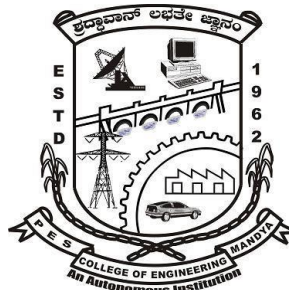# SYLLABUS

(With effect from 2022 -23)

Bachelor Degree
In

Electronics & Communication Engineering

III & IV Semester

Out Come Based Education
With
Choice Based Credit System

[National Education Policy Scheme]

P.E.S. College of Engineering, Mandya - 571 401, Karnataka

[An Autonomous Institution affiliated to VTU, Belagavi,
Grant – in – Aid Institution (Government of Karnataka),
Accredited by NBA (All UG Programs), NAAC and Approved by AICTE, New Delhi]

Ph : 08232- 220043, Fax : 08232 – 222075,Web : www.pescemandya.org

VISION

"PESCE shall be a leading institution imparting quality Engineering and Management education developing creative and socially responsible professionals."

MISSION

- ➢ *Provide state of the art infrastructure, motivate the faculty to be proficient in their field of specialization and adopt best teaching-learning practices.*
- ➢ *Impart engineering and managerial skills through competent and committed faculty using outcome based educational curriculum.*
- ➢ *Inculcate professional ethics, leadership qualities and entrepreneurial skills to meet the societal needs.*
- ➢ *Promote research, product development and industry-institution interaction.*

QUALITY POLICY

Highly committed in providing quality, concurrent technical education and continuously striving to meet expectations of stake holders.

CORE VALUES

Professionalism
Empathy
Synergy
Commitment
Ethics

Department of Electronics and Communication Engineering

The department of Electronics and Communication Engineering was incepted in 1967 with an undergraduate program in Electronics and Communication Engineering. Initially, the program had an intake of 60 students, which increased to 120 in 2012, and further increased to 180 in 2019. Almost 200 students graduate every year, and the long journey of 50 years has seen satisfactory contributions to society, the nation, and the world. The alumni of this department have a strong global presence, making their alma mater proud in every sector they represent.

The department started its PG program in 2012 in the specializations of VLSI design and embedded systems. Equipped with well qualified and dedicated faculty, the department has a focus on VLSI design, embedded systems, and image processing. The quality of teaching and training has yielded a high growth rate of placement at various organizations. The large number of candidates pursuing research programs (M.Sc. and Ph.D.) is a true testimonial to the research potential of the department. The department is recognized as a research centre by VTU, and Mysore University offers a part-time and full-time Ph.D. Program.

Vision

The department of E & C would endeavour to create a pool of Engineers who would be extremely competent technically, ethically strong also fulfil their obligation in terms of social responsibility.

Mission

- M1: Adopt the best pedagogical methods and provide the best facility, infrastructure and an ambience Conducive to imbibe technical knowledge and practicing ethics.
- M2: Group and individual exercises to inculcate habit of analytical and strategic thinking to help the Students to develop creative thinking and instil team skills
- M3: MoUs and Sponsored projects with industry and R & D organizations for collaborative learning
- M4: Enabling and encouraging students for continuing education and moulding them for life-long Learning process

Program Educational Objectives (PEOs)

- **PEO1:** Graduates to exhibit knowledge in mathematics, engineering fundamentals applied to Electronics and Communication Engineering for professional achievement in industry, research and academia
- **PEO2:** Graduates to identify, analyse and apply engineering concepts for design of Electronics and Communication Engineering systems and demonstrate multidisciplinary expertise to handle societal needs and meet contemporary requirements
- **PEO3:** Graduates to perform with leadership qualities, team spirit, management skills, attitude and ethics need for successful career, sustained learning and entrepreneurship.

Program Outcomes (POs)

- **Engineering knowledge:** Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
- **Problem analysis:** Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.
- **Design/development of solutions:** Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.
- **Conduct investigations of complex problems:** Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.
- **Modern tool usage:** Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.
- **The engineer and society:** Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.
- **Environment and sustainability:** Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.
- **Ethics:** Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.
- **Individual and team work:** Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.
- **Communication:** Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.
- **Project management and finance:** Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.
- **Life-long learning:** Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

Program Specific Outcomes (PSOs)

Electronics and Communication Engineering Graduates will be able to
- **PSO1:** An ability to understand the basic concepts in Electronics and Communication Engineering and to apply them in the design and implementation of Electronics and Communication Systems.
- **PSO2:** An ability to solve complex problems in Electronics and Communication Engineering, using latest hardware and software tools, along with analytical skills to arrive at appropriate solutions.

Bachelor of Engineering (III –Semester)

Sl. No.	Course Code	Course Title	Teaching Department	L	T	P	Credits	CIE	SEE	Total
				Hrs / Week				**Examination Marks**		
1	P21MA301	Transform and Numerical Analysis	MA	2	2	-	3	50	50	100
2	P21EC302	Linear Integrated Circuits	EC	3	-	-	3	50	50	100
3	P21EC303	Circuit Theory	EC	3	-	-	3	50	50	100
4	P21EC304	Digital Logic design	EC	3	-	2	4	50	50	100
5	P21EC305	Signals and Systems	EC	3	-	2	4	50	50	100
6	P21ECL306	Linear Integrated Circuits Laboratory	EC	-	-	2	1	50	50	100
7	P21KSK307	Samskrutika Kannada /	HSMC	-	2	-	1	50	50	100
	P21KBK307	Balake Kannada								
		OR								
	P21CIP307	Constitution of India and Professional Ethics	HSMC	-	2	-	1	50	50	100
8	P21HSMC308	Employability Enhancement Skills - III	HSMC	-	2	-	1	50	50	100
9.	P21AEC309	Innovation and Design Thinking	EC	-	2	-	1	50	50	100
		Total					**21**			

| 10 | P21MDIP301 | Basic Engineering Mathematics - I | MA | 2 | 2 | - | 0 | 100 | - | 100 |
| 11 | P21HDIP308 | Employability Enhancement Skills - I | HSMC | - | 2 | - | 0 | 100 | - | 100 |

Bachelor of Engineering (IV –Semester)

Sl. No.	Course Code	Course Title	Teaching Department	L	T	P	Credits	CIE	SEE	Total
				Hrs / Week				**Examination Marks**		
1	P21MA401	Applied Mathematical Methods	MA	2	2	-	3	50	50	100
2	P21EC402	Analog and Digital Communication	EC	3	-	-	3	50	50	100
3	P21EC403	Electromagnetic field theory	EC	3	-	-	3	50	50	100
4	P21EC404	Digital Design Using Verilog HDL	EC	3	-	2	4	50	50	100
5	P21EC405	Microcontroller	EC	3	-	2	4	50	50	100
6	P21ECL406	Analog and Digital Communication Laboratory	EC	-	-	2	1	50	50	100
7	P21KSK407	Samskrutika Kannada /	HSMC	-	2	-	1	50	50	100
	P21KBK407	Balake Kannada								
		OR								
	P21CIP407	Constitution of India and Professional Ethics	HSMC	-	2	-	1	50	50	100
8	P21HSMC408	Employability Enhancement Skills - IV	HSMC	-	2	-	1	50	50	100
9.	P21INT409	Internship – I	EC	-	-	-	1	-	100	100
		Total					**21**			

| 10 | P21MDIP401 | Basic Engineering Mathematics - II | MA | 2 | 2 | - | 0 | 100 | - | 100 |
| 11 | P21HDIP408 | Employability Enhancement Skills – II | HSMC | - | 2 | - | 0 | 100 | - | 100 |

L –Lecture, T – Tutorial, P- Practical/ Drawing, CIE: Continuous Internal Evaluation, SEE: Semester End Examination

Transform and Numerical Analysis
[As per Choice Based Credit System (CBCS) & OBE Scheme]
SEMESTER – III

Course Code:	**P21MA301**	**Credits:**	**03**
Teaching Hours/Week (L:T:P):	**2-2-0**	**CIE Marks:**	**50**
Total Number of Teaching Hours:	**40**	**SEE Marks:**	**50**

Course Learning Objectives:

- Adequate exposure to basics of engineering mathematics so as to enable them to visualize the applications to engineering problems
- Analyze periodic phenomena using concept of Fourier series, series solution of Engineering problems
- Understand Fourier transforms of functions and use it to solve initial value, boundary value problems.
- Apply Z-Transform technique to Solve difference equations and Numerical Technique to estimate interpolation, Extrapolation and area - (All formulae without proof)-problems only
- Use mathematical IT tools to analyze and visualize the above concepts.

UNIT – I	**8 Hours**

Fourier Series: Introduction, periodic function, even and odd functions, properties. Special waveforms - square wave, half wave rectifier, saw-tooth wave and triangular wave. Dirichlet's conditions, Euler's formula for Fourier series (no proof). F urier series for functions of period 2L (all particular cases) – problems, Half Range Fourier series-Construction of Half range cosine and sine series and problems Practical harmonic analysis-Illustrative examples from engineering field.

Self-study component:	Derive Euler's formula, Fourier series in complex form.

UNIT – II	**8 Hours**

Partial differential equations (PDE's):
Formation of PDE's. Solution of non-homogeneous PDE by direct integration. Solutions of homogeneous PDE involving derivative with respect to one independent variable only, Method of separation of variables(first and second order equations).

Applications of PDE's: Various Possible solution of PDE's
Classification of second order PDE, various possible solutions for One- dimensional wave and heat equations, by the method of separation of variables. Solution of all these equations with specified boundary conditions (Boundary value problems). Illustrative examples from engineering field.

Self-study component:	Charpit's Method -simple problem. Various possible solutions of Two dimensional Laplace equation.

UNIT – III	**8 Hours**

Finite Differences and Interpolation: Forward and backward differences, Interpolation, Newton-Gregory forward and backward interpolation formulae, Lagrange's interpolation formula and Newton's divided difference interpolation formula (All formulae without

proof)-problems only.

Numerical Differentiation: Derivatives using Newton-Gregory forward and backward interpolation formulae, Applications to Maxima and Minima of atabulated function.

Numerical Integration: Newton-Cotes quadrature formula, Simpson's 1/3rd rule and Simpson's $3/8^{th}$ rule. Weddle's rule (All rules without proof)-

Self-study component:	Inverse Lagrange's Interpolation formula, Central differences.

UNIT – IV	8 Hours

Fourier Transforms: Infinite Fourier transforms. Properties- linearity, scaling, shifting and modulation (no proof), Fourier sine and cosine transforms. Inverse Fourier Transforms, Inverse Fourier cosine and sine transforms. Problems. Convolution theorem and Parseval's Identity (noproof)-problems.

Self-study component:	Finite Fourier transform, Fourier transform of derivatives of functions

UNIT – V	8 Hours

Z - Transforms: Definition. Z-transforms of basic sequences and standard functions. Properties-linearity, scaling, Damping rule, first and second shifting, multiplication by n, initial and final value theorem (statement only)-problems. Inverse Z- transforms- problems.

Difference Equations: Definition. Formation of Difference equations, Linear & simultaneous linear difference equations with constant coefficients-problems, Solutions of difference equations using Z- transforms.

Self-study component:	Convolution theorem and problems, Application to deflection of a loaded string.

Course Outcomes: On completion of the course, student should be able to:

CO1	**Analyze** engineering problems using the fundamental concepts in Fourier series, FourierTransforms and Basics ideas of PDE's.
CO2	**Explain** various methods to find the Fourier constants, solution of PDE's, Estimation of interpolationand find the area, solution of difference equations.
CO3	**Apply** the acquired knowledge to construct the Half- range Fourier series, Finding Fourier transformsand Inverse Laplace transforms for some standard functions.
CO4	**Evaluate** Z-transform of various functions, solutions of differential equations with initial and boundaryconditions.

TEXT BOOKS

1. B.S. Grewal, Higher Engineering Mathematics (44th Edition 2018), Khanna Publishers, New Delhi.
2. E. Kreysizig, Advanced Engineering Mathematics, John Wiley and sons, 10th Ed. (Reprint) 2016.

REFERENCE BOOKS

1. V. Ramana: Higher Engineering Mathematics, McGraw –Hill Education,11th Ed..
2. H. C. Taneja, Advanced Engineering Mathematics, Volume I & II, I.K.

International PublishingHouse Pvt. Ltd., New Delhi.

3. N.P. Bali and Manish Goyal, A text book of Engineering Mathematics, Laxmi Publications,Reprint, 2010.

ONLINE RESOURCES

1. http://www.nptel.ac.in
2. https://en.wikipedia.org
3. https://ocw.mit.edu/courses/18-085-computational-science-and-engineering-i-fall-2008/resources/lecture-28- fourier-series-part-1/
4. https://www.thefouriertransform.com/
5. http://mcatutorials.com/mca-tutorials-numerical-methods-tutorial.php

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	2	2										
CO2	2	3										
CO3	3	2										
CO4	2	3										
Strength of correlation: Low-1, Medium- 2, High-3												

Linear Integrated Circuits
[As per Choice Based Credit System (CBCS) & OBE Scheme]
SEMESTER – III

Course Code:	P21EC302	Credits:	03
Teaching Hours/Week (L:T:P):	3 : 0 : 0	CIE Marks:	50
Total Number of Teaching Hours:	40	SEE Marks:	50

Course Learning Objectives: This course will enable the students to:

- Understand the basic operation of Op–Amp and its operation as DC and AC amplifiers.
- Understand the various applications of Op-Amp like inverting amplifier, non–inverting amplifier, voltage follower, summing amplifier and difference amplifier.
- Understand the voltage sources, current sources, current amplifiers, Circuit stability and Frequency compensation methods.
- Understand the operation of Op Amp based differentiating, integrating and Schmitt trigger circuits.
- Know the applications of 555 timer such as monostable, astable multivibrators and use of Op–Amps in signal generators, filters and DC voltage regulators.
- Explaining the operation of ADC, DAC and PLL.

UNIT – I	8 Hours

Operational Amplifier Fundamentals: IC Operational amplifiers, Op–Amp parameters – Input, output and supply voltages, Offset voltages and currents, Slew rate and frequency limitation. **Op–Amps as DC Amplifiers**– Biasing Op–Amps, Direct coupled –Voltage Follower, Direct–Coupled Non–inverting Amplifiers, Direct–Coupled Inverting amplifiers, Summing amplifiers, Difference amplifier.

Op–Amps as AC Amplifiers: Capacitor coupled Voltage Follower, Capacitor Coupled Non–inverting Amplifier, Capacitor Coupled Inverting Amplifier, Capacitor Coupled Difference amplifier.

Text 1: 1.1, 2.3, 2.4, 2.6, 3.1, 3.2, 3.3, 3.4, 3.6, 3.7, 4.1, 4.3, 4.5, 4.7.

Self-study component:	1. Study of instrumentation amplifier. 2. Study of High Input Impedance Capacitor Coupled Voltage Follower.

UNIT – II	8 Hours

Op–Amps Frequency Response and Compensation: Op-Amp Circuit Stability, Frequency Compensation Methods, Circuit Stability Precautions.

OP–AMP Applications: Voltage Sources, Current Sources and Current Sinks, Current Amplifiers, Voltage Level Detectors, Inverting Schmitt Trigger Circuit, Differentiating Circuit, Integrating Circuit.

Text 1: 5.1, 5.2, 5.6, 7.1, 7.2, 7.3, 8.2, 8.3, 8.6, 8.7.

Self-study component:	1. Study of Log and Anti-log amplifiers. 2. Study of Circuit Band width and Slew rate.

UNIT – III	8 Hours

Signal Processing Circuits: Precision Half–Wave Rectifiers: Saturating Precision Rectifier and Non saturating Precision Rectifier, Precision Full–Wave Rectifiers: Half wave and summing circuit, Limiting circuits: Peak Clipper and precision clipper, Clamping circuits, Peak detectors: Precision rectifier peak detector, Sample and Hold Circuits, Astable Multivibrator using Op-Amp, Triangular wave generator

Text 1: 9.1, 9.2. 9.3 (Mentioned topics only), 9.4, 9.5 (Mentioned topics only), 9.6, 10.1, 10.3.

Self-study component:	1. Study Mono stable Multivibrator using Op-Amp. 2. Study of Dead Zone Circuit

UNIT – IV	8 Hours

Signal Generators: 555 Timer Monostable, 555 Timer Astable, Phase Shift and Quadrature Oscillators, Colpitts and Hartley Oscillators, **Active Filters –**Filter types and characteristics, First order active filter, Second Order active filters.

DC Voltage Regulators: Voltage Regulator Basics, Op–Amp Series Voltage Regulator, Adjustable Output Regulators, IC linear Voltage Regulators: 723 IC regulator and LM 317 IC regulator.

Text 1:10.6, 10.7, 11.1, 11.2, 12.1, 12.2, 12.3, 13.1, 13.2, 13.3, 13.5(Mentioned topics only)

Self-study component:	1. Study of Band pass and Band reject filter using Op-amp. 2. Study of LM337 IC regulator and IC Function Generator (IC8038).

UNIT – V	8 Hours

DAC and ADC: Analog/Digital Conversion Basics, Digital-To-Analog Conversion, Parallel ADC, ADC Counting Methods: Dual-Slope Integrator ADC, Digital Ramp ADC(Mentioned topics only).

