze pulse modulation and sampling techniques.

Modules	Teaching Hours
Module -1	
Amplitude Modulation: Amplitude Modulation, Virtues, Limitations, and Modifications of Amplitude Modulation, Double Sideband-Suppressed Carrier Modulation, Costas Receiver, Quadrature-Carrier Multiplexing, Single-Sideband Modulation, Vestigial Sideband Modulation, Baseband Representation of Modulated Waves and Band-Pass Filters (Text 1: 3.1 to 3.7).	**10 Hours**
Module -2	
Angle Modulation: Basic Definitions, Narrowband frequency modulation, generation of FM waves, Demodulation of FM signal using frequency discriminator (Text 1: 4.1, 4.4, 4.7, 4.8),), Detection of Frequency modulation, FM pre-emphasis and De-emphasis(Text 1: 9.7,9.8). **Pulse Modulation: Transition from analog to digital communications:** Sampling process, Pulse Amplitude Modulation, pulse position modulation, completing the Transition from analog to digital, (Text 1: 5.1 to 5.4).	**10 Hours**
Module -3	
Pulse Modulation: Transition from analog to digital communications: Quantization process, Pulse code modulation (PCM), Delta modulation, Differential pulse code modulation, line codes (Text 1: 5.5 to 5.9). **Baseband Data Transmission:** Baseband transmission of digital data, The inter symbol interference problem, The Nyquist channel, The eye pattern (Text 1: 6.1 to 6.4 and 6.5).	**10 Hours**
Module -4	
Digital Band pass Modulation Techniques: Binary amplitude shift keying, Phase shift Keying, Frequency shift keying, Summary of three binary signaling schemes, Non coherent digital modulation schemes, M-ary Digital modulation scheme, Mapping of digitally modulated waveform onto constellations of signal point(Text 1: 7.2 to 7.8)	**10 Hours**
Module-5	
Principles of Spread Spectrum: Spread Spectrum Communication Systems: Model of a Spread Spectrum Digital Communication System, Direct Sequence Spread Spectrum Systems, Effect of De-spreading on a narrowband Interference, Probability of error (statement only), Some applications of DS Spread Spectrum Signals, Generation of PN Sequences, Frequency Hopped Spread Spectrum, CDMA based on IS-95 (Text 2: 11.3.1, 11.3.2, 11.3.3, 11.3.4, 11.3.5, 11.4.2).	**10 Hours**

Course Outcomes: At the end of this course students will demonstrate the ability to

CO-1- Comprehend and analyze the basic principles of Amplitude Modulation (AM).

CO-2- Apply the knowledge of sampling and analyze Angle modulation techniques used in communication systems.

CO-3- Examine inter-symbol interference (ISI) and understand the role of the Nyquist 4channel in baseband transmission.

CO-4- Generation and detection of signals using digital band pass modulation techniques

CO-5- Comprehend the different types of spread spectrum communication systems.

Text Books

1. Simon Haykin, Michael Moher " Introduction to Analog And Digital Communications " 2nd Edition 2013.

2. Proakis J. G. and Salehi M., "Communication Systems Engineering", Pearson Education, 2002.

3. Haykin S., "Communications Systems", John Wiley and Sons, 2001.

4. Taub H. and Schilling D.L., "Principles of Communication Systems", Tata McGraw Hill, 2001.

Reference Books:

1. Wozencraft J. M. and Jacobs I. M., ``Principles of Communication Engineering",John Wiley,
1965.

2. Barry J. R., Lee E. A. and Messerschmitt D. G., ``Digital Communication", Kluwer Academic Publishers, 2004.

3. Proakis J.G., ``Digital Communications", 4th Edition, McGraw Hill, 2000.

COURSE OUTCOME AND REVISED BLOOM'S TAXONOMY LEVEL MAPPING (Y/N)

COURSE OUTCOME	Remember L1	Understand L2	Apply L3	Analyze L4	Evaluate L5	Create L6
CO1	Y	Y	Y	N	N	N
CO2	Y	Y	N	Y	N	N
CO3	Y	Y	N	Y	N	N
CO4	Y	Y	N	N	N	Y
CO5	Y	Y	Y	N	N	N

COURSE OUTCOME AND PROGRAMME OUTCOME MAPPING (1/2/3):

Note: 1-Low, 2-Medium, 3-High

CO/PO	PO.1	PO.2	PO.3	PO.4	PO.5	PO.6	PO.7	PO.8	PO.9	PO.10	PO.11	PO.12	PSO.1	PSO.2	PSO.3
CO1	3	2	2	-	-	-	-	-	-	-	-	-	3	-	-
CO2	3	2	2	-	-	-	-	-	-	-	-	-	3	-	-
CO3	3	3	-	-	-	-	-	-	-	-	-	-	3	-	-
CO4	3	3	2	-	-	-	-	-	-	-	-	-	3	-	-
CO5	3	3	-	-	-	-	2	-	-	-	-	-	3	-	-

MICROCONTROLLER

[As per NEP, Outcome Based Education (OBE) and Choice Based Credit System (CBCS) Scheme]
SEMESTER-IV

Subject Code	21EC43	CIE Marks	50
Number of Lecture Hours/Week	3L	SEE Marks	50
Total Number of Lecture Hours	40	Exam Hours	03

CREDITS-03

Course objectives: This course will enable students to:

- Understand the basics of microcontroller, Embedded systems and architecture of 8051 microcontroller.
- Explain and analyze the instruction sets of 8051 microcontrollers and also to write the AssemblyLevelProgramsusing8051Instructionset.
- Understand and write peripheral programming for Timers, Serial Port and Interrupt system of 8051.
- Analyze the Application and Interfacing of8051MicrocontrollertoI/Odevices.

Module -1	Teaching Hours
8051 Microcontroller: Introduction to 8051, Embedded systems, Microprocessor vs. Microcontrollers., Desirable Features of embedded systems. 8051 Architecture- Oscillator and Clock, Role of PC and DPTR, Flags and PSW, CPU registers, Internal RAM and RAM organization, Internal Memory, Special Function Registers, I/O pins, ports and circuits, External memory, Counter and Timers, Serial Transmission, Interrupts.	**08 Hours**
Module -2	
8051Instruction Set: Addressing Modes, Data Transfer Instructions, Logical Instructions, Arithmetic Instructions, Jump Loop & Call Instruction, 8051 Stack, Stack and Subroutine instructions.	**08 Hours**
Module -3	
Assembly Language Programming: Assembly language program involving Jump, Loop, Call, Arithmetical and Logical Instructions, I/O Port Programming, Data conversion programs, Data types and time delays.	**08 Hours**
Module -4	
Peripheral Programming: 8051 timer programming, serial port and its programming, interrupt programming**.**	**08 Hours**
Module -5	
Interfacing and its Applications: LCD and keyboard interfacing, ADC and DAC interfacing, interfacing to external memory **,** Stepper Motor Interfacing, DC motor interfacing, PWM generation using 8051.	**08 Hours**

Course outcomes: At the end of the course, students will be able to:

CO1- Demonstrate the basics of microcontrollers and embedded systems, including the architecture of the 8051 microcontrollers.
CO2-Explore the instruction set of 8051 microcontrollers.
CO3-Develop the programs using the 8051-microcontroller instruction set.
CO4- Develop programs for timers, counters, serial communication and interrupts in 8051 microcontrollers.
CO5- Develop programs for various interfacing applications in the 8051 microcontrollers.