PLL: Basic PLL System, PLL Components, PLL Performance Factors, Integrated Circuit PLL

Text1: 15.1, 15.2, 15.3, 15.4 (Mentioned topics only), 16.1, 16.2, 16.3, 16.5

Self-study component:	1. Study of Linear Ramp ADC. 2. Study of applications of PLL

Course Outcomes: On completion of this course, students are able to:

COs	Course Outcomes with *Action verbs* for the Course topics	Bloom's Taxonomy Level	Program Outcome Addressed (PO #) with BTL
CO1	**Apply** the knowledge of basic circuit concepts to describe the operation and characteristics of Op-Amps.	Remember	L3 (PO1)
CO2	**Discuss** the working of op-amp applications, signal generators, voltage regulators, ADC, DAC and PLL.	Understanding	L3(PO2)
CO3	**Analyze** the Circuit stability and Frequency	Understanding	L3(PO2)

	compensation methods, and applications of op-amps.		
CO4	**Design** the different op-amp applications circuits, signal generators, voltage regulators, ADC, DAC and PLL systems for a given specifications.	Applying	L4(PO3)
CO5	**Design and develop** the given op-amp circuits and also simulate the same using any simulation tools as an individual or in a group.	Applying	L3(PO5,PO9, PO12)

Text Book(s):

1. **"Operational Amplifiers and Linear IC's"**, David A. Bell, 3rd edition, Oxford university Press, 2011.ISBN-13: 978-0-19-569613-4 ISBN-10: 0-19-569613-1

Reference Book(s):

1. **"Linear Integrated Circuits",** D. Roy Choudhury and Shail B. Jain, [2]nd edition, Reprint 2006, New Age International. ISBN-10: 8122430988: ISBN-13: 978-8122430981

2. **"Op – Amps and Linear Integrated Circuits",**Ramakant A. Gayakwad, 4th edition, PHI.

Web and Video link(s):

1. Analog Electronic Circuit- https://youtu.be/pkIxCmaxWFg
2. Differential and Operational Amplifiers- https://youtu.be/LS8ne40mSTE

E-Books/Resources:

1. https://www2.mvcc.edu/users/faculty/jfiore/OpAmps/OperationalAmplifiersAndLinearICs_3E.pdf
2. https://books.google.co.in/books?id=aByz 9D63wC&printsec=frontcover#v=onepage&q&f=false
3. https://drive.google.com/u/0/uc?id=1cK8mBJXxeFyNENRFYzSuqLCHWsqy Rzzp&export=download

D. Course Articulation Matrix (CAM)

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
#1	2												2	
#2		3												3
#3		2												2
#4			3											
#5					2				2			1		

Circuit Theory
[As per Choice Based Credit System (CBCS) & OBE Scheme]
SEMESTER – III

Course Code:	P21EC303	Credits:	03
Teaching Hours/Week (L:T:P):	3 : 0 : 0	CIE Marks:	50
Total Number of Teaching Hours:	40	SEE Marks:	50

Course Learning Objectives: This course will enable the students to:

- Understand electrical circuits, their sources and transformations and also their analysis and solutions through node analysis and mesh analysis methods, various network theorems (ac and dc) to analyze complex circuits.
- Analyze the transient conditions that may occur in electrical networks by solving necessary differential equations.
- Provide explanation of Laplace transform and its application in solving circuit problems.
- Determine transient response of electrical circuits by Laplace transform method.
- Examine the behaviour of two-port networks and learn about few special two-port networks.
- Demonstrate that the graph theory concept eases the solution method for solving networks with a large number of nodes and branches.
- Discuss the various properties and synthesis methods for different one-port networks

UNIT – I	8 Hours

Introduction to Network Theorems: Mesh Analysis, Node Analysis, Superposition Theorem, Thevenin's Theorem, Norton's Theorem, Maximum Power Transfer Theorem, Reciprocity Theorem.

Text: 6.1, 6.2, 6.3, 6.4, 6.5, 6.6, 6.7, 6.8

Self-study component:	Source Transformation, Star Delta Transformation, Millman's Theorem, Substitution Theorem.

UNIT – II	8 Hours

Introduction to Resonance: Series Resonance, Parallel Resonance
Introduction to Transient Analysis: Initial Conditions, Resistor-Inductor Circuit, Resistor-Capacitor Circuit, Resistor-Inductor- Capacitor Circuit.

Text: 5.1, 5.2, 5.3, 10.1, 10.2, 10.3, 10.4, 10.5

Self-study component:	Comparison of Series and Parallel Resonance Circuits, Behaviour of Pure Resistor in an ac Circuit, Behaviour of Pure Inductor in an ac Circuit, Behaviour of Pure Capacitor in an ac Circuit.

UNIT – III	8 Hours

Introduction to Laplace Transforms and its Applications: Laplace transforms of Periodic Functions, Waveform Synthesis, The Transformed Circuit, Resistor-Inductor Circuit, Resistor-Capacitor Circuit, Resistor-Inductor- Capacitor Circuit, Response of RL Circuit to Various Functions, Response of RC Circuit to Various Functions.

Text: 11.1, 11.5, 11.6, 11.10, 11.11, 11.12, 11.13, 11.14, 11.15

Self-study component:	Write programs in MATLAB/PYTHON to synthesis the waveforms.

UNIT – IV	8 Hours

Introduction to Network Topology: Graph of a Network, Definitions Associated with a Graph, Incidence Matrix, Loop Matrix or Circuit Matrix, Cutset Matrix,
Introduction to Two-Port Networks: Open-Circuit Impedance Parameters (Z Parameters), Short-Circuit Admittance Parameters (Y Parameters), Transmission Parameters (ABCD Parameters), Hybrid Parameters (h parameters).

Text: 9.1, 9.2, 9.3, 9.4, 9.5, 9.6, 13.1, 13.2, 13.3, 13.4, 13.6

Self-study component:	Duality, Inter-relationships between the Parameters.

UNIT – V	8 Hours

Introduction to Network Synthesis: Hurwitz Polynomials, Positive Real Functions, Elementary Synthesis Concepts, Realization of LC Functions, Realization of RC Functions.

Text: 16.1, 16.2, 16.3, 16.4, 16.5, 16.6, 16.7

Self-study component:	Passive Filters, Realization of RL Functions

Course Outcomes: On completion of this course, students are able to:

COs	Course Outcomes with *Action verbs* for the Course topics	Bloom's Taxonomy Level	Program Outcome Addressed (PO #) with BTL
CO1	Ability to **apply** the fundamental concepts in solving and analyzing different Electrical networks	Remember	L3(PO1)
CO2	Ability to **solve** circuits using appropriate technique	Understanding	L3(PO2)
CO3	Ability to **apply** mathematics in analyzing and synthesizing the networks in time and frequency domain	Understanding	L3(PO2)
CO4	Ability to **analyze** the performance of a particular network	Applying	L4(PO3)
CO5	Ability to **formulate** various synthesis methods for different one-port networks	Applying	L3(PO5,PO9,PO12)

Text Book(s):

1. Network Analysis and Synthesis, Ravish R Singh,
   McGraw Hill Education (India) Private Limited. ISBN: 978-1259062957

Reference Book(s):

1. Network analysis, 3E, M. E. Van Valkenburg and T.S. Rathore,
   Pearson Education. ISBN: 978-9353433123

2. Engineering Circuit Analysis, 9E, William H. Hayt Jr., Jack E. Kemmerly,
   Jamie D. Phillips, Steven M. Durbin, McGraw Hill Education (India) Private Limited.
   ISBN: 978-9390185139

3. Problems and Solutions in Engineering Circuit Analysis, William Hayt, Jack Kemmerly, McGraw Hill Education (India) Private Limited. ISBN: 978-0071333030

Web and Video link(s):

https://archive.nptel.ac.in/courses/108/105/108105159/

Network Analysis by Prof. Tapas Kumar Bhattacharya, IIT Kharagpur

E-Books/Resources:

D. Course Articulation Matrix (CAM)

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
#1	2												2	
#2		3												3
#3		2												2
#4			3											
#5					2				2			1		

Digital Logic Design
[As per Choice Based Credit System (CBCS) & OBE Scheme]
SEMESTER – III

Course Code:	P21EC304	Credits:	04
Teaching Hours/Week (L:T:P):	3 : 0 : 2	CIE Marks:	50
Total Theory Teaching Hours:	40	SEE Marks:	50
Total Laboratory Hours:	24		

Course Learning Objectives: This course will enable the students to:

- Discuss the simplification techniques such as K–map, QM method and VEM Technique.
- Design and implement the combinational logic circuits.
- Analyze the sequential elements and sequential circuits.
- Design and implement the sequential logic circuits.
- Develop digital circuits/systems applying finite state machine approach.
- Discuss the structure of Computer architecture, ROM, PLA and FPGA with logic Implementation.

UNIT – I	8 Hours

Simplification Methods and NAND/NOR Implementation: The Map Method, Two-Variable, Three-Variable and Four Variable K-Maps, NAND and NOR Implementation, Don't – Care Conditions, Determination of Prime-Implicants.
Combinational Logic: Design Procedure, Binary Parallel Adder, Magnitude Comparator, Encoders, Decoders, Multiplexers, Demultiplexers.
Text 1: 3.1-3.3, 3.6, 3.8-3.10, 4.2, 5.2, 5.4-5.6

Self-study component:	Tabulation Method, Logic Synthesis and optimization, Decoders in RAM.
Practical Topics: (6 Hours)	1.Discrete Gate Implementation (i) Logic circuit realization using basic gates. (ii) Logic circuit realization using universal gates. 2.(i) Realization of parallel adder/subtractor using 7483 chip (ii) Demonstration of BCD to Excess–3 code conversion andvice versa.

UNIT – II	8 Hours

Sequential Logic: Introduction, Flip-Flops, Triggering of Flip-Flops.
Registers and Counters: Introduction, Registers, Shift Registers, Ripple Counters, Synchronous-counters.
Text 1: 6.1-6.3, 7.1-7.5

Self-study component:	Setup and hold time issues, flip-flop versus latches, Delay elements, Watchdog timer.
Practical Topics: (6 Hours)	1. (i) Realization of Boolean expression/Combinational Logic. (ii) Application of the IC's – MUX–74153 and DEMUX – 74139 for half and full adders for 3 – bit binary to gray and BCD to Excess–3 code converters. 2. Realization of 2– bit comparator using gates and basic operational study of Priority encoder using 74147.

UNIT – III	8 Hours

State Machines: State Tables and Graph, General Models of Sequential Circuits, Design of a Sequence detector, More Complex Design Problems, Guidelines for Construction of State Graphs, Elimination of Redundant States, Equivalent States, Equivalent Sequential Circuits, Reducing incompletely Specified State Tables, Derivation of Flip-Flop Input Equations.

Text 2: 13.3-13.4, 14.1-14.3, 15.1,15.2, 15.4-15.6

Self-study component:	Digital Camera Controller State Machine. Bluetooth Controller.
Practical Topics: (4 Hours)	1. Design 2/3 bit synchronous counters using Flip–Flops. 2. Design 2/3 bit asynchronous counters using Flip–Flops.

UNIT – IV	8 Hours

Programmable Logic and Storage Devices: Read-Only Memory (ROM), ROM Based Implementation of Combinational Logic, Programmable Logic Array (PLA), Programmability of PLD's, CPLD's, XILINX XC9500 CPLD's, XILINX FPGA Flied Programmable Gate Array (FPGA), XILINX Spartan XL FPGA 's.

Text 3: 5.7-5.8

Self-study component:	Architecture and programming examples of FPGA's.
Practical Topics: (4 Hours)	1. Design the Ring counters and Johnson counter. 2. Demonstration of FPGA.

UNIT – V	8 Hours

Computer Architecture and Memory: The Memory unit, Examples of Random-access Memories. Introduction, Processor Organization, Arithmetic Logic Unit, Design of Arithmetic Circuit, Design of Logic Circuit, Design of Arithmetic Logic Unit, Status Register, Design of Shifter, Processor Unit, Design of Accumulator.

Text 1: 7.7-7.8, 9.1-9.10

Self-study component:	Intel 4004, 8085 processors, ARM Machine and AMD's Processors.
Practical Topics: (4 Hours)	1. Demonstration of 7489, 16 by 4 random access memory. 2. Realization of Shift operations using 7495.

Course Outcomes: On completion of this course, students are able to:

COs	Course Outcomes with *Action verbs* for the Course topics	Bloom's Taxonomy Level	Program Outcome Addressed (PO #) with BTL
CO1	Apply the simplification techniques/methods to Optimize and Implement the digital functions/circuits.	Understand & Apply	L2,L3 (PO1, PO2)

CO2	Analyze, Debug and design combinational and sequential logic circuit for the given requirements/specification.	Apply, Analyze & Create	L3,L4,L6 (PO2,PO3)
CO3	Develop, Simulate and Implement logic circuits for the given requirements/specification.	Analyze & Create	L4,L6 (PO4, PO5,PO9, PO12)
CO4	Analyze and Design processor data path blocks.	Analyze & Create	L4, L6 (PO2, PO3)
CO5	Design ROM/PLA/FPGA based circuits for the given requirements/specifications.	Apply and Create	L3, L6 (PO3)

Text Book(s):

1. M.Morris Mano, "Digital Logic and Computer Design",Pearson, 2020.ISBN: 978-93-325-4252-5.

2. Charles H Roth Jr, Larry L. Kinney, "Fundamentals of Logic Design",7 th Edition, Thomson Learning, 2019.ISBN-13: 978-81-315-2615-6.

3. Michael D. Ciletti, "Advanced Digital Design with the Verilog HDL", 2 nd Edition, Pearson, 2011. ISBN-13: 9780133002546.

Reference Book(s):

1. John.M Yarbrough, "Digital logic applications and Design", Pearson, Thomson Learning,2006.ISBN: 981-240-62-1.

Web and Video link(s):

1. https://nptel.ac.in/courses/108106177 -Course by Neeraj Goel, IIT Ropar.

2. https://nptel.ac.in/courses/106105185 - Course by Indranil Sengupta, IIT Kharagpur.

3. https://ocw.mit.edu/courses/6-004-computation-structures-spring-2017/pages/syllabus/ - Chris Terman, Massachusetts Institute of Technology.

E-Books/Resources:

Course Articulation Matrix (CAM)

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
#1	3	3											3	3
#2		2	3											2
#3				2	3									
#4		2	2											2
#5			2											

Signals and Systems
[As per Choice Based Credit System (CBCS) & OBE Scheme]
SEMESTER – III

Course Code:	P21EC305	Credits:	04
Teaching Hours/Week (L:T:P):	3:0:2	CIE Marks:	50
Total Theory Teaching Hours:	40	SEE Marks:	50
Total Laboratory Hours:	24		

Course Learning Objectives: This course will enable the students to:

- Classify the signals and understand different operations on signals.
- Recognize the basic signals (both continuous- time and discrete-time) like impulse, unit step, ramp, sinusoids and exponentials, represented both in frequency and time domains.
- Characterize LTI system using impulse response and linear constant coefficient differential equations.
- Represent all types of signals (CT/DT, periodic/non-periodic) in terms of complex
- Define relationship between Z transform and Fourier transform.
- Implement the systems (any order) in Direct-form-I and Direct-form-II

UNIT – I	**8 Hours**

Continuous time and discrete time signals, transformations of the independent variable, exponential and sinusoidal signals, the unit impulse and unit step functions, Continuous-time and discrete-time systems, basic system properties.
Text1: 1.1,1.2,1.3,1.4, 1.6

Self-study component:	More problems on the periodicity, energy and power a signal.

Practical Topics: (6 Hours)	1. Develop a MATLAB code to generate the CTS and DTS
	  a. Periodic Signals
	  b. Exponential Signals
	  c. Sinusoidal Signals
	2. Develop a MATLAB code to generate the CTS and DTS
	  a. Exponentially Damped Sinusoidal Signals
	  b. Step, Impulse and Ramp functions
	  c. User defined functions

UNIT – II	**8 Hours**

Linear Time Invariant Systems: Discrete-time LTI systems- The Convolution sum, Continuous-time LTI systems- The Convolution integrals, properties of linear time-invariant systems, Causal LTI systems described by differential and difference equations,
Text1: 2.1 to 2.4.3

Self-study component:	1. Examples on the causality, time invariant and linearity of the system 2. Block diagram representation of systems (Direct form-I and Direct form-II)
Practical Topics: (6 Hours)	1. Write a MATLAB code to simulate difference equation. 2. Write a MATLAB code to find the frequency response of LTI systems described by differential or difference equations. 3. Write a MATLAB code to perform convolution of signals.

UNIT – III	8 Hours

Fourier Representation of Continuous-time (CT) Signals: Fourier series representation of continuous-time periodic signals, Properties of continuous –Time Fourier Series. CT Non-Periodic Signals: Representation of Aperiodic signals: The continuous time Fourier transform, Properties of continuous- time Fourier Transform, Convolution property.

Text1: 3.3, 3.5, 4.1,4.3,4.3.1,4.3.5,4.3.7, 4.4

Self-study component:	1. Examples on the convolution of two discrete time signals and Fourier transform of the signal. 2. Properties of continuous- time Fourier Transform . 3. The fourier transform for periodic signals.
Practical Topics: **(4 Hours)**	1. Write a MATLAB code to generate Amplitude Modulated signal. 2. Write a MATLAB code to find the DTFS of the given signal.

UNIT – IV	8 Hours

Discretization of CT signals and Fourier Representation of Discrete-Time (DT) Signals Sampling of CT Signals- Representation Of continuous-Time signals by its samples: The sampling theorem, **Fourier Representation for DT Non Periodic Signals**: Representation of Aperiodic signals: The discrete- Time fourier Transform, Properties of the Discrete- Time Fourier transforms, Multiplication Property.

Text1:7.1, 5.1, 5.3, 5.5

Self-study component:	The Convolution property
Practical Topics: **(4 Hours)**	1. Write a MATLAB code to find Poles and Zeros of LTI systems. 2. Write a MATLAB code to generate sampled signal of a discrete and Continuous-time signal.

UNIT – V	8 Hours

Z–Transforms: The Z – transform, the region of convergence for the Z-transform. The inverse Z-transform, properties of Z – transforms, System function algebra and block diagram representations, The Unilateral Z transform.