Text Books:

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, 2006.
2. "The 8051 Microcontroller", Kenneth J. Ayala, 3rd Edition, Thomson /Cengage Learning.

Reference Book:

1. " The 8051 Microcontroller Based Embedded Systems", Manish K Patel, McGraw Hill, 2014, ISBN:978-93-329-0125-4.
2. "Microcontrollers: Architecture, Programming, Interfacing and System Design", Raj Kamal, Pearson Education,2005.

COURSE OUTCOME AND REVISED BLOOM'S TAXONOMY LEVEL MAPPING						
COURSE OUTCOME	**Remember L1**	**Understand L2**	**Apply L3**	**Analyze L4**	**Evaluate L5**	**Create L6**
CO1	Y	Y	N	N	N	N
CO2	Y	Y	Y	N	N	N
CO3	Y	Y	Y	Y	N	N
CO4	Y	Y	N	N	N	N
CO5	Y	Y	N	N	Y	N

COURSE OUTCOME AND PROGRAMME OUTCOME MAPPING(1/2/3):

Note:1-Low, 2-Medium, 3-High

CO/PO	**PO.1**	**PO.2**	**PO.3**	**PO.4**	**PO.5**	**PO.6**	**PO.7**	**PO.8**	**PO.9**	**PO.10**	**PO.11**	**PO.12**	**PSO.1**	**PSO.2**	**PSO.3**
CO1	**3**	**2**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**3**	**-**	**-**
CO2	**3**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**3**	**-**	**-**
CO3	**3**	**3**	**3**	**-**	**-**	**-**	**2**	**-**	**-**	**-**	**-**	**-**	**3**	**-**	**-**
CO4	**2**	**3**	**3**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**3**	**-**	**-**
CO5	**3**	**3**	**3**	**-**	**-**	**-**	**2**	**-**	**-**	**-**	**-**	**-**	**3**	**-**	**-**

SIGNALS AND SYSTEMS

[As per NEP, Outcome Based Education (OBE) and Choice Based Credit System (CBCS) Scheme]

SEMESTER-IV

Subject Code	21EC44	CIE Marks	50
Number Lecture Hour/Week	3L	SEE Marks	50
Number of Lecture Hours	40	Exam Hours	03

CREDITS-03

Course Objectives: Students will be taught to:

- Understand the classification of signals into different categories based on their properties. Explain basic operations on signals and properties of systems.
- Use convolution in both continuous and discrete domains for the analysis of systems given the impulse response of a system.
- Evaluate response of a given linear time invariant system and Fourier representation of periodic signals.
- Apply continuous time Fourier transform representation and discrete time Fourier transform representation to study signals and linear time invariant systems.
- Use Z-transform and properties of Z transform for the analysis of discrete time systems.

Modules	Teaching Hours
Module -1	
Introduction and Classification of signals: Definition of signal and systems, communication and control systems as examples. Classification of signals. **Basic Operations on signals:** Amplitude scaling, addition, multiplication, differentiation, integration, time scaling, time shift and time reversal. **Elementary signals/Functions:** Exponential, sinusoidal, step, impulse and ramp functions. Expression of triangular, rectangular and other waveforms in terms of elementary signals.	**08 Hours**
Module -2	
System Classification and properties: Linear-nonlinear, Time variant-invariant, causal-noncausal, static-dynamic, stable-unstable, invertible. **Time domain representation of LTI System:** Impulse response, convolution sum, convolution integral. Computation of convolution sum and convolution integral using graphical method for unit step and unit step, unit step and exponential, exponential and exponential, unit step and rectangular, and rectangular and rectangular.	**08 Hours**
Module -3	
Differential & Difference Equation representation of LTI systems: Solution for Differential & Difference equations. Fourier Representation of Periodic Signals: Orthogonality of complex sinusoids, CTFS properties (No derivation)and basic problems.	**08 Hours**
Module -4	
Fourier Representation of aperiodic Signals: Introduction to Fourier Transform & DTFT, Definition and basic problems. Properties of Fourier Transform: Linearity, Symmetry, Time shift, Frequency shift, Scaling, Differentiation and Integration, Convolution and Modulation, Parsevals relationships.	**08 Hours**
Module-5	
The Z-Transforms : Z transforms, properties of the region of convergence, properties of the Z-transform, Inverse Z-transform.	**08 Hours**

CO1- Analyze the fundamental concepts of signals, including their classifications and perform basic operations on signals.

CO2- Analyze the fundamental concepts of systems and apply the convolution integral and sum to compute the responses of continuous and discrete LTI systems.

CO3- Analyze LTI systems through differential and difference equations, and explore the Fourier representation of periodic signals.

CO4- Examine the spectral characteristics of continuous and discrete-time signals using Fourier analysis.

CO5- Analyze the region of convergence (ROC) and apply Z-transform properties to simplify discrete-time signals.

Text Book:

Simon Haykins and Barry Van Veen, "Signals and Systems", 2nd Edition, 2008, WileyIndia. ISBN 9971-51-239-4.

Reference Book:

1. Michael Roberts, "Fundamentals of Signals & Systems", 2nd edition, Tata McGraw-Hill, 2010, ISBN 978-0-07-070221-9.
2. Alan V Oppenheim, Alan S, Willsky and A Hamid Nawab, "Signals and Systems" Pearson Education Asia / PHI, 2nd edition, 1997. Indian Reprint 2002.
3. H. P Hsu, R. Ranjan, "Signals and Systems", Scham's outlines, TMH, 2006.
4. B. P. Lathi, "Linear Systems and Signals", Oxford University Press, 2005.
5. Ganesh Rao and Satish Tunga, "Signals and Systems", Pearson/Sanguine

COURSE OUTCOME AND REVISED BLOOM'S TAXONOMY LEVEL MAPPING						
COURSE OUTCOME	**Remember L1**	**Understand L2**	**Apply L3**	**Analyze L4**	**Evaluate L5**	**Create L6**
CO1	Y	Y	N	N	N	N
CO2	Y	Y	Y	N	N	N
CO3	Y	Y	N	Y	N	N
CO4	Y	Y	N	N	Y	N
CO5	Y	Y	N	N	N	N

COURSE OUTCOME AND PROGRAMME OUTCOME MAPPING(1/2/3):

Note:1-Low, 2-Medium, 3-High

CO/PO	**PO.1**	**PO.2**	**PO.3**	**PO.4**	**PO.5**	**PO.6**	**PO.7**	**PO.8**	**PO.9**	**PO.10**	**PO.11**	**PO.12**	**PSO.1**	**PSO.2**	**PSO.3**
CO1	**3**	**3**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**3**	**-**	**-**
CO2	**3**	**3**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**3**	**-**	**-**
CO3	**3**	**3**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**3**	**-**	**-**
CO4	**3**	**3**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**3**	**-**	**-**
CO5	**3**	**3**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**3**	**-**	**-**

INFORMATION THEORY AND CODING

[As per NEP, Outcome Based Education (OBE) and Choice Based Credit System (CBCS) Scheme]

SEMESTER-IV

Subject Code	21EC45	CIE Marks	50
Number Lecture Hour/Week	2L	SEE Marks	50
Number of Lecture Hours	30	Exam Hours	03

CREDITS-02

Course Objectives: Students will be taught to:

- Provide an insight into the concept of information in the context of communication theory and its significance in the design of communication receivers.
- Study various source encoding algorithms.
- Model the communication channels.
- Study various error control coding algorithms.

Module -1	**Teaching Hours**
Information Theory: Introduction, Measure of information: Information content of a message, Average information content of symbols in long independent sequences, Average information content of symbols in long dependent sequences, Markoff statistical model for information sources, Entropy and information rate of Markoff sources. (Section 4.1, 4.2 of Text 1)	**06 Hours**
Module -2	
Source Coding: Encoding of the source output: Shannon's Encoding Algorithm. (Section 4.3 of Text 1) Source coding theorem: Prefix Codes, Kraft-McMillan inequality property, Huffman codes. (Section 2.2,2.3 of Text 2)	**06 Hours**
Module -3	
Information Channels: Communication Channels, Discrete Communication channels. (Section 4.4, 4.5: 4.5.1 of Text 1) Mutual Information, Channel capacity of binary symmetric channel. (Section 2.5, 2.6 of Text 2)	**06 Hours**
Module -4	
Error Control Coding: Introduction, Linear block codes: Matrix description of linear block codes. **Binary cyclic codes:** Algebraic structure of cyclic codes, Encoding using an (n-k) bit shift register, Syndrome calculation, Error detection and error correction. (Section 9.1, 9.2:9.2.1, 9.3:9.3.1,9.3.2,9.3.3 of Text 1)	**06 Hours**
Module-5	
Convolution Codes: Convolution Encoder, Time domain approach, Transform domain approach, Code Tree. (Section 8.5 of Text 2)	**06 Hours**

Course Outcomes: After studying this course, students will be able to:

CO1- Explain the fundamental concepts of information theory and apply them to statistical Markov modeling.

CO2-Apply the various types of source coding algorithms and analyze their performance.

CO3- Analyze the discrete communication channels using probability channel matrix.

CO4- Develop the linear block codes and cyclic codes for error detection and correction.

CO5- Develop the convolution codes for channel coding.

Text Books:

1. Digital and Analog Communication Systems, K. Sam Shanmugam, John Wiley India Pvt. Ltd, 1996.
2. Digital Communications, Simon Haykin, John Wiley India Pvt. Ltd, 2008.

Reference Books:

1. ITC and Cryptography, Ranjan Bose, TMH, II edition, 2007
2. Digital Communications- Fundamentals and Applications, Bernard Sklar, Second Edition, Pearson Education, 2016.
3. Information Theory and Coding, K.N. Haribhat, D. Ganesh Rao, Cengage Learning, 2017.

COURSE OUTCOME AND REVISED BLOOM'S TAXONOMY LEVEL MAPPING						
COURSE OUTCOME	**Remember L1**	**Understand L2**	**Apply L3**	**Analyze L4**	**Evaluate L5**	**Create L6**
CO1	Y	Y	Y	N	N	N
CO2	Y	Y	Y	Y	N	N
CO3	Y	Y	Y	Y	N	N
CO4	Y	Y	Y	N	N	N
CO5	Y	Y	Y	N	N	N

COURSE OUTCOME AND PROGRAMME OUTCOME MAPPING(1/2/3):
Note:1-Low, 2-Medium, 3-High

CO/PO	**PO.1**	**PO.2**	**PO.3**	**PO.4**	**PO.5**	**PO.6**	**PO.7**	**PO.8**	**PO.9**	**PO.10**	**PO.11**	**PO.12**	**PSO.1**	**PSO.2**	**PSO.3**
CO1	**3**	**-**	**-**	**-**	**-**	**-**	**1**	**-**	**-**	**-**	**-**	**-**	**3**	**-**	**-**
CO2	**3**	**3**	**-**	**-**	**-**	**-**	**1**	**-**	**-**	**-**	**-**	**-**	**3**	**-**	**-**
CO3	**3**	**3**	**-**	**-**	**-**	**-**	**1**	**-**	**-**	**-**	**-**	**-**	**3**	**-**	**-**
CO4	**3**	**3**	**2**	**-**	**-**	**-**	**1**	**-**	**-**	**-**	**-**	**-**	**3**	**-**	**-**
CO5	**3**	**3**	**2**	**-**	**-**	**-**	**1**	**-**	**-**	**-**	**-**	**-**	**3**	**-**	**-**

ANALOG AND DIGITAL COMMUNICATION LABORATORY

[As per NEP, Outcome Based Education (OBE) and Choice Based Credit System (CBCS) Scheme]

SEMESTER-IV

Subject Code	21ECL46	CIE Marks	50
Number Lecture Hour/Week	2P	SEE Marks	50
Total Number of Hours	20	Exam Hours	03

CREDITS-01

Course Objectives: Students will be taught to:

- Design, Demonstrate and Analyze filters using op-amp.
- Design, Demonstrate and Analyze analog systems for AM, FM, PPM, PAM, PWM operations.
- Design and demonstrate the digital modulation techniques.
- study phase lock loop and its capture range, lock range and free running VCO.