Text1: 10.1,10.2,10.3,10.5,10.8,10.9

Self-study component:	1. Find Z transform of the unit impulse, unit step, cosine signals and find the z transform using differentiation property 2. Analysis and characterization of LTI systems using Z-transforms.
Practical Topics: **(4 Hours)**	1. Write a MATLAB code to find Z-transform and inverse of the Z-transform.

	2. Solve a given difference equation/system of linear equations [Z-transform].		

Course Outcomes: On completion of this course, students are able to:

COs	Course Outcomes with *Action verbs* for the Course topics	Bloom's Taxonomy Level	Program Outcome Addressed (PO #) with BTL
CO1	**Apply** knowledge of basic mathematics to classify different signals and systems	Remember	L1 [PO1]
CO2	**Analyze** signals and systems to determine their properties.	Understanding	L2[PO2]
CO3	**Develop** LTI/LSI systems in time domain and frequency domain to determine system output and properties.	Applying	L3[PO2],[PO3]
CO4	**Design** CT and DT system and implement using different structures.	Applying	L3[PO2],[PO3]
CO5	**Develop** and **Simulate** the different types of signals and perform many operations on discrete time signals and Continuous time signals using tools.	Analyzing	L4[PO5],[PO9]

Text Book(s):

1. **"Signals and Systems",**V.Oppenheim, Alan Willsky and A.HamidNawab, Pearson education asia/PHI, 2ndedition, 2006. ISBN: 9789332550230, 9332550239
2. **"Signals and Systems",** Simon Haykin and Barry Van Veen, 2nd Edition John Wiley & Sons, 2nd edition 2008. ISBN:9788126512652, 8126512652

Reference Book(s):

1. **"Signals and systems",**H.P.Hsu, R.Ranjan, Schaum's outlines, TMH, 2006. ISBN:9780070669185, 007066918X
2. **"Signals and Systems",** A NagoorKani, McGraw Hill 2010 . ISBN: 9780070151390, 0070151393.
3. **"Fundamentals of Signals and Systems",** Michael J Roberts, Govind Sharma, McGraw Hill 2010. ISBN: 0070702217, 9780070702219.

Web and Video link(s):

- **https://www.youtube.com/watch?v=up55tuwestg&list=PLWPirh4EWFpHr_1ZCkuF9To** **YUrmujv9Aa**
- **https://www.youtube.com/watch?v=I_ZcZF-EWj8&list=PLWPirh4EWFpHr_1ZCkuF9ToYUrmujv9Aa&index=3**
- https://www.youtube.com/watch?v=0nZYen9w_eo&list=PLyqSpQzTE6M8KJ-XQ1m2vl3nd2ZUqKEN8
- **https://www.youtube.com/watch?v=uEIVDGbaE5c**

E-Books/Resources:

- **https://link.springer.com/book/10.1007/978-3-031-02545-7?page=2#book-header**

"Fundamentals of Signals & Systems" , **Benoit Boulet, Charles River Media 2006, ISBN:1-58450-381-5, eISBN: 1-58450-660-1.**

- https://mlichouri.files.wordpress.com/2013/10/fundamentals-of-signals-and-systems.pdf.

D. Course Articulation Matrix (CAM)

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
#1	3												3	
#2		2												2
#3		3	2											3
#4		2	1											2
#5					1				1					

Linear Integrated Circuit Laboratory [As per Choice Based Credit System (CBCS) & OBE Scheme] SEMESTER – III			
Course Code:	**P21ECL306**	**Credits:**	**01**
Teaching Hours/Week (L:T:P):	0-0-2	**CIE Marks:**	**50**
Contact Period:	Lecture :2 Hr, Exam: 2Hr.	**SEE Marks:**	**50**

Prerequisite: Basic Electronics and Basic Electricals.

Course Learning Objectives (CLOs)

This course aims to

1. Provide the basic knowledge of how to use CRO, signal generator, bread board, power supply, ammeter, voltmeter and how to rig-up the circuits.
2. Analyze the characteristics of MOSFET, Op-amp.
3. Design Inverting and Non-inverting amplifiers, Summing, Subtracting and Schmitt trigger circuit using Op-Amp.
4. Demonstrate the working of Integrator, Differentiating circuit, precision half wave and full wave rectifier using 741 IC
5. Design the RC phase shift oscillators using Op-amp.
   Understanding the working DAC using Op-Amp and Voltage regulator using LM 317 IC regulator.

Course Content

1. MOSFET drain and transfer characteristics
2. Op-amp RC phase shift oscillator.
3. Determining the Characteristic parameters of Op-Amp 741 IC,
4. Design of Inverting and Non-inverting amplifier using 741 IC
5. Op-amp as adder, subtractor and voltage follower
6. Op-amp as Integrator and Differentiator circuit
7. Precision half wave and full wave rectifier using 741 IC.
8. Design of Schmitt trigger and zero crossing detection using 741 IC
9. 4 bit R-2R DAC using Op-amp 741 IC
10. Voltage regulator using LM 317 IC regulator.

Open ended experiments

1. Conduct an experiment for the voltage level monitor to energize the LED when Vcc exceeds 16V. Use zener diode and 471 op-amp with single power supply
2. Conduct an experiment to sum two sinusoidal signals of peak amplitude 4v and clip the output level to 5v.
3. Conduct an experiment to clip negative half cycle at 2 V and invert the signal. Assume 5V p-p sinusoidal input signal.

Course Outcome (CO)

CO #	Course Outcome	Bloom Taxonomy Levels	Program Outcome Addressed (PO #) with BTL
CO1	**Analyze** the MOSFET characteristics, working of amplifier and oscillator with Op-amp, and to find characteristics of Op-Amp.	Understanding	L3(PO2)
CO2	**Design** the inverting and non-inverting amplifier for a given gain, Schmitt trigger circuit for a given LTP and UTP, and voltage regulator using LM 217 regulator.	Apply	L4(PO3)
CO3	**Ability** to conduct experiments using op-amps and other electronic components on adder, subtractor, voltage follower, integrator, differentiator, rectifiers and DAC circuits.	Apply	L4(PO2)
CO4	**Ability** to work effectively in a team to analyze the given design and conduct experiment.	Evaluate	L4(PO2, PO9, PO12)

Course Articulation Matrix (CAM)

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
#1		2												2
#2			3											
#3		3												3
#4		2							2			1		2

Employability Enhancement Skills (EES) - III				
[As per Choice Based Credit System (CBCS) & OBE Scheme]				
SEMESTER – III				
Course Code:	**P21HSMC308**		**Credits:**	**01**
Teaching Hours/Week (L:T:P):	**0:2:0**		**CIE Marks:**	**50**
Total Number of Teaching Hours:	**28**		**SEE Marks:**	**50**

Course Learning Objectives: This course will enable students to:
- Build Personal Branding, team binding.
- Present the data using presentation skills in a better manner.
- Understand the importance of stress management, Entrepreneurship & Business skills.
- Usage of various voices in a sentence and critical reasoning.
- Explain the basic concepts in boat and stream, geometry and trigonometry problems.
- Calculations involving Permutations and combinations, probability and logarithms.
- Explain concepts behind logical reasoning modules of analytic, syllogisms, venn diagrams and puzzles.

UNIT – I	**8 Hours**

Soft Skills: Personal Branding, Synergy between Teams (Online and Offline), Interview skills, Stress Management, Entrepreneurship & Business skills.

Verbal Ability: Active voice and passive voice, critical reasoning.

Self-Study: Corporate ethics and Mannerism

UNIT – II	**10 Hours**

Quantitative Aptitude: Boats and streams, Geometry & Trigonometry, Permutations and combinations, Probability & Logarithms.

Self-Study: Pipes and cisterns

UNIT – III	**10 Hours**

Logical Reasoning: Analytical reasoning, Syllogisms, clocks and calendars, Venn diagram, puzzles.

Self-Study: Binary logic

Course Outcomes: On completion of this course, students are able to:	
CO – 1:	Exhibit amplified level of confidence to express themselves in English
CO – 2:	Develop the presentation skills, entrepreneurial skills by managing stress at various levels.
CO – 3:	Solve the problems based on Boats and streams, Geometry & Trigonometry, Permutations and combinations, Probability & Logarithms.
CO – 4:	Solve logical reasoning problems based on Analytical reasoning, Syllogisms, clocks and calendars, cases and Venn diagram, puzzles.

Text Book(s):

1. Word Power Made Easy New Revised and Expanded Edition, First Edition, Norman Lewis, Goyal Publisher.
2. Essential English Grammar by Raymond Murphy, Cambridge University Press, new edition
3. The 7 habits of Highly Effective People by Stephen R. Covey
4. Quantitative aptitude by Dr. R. S Agarwal, published by S.Chand private limited.
5. Verbal reasoning by Dr. R. S Agarwal , published by S. Chand private limited.

Reference Book(s):

1. Quantitative Aptitude by Arun Sharma, McGraw Hill Education Pvt Ltd
1. 2. CAT Mathematics by Abhijith Guha, PHI learning private limited.

Web and Video link(s):

1. NPTEL Course: Soft skills by By Prof. Binod Mishra, IIT Roorkee

https://onlinecourses.nptel.ac.in/noc21_hs76/preview

COURSE ARTICULATION MATRIX [Employability Enhancement Skills (EES) - III]												
COs	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**
CO-1	-	-	-	-	-	-	-	-	2	3	-	2
CO-2	-	-	-	-	-	-	-	-	2	3	2	2
CO-3	2	-	-	-	-	-	-	-	-	-	-	-
CO-4	2	-	-	-	-	-	-	-	-	-	-	-

Innovation and Design Thinking			
[As per Choice Based Credit System (CBCS) & OBE Scheme]			
SEMESTER – III			
Course Code	**P21AEC309**	**Credits**	**01**
Teaching Hours/Week (L: T:P: S)	**0:2:0**	**CIE Weightage**	**50**
Total Hours of Pedagogy	**25**	**SEE Weightage**	**50**
Exam Hour	**01**	**Total Marks**	**100**

Course Category: Foundation

Preamble: This course provides an introduction to the basic concepts and techniques of engineering and reverses engineering, the process of design, analytical thinking and ideas, basics and development of engineering drawing, application of engineering drawing with computer aide.

Course objectives:

- To explain the concept of design thinking for product and service development
- To explain the fundamental concept of design thinking
- To discuss the methods of implementing design thinking in the real world.

Module-1

Understanding Design Thinking

Definition of design - Design Vs Engineering Design– Difference between Design and Engineering Design– The General Design process Model – Design to Design thinking - Time line of Design thinking.

Module-2

Features of Design Thinking

Venn diagram of design thinking– Design thinking resources – Design thinking process Models – Design thinking methodologies

Module-3

Models to Do Design Thinking

Different kinds of thinking – 5 Stage d.School Process - 5 stages of Stanford – Empathize – Define- Ideate – Prototype – Test – Iterate - Applications of Design Thinking.

Module-4

Design thinking for Engineering - Concept models for comparing design thinking and engineering systems thinking - The Distinctive Concept Model - The Comparative Concept Model - The Inclusive Concept Model - The Integrative Concept Model.

Module-5

Design Thinking Tools and Methods - Purposeful Use of Tools and Alignment with Process - What Is: Visualization - What Is: Journey Mapping - What Is: Value Chain Analysis - What Is: Mind Mapping - What If: Brainstorming - What If: Concept Development - What Wows: Assumption Testing - What Wows: Rapid Prototyping - What Works: Customer Co-Creation - What Works: Learning Launch.

Course Outcomes:

Upon the successful completion of the course, students will be able to:

CO Nos.	Course Outcomes	Knowledge Level (Based on revised Bloom's Taxonomy)
CO1	Understanding Design Thinking process	L2
CO2	Appreciate various design process procedure	L2
CO3	Generate and develop design ideas through different Technique.	L2
CO4	Identify the significance of reverse Engineering to Understand products	L3
CO5	Practice the methods, processes, and tools of Design Thinking	L2

Suggested Learning Resources:

Text Books :

1. John.R.Karsnitz, Stephen O'Brien and John P. Hutchinson, "Engineering Design",Cengagelearning (International edition) Second Edition, 2013.
2. Roger Martin, "The Design of Business: Why Design Thinking is the Next Competitive Advantage",Harvard Business Press , 2009.

References:

1. Jake knapp, John keratsky and Braden kowitz "Sprint how to solve big problems and test new ideas in just five days"
2. Tim Brown "Change by design"
3. Steve Krug "Don't make me think; Revisited"
4. Roger martin "The design of Business"
5. Yousef Haik and Tamer M.Shahin, "Engineering Design Process", CengageLearning, SecondEdition, 2011.
6. Idris Mootee, "Design Thinking for Strategic Innovation: What They Can't Teach You at Businessor Design School", John Wiley & Sons 2013.
7. Hasso Plattner, Christoph Meinel and Larry Leifer (eds), "Design Thinking: Understand – Improve – Apply", Springer, 2011

Basic Engineering Mathematics - I			
[As per Choice Based Credit System (CBCS) & OBE Scheme]			
SEMESTER – III (Lateral Entry: Common to all branches)			
Course Code:	P21MDIP301	**Credits:**	00
Teaching Hours/Week (L:T:P):	2-2-0	**CIE Marks:**	100
Total Number of Teaching Hours:	40	**SEE Marks:**	-

Course Learning Objectives: The mandatory learning course **P21MADIP301**viz., **Basic Engineering Mathematics-I** aims to provide basic concepts of complex trigonometry, vector algebra, differential & integral calculus, vector differentiation and various methods of solving first order differential equations.

UNIT – I	8 Hours

Complex Trigonometry: Complex Numbers: Definitions & properties. Modulus and amplitude of a complex number, Argand's diagram, De- Moivre's theorem (without proof).

Vector Algebra: Scalar and vectors. Vectors addition and subtraction. Multiplication of vectors (Dot and Cross products). Scalar and vector triple products-simple problems.

Self-study component:	De-Moivre's theorem (without proof). Roots of complex number - Simple problems.

UNIT – II	8 Hours

Differential Calculus: Polar curves –angle between the radius vector and the tangent pedal equation- Problems. Taylor's series and Maclaurin's seriesexpansions- Illustrative examples.

Partial Differentiation: Elementary problems. Euler's theorem for homogeneous functions of two variables. Total derivatives-differentiation of composite and implicit function.

Self-study component:	Review of successive differentiation. Formulae for n^{th} derivatives of standard functions- Liebnitz's theorem (without proof). Application to Jacobians, errors & approximations.

UNIT – III	8 Hours

Integral Calculus: reduction formulae for $sin^n x$, $cos^n x$, and $sin^m x cos^m x$ and evaluation of these with standard limits-Examples. Applications of integration to area, length of a given curve, volume and surface area of solids of revolution.

Self-study component:	Differentiation under integral sign (Integrals with constants limits)-Simple problems.

UNIT – IV	8 Hours

Vector Differentiation: Differentiation of vector functions. Velocity and acceleration of a particle moving on a space curve. Scalar and vector point functions. Gradient, Divergence, Curl and Laplacian (Definitions only).

Self-study component:	Solenoidal and irrotational vector fields-Problems.

UNIT – V	8 Hours

Ordinary differential equations (ODE's): Introduction-solutions of first order and first degree differential equations: homogeneous, exact, linear differential equations of order one and equations reducible to above types.

Self-study component:	Applications of first order and first degree ODE's - Orthogonal trajectories of Cartesian and polar curves. Newton's law of cooling, R-L circuits- Simple illustrative examples from engineering field.

Course Outcomes: After the successful completion of the course, the students are able to

CO1	**Explain** the fundamental concepts –in complex numbers and vector algebra to analyze the problemsarising in related area of engineering field.
CO2	**Identify** – partial derivatives to calculate rate of change of multivariate functions.
CO3	**Apply** - the acquired knowledge of integration and differentiation to evaluate double and triple integrals tocompute length surface area and volume of solids of revolution and indentify velocity, acceleration of a particle moving in a space.
CO4	**Find** analytical solutions by solving first order ODE's which arising in different branches of engineering.

TEXT BOOKS

1. B.S. Grewal, Higher Engineering Mathematics (44th Edition), Khanna Publishers, New Delhi.
2. B.V. Ramana, Higher Engineering Mathematics, Tata McGraw Hill publications, New Delhi, 11thReprint, 2010.

REFERENCE BOOKS

1. Erwin Kreyszig, Advanced Engineering Mathematics (Latest Edition), Wiley Publishers, New Delhi.
2. H. C. Taneja, Advanced Engineering Mathematics, Volume I & II, I.K. International PublishingHouse Pvt. Ltd., New Delhi.
3. N.P. Bali and Manish Goyal, A text book of Engineering Mathematics, Laxmi Publications, Reprint,2010.
4. V. Krishnamurthy, V.P. Mainra and J.L. Arora, An introduction to Linear Algebra, Affiliated East–West press, Reprint 2005.
5. D. Poole, Linear Algebra: A Modern Introduction, 2nd Edition, Brooks/Cole, 2005.

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	2										
CO2	3	2										
CO3	2	3										
CO4	2											
CO5	3											
Strength of correlation: Low-1, Medium- 2, High-3												

Employability Enhancement Skills (EES) - I				
[As per Choice Based Credit System (CBCS) & OBE Scheme]				
SEMESTER - III				
Course Code:	**P21HDIP308**		**Credits:**	**01**
Teaching Hours/Week (L:T:P):	**0:2:0**		**CIE Marks:**	**100**
Total Number of Teaching Hours:	**28**		**SEE Marks:**	**-**

Course Learning Objectives: This course will enable students to:

- Get introduced to some of the concepts of soft skills and enhance communication skills
- Recognize common mistakes done by an individual in the course of his / her communication
- Write effective emails
- Identify their strengths, weakness, opportunities and threats
- Understand the basic rules of sentence structures
- Understand the correct usage of parts of speech, tenses and articles
- Explain divisibility roles, properties of various types of numbers
- Explain application of percentage in our daily life
- Describe the concepts of profit, loss, discounts
- Explain concepts behind logical reasoning modules of arrangements and blood relations

UNIT – I	**10 Hours**

Soft Skills: LSRW, Listening, communication skills (verbal and non-verbal skills), public speaking, Email writing, SWOT Analysis

Self-Study: Motivation and Time Management

UNIT – II	**10 Hours**

Verbal Ability: Parts of Speech - Prepositions, Adjectives and Adverbs ; Tenses, Articles, Idioms and Phrasal verbs, Subject verb agreement, Synonyms and Antonyms

Self-Study: Para jumbles and one word substitution

UNIT – III	**8 Hours**

Quantitative Aptitude: Number system, Percentage, Profit & Loss
Logical Reasoning: Blood Relations and Arrangements

Self-Study: Speed Maths

Course Outcomes: On completion of this course, students are able to:	
CO – 1:	Exhibit amplified level of confidence to express themselves in English
CO – 2:	Understand the correct usage of tenses and articles
CO – 3:	Increase the number of words in his/her day to day
CO – 4:	Solve logical reasoning problems based on blood relations and arrangements
CO - 5:	Solve the problems based on number system, percentage and profit & loss

Text Book(s):

1. Word Power Made Easy New Revised and Expanded Edition, First Edition, Norman Lewis, Goyal Publisher.
2. Essential English Grammar by Raymond Murphy, Cambridge University Press, new edition
3. The 7 habits of Highly Effective People by Stephen R. Covey
4. Quantitative aptitude by Dr. R. S Agarwal, published by S.Chand private limited.
5. Verbal reasoning by Dr. R. S Agarwal , published by S. Chand private limited.

Reference Book(s):

1. Quantitative Aptitude by Arun Sharma, McGraw Hill Education Pvt Ltd
2. CAT Mathematics by Abhijith Guha, PHI learning private limited.

Web and Video link(s):

1. Improve Your English Communication Skills Specialization
   https://www.coursera.org/specializations/improve-english

COURSE ARTICULATION MATRIX [Employability Enhancement Skills (EES) - I]												
COs	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**
CO-1	-	-	-	-	-	-	-	-	2	3	-	2
CO-2	-	-	-	-	-	-	-	-	-	2	-	2
CO-3	-	-	-	-	-	-	-	-	-	2	-	2
CO-4	2	-	-	-	-	-	-	-	-	-	-	-
CO-5	2	-	-	-	-	-	-	-	-	-	-	-

Applied Mathematical Methods

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

SEMESTER – IV (Common to EC, EE, CS, IS)

Course Code:	21MA401B	Credits:	03
Teaching Hours/Week (L:T:P):	2-2-0	CIE Marks:	50
Total Number of Teaching Hours:	40	SEE Marks:	50

Course Learning Objectives:

- Adequate exposure to basics of engineering mathematics so as to enable them to visualize the applications to engineering problems.
- Analyze the concept of complex variables in terms real variables
- Understand the concept of statistical methods to fit curves of samples and correlation and regression analysis
- To have a insight into numerical techniques to find solution of equations having no analytic solutions
- Provide insight into develop probability distribution of discrete and continuous random variables Testing hypothesis of sample distribution

UNIT – I	8 Hours

Calculus of complex functions: Introduction to functions of complex variables. Definitions of limit, continuity and differentiability, Analytic functions: Cauchy- Riemann equations in Cartesian and polar forms (no proof) and consequences. Applications to flow problems. Construction of analytic functions: Milne-Thomson method-Problems.

Conformal transformations: Introduction. Discussion of transformations $w = z^2, w = e^z$, $w = z+1/z, (z \neq 0)$. Bilinear transformations- Problems.

Self-study component:	Derivation of Cauchy- Riemann equation in Cartesian and polar forms, transformations of reflection, translation and Inversion.

UNIT – II	8 Hours

Complex integration: complex line integrals. Cauchy theorem, Cauchy integral formula. Taylor's and Laurent's series (Statements only) and illustrative examples. Singularities, poles and residues. (Statement only). Examples.

Curve Fitting: Curve fitting by the method of least squares, fitting the curves of the forms $y = a+bx, y = ae^{bx}, y = ax^b$ and $y = a+bx+cx^2$

Statistical Methods: Correlation and regression-Karl Pearson's coefficient of correlation and rank correlation- problems, Regression analysis, lines of regression, problems.

Self-study component:	Contour integration Type-I & Type-II..

UNIT – III	8 Hours

Solution of algebraic and transcendental equations: Introduction, Bisection method, Regula-Falsi & Newton-Raphson method :- Illustrative examples only.
Numerical solution of ordinary differential equations (ODE's): Numerical solutions of ODE's of first order and first degree – Introduction. Taylor's series method. Modified Euler's method, Runge - Kutta method of fourth order (All formulae without proof). Illustrative

examples only.

Numerical methods for system of linear equations- Gauss-Jacobi and Gauss- Seidel iterative methods. Determination of largest eigen value and corresponding eigen vector by power method.

Self-study component:	Solution of equations using secant method, Picards method

UNIT – IV	8 Hours

Random variables and Probability Distributions: Review of random variables. Discrete and continuous random variables-problems. Binomial, Poisson, Exponential and Normal distributions (with usual notation of mean and variance)-: problems.

Joint Probability Distributions : Introduction, Joint probability and Joint distribution of discrete random variables and continuous random variables

Self-study component:	Geometric and Gamma distributions- problems.

UNIT – V	8 Hours

Stochastic Processes and sampling theory:

Markov Chains: Markov chains, Classification of Stochastic processes, Probability vector, Stochastic matrix, Regular stochastic matrix, Transition probabilities and Transition probability matrix.

Testing of Hypothesis Sampling distributions-introduction. Standard error, Type-I and Type-II errors. Testing of hypothesis and confidence intervals for means. Student's t – distribution and Chi-square distribution as a test of goodness of fit - Illustrative examples only.

Self-study component:	Classification of Stochastic process, Bernoulli Process, Poisson Process

Course Outcomes: On completion of the course, student should be able to:

CO1	**Apply** the concepts of an analytic function and their properties to solve the problems arising inengineering field
CO2	**Use** the concept of correlation and regression analysis to fit a suitable mathematical model for thestatistical samples arise in engineering field
CO3	**Apply** the acquired knowledge of numerical technique to solve equations approximately having no analytical solutions.
CO4	**Explain** discrete and continuous probability distributions in analyzing the probability models and solveproblems involving Markov chains.

TEXT BOOKS

1. B.S. Grewal, Higher Engineering Mathematics (44th Edition 2018), Khanna Publishers, New Delhi.
2. E. Kreysizig, Advanced Engineering Mathematics, John Wiley and sons, 10th Ed. (Reprint) 2016.

REFERENCE BOOKS

1. V. Ramana: Higher Engineering Mathematics, McGraw –Hill Education,11th Ed..
2. H. C. Taneja, Advanced Engineering Mathematics, Volume I & II, I.K.

International PublishingHouse Pvt. Ltd., New Delhi.

3. N.P. Bali and Manish Goyal, A text book of Engineering
Mathematics, Laxmi Publications,Reprint, 2010.

ONLINE RESOURCES

1. http://www.nptel.ac.in
2. https://en.wikipedia.org
3. http://mcatutorials.com/mca-tutorials-numerical-methods-tutorial.php
4. https://www.iitg.ac.in/physics/fac/charu/courses/ph503/book.pdf

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3										
CO2	3	2										
CO3	3	3										
CO4	2	3										
CO5	3	3										
Strength of correlation: Low-1, Medium- 2, High-3												

Analog and Digital Communication			
[As per Choice Based Credit System (CBCS) & OBE Scheme]			
SEMESTER – IV			
Course Code:	**P21EC402**	**Credits:**	**03**
Teaching Hours/Week (L:T:P):	**3 : 0 : 0**	**CIE Marks:**	**50**
Total Number of Teaching Hours:	**40**	**SEE Marks:**	**50**

Course Learning Objectives: This course will enable the students to:

- Analyze the elements of communication system provide basic knowledge of Modulation, generation, detection and application of Amplitude and Angle modulation of signal in time domain and frequency domain.
- Explain the aspects of sampling of signal in digital communication, the model of digital communication system and outline the use of correlation.
- Explain quantization process, quantities and commanding of signals in PCM system.
- Describe the principle of DM, ADM, DPCM systems.
- Describe and contrast various aspects of different digital coherent and non-coherent modulation schemes such as ASK, PSK, QPSK, DPSK and MSK.
- Analyze different coding schemes adopted in PAM signaling and explain the causes for the occurrence of ISI and advantages of pulse shaping and correlation coding.

UNIT – I	**8 Hours**

AMPLITUDE MODULATIONS AND DEMODULATIONS: Baseband versus carrier communications, Double-sideband amplitude modulation, Amplitude modulation, bandwidth-efficient amplitude modulations, Amplitude modulations: Vestigial sideband (VSB),Local carrier synchronization.

Text 1: 3.1-3.6

Self-study component:	Single side band modulation**,** Frequency Division Multiplexing **(FDM),** Phase locked loop.

UNIT – II	**8 Hours**

ANGLE MODULATION AND DEMODULATION: Nonlinear modulation, bandwidth of angle-modulated waves, generating FM waves, demodulation of FM signals, effects of nonlinear distortion and interference, super heterodyne analog AM/FM receivers.

Text 1: 4.1-4.7

Self-study component:	FM broadcasting system, QAM.

UNIT – III	**8 Hours**

SAMPLING: Sampling theorem, Signal Reconstruction from Uniform Samples, Practical Issues in Signal Sampling and Reconstruction, Maximum Information Rate: Two Pieces of Information per Second per Hertz, Non ideal Practical Sampling Analysis, Some Applications of the Sampling theorem, Pulse Code Modulation (PCM),Advantages of Digital Communication, Quantizing,

Principle of Progressive Taxation: Non uniform Quantization, Transmission Bandwidth and the Output SNR, Digital Telephony: PCM in T1carrier systems.

Text 1:5.1-5.3

Self-study component:	Random Variables, Mat lab/Octave code for Sampling and Reconstruction of Low pass Signals

UNIT – IV	8 Hours

ANALOG-TO-DIGITAL CONVERSION: Digital Multiplexing, Differential Pulse Code Modulation (DPCM), Adaptive Differential PCM (ADPCM), Delta Modulation.

PRINCIPLES OF DIGITAL DATA TRANSMISSION: Digital communication systems, Line coding, Pulse shaping, Scrambling, Digital receivers and regenerative repeaters.

Text 1: 5.4-5.7, 8.1-8.5   DC Voltage Regulators: Voltage Regulator Basics, Op–Amp Series Voltage Regulator, Adjustable Output Regulators, IC linear Voltage Regulators: 723 IC regulator and LM 317 IC regulator.

Text 1:10.6, 10.7, 11.1, 11.2, 12.1, 12.2, 12.3, 13.1, 13.2, 13.3, 13.5(Mentioned topics only)

Self-study component:	Adaptive delta modulation, Video Compression

UNIT – V	8 Hours

DIGITAL COMMUNICATION SYSTEM: Eye diagrams, PAM: M-ary baseband signaling for higher data rate, Digital carrier systems, M-ary digital carrier modulation, Optimum linear detector for binary polar signaling, general binary signaling, coherent receivers for digital carrier modulations, Signal space analysis of optimum detection.

Text 1:8.6-8.9, 9.1-9.4

Self-study component:	Noise in Communication systems.

Course Outcomes: On completion of this course, students are able to:

COs	Course Outcomes with *Action verbs* for the Course topics	Bloom's Taxonomy Level	Program Outcome Addressed (PO #) with BTL
CO1	Apply the basic knowledge of mathematics for Formulation and analysis of Analog and Digital communication system.	Remember	L2(PO1)
CO2	Analyze various aspects of sampling, quantizing, encoding and SNR of Analog / Digital signal modulation/transmission and demodulation/reception techniques.	Understanding	L3(PO2)

CO3	Analyze digital techniques like pulse shaping, coding and other digital communication systems	Understanding	L2(PO2)
CO4	Identify and Analyze different coherent receiver for digital modulation, Eye diagram, ISI and other digital communication signaling techniques.	Applying	L3(PO2)
CO5	**Apply** appropriate techniques, resources and modern tools to **examine** and **design** elementary communication system for various modulation schemes.	Applying	L4(PO2,PO5,PO9)

Text Book(s):

1. **"Modern Digital and Analog Communication Systems",** B.P. Lathi .Zhi Ding,Hari M.Gupta 4th Edition ISBN-13:978-0-19-947628-2, ISBN-10:0-19-947628-4.

Reference Book(s):

1. **"An Introduction to analog and digital communications",** Simon Haykin, John Wiley and Sons, Inc.2013, ISBN:9788126536535.
2. **"Digital Communication",** P. Ramakrishna Rao, TATA cGraw Hill, 2011, ISBN:9780070707764.
3. **"Principles of Electronic Communication Systems",** Louis E. Frenzel, Jr. TATA McGraw Hill ,Fourth Edition, ISBN : 978-0-07-337385-0

Web and Video link(s):

1. **Analog Communication: https://archive.nptel.ac.in/courses/117/105/117105143/**
2. **Digital Communication: https://nptel.ac.in/courses/117105077**
3. **Modern Digital Communication Techniques: https://onlinecourses.nptel.ac.in/noc22_ee118/preview**

E-Books/Resources:

1. **https://www.skylineuniversity.ac.ae/pdf/computer/An%20Introduction%20to%20Digital%20Multimedia.pdf**
2. **https://edisciplinas.usp.br/pluginfile.php/5251120/mod_resource/content/1/B.%20P.%20Lathi%2C%20Zhi%20Ding%20%20Modern%20Digital%20and%20Analog%20Communication%20Systems-Oxford%20University%20Press%20%282009%29.pdf**

D. Course Articulation Matrix

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
#1	3												3	
#2		3												3
#3		2												2
#4		2												2
#5		2			2				2					**2**

Electromagnetic Field Theory			
[As per Choice Based Credit System (CBCS) & OBE Scheme]			
SEMESTER – IV			
Course Code:	**P21EC403**	**Credits:**	**03**
Teaching Hours/Week (L:T:P):	**3:0:0**	**CIE Marks:**	**50**
Total Number of Teaching Hours:	**40**	**SEE Marks:**	**50**

Course Learning Objectives: This course will enable the students to:

- Provide the basic knowledge of electromagnetic fields and waves of radio communication.
- Describe the basic laws, properties and equations of static electric field using 3– dimensional vector method.
- Understand the basic laws, properties and equations of static magnetic field using 3 – dimensional vector method.
- Analyse the concepts of magnetic forces and inductance.
- Extend the Maxwell's equations to time varying electromagnetic waves.
- Illustrate the properties of electromagnetic waves.

UNIT – I	**8 Hours**

Electrostatic Fields Part1: Coulomb's law and Field intensity, Electric fields due to Continuous charge distributions- line charge, surface charge, Electric Flux density, divergence of a vector and divergence theorem, Gauss law, Application of Gauss's Law: Point charge, Infinite Line charge.

Text 1: 3.6,4.2 to 4.6.

Self-study component:	1. Vectors and Co-ordinate Systems: Cartesian Coordinates, Cylindrical Coordinates, Spherical Coordinates. 2. Applications of Gauss law

UNIT – II	**8 Hours**

Electrostatic Fields Part 2: Electric potential, Del operator, gradient of a scalar, Relationship between E and V, An Electric Dipole and Flux lines.

Electric Fields in material Space: Convection and Conduction current, Continuity equations and Relaxation time, Boundary conditions.

Electrostatic Boundary–value Problems: Poisson's and Laplace's equations, Uniqueness Theorem

Text1:3.4, 3.5, 4.7 to 4.9, 5.3, 5.8, 5.9, 6.2 to 6.3.

Self-study component:	1. Energy density in electrostatic fields 2. Resistance and Capacitance

UNIT – III	**8 Hours**

Magnetostatics Fields: Biot– Savart's law, Ampere's circuital law, applications of Ampere's law, magnetic flux density, Curl of a vector and Stroke theorem, Maxwell's equations for static fields, Magnetic scalar and vector potentials.

Magnetic Forces: Forces due to magnetic fields, A magnetic dipole, magnetic boundary conditions.

Text 1:7.2-7.7, 3.7, 8.2, 8.4, 8.7

Self-study component:	1. Magnetic torque and moment. 2. Inductors and inductance.

UNIT – IV	8 Hours

forces, displacement current, Maxwell's equations in final forms, Time Varying Potential.
Electromagnetic Wave Propagation: Introduction, Waves in general, Wave propagation in Lossy dielectrics, Plane waves in free space, Wave Polarization, Power and Poynting Vector.
Text 1:9.2-9.6, 10.2, 10.3, 10.5,10.7, 10.8

Self-study component:	1. Plane waves in Losses dielectrics and Good Conductors. 2. Reflection of plane wave in normal incidence.