Laboratory oratory Experiments

1. Design active second order Butterworth low pass and high pass filters.
2. Amplitude modulation using transistor/FET (Generation and detection).
3. Frequency modulation using IC 8038/2206 and demodulation.
4. Frequency synthesis using PLL
5. Pulse amplitude modulation and detection.
6. Pulse Width modulation and detection.
7. Pulse Position Modulation and detection.
8. Time Division Multiplexing and De-multiplexing of two bandlimited signals.
9. ASK generation and detection.
10. FSK generation and detection.
11. PSK generation and detection.
12. PCM generation and detection.

Course Outcomes: After studying this course, the students will be able to:

CO1- Develop a strong foundation in applying theoretical concepts by designing /simulating the experiment.

CO2- Utilize laboratory oratory instruments/simulation tools to build and test experiments.

CO3- Analyze experimental data/simulation results and interpret findings to draw meaningful conclusions.

CO4- Learn to work effectively in teams while identifying and correcting faults in electronic circuits/programs.

CO5- Manage time effectively in a simulation/laboratory oratory environment, balancing experimental work, data collection, and report writing within specified deadlines.

COURSE OUTCOME AND REVISED BLOOM'S TAXONOMY LEVEL MAPPING (Y/N)						
COURSE OUTCOME	**Remember L1**	**Understand L2**	**Apply L3**	**Analyze L4**	**Evaluate L5**	**Create L6**
CO1	Y	Y	Y	N	N	N
CO2	Y	Y	N	Y	N	N
CO3	Y	Y	N	N	N	Y
CO4	Y	Y	N	N	N	N
CO5	Y	Y	N	N	N	N

COURSE OUTCOME AND PROGRAMME OUTCOME MAPPING(1/2/3):
Note:1-Low, 2-Medium, 3-High

CO/PO	PO.1	PO.2	PO.3	PO.4	PO.5	PO.6	PO.7	PO.8	PO.9	PO.10	PO.11	PO.12	PSO.1	PSO.2	PSO.3
CO1	**3**	**2**	**3**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**3**	**-**
CO2	**2**	**3**	**1**	**-**	**3**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**3**	**-**
CO3	**2**	**3**	**2**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**3**	**-**
CO4	**2**	**3**	**2**	**-**	**-**	**-**	**-**	**3**	**3**	**2**	**-**	**-**	**-**	**3**	**-**
CO5	**2**	**2**	**2**	**-**	**-**	**-**	**-**	**3**	**-**	**3**	**3**	**-**	**-**	**3**	**-**

MICROCONTROLLERS LABORATORY

[As per NEP, Outcome Based Education (OBE) and Choice Based Credit System (CBCS) Scheme]

SEMESTER-IV

Subject Code	21ECL47	CIE Marks	50
Number of Practical Hour/Week	2P	SEE Marks	50
Number of Practical Hours	20	Exam Hours	03

CREDITS-01

Course Objectives: Students will be taught to :

- Write 8051 application specific programs in Assembly Language and C for 8051.
- Interface various hardware modules to 8051 Microcontroller board.
- Use open source software tools like Keil and Flash magic.
- Develop applications based on Microcontroller 8051.

List of Experiments:

Software program using 8051 Microcontroller

Simple Assembly Language;

1. Program using 8051 in Block, Move, Exchange.
2. Program on Arithmetic Instructions - Addition/Subtraction, Multiplication and Division, Square, Cube
3. Program in sorting, finding largest and smallest element in an array.
4. Counters ---> For Hex and BCD up/ down count.
5. Boolean and Logical Instructions. (BitManipulation).
6. Subroutines using CALL and RETURN Instructions.
7. Code Conversions ---> ASCII to Decimal, Decimal to ASCII, BCD to ASCII

Hardware Programming (using 8051 With C Program)

1. Stepper Motor Interface to 8051 Microcontroller.
2. Seven Segment Displays to 8051 Microcontroller.
3. Hex Keyboard Interface to 8051.
4. DAC Interface for to generate Sine wave, Square wave, Triangular wave, Ramp wave through 8051Microcontroller.
5. ADC Interfacing to8051 Microcontroller
6. LCD Interfacing to 8051 Microcontroller

Course Outcomes: After studying this course, the students will be able to:

CO1- Develop a strong foundation in applying theoretical concepts by designing /simulating the experiment.

CO2- Utilize laboratory oratory instruments/simulation tools to build and test experiments.

CO3- Analyze experimental data/simulation results and interpret findings to draw meaningful conclusions.

CO4- Learn to work effectively in teams while identifying and correcting faults in electronic circuits/programs.

CO5- Manage time effectively in a simulation/laboratory oratory environment, balancing experimental work, data collection, and report writing within specified deadlines.

COURSE OUTCOME AND REVISED BLOOM'S TAXONOMY LEVEL MAPPING						
COURSE OUTCOME	**Remember L1**	**Understand L2**	**Apply L3**	**Analyze L4**	**Evaluate L5**	**Create L6**
CO1	Y	Y	Y	N	N	N
CO2	Y	Y	Y	N	N	N
CO3	Y	Y	N	Y	N	N
CO4	Y	Y	N	N	N	N
CO5	Y	Y	N	N	N	N

COURSE OUTCOME AND PROGRAMME OUTCOME MAPPING(1/2/3):
Note:1-Low, 2-Medium, 3-High

CO/PO	**PO.1**	**PO.2**	**PO.3**	**PO.4**	**PO.5**	**PO.6**	**PO.7**	**PO.8**	**PO.9**	**PO.10**	**PO.11**	**PO.12**	**PSO.1**	**PSO.2**	**PSO.3**
CO1	**3**	**2**	**3**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**3**	**-**
CO2	**2**	**3**	**1**	**-**	**3**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**3**	**-**
CO3	**2**	**3**	**2**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**3**	**-**
CO4	**2**	**3**	**2**	**-**	**-**	**-**	**-**	**3**	**3**	**2**	**-**	**-**	**-**	**3**	**-**
CO5	**2**	**2**	**2**	**-**	**-**	**-**	**-**	**3**	**-**	**3**	**3**	**-**	**-**	**3**	**-**

SIGNALS AND SYSTEMS LABORATORY

[As per NEP, Outcome Based Education (OBE) and Choice Based Credit System (CBCS) Scheme]

SEMESTER-IV

Subject Code	21ECL48	CIE Marks	50
Number of Lecture Hour/Week	2P	SEE Marks	50
Total Number of Hours	20	Exam Hours	03

CREDITS-01

Course Objectives: Students will be taught to:

- Simulate basic signals impulse, unit step, unit ramp, sinusoidal, cosine and exponential.
- Find the even and odd component of the signal and computation of energy and power of the
- signal.
- Find solution to the difference equations and computation of convolution.
- Compute the DFT for a discrete signal.
- Evaluate the sampling theorem.

Note: The experiments are to be carried using Matlaboratory / Scilaboratory / Octave or equivalent.

List of Experiments:

1. Generate and plot elementary signals like impulse, unit step, unit ramp, sinusoidal, cosine and exponential.
2. To calculate signal energy and signal power.
3. Finding even and odd of the signal.
4. Perform operations on independent variable of a signal.
5. Perform operations on dependent variable of a signal.
6. To compute the linear convolution of the given input sequence & the impulse response of the system.
7. Find the Fourier transform, plot magnitude and phase.
8. Find the inverse Fourier transform, plot magnitude and phase.
9. Solve any given difference equation of an LTI System.
10. Demonstration of sampling theorem.
11. Finding frequency response of LTI system.

Course Outcomes: After studying this course, the students will be able to:

CO1- Develop a strong foundation in applying theoretical concepts by designing /simulating the experiment.

CO2- Utilize laboratory oratory instruments/simulation tools to build and test experiments.

CO3- Analyze experimental data/simulation results and interpret findings to draw meaningful conclusions.

CO4- Learn to work effectively in teams while identifying and correcting faults in electronic circuits/programs.

CO5- Manage time effectively in a simulation/laboratory oratory environment, balancing experimental work, data collection, and report writing within specified deadlines.

COURSE OUTCOME AND REVISED BLOOM'S TAXONOMY LEVEL MAPPING						
COURSE OUTCOME	**Remember L1**	**Understand L2**	**Apply L3**	**Analyze L4**	**Evaluate L5**	**Create L6**
CO1	Y	Y	Y	N	N	N
CO2	Y	Y	Y	N	N	N
CO3	Y	Y	N	Y	N	N
CO4	Y	Y	N	N	N	N
CO5	Y	Y	N	N	N	N

COURSE OUTCOME AND PROGRAMME OUTCOME MAPPING(1/2/3):
Note:1-Low, 2-Medium, 3-High

CO/PO	PO.1	PO.2	PO.3	PO.4	PO.5	PO.6	PO.7	PO.8	PO.9	PO.10	PO.11	PO.12	PSO.1	PSO.2	PSO.3
CO1	**3**	**2**	**3**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**3**	**-**
CO2	**2**	**3**	**1**	**-**	**3**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**3**	**-**
CO3	**2**	**3**	**2**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**3**	**-**
CO4	**2**	**3**	**2**	**-**	**-**	**-**	**-**	**3**	**3**	**2**	**-**	**-**	**-**	**3**	**-**
CO5	**2**	**2**	**2**	**-**	**-**	**-**	**-**	**3**	**-**	**3**	**3**	**-**	**-**	**3**	**-**

PROJECT-IV [As per NEP, Outcome Based Education (OBE) and Choice Based Credit System (CBCS) Scheme] SEMESTER-IV			
Subject Code	21PRJ49	CIE Marks	50
Number Lecture Hour/Week	2P	SEE Marks	50
Total Number of Hours	20	Exam Hours	03
CREDITS-01			

Course Objectives: Students will be taught to:

- Get exposure about the electronics hardware and various software tools.
- Design the working model of the open ended problem.
- Understand concepts of Packaging.
- Understand the latest technology trends in the PCB design.
- Prepare technical documentation of the project.

STUDENTS WILL BE GIVEN A OPEN ENDED PROBLEM OF THE SOCIETY AND ASKED TO SOLVE BY DESIGNING AND IMPLEMENTING THE SYSTEM IN TEAM.

Course outcomes: After studying this course, students will be able to:

CO1- Apply the knowledge of electronics hardware and software components to solve the real time problems of the society.

CO2- Analyze the various existing solutions avail laboratory le to solve the real time problem and propose the best solution.

CO3- Design and implement the system to solve the real time problem of the society.

CO4- Conduct investigations on the output and prepare the technical documentation of the designed system in a team.

CO5- Use the modern tool avail laboratory be like advanced hardware and software tools.

COURSE OUTCOME AND REVISED BLOOM'S TAXONOMY LEVEL MAPPING						
COURSE OUTCOME	**Remember L1**	**Understand L2**	**Apply L3**	**Analyze L4**	**Evaluate L5**	**Create L6**
CO1	**Y**	**Y**	**Y**	N	N	N
CO2	**Y**	**Y**	N	Y	N	**N**
CO3	**Y**	**Y**	N	**N**	N	Y
CO4	**Y**	**Y**	N	N	N	N
CO5	**Y**	**Y**	N	**N**	N	N

COURSE OUTCOME AND PROGRAMME OUTCOME MAPPING (1/2/3):
Note:1-Low, 2-Medium, 3-High

CO/PO	PO.1	PO.2	PO.3	PO.4	PO.5	PO.6	PO.7	PO.8	PO.9	PO.10	PO.11	PO.12	PSO.1	PSO.2	PSO.3
CO1	**3**	**2**	**-**	**-**	**2**	**2**	**-**	**-**	**3**	3	**-**	**3**	**-**	**3**	**-**
CO2	**3**	**3**	**1**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**3**	**-**	**3**	**-**
CO3	**3**	**3**	**3**	**2**	**3**	**2**	**2**	**-**	**3**	**3**	**2**	**3**	**-**	**3**	**-**
CO4	**3**	**3**	**3**	**2**	**-**	**-**	**-**	**3**	**3**	**3**	**3**	**3**	**-**	**3**	**-**
CO5	**-**	**-**	**-**	**-**	**3**	**-**	**-**	**3**	**3**	**3**	**3**	**3**	**-**	**3**	**-**

KANNADA KALI-4

[As per Choice Based Credit System (CBCS) Scheme]

SEMESTER-IV

Subject Code	18KANKK410	CIE Marks	50
Number of Lecture Hour/Week	1L	SEE Marks	50
Number of Lecture Hours	14	Exam Hours	03

CREDITS-01

Course Objectives:

- ಅನ್ಯಭಾಷಿಕ ವಿದ್ಯಾರ್ಥಿಗಳಿಗೆ ಕನ್ನಡ ಮಾತನಾಡುವುದು ಬರೆಯುವ ಕೌಶಲ್ಯ ಕಲಿಸುವುದು.
- ಕನ್ನಡ ಭಾಷಾಜ್ಞಾನದ ಅರಿವು ಮೂಡಿಸುವುದು.
- ಕನ್ನಡ ಬರವಣಿಗೆ ಕುರಿತು ತಿಳುವಳಿಕೆ ಮೂಡಿಸುವುದು.
- ಕನ್ನಡ ನಾಡು ನುಡಿ, ಸಂಸ್ಕೃತಿಯ ಬಗ್ಗೆ ತಿಳಿಸುವುದು.
- ಕನ್ನಡ ಭಾಷಾ ಪ್ರೇಮವನ್ನು ಬೆಳೆಸುವುವುದು.