UNIT – V	8 Hours

Basics of Wave Propagation: Introduction, Definition and Broad Categorization, Basic Definition, Guided Waves, Unguided Waves, Different modes of wave propagation.
Ground Wave Propagation: Introduction, Space Wave and Surface Wave, Transition between Surface and Space Wave, Tilt of Wave Front due to Ground Losses.
Space Wave Propagation: Introduction, Field Strength Relation, Effects of Imperfect Earth, Effects of Curvature of Earth, Effects of Interference Zone, Shadowing Effect of Hills and Buildings.
Sky Wave Propagation: Introduction, Structural Details of the Ionosphere, Refraction and Reflection of Sky Waves by Ionosphere, Ray Path, Critical Frequency, MUF, LUF of,Virtual Height and Skip Distance, Relation between MUF and the Skip Distance.
Text 2:22.1-22.2, 22.5**,** 23.1, 23.3 to 23.5, 24.1 to 24.6, 25.1, 25.2, 25.4, 25.5, 25.6.

Self-study component:	1. Scattering Phenomena, Tropospheric Propagation, Fading, Path Loss Calculations. 2. Electromagnetic Interference (EMI) and Electromagnetic Compatibility (EMC).

Course Outcomes: On completion of this course, students are able to:

COs	Course Outcomes with *Action verbs* for the Course topics	Bloom's Taxonomy Level	Level Indicator
CO1	**Apply** the knowledge of physics and Vector calculus to understand EM fields and waves.	Remember	L3(PO1)
CO2	**Analyze** Electric fields, magnetic fields and EM waves and its effect in various charge distribution of medium.	Applying	L4(PO1,PO2)
CO3	**Compute** the electric and magnetic field potentials due to different charge distributions and boundary conditions.	Applying	L3(PO2,PO3)
CO4	**Discuss** time-varying electromagnetic fields and waves as governed by Maxwell's equations.	Understanding	L4(PO2)
CO5	**Examine** the effects and losses of medium on wave and various parameters influencing wave propagation	Understanding	L4(PO1,PO2)

Text Book(s):

1. **"Principles of Electromagnetics"** Matthew N.O. Sadiku, S.V Kulkarni Oxford University Press 6th edition, 2018.ISBN-13: 978-0-19-946185-1, ISBN-10:0-19-946185-6

2. **"Antennas and Wave Propagation",**John D Kraus, Ronald J Marhefka and Ahmed S Khan, Tata McGraw Hill, 4th Edition, 2015.ISBN: 9780070671553.

Reference Book(s):

1. **"Electromagnetics with Application"**, John Kraus and Daniel .A. Fleischer, McGraw Hill, 5th edition 1999.ISBN: 9780071164290

2. **"Electromagnetics",** Joseph A Edminister, Adapted by: Vishnu priye. McGraw–Hill, Revised 2nd edition, 2013.ISBN:9780070353961

3. **"Engineering Electromagnetics"**, William H. Hayt Jr. John A. Buck and M Jaleel Akhtar McGraw–Hill, 8th edition, 2015. ISBN: 9789339203276.

Web and Video link(s):

https://archive.nptel.ac.in/courses/108/106/108106073/

E-Books/Resources:

1. **Electromagnetic Fields and Energy By Hermann A. Haus | James R. Melcher | 1998 | PDF**

2. **Electromagnetic Field Theory: A Problem Solving Approach By Markus Zahn | 2003 | 752 pages | PDF**

3. **Introduction to Electromagnetic Engineering by Roger F.Harrington – McGraw-Hill, 1958**

D. Course Articulation Matrix (CAM)

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
#1	3								1				3	
#2	2	3											2	3
#3		2	3											2
#4		3												3
#5	3	2							1				3	2

Digital Design Using Verilog HDL
[As per Choice Based Credit System (CBCS) & OBE Scheme]
SEMESTER – IV

Course Code:	P21EC404	Credits:	04
Teaching Hours/Week (L:T:P):	3:0:2	CIE Marks:	50
Total Theory Teaching Hours:	40	SEE Marks:	50
Total Laboratory Hours:	24		

Course Learning Objectives: This course will enable the students to:

- Explain the working knowledge of a broad variety of Verilog based topic for global understating of Verilog HDL based design.
- Describe the practical design perspective of Verilog HDL.
- Explain the logical progression of Verilog HDL based topics.
- Explain the basics and some advanced topics such as PLI and logic synthesis.

UNIT – I	8 Hours

Basic Concepts: Lexical Conventions, Data Types, System Tasks and Compiler Directives.
Modules and Ports: Modules, Ports, Hierarchical Names.
Gate-Level Modeling: Gate Types, Gate Delays.
Dataflow Modeling: Continuous Assignments, Delays, Expressions, Operators, and Operands, Operator Types, Examples.

Self-study component:	Develop a Verilog code and test bench for following question and verify it by using any EDA tool (Xilinx/libero/vivado/ iverilogetc.). 1. Study typical design flow for designing VLSI Circuits. 2. Design 2 to 1 mux using bufif0 and bufif1. 3. Design 4 bit mod 13 counter and display all input and output values in command window.

Practical Components (6 Hours)	1. Write Verilog HDL code to realize all the logic gates.
	2. Write a Verilog HDL program for the following combinational designs
	  a. Decoder
	  b. Encoder (with and without priority)

UNIT – II	8 Hours

Behavioral Modeling: Structured Procedures, Procedural Assignments, Timing Controls, Conditional Statements, Multiway Branching, Loops, Sequential and Parallel Blocks, Generate Blocks. Examples.
Tasks and Functions: Difference between Tasks and Functions, Tasks, Functions.

Self-study component:	1. Design 8-bit ALU Using task or function. 2. Design clock with time period = 80 and duty cycle of 40 % using always & initial statement.

Practical Components (6 Hours)	1. Write a Verilog HDL program for the following combinational designs.
	  a. Multiplexer and Demultiplexer
	  b. Code converter.
	  c. Comparator.
	2. Write a VERILOG HDL code to describe the functions of a Full

	Adder, parallel adder and subtractor using three Modeling styles.
UNIT – III	**8 Hours**

Useful Modeling Techniques: Procedural Continuous Assignments, Overriding Parameters, Conditional Compilation and Execution, Time Scales, Useful System Tasks.
Timing and Delays: Types of Delay Models, Path Delay Modeling, Timing Checks, Delay Back-Annotation.
Switch Level Modeling: Switching-Modeling Elements, Examples.

Self-study component:	1. Design 16 to 1 mux using 4 to 1 mux and display all input and output values in command window. 2. Create a design that uses the full adder example above. Use a conditional compilation (`ifdef). Compile the fulladd4 with defparam statements if the text macro DPARAM is defined by the `define statement; otherwise, compile the fulladd4 with module instance parameter values. 3. Switch Level Verilog Description for XOR gate.
Practical Components **(4 Hours)**	1. Develop and simulate a VERILOG HDL code for 8-bit booth Multiplier. 2. Develop the VERILOG HDL code for the following flip– flops, SR, D, JK, T and counter.

UNIT – IV	**8 Hours**

User Defined Primitives: UDP basics. Combinational UDPs, Sequential UDPs, UDP Table Shorthand Symbols, Guidelines for UDP Design.
Programming Language Interface: Uses of PLI, Linking and Invocation of PLI Tasks.Internal Data Representation, PLI Library Routines.
Logic Synthesis with Verilog HDL: What Is Logic Synthesis? Impact of Logic Synthesis, Verilog HDL Synthesis, Synthesis Design Flow.

Self-study component:	1. Design the 4-bit synchronous counter shown below (Use the UDP jk_ff).
Practical Components **(4 Hours)**	1. Design and develop VERILOG HDL code for a 4-bit binary serial adder and simulate. 2. Write VERILOG HDL code to display messages on the given seven

	segment display and LCD and accepting Hex key pad input data. 3. Write VERILOG HDL code to control speed, direction of DC and Stepper motor.

UNIT – V	**8 Hours**

Logic Synthesis with Verilog HDL: Verification of the Gate-Level Netlist, Modeling Tips for Logic Synthesis, Example of Sequential Circuit Synthesis.

Advanced Verification Techniques: Traditional Verification Flow, Assertion Checking, Formal Verification.

Self-study component:	1. A 1-bit full subtractor has three inputs x, y, and z (previous borrow) and two outputs D(difference) and B(borrow). The logic equations for D and B are as follows:
	    a. $D = x'y'z + x'yz' + xy'z' + xyz$
	    b. $B = x'y + x'z + yz$
	2. Write the Verilog RTL description for the full subtractor. Synthesize the full subtractor, using any technology library available to you. Optimize for fastest timing. Apply identical stimulus to the RTL and the gate-level netlist and compare the output.

Practical Components (4 Hours)	1. Write VERILOG HDL code to accept 8 channel Analog signals, Temperature sensors and display the data on LCD panel or seven segment display. 2. Write VERILOG HDL code to generate different waveforms (Sine, Square, Triangle, Ramp etc.,) using DAC change the frequency and amplitude. 3. Write VERILOG HDL code to simulate Elevator operations.

Course Outcomes: On completion of this course, students are able to:

COs	Course Outcomes with *Action verbs* for the Course topics	Bloom's Taxonomy Level	Level Indicator
CO1	To **apply** the knowledge of digital fundamentals to explain basic concepts used in Verilog HDL	Remember	L2(PO1)
CO2	To **write** a Verilog model for combinational and sequential circuits.	Apply	L2, L3(PO2, PO3)
CO3	To **analyse** the given digital circuit and develop Verilog model for given digital circuits.	Analyze	L3, L4(PO2)
CO4	To **design** any combinational and sequential circuits and develop Verilog model for the given inputs.	Design	L4, L5(PO3, PO4,PO5)
CO5	To **verify** the design through synthesis and demonstrate the application using EDA tools.	Evaluate	L4,L5 (PO3,PO5,PO9, PO10, PO12)

Text Book(s):

1. **"Verilog® HDL, A Guide to Digital Design and Synthesis",** Samir Palnitkar Pearson Education, Second Edition, ISBN 978-81-775-918-4.

Reference Book(s):

1. **"Advanced Digital Design with the Verilog HDL",** Michael DCiletti, PHI, ISBN: 9789332584464, 933258446X**.**
2. **"A Verilog HDL Primer",** J. Bhaskar, BS Publications, ISBN: 9788178000145, 8178000148
3. **"Fundamentals of Digital Logic with Verilog Design",** Stephen brown and ZvonkoVranesic, TMH, ISBN: 9780073380544, 0073380547

Web and Video link(s):

1. https://youtu.be/VS9JzfJ6Oxg
2. https://youtu.be/wiNDn19GpRU

E-Books/Resources:

D. Course Articulation Matrix

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
#1	2												2	
#2		2	3											2
#3		2												2
#4			2	2	2									
#5			2		2				3	1		1		

	Microcontroller		
	[As per Choice Based Credit System (CBCS) & OBE Scheme]		
	SEMESTER – IV		
Course Code:	**P21EC405**	**Credits:**	**04**
Teaching Hours/Week (L:T:P):	**3:0:2**	**CIE Marks:**	**50**
Total Theory Teaching Hours:	**40**	**SEE Marks:**	**50**
Total Laboratory Hours:	**24**		

Course Learning Objectives: This course will enable the students to:

- Provide the basic knowledge of embedded systems.
- Outline the architecture of MSP430.
- Make use of the instruction sets and addressing modes for writing programs.
- Understand working and applications of interrupts.
- Utilize the Low-Power Modes for the Operation of MSP430
- Summarize the operation and utilization of timers.

UNIT – I	**8 Hours**

Embedded Electronic Systems and Microcontrollers: What and where are embedded systems, Approaches to Embedded Systems, Small Microcontrollers, Anatomy of a Typical Small Microcontroller, Memory, and Software.

The Texas Instruments MSP430: The Outside View—Pin-Out, the Inside View—Functional Block Diagram, Memory, Memory Mapped input and output, Clock Generator, Exceptions: Interrupts and Resets.

Text1:1.1, 1.2, 1.3, 1.4, 1.5, 1.6, 2.1, 2.2, 2.3, 2.5, 2.6, 2.7.

Self-study component:	1. Study and understand the application of MSP430 in real time applications. 2. Understand the environmental development to develop programs for microcontroller.
Practical Topics: **(6 Hours)**	1. Arithmetic operation -Addition, Subtraction, multiplication, division, incrementing, decrementing operations. 2. Data transfer- Block move and exchange, sorting, finding largest and smallest element in an array.

UNIT – II	**8 Hours**

Architecture of the MSP430 Processor: Central Processing Unit, Addressing Modes, Constant Generator and Emulated Instructions, Instruction set, Examples, Reflections on the CPU and Instruction Set, Resets, Clock system.

Text1:5.1, 5.2, 5.3, 5.4, 5.5, 5.6, 5.7, 5.8.

Self-study component:	1. Light LED's in C and Assembly Language. 2. Access to the microcontroller for programming and debugging

	along with demonstration boards
Practical Topics: (6 Hours)	1. Boolean and logical instructions: AND, OR, XOR, NOT, rotate and swap operations, Conditional CALL and RETURN. Interfacing experiments: 2. Program to blink the LED's using on-chip timer.

UNIT – III	**8 Hours**

Functions, Interrupts and Low-Power Modes: Functions and Subroutines, What happens when a Subroutine is called?, Storage for Local Variables, Passing Parameters to a Subroutine and Returning a Result, Interrupts, what happens when an interrupt is requested?, Interrupt Service Routines, Issues Associated with Interrupts, Low-Power Modes of Operation.

Text1: 6.1, 6.2, 6.3, 6.4, 6.6, 6.7, 6.8, 6.9, 6.10.

Self-study component:	1. Study of assembly language/ c-programming tools with programming exercises. 2. Develop and Implement a assembly level program to Flash LED's with frequency of 1Hz using software delay and subroutine.
Practical Topics: (4 Hours)	1. Interfacing an LCD unit to MSP430F2013. 2. Generation of different wave forms using DAC interface.

UNIT – IV	**8 Hours**

Timers: Watchdog Timer, BasicTimer1, Timer_A, Measurement in the Capture Mode, Measurement of time: Press and Release of button, Output in the Continuous Mode, operation of Timer_A in the sampling mode, Timer_B, what Timer where?

Text1:8.1, 8.2, 8.3, 8.4, 8.4.1, 8.5, 8.8, 8.9, 8.10.

Self-study component:	1. Study of ouput in the up mode- Edge-Aligned PWM. 2. Design and develop a assembly level program to generate pseudorandom stream of bits using shift register.
Practical Topics: (4 Hours)	1. Stepper motor interface and speed control of stepper motor. 2. Measurement of pressure, temperature, weight.

UNIT – V	**8 Hours**

Mixed signal system: Analog input and output: Comparator_A, Analog-to-Digital Conversion: General Issues, Analog-to-Digital Conversion: Successive Approximation, Operation of a switched capacitor SAR ADC. TheADC10 Successive-Approximation ADC, Basic Operation of the ADC10, ADC conversion Sigma-Delta.

Text1:9.1, 9.2, 9.3, 9.3.1, 9.4, 9.5, 9.8.

Self-study component:	1. Study of ADC12 Successive-Approximation ADC. 2. Examine whether direct connection to a MSP430 is sufficient or further connection of the signal is required for conversions of analog signals to digital signals.
Practical Topics: **(4 Hours)**	1. Measurement of time and frequency using timers and interrupts. 2. Temperature monitoring system.

Course Outcomes: On completion of this course, students are able to:

COs	**Course Outcomes** with *Action verbs* for the Course topics	**Bloom's Taxonomy Level**	**Program Outcome Addressed (PO #) with BTL**
CO1	**Apply** the knowledge of logic design to understand the concept of 16-bit Microcontroller (MC), its instruction set, addressing modes and other features.	Remember	L1 (PO1)
CO2	**Understand working of** different peripheral components associated with MSP430 MC	Understanding	L2 (PO1, PO2)
CO3	**Develop** logical skills to write programs using MSP430 instruction set and by using 'C' for the given Engineering Problems.	Apply, Analize ,Create	L3,L4,L6 (PO3)
CO4	To **analyze** the developed code using modern engineering tools.	Applying	L2 (PO3)
CO5	**Interface hardware modules** to F2013 MC and **develop** interfacing programs in C Programming language	Analize, Create	L3,L4,L6 (PO2, PO5, PO9, PO12)

Text Book(s):

1. **"MSP430 Microcontrollers Basics",** John H. Davies, Newnes (Elsevier Science), 2008, ISBN: 978-0-7506-8276-3

Reference Book(s):

1. ,**"Getting Started with the MSP430 Launchpad",** Adrian Fernandez, Dung Dang**,**Newnes (Elsevier Science), 2013, ISBN: 978-0-124116009
2. **"Programmable Microcontrollers with Applications: MSP430 LaunchPad with CCS and Grace"** CemUnsalan, H. DenizGurhan, McGraw Hill Publictions, 2013, ISBN: 978-0071830034.

Web and Video link(s):

https://www.youtube.com/watch?v=l6M7aqN6dmo

E-Books/Resources:

https://www.academia.edu/38330666/MSP430_Microcontroller_Basics_John_H_Davies

D. Course Articulation Matrix

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
#1	2												3	
#2	2	3												3
#3		2												3
#4			2										3	2
#5		2			2				2			1		3

Analog and Digital Communication Laboratory [As per Choice Based Credit System (CBCS) & OBE Scheme] **SEMESTER – IV**		
Course Code:	P18ECL406	**Credits:**	01
Teaching Hours/Week (L:T:P):	0-0-2	**CIE Marks:**	50
Contact Period:	Lab: 36 Hrs., Exam: 3 Hrs.	**SEE Marks:**	50

<div align="center">

Course Learning Objectives (CLOs)

</div>

This course aims to:

- Provide the basic practical knowledge of Analog and Digital Fiber Optic links, laser, diode characterization and attenuation.

- Demonstrate the measurement of various parameters of Optical fiber losses, Numerical Aperture and WDM MUX- DEMUX.

- Demonstrate the generation and detection of analog signals using various modulation techniques such as AM, PAM.

- Provide the basic practical knowledge of digital modulation & demodulation.