Module -1	**Teaching Hours**
Lesson 1: Conversation 1, Conversation 2, Conversation 3, Vocabulary, Exercises. **Lesson 2:** Conversation 1, Conversation 2, Conversation 3, Vocabulary, Exercises.	03 Hours
Module -2	
Lesson 3: Conversation 1, Conversation 2, Conversation 3, Vocabulary, Exercises. **Lesson 4:** Conversation 1, Conversation 2, Conversation 3,Vocabulary, Exercises.	03 Hours
Module -3	
Lesson 5: Conversation 1, Conversation 2, Conversation 3,Vocabulary, Exercises. **Lesson 6:** Conversation 1, Conversation 2, Conversation 3,Vocabulary, Exercises.	03 Hours
Module -4	
Lesson 7: Conversation 1, Conversation 2, Conversation 3, Vocabulary, Exercises. **Lesson 8:** Conversation 1, Conversation 2, Conversation 3,Vocabulary, Exercises.	03 Hours
Module -5	
Lesson 9: Conversation 1, Conversation 2, Conversation 3,Vocabulary, Exercises. **Lesson 10:** Conversation 1, Conversation 2, Conversation 3,Vocabulary, Exercises.	02 Hours

ಬಳಕೆ ಕನ್ನಡ ಪಠ್ಯ, ಕಲಿಕೆಯಿಂದ ವಿದ್ಯಾರ್ಥಿಗಳಿಗೆ ಆಗುವ ಅನುಕೂಲಗಳು ಮತ್ತು ಫಲಿತಾಂಶಗಳು:

Course outcome : At the end of the course the student will be able to:

CO1-To understand the necessity of local language for comfortable life.

CO2-To speak, read write kannada language as per requirement.

CO3-To communicate [converse] in kannada language in their daily life with kannada speakers.

CO4-To listen and understand the kannada language properly.

CO5-To speak in polite conservation.

ಆಧಾರ ಗ್ರಂಥಗಳು:

1) **ಮಾತಾಡುಕನ್ನಡ** – ಕನ್ನಡ ಸಾಹಿತ್ಯ ಪರಿಷತ್– ಬೆಂಗಳೂರು

COURSE OUTCOME AND PROGRAMME OUTCOME MAPPING (1/2/3):
Note: 1-Low, 2-Medium, 3-High

CO/PO	PO.1	PO.2	PO.3	PO.4	PO.5	PO.6	PO.7	PO.8	PO.9	PO.10	PO.11	PO.12	PSO.1	PSO.2	PSO.3
CO1	-	-	-	-	-	-	-	-	-	3	-	-	-	-	3
CO2	-	-	-	-	-	-	-	1	-	-	-	-	-	-	3
CO3	-	-	-	-	-	-	-	1	-	-	-	-	-	-	3
CO4	-	-	-	-	-	-	-	-	-	1	-	-	-	-	3
CO5	-	-	-	-	-	-	-	1	-	-	3	-	-	-	3

MAHADASOHIGALU (ಮಹಾಚಾಸೋಹಿಗಳು)

[As per Choice Based Credit System (CBCS) Scheme]

SEMESTER-IV

Subject Code	20KANMD410	CIE Marks	50
Number of Lecture Hour/Week	1L	SEE Marks	50
Number of Lecture Hours	14	Exam Hours	03

CREDITS-01

Course Objectives:

- ಕನ್ನಡ ಭಾಷಾಜ್ಞಾನದ ಅರಿವು ಮೂಡಿಸುವುದು.
- ಕನ್ನಡ ಬರವಣಿಗೆಕುರಿತು ತಿಳುವಳಿಕೆ ಮೂಡಿಸುವುದು.
- ಕನ್ನಡ ನಾಡು ನುಡಿ, ಸಂಸ್ಕೃತಿಯ ಬಗ್ಗೆ ತಿಳಿಸುವುದು.
- ಕನ್ನಡ ಭಾಷಾ ಪ್ರೇಮವನ್ನು ಬೆಳೆಸುವುವುದು.

ಘಟಕ1 (Module 1)	**Teaching Hours ಉಪನ್ಯಾಸಅವಧಿ**
1)ಶರಣಬಸವೇಶ್ವವರರ ಬದುಕು (ಅರಳಗುಂಡಿಗೆಯಲ್ಲಿ) 2)ಸಾಧನಾಕ್ಷೇತ್ರ (ಔರಾದ,ಪರ್ತಾಬಾದ್ ಮತ್ತು ಕಲಬುರಗಿಯಲ್ಲಿ)	03 Hours
ಘಟಕ2 (Module 2)	
3)ದೊಡ್ಡಪ್ಪಅಪ್ಪ ಹಾಗೂ ಶರಣಬಸವಪ್ಪಅವರ ಸಂಬಂಧಗಳು (1 ರಿಂದ6ನೇ ಪೀಠಾಧಿಪತಿಗಳು) 4)ಮರುಳ ಶರಣಬಸಪ್ಪ (ದೇವಾಲಯ ನಿರ್ಮಾಣ, ದಾಸೋಹ ಮಹಾಮನೆಯ ಬೆಳವಣಿಗೆ)	03 Hours
ಘಟಕ3 (Module 3)	
5)ಪೂಜ್ಯದೊಡ್ಡಪ್ಪಅಪ್ಪ (ಧಾರ್ಮಿಕ ಸಾಧನೆ) 6)ಶೈಕ್ಷಣಿಕ ಸಾಧನೆಗಳು	03 Hours
ಘಟಕ4 (Module 4)	
7) ಪೂಜ್ಯಡಾ. ಶರಣಬಸವಪ್ಪಅಪ್ಪ (ಸಾಮಾಜಿಕ ಕೊಡುಗೆಗಳು) 8) ಶೈಕ್ಷಣಿಕ ಕೊಡುಗೆಗಳು	03 Hours
ಘಟಕ5 (Module 5)	
9) ಮಹಾಮನೆಯ ಮಹಾ ಮಾತೆಯರು ಮೊದಲ ನಾಲ್ಕು ಪುಣ್ಯಸ್ತ್ರೀಯರು 10)ಐದನೆಯ ಪೀಠಾಧಿಪತಿಗಳಿಂದ 8ನೇ ಪೀಠಾಧಿಪತಿಗಳ ಪುಣ್ಯಸ್ತ್ರೀಯರು	02 Hours

Course Outcomes:

1) ಕನ್ನಡ ಸಾಹಿತ್ಯ ಬಗ್ಗೆ ಅರಿತುಕೊಳ್ಳುತ್ತಾರೆ.
2) ಕನ್ನಡ ಭಾಷಾಜ್ಞಾನದ ಮಹತ್ವವನ್ನು ತಿಳಿದುಕೊಳ್ಳುತ್ತಾರೆ.
3) ಭಾಷಾಭಿಮಾನವನ್ನು ಬೆಳೆಸಿಕೊಳ್ಳುತ್ತಾರೆ.
4) ಕನ್ನಡ ಸಾಹಿತ್ಯ ಕೃತಿಗಳ ಬಗ್ಗೆ ಆಸಕ್ತಿ ಮೂಡುತ್ತದೆ.
5) ಕನ್ನಡ ಕಥೆಗಳ ಬಗ್ಗೆ ಅರಿತುಕೊಳುತ್ತಾರೆ

ಆಧಾರ ಗ್ರಂಥ:

1. ಮಹಾದಾಸೋಹಿಗಳು :

ಪ್ರಧಾನ ಸಂಪಾದಕರು: ಮಾತೋಶ್ರೀ ಡಾ. ದಾಕ್ಷಾಯಣಿ ಎಸ್. ಅಪ್ಪ

ಸಂಪಾದಕರು. ಡಾ. ಎಂ. ಎಸ್. ಪಾಟೀಲ

ಪ್ರಸಾರಾಂಗ ಶರಣಬಸವ ವಿಶ್ವವಿದ್ಯಾಲಯ, ಕಲಬುರಗಿ

COURSE OUTCOME AND PROGRAMME OUTCOME MAPPING (1/2/3):
Note: 1-Low, 2-Medium, 3-High

CO/PO	PO.1	PO.2	PO.3	PO.4	PO.5	PO.6	PO.7	PO.8	PO.9	PO.10	PO.11	PO.12	PSO.1	PSO.2	PSO.3
CO1	-	-	-	-	-	-	-	1	-	-	-	-	-	-	3
CO2	-	-	-	-	-	-	-	-	-	3	-	-	-	-	3
CO3	-	-	-	-	-	-	-	-	-	-	-	3	-	-	3
CO4	-	-	-	-	-	-	-	1	-	-	-	-	-	-	3
CO5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	3

EMBEDDED C BASICS

[As per NEP, Outcome Based Education (OBE) and Choice Based Credit System (CBCS) Scheme]

SEMESTER-IV

Laboratory oratory Code	21AEC4111	CIE Marks	50
Number of Practical Sessions/Week	2P	SEE Marks	50
Total Number of Hours	20	Exam Hours	03

CREDITS – 01

Course Learning Objectives: Students will be taught to:

- Develop the microcontroller-based programs for various applications using embedded C.

Laboratory oratory Experiments

Conduct the following experiments by writing C Program using Keil micro vision simulator (any 8051 microcontrollers can be chosen as the target).

1. Write a 8051 C program to multiply two 8 bit binary numbers.
2. Write a 8051 C program to find the sum of first 10 integer numbers.
3. Write a 8051 C program to find factorial of a given number.
4. Write a 8051 C program to add an array of 16 bit numbers and store the 32 bit result in internal RAM
5. Write a 8051 C program to find the square of a number (1 to 10) using look-up table.
6. Write a 8051 C program to find the largest/smallest number in an array of 32 numbers
7. Write a 8051 C program to arrange a series of 32 bit numbers in ascending/descending order
8. Write a 8051 C program to count the number of ones and zeros in two consecutive memory locations.
9. Write a 8051 C program to scan a series of 32 bit numbers to find how many are negative.
10. Write a 8051 C program to display “Hello World” message (either in simulation mode or interface an LCD display).

Course Outcomes: After studying this course, the students will be able to:

CO1- Develop a strong foundation in applying theoretical concepts by designing /simulating the experiment.

CO2- Utilize laboratory oratory instruments/simulation tools to build and test experiments.

CO3- Analyze experimental data/simulation results and interpret findings to draw meaningful conclusions.

CO4- Learn to work effectively in teams while identifying and correcting faults in electronic circuits/programs.

CO5-Manage time effectively in a simulation/laboratory oratory environment, balancing experimental work, data collection, and report writing within specified deadlines.

Learning Resources: “The 8051 Microcontroller: Hardware, Software and Applications”,V Udayashankara and M S MallikarjunaSwamy, McGraw Hill Education, 1st edition, 2017

COURSE OUTCOME AND REVISED BLOOM'S TAXONOMY LEVEL MAPPING (Y/N)						
COURSE OUTCOME	**Remember L1**	**Understand L2**	**Apply L3**	**Analyze L4**	**Evaluate L5**	**Create L6**
CO1	**Y**	**Y**	**Y**	N	N	N
CO2	**Y**	**Y**	Y	N	N	**N**
CO3	**Y**	**Y**	N	**Y**	N	N
CO4	**Y**	**Y**	N	N	N	N
CO5	**Y**	**Y**	N	**N**	N	N

COURSE OUTCOME AND PROGRAMME OUTCOME MAPPING (1/2/3):
Note: 1-Low, 2-Medium, 3-High

CO/PO	PO.1	PO.2	PO.3	PO.4	PO.5	PO.6	PO.7	PO.8	PO.9	PO.10	PO.11	PO.12	PSO.1	PSO.2	PSO.3
CO1	**3**	**2**	**3**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**3**	**-**
CO2	**2**	**3**	**1**	**-**	**3**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**3**	**-**
CO3	**2**	**3**	**2**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**3**	**-**
CO4	**2**	**3**	**2**	**-**	**-**	**-**	**-**	**3**	**3**	**2**	**-**	**-**	**-**	**3**	**-**
CO5	**2**	**2**	**2**	**-**	**-**	**-**	**-**	**3**	**-**	**3**	**3**	**-**	**-**	**3**	**-**

PCB DESIGN AND FABRICATION

[As per NEP, Outcome Based Education (OBE) and Choice Based Credit System (CBCS) Scheme]

SEMESTER-IV

Subject Code	21AEC4112	CIE Marks	50
Number of practical Hours/Week	2P	SEE Marks	50
Total Number of Hours	20	Exam Hours	03

CREDITS-01

Course Objectives: Students will be taught to:

- Acquire the knowledge of fabrication process in current trending technological electronic world.
- Learn the designing of circuits for PCB.
- Learn the Fabrication and Itching of PCB.
- Learn the trouble shooting of any kind of faults in PCB.
- Acquire the necessary employable skills.