- Design and Analyze the frequency response of Second order active filters using op-Amp and Astable multi-vibrators

<div align="center">

Course Content

</div>

All the following experiments have to be performed using discrete components and modules.

1. Analog and Digital Fibre optic links. Attenuation, Bending loss and Numerical aperture measurement of optical fibre.

2. Characterization of WDM MUX and DEMUX.

3. Time Division Multiplexing of signals (Using PAM Kit).

4. Amplitude Modulation and Detection in time domain and its observation in frequency domain (Use Spectrum Analyser).

5. Demonstration of ASK, FSK, PSK and DPSK modulation and Demodulation.

6. Simulation of QPSK transmitter and receiver taking into account the phase and the frequency offset (Using WICOMM–T Kit).

7. Design an A-stable Multi-vibrator using IC555 Timer.

8. Design Second order active filters for different cut-off frequencies using op-Amp: LPF, HPF and BPF.

Open Ended Experiments:

1. Analyse and Understand the Hysteresis Curve generated using Schmitt Trigger Op-amp Circuit.

2. Determine the Bit Error Rate (BER) and Analyse the Eye Pattern generated in a Digital Transmission using   Light Runner.

REFERENCE BOOKS:

1. **"Introduction to Fiber Optic",** A. Ghatak and K. Thygarajan, Cambridge University Press, Cambridge, UK 1988.
2. **"Fiber Optical Communication System",** 3rd edition Govind P. Agrawal, John wiley Sons Inc. 2002.
3. **"Optical Fiber Communication Principles and Systems",** S. Kar, A. Selvarajan and T Sreenivas Tata McGraw Hill Publishing Company Ltd., New Delfi, 2002.
4. **"An Introduction to Analog and Digital Communication System",** Simon Hykin and John Wiley 2004.
5. **"Advanced Digital Communication Laboratory Manual",** Preetha Sharan, R Bhargava Rama Gowda, CBS Publishers & Distributors Pvt. Ltd., First Edition, 2013.

Course Outcomes

CO #	Course Outcome	Bloom's Taxonomy Level	Level indicator Program Outcome
CO1	**Apply** the basic knowledge of communication to determine attenuation, losses and other parameters.	**Apply**	L2 (PO1, PO2, PO9)
CO2	**Analyze** by **applying** basic knowledge of communication theory the working of TDM, WDM- MUX and WDM-DEMUX.	**Analyze**	L3 (PO1, PO2, PO9)
CO3	**Analyze** the operation of different Analog and Digital modulation and demodulation schemes.	**Analyze**	L3 (PO2, PO4, PO9, P12)
CO4	Design and **Analyze** Second Order Active filters and Multi-vibrator.	**Create**	L4 (PO2, PO3, PO9)

D. Course Articulation Matrix (CAM)

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
#1	2	2							3				2	2
#2	2	2							3				2	2
#3	3	2		2					3			1	3	2
#4	2		2						3				2	2

Employability Enhancement Skills (EES) - IV
[As per Choice Based Credit System (CBCS) & OBE Scheme]
SEMESTER – IV

Course Code:	P21HSMC408	Credits:	01
Teaching Hours/Week (L:T:P):	0:2:0	CIE Marks:	50
Total Number of Teaching Hours:	28	SEE Marks:	50

Course Learning Objectives: This course will enable students to:
- Solve problems on ages, mixtures and alligations and progressions.
- Understand the concepts of Data interpretation, crypt arithmetic and data sufficiency.
- Understand the basic concepts of C programming language.
- Apply programming constructs of C language to solve the real-world problem.
- Explore user-defined data structures like arrays, structures and pointers in implementing solutions to the problems.
- Design and Develop solutions to problems using functions.

UNIT – I	10 Hours

Quantitative Aptitude: Problems on Ages, Mixtures and Alligations, Progressions.
Logical Reasoning: Data Interpretation, Cryptarithmetic, Data sufficiency.

Self-Study: Sequential output tracing

UNIT – II	08 Hours

C Programming: Data types and Operators, Control statements, Looping, Arrays and Strings

Self-Study: Pre-processors

UNIT – III	10 Hours

C Programming: Functions, Recursion, Structure, Pointers, Memory management.

Self-Study: Enum and Union

Course Outcomes: On completion of this course, students are able to:

CO – 1:	Solve the problems based on ages, Mixtures, alligations and progressions.
CO – 2:	Apply suitable programming constructs of C language to solve the given problem.
CO – 3:	Design and Develop solutions to problems using functions and recursion.

Text Book(s):

1. Quantitative aptitude by Dr. R. S Agarwal, published by S.Chand private limited.
2. Exploring C by Yashavant Kanetkar, 2nd edition, BPB Publications
3. 3. Test Your C Skills by Yashavant Kanetkar, 2nd edition, BPB Publications

Reference Book(s):
1. Quantitative Aptitude by Arun Sharma, McGraw Hill Education Pvt Ltd
2. Reema Thareja, Programming in C, 2nd Edition, Oxford University Press, 2016.
3. Schaum's outlines, Programming with C, Byron Gottfried, 3rdEdition, Tata McGraw-Hill Publication, 2017.

Web and Video link(s):

1. NPTEL Course: Problem Solving through Programming in C, Prof. Anupam Basu, IIT Kharagpur

https://nptel.ac.in/courses/106/105/106105171/

COURSE ARTICULATION MATRIX [Employability Enhancement Skills (EES) - IV]												
COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO-1	2	-	-	-	-	-	-	-	-	-	-	-
CO-2	-	2	1	-	-	-	-	-	3	1	2	2
CO-3	-	1	2	-	-	-	-	-	-	2	-	1

Internship - I			
[As per Choice Based Credit System (CBCS) & OBE Scheme]			
SEMESTER – IV			
Course Code:	**P21INT409**	**Credits:**	**01**
Teaching Hours/Week (L:T:P):	**0 : 0 : 0**	**CIE Marks:**	**-**
Internship duration:	**2 weeks**	**SEE Marks:**	**100**

All the students registered to II year of BE shall have to undergo a mandatory internship of 02 weeks during the intervening vacation of II and III semesters or III and IV semester. Internship shall include Inter / Intra Institutional activities. A Semester End Examination (Presentation followed by question-answer session) shall be conducted during IV semester and the prescribed credit shall be included in IV semester. The internship shall be considered as a head of passing and shall be considered for the award of degree. Those, who do not take up / complete the internship shall be declared fail and shall have to complete during subsequent Semester End Examination after satisfying the internship requirements. (The faculty coordinator or mentor has to monitor the students' internship progress and interact to guide them for the successful completion of the internship.)

List of Activities

1. Activities concerned with the works of Indian scholars like Charaka and Susruta, Aryabhata, Bhaskaracharya, Chanakya, Madhava, Patanjali, Panini and Thiruvalluvar, among numerous others. (Reference NEP 2020, page 04)

2. Activities such as training with higher Institutions or Soft skill training organized by Training and Placement Cell of the respective institutions.

3. Contribution at incubation/ innovation /entrepreneurship cell of the institute.

4. Participation in conferences/ workshops/ competitions etc.

5. Learning at Departmental Lab/Tinkering Lab/ Institutional workshop.

6. And working for consultancy/ research project with-in the institute. [Serial numbers 2 to 6, AICTE Internship Policy.pdf page 8]

7. Learning MS Word, Excel, Microsoft equations, MS drawing tools, MS Power point, etc.

8. Coding.

9. Mini-projects using commercially available assembled electronic products.

10. Debates, quizzes, and group discussions: On technica

11. Essay competitions: Both in Kannada and English on technical topics already studied.

12. Survey and study of published literature on the assigned topic: Technical paper survey, Preparation of synopsis. Exposure to technical paper publications.

13. Athletics and Sports.

14. Photography.

15. Short film production: Contemporary aspects, Technical aspects etc.

16. Music Competition (Vocal and Instrumental): Classical – Indian and western, Sugama-Sangeetha (Bhava Geethegalu), Folk songs, film songs etc.

17. Internship in Disaster Management. [AICTE APH 2021-22 pdf page166]

18. Solar energy connected activities that help common man. [AICTE APH 2021-22 pdf page166]

19. Working with Smart City Administration.

20. Hackathon (it is a design sprint-like event in which computer programmers and others involved in software development, including graphic designers, interface designers, project managers, and others, often including domain experts, collaborate intensively on software projects).

21. Industrial Safety, Fire Safety, Electrical Safety, Chemical Process Safety, Food Safety etc.

22. Internship and project work in Indian Knowledge System related Areas / Topics.

23. Industrial visits / small scale Industries / Factories / Cottage Industries / substation visit / short project tour, etc., and submission of report.

Documents to be submitted by Students for Internship Evaluation

I.   Student's Diary

The main purpose of writing a daily diary is to cultivate the habit of documenting and to encourage the students to search for details. It develops the students' thought process and reasoning abilities. The students shall record in the daily training diary the day to day account of the observations, impressions, information gathered and suggestions given, if any, and activities carried out. It should contain the sketches and drawings related to the observations made by the students. The daily training diary should be signed after every day or at least twice a week by the Faculty/ in charge of the section (external expert) where the student has been working.

The student's Diary should be submitted by the students along with attendance record. It shall be evaluated on the basis of the following criteria:

(i)   Regularity in the maintenance of the diary.

(ii)   Adequacy and quality of information recorded.

(iii)   Drawings, sketches, and data recorded.

(iv)   Thought process and recording techniques used.

(v)   Organization of the information.

II.   Internship Report

After completion of the Internship, the student shall prepare, with daily dairy as a reference, a comprehensive report in consultation with the evaluators to indicate what he has observed and learned in the training period along with the internship outcomes. The training report should be signed by the Evaluator.

The Internship report shall be evaluated on the basis of the following criteria and/or other relevant criteria pertaining to the activity completed.

(i)   Originality.

(ii)   Adequacy and purposeful write-up.

(iii)   Organization, format, drawings, sketches, style, language etc.

(iv)   Variety and relevance of learning experience.

Practical applications relationships with basic theory and concepts taught in the course.

Sl No	Sub Activity Head	Performance/ Appraisal	Assessment Rubrics (Allotted marks decide the letter grade)	Proposed Document as Evidence	Evaluated by
Table – 1: Intra and Inter Institute Activities and Assessment Rubrics					
1	Inter/Intra Institutional Workshop/ Training.	Excellent	80 to 100	**(i)** Student's Diary and **(ii)** Internship Report along with the certificate issued from relevant authorized Authority	**i)** Institute Faculty together with External Expert if any. **(ii)** Training and Placement Officer. **(iii)** Physical Education Officer or the concerned in charge Officer of the Activity
		Good	79 to 60		
		Satisfactory	59 to 40		
		Unsatisfactory and fail	<39		

Basic Engineering Mathematics - II

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

SEMESTER – IV (Lateral Entry: Common to all branches)

Course Code:	P21MDIP401	Credits:	00
Teaching Hours/Week (L:T:P):	2-2-0	CIE Marks:	100
Total Number of Teaching Hours:	40	SEE Marks:	-

Course objective: The mandatory learning course **P21MADIP401** viz., **BASIC ENGINEERINGMATHEMATICS-II** aims to provide essential concepts of linear algebra, introductory concepts of second & higher order differential equations along with various techniques/ methods to solve them, Laplace & inverseLaplace transforms and elementary probability theory.

UNIT – I	8 Hours

Linear Algebra: Introduction - Rank of matrix by elementary row operations - Echelon form of a matrix. Consistency of system of linear equations - Gauss elimination method. Gauss-Jordan and LU decomposition methods. Eigen values and Eigen vectors of a square matrix.

Self-study component:	Application of Cayley-Hamilton theorem (without proof) tocompute the inverse of a matrix-Examples.

UNIT – II	8 Hours

Higher order ODE's: Linear differential equations of second and higher order equations with constant coefficients. Homogeneous /non-homogeneous equations. Inverse differential operators. and variation of parameters. Solution of Cauchy's homogeneous linear equation and Legendre's linear differential equation.

Self-study component:	Method of undetermined coefficients

UNIT – III	8 Hours

Multiple Integrals: Double and triple integrals-region of integration. Evaluation of double integrals by change of order of integration.

Vector Integration: Vector Integration: Integration of vector functions. Concept of a line integrals, surface and volume integrals. Green's, Stokes's and Gauss theorems (without proof) problems.

Self-study component:	Orthogonal curvilinear coordinates.

UNIT – IV	8 Hours

Laplace transforms: Laplace transforms of elementary functions. Transforms of derivatives and integrals, transforms of periodic function and unit step function-Problems only. Inverse Laplace transforms: Definition of inverse Laplace transforms. Evaluation of Inverse transforms by standard methods.

Self-study component:	Application to solutions of linear differential equations and simultaneous differential equations.

UNIT – V	8 Hours

Probability: Introduction. Sample space and events. Axioms of probability. Addition and multiplication theorems. Conditional probability – illustrative examples.

Self-study component:	State and prove Bayes's theorem.

Course Outcomes: After the successful completion of the course, the students are able to

CO1	**Apply** matrix theory for solving systems of linear equations in the different areas of linear algebra.
CO2	**Solve** second and higher order differential equations occurring in of electrical circuits, damped/un-damped vibrations.
CO3	**Identify** - the technique of integration to evaluate double and triple integrals by change of variables, and vector integration technique to compute line integral
CO4	**Explore** the basic concepts of elementary probability theory and, apply the same to the problems ofdecision theory.

TEXT BOOKS

1. B.S. Grewal, Higher Engineering Mathematics (44th Edition), Khanna Publishers, New Delhi.
2. B.V. Ramana, Higher Engineering Mathematics, Tata McGraw Hill publications, New Delhi, 11thReprint, 2010.

REFERENCE BOOKS

1. Erwin Kreyszig, Advanced Engineering Mathematics (Latest Edition), Wiley Publishers, New Delhi.
2. H. C. Taneja, Advanced Engineering Mathematics, Volume I & II, I.K. International Publishing HousePvt. Ltd., New Delhi.
3. N.P. Bali and Manish Goyal, A text book of Engineering Mathematics, Laxmi Publications, Reprint,2010.
4. V. Krishnamurthy, V.P. Mainra and J.L. Arora, An introduction to Linear Algebra, Affiliated East–Westpress, Reprint 2005.
5. D. Poole, Linear Algebra: A Modern Introduction, 2nd Edition, Brooks/Cole, 2005

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	2										
CO2	3	2										
CO3	2	3										
CO4	2	2										
CO5	3											
Strength of correlation: Low-1, Medium- 2, High-3												

Employability Enhancement Skills (EES) - II *[As per Choice Based Credit System (CBCS) & OBE Scheme]* **SEMESTER – IV**			
Course Code:	**P21HDIP408**	**Credits:**	**01**
Teaching Hours/Week (L:T:P):	**0:2:0**	**CIE Marks:**	**100**
Total Number of Teaching Hours:	**28**	**SEE Marks:**	**-**

Course Learning Objectives: This course will enable students to:
- Get introduced to the concepts of teamwork and leadership
- Understand the importance of professional etiquettes
- Describe the reading with comprehension
- Explain the purpose, plan and ways to identify specific details in a paragraph for better comprehension
- Form grammatically correct sentences
- Explain the basic concepts in calculating simple interest and compound interest
- Explain concepts behind logical reasoning modules of direction sense, coding & decoding, series and visual reasoning

UNIT – I	**10 Hours**

Soft Skills: Etiquette, Presentation Skills, Introduction to Body Language, Interpersonal and Intrapersonal Skills, Team work, Leadership skills, Extempore

Self-Study: Concepts of Sympathy and Empathy

UNIT – II	**10 Hours**

Verbal Ability: Verbal Analogies, Sentence completion & correction, Reading comprehension

Self-Study: Paragraph sequencing

UNIT – III	**8 Hours**

Quantitative Aptitude: Simple & Compound Interest, Ratio & Proportion, Time & Work
Logical Reasoning: Direction Sense, Coding and Decoding, Series, Visual reasoning

Self-Study: Directions and Pythagoras Theorem, differences between mirror and water images

Course Outcomes: On completion of this course, students are able to:

CO – 1: Exhibit amplified level of confidence to express themselves in English

CO – 2: Critical awareness of the importance of teamwork and development of the skills for building effective teams

CO – 3: Solve the questions under reading comprehension confidently with higher accuracy

CO – 4: Solve the problems based on interest, ratio & proportion, time & work

CO – 5: Solve logical reasoning problems based on direction sense, coding & decoding and series

Text Book(s):

1. Word Power Made Easy New Revised and Expanded Edition, First Edition, Norman Lewis, Goyal Publisher.
2. Essential English Grammar by Raymond Murphy, Cambridge University Press, new edition
3. The 7 habits of Highly Effective People by Stephen R. Covey
4. Quantitative aptitude by Dr. R. S Agarwal, published by S.Chand private limited.
5. Verbal reasoning by Dr. R. S Agarwal , published by S. Chand private limited.

Reference Book(s):

1. Quantitative Aptitude by Arun Sharma, McGraw Hill Education Pvt Ltd
2. CAT Mathematics by Abhijith Guha, PHI learning private limited.

Web and Video link(s):

1. Teamwork Skills: Communicating Effectively in Groups
   https://www.coursera.org/learn/teamwork-skills-effective-communication

COURSE ARTICULATION MATRIX [Employability Enhancement Skills (EES) - II]											
COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO-1	-	-	-	-	-	-	-	-	2	3	-	2
CO-2	-	-	-	-	-	-	-	-	3	1	2	2
CO-3	-	-	-	-	-	-	-	-	-	2	-	1
CO-4	2	-	-	-	-	-	-	-	-	-	-	-
CO-5	2	-	-	-	-	-	-	-	-	-	-	-

BE – III / IV Semester – Common to all

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9µ³oc³Ä ¸³oa*Ãv³ (Course Code)	P21KSK307/407	9g³ov³g³ Dov³øa³ ³cË®¸³cÁ¥³£³ eoa³n³æ³Ä	50
soz³A ªAg³a*Ì ¨*sÄzs³£A eᵃ³øü Teachin Hours / Week (L:T:P)	0-2-0	¸9Ä¸³Ögï **eovz³** ¥³øÃa*¸oc³Ä eoa³n³æ³Ä	50
sl¦ ¨*sÄzs³£³ eᵃ³øü	25 n³om*n³æ³Ä	**s**l¦ eoa³n³æ³Ä	100
a*.rmï (Credits)	1	¥³øÃa*¸oc³Ä eᵃ³øü	01 n³om*

¸Áo¸³Ìø&a³ a³£³ßq³ ¥³o³**z** a³°a*oc³Ä wz*ÝÃ±³n³æ³Ä:

C. v'ÈwÛ¥'g' ¥'z'9 9zÁ¸%tn'ʙÁRg'Äv'çz'øoz' a'£'ßq' ¨sÁµ³, ¸Áœe'¸ v'Äe'ÄÛ a'£'ßq'z' ¸Áo¸'Ìøwoc'Ä ¥'øZ'oc'Ä v'cÁra³sq'Äv'çz'Ä.

2. a'£'ʙq'¸ ¸Áœe'¸z' ¥'.zsÁ£' ¨sÁn'vÁz' Dzs'Äea¦ ¥'sv't v'Äe'ÄÛ Dzs'Äea¦ aÁv'¸n'ʙ'£'Äß ¸Áoa³9wa'vÁR ¥'øZ'º'°øÄ¹ 9zÁ¸%tn'ʙ'°è ¸Áœe'¸ v'Äe'ÄÛ ¸Áo¸'Ìøwoc'Ä §n³Î 9øv'ç °Án's D¸'&Ûoc'Ä£'Äß v'Äsr¸'Äv'çz'Ä.

6. eÁow.a¦ v'¸&Ûn'ʙ' ¥'øZ'oc'Äv'£'Äß °Án's 9v'g'Än'ʙ' ¸Áøü¹z' 9µ'oc'Än'ʙ'£'Äß ¥'øZ'øÄ¸'Äv'çz'Ä

6. a'£'ʙq¦ ±'§¦¸'o¥'wÛ£¦ ¥'øZ'oc'Ä v'Äe'ÄÛ a'£'ʙq¦ ¨sÁ¶oc'Ä §ʙ'&¦ °Án's a'£'ßq'z'°è ¥'e'. v'¸v'°Ág'v'£'Äß w½¹a³sq'Äv'çz'Ä.

¨*sÄzs³£* ³Äv³ÄÛ a³°aÁ ³³¸¦ (Teaching-Learning Process – General Instructions):

These are sample Strategies, which teacher can use to accelerate the attainment of the course outcomes.

C. ¸Áo¸'Ìøwa¦ a'£'ßq'v'£'Äß ¨³s9øü¸'®Ä e'g'n'woc'İ°è &a'¸a'g'Ä ¥'¸¸ÄÛe' ¥'Ä¸'Ûa' DzsÁø¹ ¨Áèaï ¨³s9qït 9zsÁ£'v'£'Äß 9£'Ä¸'ø¸'Äv'çz'Ä. ¥'¸v'Ää& 9o±'n'ʙ' ZÁ¤ïtn'ʙ'£Å e'oc'cÁø¸'®Ä 9zÁ¸%tn'ʙ'£'Äß ¥³.9g³9¦¸'Äv'çz'Ä v'Äe'ÄÛ e'g'n'woc'İ°è 9v'çn'ʙ'£'Äß Z'gt¸'®Ä 9v'aÁ±' v'cÁra³sq'Äv'çz'Ä.

2. rw.9g£¦ e'oe'.eÁÕ£'z' 9£'Äa's®n'ʙ'£'Äß **§**ʙ'¹a³sʙ'Äv'çz'Ä – 9oz'g³ a'9-aÁv'¸ ¥'øZ'oc'Äz'°è a'9n'ʙ ge'.s v'Äe'ÄÛ e³9&£'n'ʙ'Ä v'Äe'ÄÛ a'¾³a³ aÁv'¸n'ʙ' v'Äs® 9o±'n'½¹n³ ¸'o§ozs'¥'¤Ö zs'¸e ge'¸n'ʙ'Ä, ¸'o¨sÁµ'u³n'ʙ'Ä, FnÁn'e³9 re'g' 9v'Ä±'ta'g'Ä §g³øg'Äv' **9**v'Ä±Áte'ºa¦ **9µ**¦oc'Än'ʙ'£Å n¦n, r9¤eï v'cÁzs'¸v'Än'ʙ' v'Ä6Áoe'g 9±³è9¶¸'Äv'çz'Ä.

6. £'99£¦ v'cÁz'øoc'Ä ¸Áœe'¸ ¨³s9zs'£³n³ ¸'o§ozs'¥'¤Ö 9zsÁ£n'ʙ'£Å &a'¸a'g'Ä 9zÁ¸%tn'½¹n³ 9£'Äa's®vÁn'Äv ø9woc'İ°è 9ʙ'v'r¹a³sʙ'Î§°Áz'Ä.

W³Ìa³ – C e*ÃR£³n³æ³Ä

C. a'£Át¤a' ¸'o¸'Ìøw - °'o¥' £Án'gÁcoc'Ä¸

2. a'£Át¤a'z' s&9a'g's : soz'Ä 9¥'sv't Z'øe³. – 9. v³oa'¤¸'ħoc'Ä¸

3. Dq'½e' ¨sÁµ³oc'cÁR a'£'ßq' – qÁ. ceï. wv¦Åäg9± v'Äe'ÄÛ ¥³s.9. 9. a³9±'v'v'Äswt

¨*sÄzs³£* ³Äv³ÄÛ a³°aÁ 9zsÁ£	¥³Ä¸³Ûa³ DzsÁøv³ ¨Áèaï ¨*sÄqï5 9zsÁ£³, ¥³.³ÄÄR **eo**±³n³æ¦ ZÁmï5n³æ³£³Äß §æ³¸³Ä³Åz³Ä, ¦¦n ³Äv³ÄÛ z³È±³ ³cÁzs³¸³Äz³ 9roc*sÄn³æ³£³Äß §æ³¸³Ä³Åz³Ä, 9zÁ¸%5n³æ*soøn* Z³ÌÄ³na*n³æ³ ³ÄÄ6Áov³g³ Z³95¸³Ä³Åz³Ä.

W³la³ – 2 Dzs³Ä9a³ ¥³sª³5z³ aÁª³¸ sÃn³	
	C. v'Z'£'n'ʙ'A: §¸'v's¿, 9aⁱ|ʷA°z³99, 9®∨'A¥'¨s'A, Doc'AY&I v'cAg'oc'A¿, e³9q'g'zA¹v'Aoc'A¿, Doc'AY&I ®a'Iv'Aä.
	2. &9e't£³n'ʙ'Ä: 9z'øoz³9£'Ä ¥¦® rz'øoz³9£'Ä ¥s'® - ¥'Ägoz'g'zÁ¸'g'Ä
	e'®èsª¸'øg'Ä a'oq'¿ eÁʙ'Ä v'Ä£'v³9 – a'£a'zÁ¸'g'Ä
	3. e'e'¸¥'z'n'ʙ'Ä: ¸Á9g' a³sq'n'ʙ ¸'Ä¤ÄÖ - &±'Ä£Áʙ' ±'ø9¥s'
¨*sÃzs³£* ª³Äv³ÄÛ a³°aÁ 9zsÁ£	¥³Ä¸³Ûa³ DzsÁøv³ ¨Áèaï ¨*sÃqï5 9zsÁ£³, ¥³.ª³ÄÄR **eo±³n³æ** ZÁmï5n³æ³£³Äß §æ³¸³Äª³Åz³Ä, ¦¦n ª³Äv³ÄÛ z³È±³¸ ª³cÁzs³¸ª³Äz³ 9roc*sÃn³æ³£³Äß §æ³¸³Äª³Åz³Ä, 9zÁ¸%5n³æ*soøn* Z³lÄª³na*n³æ³ ª³ÄÄ6Áov³g³ Z³95¸³Äª³Åz³Ä.
W³la³ – 6 Dzs³Ä9a³ aÁª³¯¯Án³	
	C. r99 g'v'g' v'Äoa'Äwv'Ä¦£ a'n'Îøoz' Doc'ÄY a³®v'ç ¨sÃn'n'ʙ'Ä
	2. a'Äg'Äq'Ä aÁoZÁs: zÁ.gÁ. ¨³9oz³.
	3. ○³s¸'¨Á½£ R9e³: a'Äv³o¥'Ä
¨*sÃzs³£* ª³Äv³ÄÛ a³°aÁ 9zsÁ£	¥³Ä¸³Ûa³ DzsÁøv³ ¨Áèaï ¨*sÃqï5 9zsÁ£³, ¥³.ª³ÄÄR **eo±³n³æ** ZÁmï5n³æ³£³Äß §æ³¸³Äª³Åz³Ä, ¦¦n ª³Äv³ÄÛ z³È±³¸ ª³cÁzs³¸ª³Äz³ 9roc*sÃn³æ³£³Äß §æ³¸³Äª³Åz³Ä, 9zÁ¸%5n³æ*soøn* Z³lÄª³na*n³æ³ ª³ÄÄ6Áov³g³ Z³95¸³Äª³Åz³Ä.
W³la³ – 6 vÁo&.aⁱ ª³¸&Ûn³æ³ ¥³øZ³oc³Ä	
	C. qÁ.¸'gï. co. 9±³,9±'¸'g'oc'Ä¿: v'¸&Û v'Äe'ÄÛ swᵒ'¿ – c c£ï v'ÄswtgÁvï
	2. a'g'a'Ä±'® a'e³n'ʙ'Ä v'Äe'ÄÛ ¥'g'o¥'g³oc'Ä 9eÁÔ£': a'ø9nËq' 99Z'£'ᵒ½ⁱ
¨*sÃzs³£* ª³Äv³ÄÛ a³°aÁ 9zsÁ£	¥³Ä¸³Ûa³ DzsÁøv³ ¨Áèaï ¨*sÃqï5 9zsÁ£³, ¥³.ª³ÄÄR **eo±³n³æ** ZÁmï5n³æ³£³Äß §æ³¸³Äª³Åz³Ä, ¦¦n ª³Äv³ÄÛ z³È±³¸ ª³cÁzs³¸ª³Äz³ 9roc*sÃn³æ³£³Äß §æ³¸³Äª³Åz³Ä, 9zÁ¸%5n³æ*soøn* Z³lÄª³na*n³æ³ ª³ÄÄ6Áov³g³ Z³95¸³Äª³Åz³Ä.
W³la³ – & a³x* ª³Äv³ÄÛ ¥³.ªÁ¸³ a³x³£	
	C. oc'ÄÄnÁø: v'¸'Äzs³9oz'.
	2. v³ÄnÁ£³ co§ Røc£ ¥'v'te': œ.g. ¨³s9g'ᵒon'oc'Ä¿
¨*sÃzs³£* ª³Äv³ÄÛ a³°aÁ 9zsÁ£	¥³Ä¸³Ûa³ DzsÁøv³ ¨Áèaï ¨*sÃqï5 9zsÁ£³, ¥³.ª³ÄÄR **eo±³n³æ** ZÁmï5n³æ³£³Äß §æ³¸³Äª³Åz³Ä, ¦¦n ª³Äv³ÄÛ z³È±³¸ ª³cÁzs³¸ª³Äz³ 9roc*sÃn³æ³£³Äß §æ³¸³Äª³Åz³Ä, 9zÁ¸%5n³æ*soøn* Z³lÄª³na*n³æ³ ª³ÄÄ6Áov³g³ Z³95¸³Äª³Åz³Ä.

¸Áo¸Ìø&a³ a³£³ßq³ a³ºa*&Äoz³ **9zÅ¸%5n³½n** Dn³Åª ¥³øuÁª³Än³æ³Ä (Course Outcomes)

C. a'£ⁿq ¨sÁµ³, ¸Áœe'¸ v'Äe'ÄÛ a'£'ßq'z' ¸'o¸Ìøwoc'Ä ¥'øZ'oc'ÄvÁn'Äe'Ûz³.

2. a'£ⁿq ¸Áœe'¸z' Dzs'Äea' ¥'sv't v'Äe'ÄÛ Dzs'Äea' aÁv'¸n'ʙ'Ä v'Äe'ÄÛ ¸'o¸Ìøwoc'Ä §n³Î D ¸'ᵗoc'ÄÄ v'Äsq'Äe'z³.

3. eÁow.a v'¸&Ûn'ʙ' ¥'øZ'oc'ÄvÁn'Äe'z³.

4. a'£ⁿq ¨sÁµ¨sÁ¸', ¸Áv'cÁ£ a'£ⁿq ºÁn's Dq'½e' a'£ⁿq'z' ¥'z'n'ʙ' ¥'øZ'oc'ÄvÁn'Äe'Ûz³.

ª³cË®¸ª³cÁ¥³£³z³ **9z**sÁ£ⁿ (Assessment Details – both CIE and SEE)

(methods of CIE – MCQ, Quizzes, Open book test, Seminar or micro project)

The weightage of Continuous Internal Evaluation (CIE) is 50% and for Semester End Exam (SEE) is

50%. The student has to obtain a minimum of 40% marks individually both in CIE and 35% marks in SEE to pass. Theory Semester End Exam (SEE) is conducted for 50 marks (01 hour duration). Based on this grading will be awarded.

Continuous Internal Evaluation:

Two Tests each of **40 Marks (duration 01 hour)**

Two assignments each of **10 Marks**

CIE methods / question paper is designed to attain the different levels of Blomm's taxonomy as Per the outcome defined for the course.

¸*9Ä¸³Ögï **eov¦z³** ¥³øÃa*¸oc³ÄÄ F a*æ³V£³o&g³Äv³Ûz* – Semester end Exam

SEE will be conducted as per the scheduled timetable, with common question papers for the subject,

1. The question paper will have 25 questions. Each question is set for 02 marks.

2. SEE Pattern will be in MCQ Model for 50 marks. Duration of the exam is 01 hour.

¥³o³¸ ¥³Ä¸³Ûa³:

¸Áo¸³ìø&a³ a³£³ßq³
qÁ. œ.g. ¨³s9g'°on'oc'Ä¸ v'Äe'ÄÛ ceï. wv³Ää9±',
¥'¸ÁgÁon', 9±³,9±'g'oc'Ä¸ eÁoe'¸a 9±',9zÁ¸®oc'Ä, ¨³ʙ'nÁ9

BE – III / IV Semester – Common to all

§æ³a* a³£³ßq³ – Balake Kannada (Kannada for Usage)			
a³£³ßq³ a³°a*nÁV 9n³ø¥³r¹z³ ¥³o³¸¥³Ä¸³Ûa³ – (Prescribed Textbook to Learn Kannada)			
9µ³oc³Ä ¸³oa*Ãv³ (Course Code)	P21KBK307/407	9g³ov³g³ Dov³øa³ ³cË®¸³cÁ¥³£³ eoa³n³æ³Ä	50
soz³A ªAg³a*l ¨*sÄzs³£A eª³øü Teachin Hours / Week (L:T:P)	0-2-0	¸*9Ä¸³Ögï eovz³ ¥³øÃa*¸oc³Ä eoa³n³æ³Ä	50
s|¨*sÄzs³£³ eª³øü	25 n³om*n³æ³Ä	s| eoa³n³æ³Ä	100
a*rmï (Credits)	1	¥³øÃa*¸oc³A eª³øü	01 n³om*

§æ³a* a³£³ßq³ ¥³o³¸z| a³°a*oc³A wz*YÁ±³n³æ³A (Course Learning Objectives):

- To create the awareness regarding the necessity of learning local language for comfortable and healthy life.
- To enable learners to Listen and understand the Kannada language properly.
- To speak, read and write Kannada language as per requirement.
- To rain the learners for correct and polite conservation.

¨*sÄzs³£* ³Äv³ÄÛ a³°aÁ ª|a³¸| (Teaching-Learning Process – General Instructions):

These are sample Strategies, which teacher can use to accelerate the attainment of the course outcomes.

C. §B'a a'£ßq'v'£Äß e'g'n'e³oc'Ä°è &a'¸a'g'Ä ¨³s9øü¸'®Ä v'noc'ÄÄ¸ ¸sg¹g'Ä ¥'o¸¥'Ä¸|a'v'£Äß w¥'oc³sR¸'¨³9a'Ä.

2. ¥'.v'ÄÄ& 9o±'n'B ZÁ¤ït n'B'£'Äß e'oc'cÁø¸'®Ä 9zÁ¸%tn'B'£'Äß we³Û99¸'Äv'çz'Ä v'Äe'ÄÛ e'g'n'woc'Ä°è 9v'çn'B'£'Äß Z'gt¸'®Ä 9v'aÁ± v'cÁra³sq'Äv'çz'Ä.

3. ¥'.w 9zÁ¸%t ¥'Ä¸|a'v'£Äß e'g'n'woc'Ä°è §B'¸Äv'oe £³s9ra³s|Äv'çz'Ä v'Äe'ÄÛ ¥'.e³ ¥Áo' v'Äe'ÄÛ ¥'.v'Z'£'n'B' v'Äs® 9o±'n'½n³ ¸'o§ozs'¥'¤Öoe³ ¥'sg'a Z'¤Äv'na³n'½n³ e³sq'R¸'e'a'Ìz'ÄÝ.