Laboratory oratory Experiments

1. Study of basic electronics components.
2. Study the basic functionality of PCB designing CAD software (PCB EXPRESS)
3. Study the basic fabrication process
4. Study the basic Etching process
5. Applications of PCB designing, Etching & fabrication.
6. Design, Etch and fabricate the LED switch circuit.
7. Design, Etch and fabricate the circuit for regulate the speed of fan.
8. Design, etch and fabricate the circuit for touch switch circuit.
9. Design, etch and fabricate the circuit for non-contact AC Voltage Detector.
10. Design, etch and fabricate the circuit for Simple Water Level Indicator.

Course Outcomes: After studying this course, the students will be able to:

CO1- Develop a strong foundation in applying theoretical concepts by designing /simulating the experiment.
CO2- Utilize laboratory oratory instruments/simulation tools to build and test experiments.
CO3- Analyze experimental data/simulation results and interpret findings to draw meaningful conclusions.
CO4- Learn to work effectively in teams while identifying and correcting faults in electronic circuits/programs.
CO5- Manage time effectively in a simulation/laboratory oratory environment, balancing experimental work, data collection, and report writing within specified deadlines.

Reference material information

1. R.S Khandpur, "Printed Circuit Boards - Design, Fabrication, Assembly and Testing," 1st Edition, TMH, 2017.
2. Walter C. Bosshart, "Printed Circuit Boards- Design and Technology," McGraw Hill Education,1983.
3. Clyde F. Coombs, "Printed Circuits Handbook," 6th Edition, McGraw Hill Education, 2007.
4. Kraig Mitzner, "Complete PCB Design Using Or CAD Capture and PCB Editor," 2nd Edition, Academic Press, 2019.
5. Rao R. Tummala, "Introduction to System-on-Package (SOP): Miniaturization of the Entire System," McGraw Hill, 2008.
6. Mark I. Montrose, "EMC and the Printed Circuit Board-Design, Theory and Layout Made simple," 1st Edition, Wiley-IEEE Press, 1998. 2013.
7. G. C. Loveday, "Electronic fault diagnosis," Pearson Education, 1994

COURSE OUTCOME AND REVISED BLOOM'S TAXONOMY LEVEL MAPPING						
COURSE OUTCOME	**Remember L1**	**Understand L2**	**Apply L3**	**Analyze L4**	**Evaluate L5**	**Create L6**
CO1	Y	Y	N	N	N	N
CO2	Y	Y	Y	N	N	N
CO3	Y	Y	N	N	N	Y
CO4	Y	Y	N	N	N	N
CO5	Y	Y	N	N	N	N

COURSE OUTCOME AND PROGRAMME OUTCOME MAPPING (1/2/3):
Note: 1-Low, 2-Medium, 3-High

CO/PO	PO.1	PO.2	PO.3	PO.4	PO.5	PO.6	PO.7	PO.8	PO.9	PO.10	PO.11	PO.12	PSO.1	PSO.2	PSO.3
CO1	**3**	**2**	**3**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**3**	**-**
CO2	**2**	**3**	**1**	**-**	**3**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**3**	**-**
CO3	**2**	**3**	**2**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**3**	**-**
CO4	**2**	**3**	**2**	**-**	**-**	**-**	**-**	**3**	**3**	**2**	**-**	**-**	**-**	**3**	**-**
CO5	**2**	**2**	**2**	**-**	**-**	**-**	**-**	**3**	**-**	**3**	**3**	**-**	**-**	**3**	**-**

ADDITIONAL MATHEMATICS – II

[As per Choice Based Credit System (CBCS) Scheme]

SEMESTER- IV

Subject Code	21MATDIP41	CIE Marks	00
Number of Lecture Hour/Week	4L	SEE Marks	100
Number of Lecture Hours	40	Exam Hours	03

CREDITS-00

Course Objectives: This course will enable students to:

- Solve first order differential equations. .
- Solve second and higher order differential equations.
- Understand and solve the partial differential equation.
- To acquire the knowledge of elementary probability theory.
- Know the basic concepts of evaluation of double and triple integrals.

Module -1	**Teaching Hours**
Differential Equation-1: Solution of first order and first degree differential equations: Variable separable, Homogeneous, Exact and Reducible to exact differential equation, Linear differential equation. Applications of first order first degree differential equations: Newton's law of cooling.	08 Hours
Module -2	
Differential Equations-2: Solution of second & higher order Ordinary linear differential equation with constant co-efficients. Method of variation of parameters. Solution of homogeneous LDE by Power series solution Method.	08 Hours
Module -3	
Partial Differential Equations(PDE's): Formation of PDE by eliminating arbitrary constant & functions, Solution of Non-homogeneous PDE by direct integration, solution of homogeneous PDE with respect to one independent variable only. Derivation of one dimensional wave equation and heat equation and Various possible solution of wave & heat equations by methods of separation of variables.	08 Hours
Module -4	
Improper Integrals: Beta and gamma functions and its properties and examples. Evaluation of double integral over a specific region, changing the order of integration , changing into polar form.	08 Hours
Module -5	
Probability: Introduction , Sample space and Events. Axioms of Probability, Addition & Multiplication theorems. Conditional probability- illustrative examples. Baye's theorem-examples.	08 Hours

Course Outcomes: After studying this course, students will be able to:
CO1-Solve first order differential equations in the different areas of Engineering.
CO2-Solve second and higher order differential equations occurring in of electrical circuits, damped/un-damped vibrations.
CO3-Solve second order partial differential equations in the different areas in the real world.
CO4-Recall basic concepts of elementary probability theory and, solve problems related to the decision theory, synthesis and optimization of digital circuits. CO5-To find the surface area and volume of 3D objects.

Text Books:

1. *B.S. Grewal: Higher Engineering Mathematics, Khanna Publishers, New Delhi, 43rd Ed., 2015*

Reference Books:

1. *E. Kreyszig: Advanced Engineering Mathematics, John Wiley & Sons, 10th Ed., 2015.*
2. *N.P.Bali and Manish Goyal: Engineering Mathematics, Laxmi Publishers, 7th Ed., 2007.*

COURSE OUTCOME AND PROGRAMME OUTCOME MAPPING (1/2/3):
Note: 1-Low, 2-Medium, 3-High

CO/PO	PO.1	PO.2	PO.3	PO.4	PO.5	PO.6	PO.7	PO.8	PO.9	PO.10	PO.11	PO.12
CO1	**3**	-	-	-	-	-	-	-	-	-	-	**2**
CO2	**3**	-	-	-	-	-	-	-	-	-	-	**2**
CO3	**3**	-	-	-	-	-	-	-	-	-	-	**2**
CO4	**3**	-	-	-	-	-	-	-	-	-	-	**2**
CO5	**3**	-	-	-	-	-	-	-	-	-	-	**2**