4. r9¤eï e'oe'.eÁÕ£'z' v'ÄÄ6Áoe'g' rwÛ9Z³n³ r9¤°9a'g'sn³sorg'Äv' ¨sÁµ|a'°a³oc'Ä 9zsÁ£'n'B'£Äß ¦¦n v'Äe'ÄÛ z'È±'¸ v'cÁzs'¸v'Äz' v'ÄÄ6Áoe'g' Z'gt¸'®Ä a'.v'Äa|¦n³s|B'Äv'çz'Ä. rz'øoz' 9zÁ¸%tn'B'£'Äß e'g'n'woc'Ä°è °³Z'¶ saÁn'.eª³øÄoz' ¥Áo' a³9B'®Ä v'Äe'ÄÛ 9zs'¸oc'Ä£'z'°è e³sq'n'®Ä 9£'Äa's®vÁn'Äe'z³.

&. ¨sÁµÁa'°a³oc'Ä ¥'.oc³s9nÁ®oc'Äz' v'ÄÄ6Áoe'g' §°³Ä¨³9n' a'£|¦q' ¨sÁµ³oc'Ä£'Äß a'°oc'Ä®Ä 9£'Äa's®vÁn'Äv'oe³ aÁoc'ctZ'¤Äv'na³n'B'£'Äß v'Äe'ÄÛ &.oc'cÁ oc³s9c£³³n'B'£Äß g's¦¸'Äv'çz'Ä.

Module - 1

1. Introduction, Necessity of learning a local language. Methods to learn the Kannada language.
2. Easy learning of a Kannada Language: A few tips. Hints for correct and polite conservation, Listening and Speaking Activites
3. Key to Transcription.
4. v³Êoc'Ä&Ûa', ¸Á¸v'Ä¸¸'sZ'a / ¸'o§oøüe' ¸Áv't£Áv'Än'B'Ä v'Äe'ÄÛ ¥'¸±Áß¾'ta' ¥'z'n'B'Ä –Personal Pronouns, Possessive Forms, Interrogative words

¨*sÄzs³£* ³Äv³ÄÛ a³°aÁ	¥³Ä¸³Ûa³ DzsÁØv³ ¨Áeaï ¨*sÄqï5 9zsÁ£³, ¥³.ª³ÄÄR eo±³n³æ ZÁmï5n³æ³£³Äß §æ³¸³Ä³Áz³Ä, ¦¦n ³Äv³ÄÛ z³È±³¸ ³cÁzs³¸³Äz³ 9roc*sÄn³æ³£³Äß §æ³¸³Ä³Áz³Ä, 9zÁ¸%5n³æ*soøn* Z³lÄ³na*n³æ³ ³ÄÄ6Áov³g³ Z³9 5¸Ä³Áz³Ä.

9zsÁ£	

Module - 2	
	C. £Áv'ÄÝ'z'n'ʙ' ¸'o§ozsÁ¾'ta' g'sÝ'n'ʙ'Ä, ¸'oz³9ºÁ¸'àz' Ý'.±³ßn'ʙ'Ä v'Äe'ÄÛ ¸'o§ozs'vÁZ'a' £Áv'ÄÝ'z'n'ʙ'Ä – Possessive forms of nouns, dubitive question and Relative nouns
	2. n'Äs, Ý'øv'cÁs v'Äe'ÄÛ v'st§s 9±³9µ'sn'ʙ'Ä, ¸'o6Á¸vÁZ'a'n'ʙ'Ä Qualitative and Colour Adjectives, Numerals
	3. aÁg'a g'sÝ'n'ʙ'Ä v'Äe'ÄÛ 9¨s'॒ Ý'.e'¸oc'Än'ʙ'Ä - ¸'Ý|9Ä 9¨॒ÛÛ Ý'.e'¸oc'Ä – (D, 9z'Ä, 9v'ç, 9°è) Predictive Forms, Locative Case

| ¨'sÃzs³£'* a³Äv³ÄÛ a³°aÁ 9zsÁ£ | ¥³Ä¸³Ûa³ DzsÁøv³ ¨Áèaï ¨'sÃqï5 9zsÁ£³, ¥³.a³ÄÄR eo±³n³æ॒ ZÁmï5n³æ³£³Äß §æ³¸³Ä³a³Åz³Ä, ॑n a³Äv³ÄÛ z³È±³¸ a³cÁzs³¸a³Äz³ 9roc*sÃn³æ³£³Äß §æ³¸³Ä³a³Åz³Ä, 9zÁ¸%5n³æsoøn Z³lÄ³a³na*n³æ³ a³ÄÄ6Áov³g³ Z³95¸³Ä³a³Åz³Ä. |

Module - 3	
	C. Z'e'Ä%t 9¨s'॒Û Ý'.e'¸oc'Äz' §ʙ'a³ v'Äe'ÄÛ ¸'o6Á¸vÁZ'a'n'ʙ'Ä – Dative Cases, and Numerals
	2. ¸'o6Á¸n'ÄsvÁZ'a'n'ʙ'Ä v'Äe'ÄÛ s°¨Äv'Z'£ £Áv'Äg's¥'n'ʙ'Ä – Ordinal numerals and Plural markers
	3. £'s¸£॒ / eµ³9zsÁ¾'ta' ॒.oc'cÁ¥'z'n'ʙ'Ä v'Äe'ÄÛ v'st n'ÄsvÁZ'a'n'ʙ'Ä – Defective / Negative Verbs and Colour Adjectives

| ¨'sÃzs³£'* a³Äv³ÄÛ a³°aÁ 9zsÁ£ | ¥³Ä¸³Ûa³ DzsÁøv³ ¨Áèaï ¨'sÃqï5 9zsÁ£³, ¥³.a³ÄÄR eo±³n³æ॒ ZÁmï5n³æ³£³Äß §æ³¸³Ä³a³Åz³Ä, ॑n a³Äv³ÄÛ z³È±³¸ a³cÁzs³¸a³Äz³ 9roc*sÃn³æ³£³Äß §æ³¸³Ä³a³Åz³Ä, 9zÁ¸%5n³æ*soøn* Z³lÄ³a³na*n³æ³ a³ÄÄ6Áov³g³ Z³95¸³Ä³a³Åz³Ä. |

Module - 4	
	C. 9Ý'àu³ / s॑àn³, ez³9t±'£', ¥³s.9e॒° v'Äe'ÄÛ seÁoc॑ 9¾'tg's¥' ¥'z'n'ʙ'Ä v'Äe'ÄÛ vÁa'¸n'ʙ'Ä Permission, Commands, encouraging and Urging words (Imperative words and sentences)
	2. ¸Áv'cÁ£'¸ ¸'o¨sÁµ'u³n'ʙ'°è ø,w9oc'Ä 9¨s'॒ Ý'.e'¸oc'Än'ʙ'Ä v'Äe'ÄÛ ¸'o¨s'v'e9oc'Ä Ý'.aÁg'n'ʙ'Ä Accusative Cases and Potential Forms used in General Communication
	3. *rg'Ä* v'Äe'ÄÛ *rg'®è* ¸'ºÁoc'Äa' ॒.oc'cÁ¥'z'n'e'Ä, ¸'o¨sÁv'¸¸'sZ'a' v'Äe'ÄÛ eµ³9zsÁ¾'ta ॒.oc'cÁ ¥'z'n'e'Ä – Helping Verbs "iru and iralla", Corresponding Future and Negation Verbs
	4. º³s9°a³ (e'g'e'v'Ä), ¸'o§ozs' ¸'sZ'a' v'Äe'ÄÛ v'¸'ÄÛ ¸'sZ'a' Ý'.e'¸oc'Än'ʙ'Ä v'Äe'ÄÛ eµ³9zsÁ¾'ta' ¥'z'n'ʙ' §ʙ'a³ – Comparative, Relationship, Identification and Negation Words

| ¨'sÃzs³£'* a³Äv³ÄÛ a³°aÁ 9zsÁ£ | ¥³Ä¸³Ûa³ DzsÁøv³ ¨Áèaï ¨'sÃqï5 9zsÁ£³, ¥³.a³ÄÄR eo±³n³æ॒ ZÁmï5n³æ³£³Äß §æ³¸³Ä³a³Åz³Ä, ॑n a³Äv³ÄÛ z³È±³¸ a³cÁzs³¸a³Äz³ 9roc*sÃn³æ³£³Äß §æ³¸³Ä³a³Åz³Ä, 9zÁ¸%5n³æ*soøn* Z³lÄ³a³na*n³æ³ a³ÄÄ6Áov³g³ Z³95¸³Ä³a³Åz³Ä. |

Module - 5	

C.   aÁ® v'Äe'ÄÛ ¸'v'Äoc'Äz' °Án's &.oc'cÁ¥'z'n'ʙ' 99zs ¥'.aÁg'n'ʙ'Ä – ifferint types of forms of Tense, Time and Verbs

2.   zï, -eï, -e'Ä, -re'Ä, -DR, -9®è, -nï, -aï, rz³, &.oc'cÁ ¥'¸e'¸oc'Än'ʙ³ꜱoø ¨s'se', ¨s'9µ'¸eï v'Äe'ÄÛ v'e'tv'cÁ£' aÁ® vÁa'¸ g'Z'£³ – Formation of past, Future and Present Tense Sentences with Verb Forms

3.   Kannada Vocabulary List : ¸'o¨sÁµ'u³oc'Ä°è ø£³s9¥'oc³s9R a'£'ßq' ¥'z'n'ʙ'Ä – Kannada Words in Conversation

| ¨*sÃzs³£*³Äv³ÄÛ a³°aÁ 9zsÁ£ | ¥³Ä¸³Ûa³ DzsÁøv³ ¨Áèaï ¨*sÃqï5 9zsÁ£³, ¥³.³ÄÄR eo±³n³æ ZÁmï5n³æ³£³Äß §æ³¸³Ä³³Åz³Ä, ¡ɪn ³³Äv³ÄÛ z³È±³¸ ³³cÁzs³¸³Äz³ 9roc*sÃn³æ³£³Äß §æ³¸³Ä³³Åz³Ä, 9zÁ¸%5n³æ*soøn* Z³lÄ³³na*n³æ³ ³³ÄÄ6Áov³g³ Z³95¸³Ä³³Åz³Ä. |

§æ³a* a³£³ßq³ ¥³o³¸z a³°a*&Åoz 9zA¸%5n³½n Dn³Aª e£³Aa³s®n³æ³A ª³Av³A¶ ¥s³°vÁo±³n³æ³A :

Course Outcomes (Course Skill Set): At the end of the Couse, The Students will be able

1. To understand the necessity of learning of local language for comfortable life.
2. To Listen and understand the Kannada language properly.
3. To speak, read and write Kannada language as per requirement.
4. To communicate (converse) in Kannada language in their daily life with kannada speakers.
5. To speak in polite conservation.

(Assessment Details – both CIE and SEE)

The weightage of Continuous Internal Evaluation (CIE) is 50% and for Semester End Exam (SEE) is 50%. The minimum passing mark for the CIE is 40% of the maximum marks (20 marks). A student shall be deemed to have satisfied the academic requirements and aearned the credits allotted to each subject / course if the student secures not less than 35% (18 Marks out of 50) in the semester – end examination (SEE), and a minimum of 40% (40 maeks out of 100) in the sum total of the CIE (Continuous Internal Evaluation) and SEE (Semester End Examination) taken together

Continuous Internal Evaluation:

Two Tests each of **40 Marks (duration 01 hour)**
Two assignments each of **10 Marks**

CIE methods / question paper is designed to attain the different levels of Blomm's taxonomy as per the outcome defined for the course.

¸*9Ä¸³Ögï **eov¦z³ ¥³øÃa*¸oc³ÄÄ** F a*æ³V£³o&g³Äv³Ûz* – Semester end Exam (SEE)

SEE will be conducted as per the scheduled timetable, with common question papers for the subject,

1. The question paper will have 25 questions. Each question is set for 02 marks.
2. SEE Pattern will be in MCQ Model for 50 marks. Duration of the exam is 01 hour.

 ¥³o³¸ ¥³Ä¸³Ûa¦ (Text book) :

 §æ³a* a³£³ßq³
e³9&a'g'Ä: qÁ. ceï. wv³Ää9±',
¥'¸ÁgÁon', 9±³¸9±'g'oc'Ä¸ eÁoe¦¸a 9±',9zÁ¸®oc'Ä, ¨³B'nÁ9

BE – III / IV Semester – Common to all

Constitution of India and Professional Ethics (CIP)

Course Code	P21CIP307/407	CIE Marks	50
Teachin Hours / Week (L:T:P)	0-2-0	SEE Marks	50
Total Hours of Pedagogy	25 Hours	Total Marks	100
Credits	1	Exam Hours	01 Hour

Course Objectives: This course will enable the students

a. To know the fundamental political structure & codes, procedures, powers, and duties of Indian government institutions, fundamental rights, directive principles, and the duties of citizens.

b. To understand engineering ethics and their responsibilities, identify their individual roles and ethical responsibilities towards society.

Teaching-Learning Process (General Instructions)

These are sample Strategies, which teacher can use to accelerate the attainment of the various course outcomes.

✓ Teachers shall adopt suitable pedagogy for effective teaching - learning process. The pedagogy shall involve thecombination of different methodologies which suit modern technological tools and software's to meet the present requirements of the Global employment market.

(i) Direct instructional method (Low /Old Technology),

(ii) Flipped classrooms (High/advanced Technological tools),

(iii) Blended learning (combination of both),

(iv) Enquiry and evaluation based learning,

(v) Personalized learning,

(vi) Problems based learning through discussion,

(vii) Following the method of expeditionary learning Tools and techniques,

1. Apart from conventional lecture methods, various types of innovative teaching techniques through videos, animation films may be adapted so that the delivered lesson can enhance the students in theoretical applied andpractical skills in teaching of 21CIP39/49 in general.

Module - 1
Introduction to Indian Constitution: Definition of Constitution, Necessity of the Constitution, Societies before and after the Constitution adoption. Introduction to the Indian constitution, Making of the Constitution,Role of the Constituent Assembly. Preamble of Indian Constitution & Key concepts of the Preamble. Salientfeatures of India Constitution.

Teaching-Learning Process	Chalk and talk method, Videos, Power Point presentation to teach. Creating real time stations in classroom discussions, Giving activities and assignments (Connecting Campus & community withadministration real time situations).

Module - 2	
Fundamental Rights (FR's), Directive Principles of State Policy (DPSP's) and Fundamental Duties (FD's): Fundamental Rights and its Restriction and limitations in different Complex Situations. DPSP's and its present relevance in Indian society. Fundamental Duties and its Scope and significance inNation building.	
Teaching-Learning Process	Chalk and talk method, Videos, Power Point presentation to teach. Creating real time stations in classroom discussions, Giving activities and assignments (Connecting Campus & community withadministration real time situations).

Module - 3	
Union Executive: Parliamentary System, Union Executive – President, Prime Minister, Union Cabinet, Parliament - LS and RS, Parliamentary Committees, Important Parliamentary Terminologies. Supreme Courtof India, Judicial Reviews and Judicial Activism.	
Teaching-Learning Process	Chalk and talk method, Videos, Power Point presentation to teach. Creating real time stations in classroom discussions, Giving activities and assignments (Connecting Campus & community withadministration real time situations).

Module - 4	
State Executive & Elections, Amendments and Emergency Provisions: State Executive, Election Commission, Elections & Electoral Process. Amendment to Constitution (Why and How) and Important Constitutional Amendments till today. Emergency Provisions.	
Teaching-Learning Process	Chalk and talk method, Videos, Power Point presentation to teach. Creating real time stations in classroom discussions, Giving activities and assignments (Connecting Campus & community withadministration real time situations).

Module - 5	
Professional Ethics: Definition of Ethics & Values. Professional & Engineering Ethics. Positive andNegative aspects of Engineering Ethics. Clash of Ethics, Conflicts of Interest. The impediments to Responsibility. Professional Risks, Professional Safety and liability in Engineering. Trust & Reliability inEngineering, Intellectual Property Rights (IPR's).	
Teaching-Learning Process	Chalk and talk method, Videos, Power Point presentation to teach. Creating real time stations in classroom discussions, Giving activities and assignments (Connecting Campus & community withadministration real time situations).

Course outcome (Course Skill Set)
At the end of the course the student should :

CO 1: Have constitutional knowledge and legal literacy.

CO 2: Understand Engineering and Professional ethics and responsibilities of Engineers.

Assessment Details (both CIE and SEE)

The weightage of Continuous Internal Evaluation (CIE) is 50% and for Semester End Exam (SEE) is 50%. The minimum passing mark for the CIE is 40% of the maximum marks that is 20 marks. A student shall be deemed to have satisfied the academic requirements and earned the credits allotted to each subject/ course if the student secures not less than 35% (18 Marks out of 50)in the semester-end examination(SEE), and a minimum of 40% (40 marks out of 100) in the sum total of the CIE and SEE taken together

Continuous Internal Evaluation:

Two Tests each of **40 Marks (duration 01 hour)**

Two assignments each of **10 Marks**

The average of two tests, two assignments, and quiz/seminar/group discussion will be out of 50 marks

CIE methods /question paper is designed to attain the different levels of Bloom's taxonomy as per theoutcome defined for the course.

Semester End Examination:

SEE will be conducted by University as per the scheduled timetable, with common question papers for the subject.

- The question paper will have 25 questions. Each question is set for 02 marks.
- SEE Pattern will be in MCQ Model (Multiple Choice Questions) for 50 marks. Duration of the examination is 01 Hour.

Textbook:

1. **"Constitution of India & Professional Ethics"** Published by Prasaranga or published onVTU website with the consent of the university authorities VTU Belagavi.