KARNATAK LAW SOCIETY'S

GOGTE INSTITUTE OF TECHNOLOGY

UDYAMBAG, BELAGAVI-590008

(An Autonomous Institution under Visvesvaraya Technological University, Belagavi)

(APPROVED BY AICTE, NEW DELHI)

Department of Electronics and Communication Engineering

Scheme and Syllabus (2016 Scheme)

3rd Semester B.E.

INSTITUTION VISION

Gogte Institute of Technology shall stand out as an institution of excellence in technical education and in training individuals for outstanding caliber, character coupled with creativity and entrepreneurial skills.

MISSION

To train the students to become Quality Engineers with High Standards of Professionalism and Ethics who have Positive Attitude, a Perfect blend of Techno-Managerial Skills and Problem solving ability with an analytical and innovative mindset.

QUALITY POLICY

- Imparting value added technical education with state-of-the-art technology in a congenial, disciplined and a research oriented environment.
- Fostering cultural, ethical, moral and social values in the human resources of the institution.
- Reinforcing our bonds with the Parents, Industry, Alumni, and to seek their suggestions for innovating and excelling in every sphere of quality education.

DEPARTMENT VISION

The Electronics & Communication Engineering department shall impart quality technical education and entrepreneurship skills to develop creative individuals to face changing global scenario.

MISSION

To augment the national talent pool, with Electronics and Communication Engineers having all-encompassing technical knowledge, principled practices and nationalistic outlook.

PROGRAM EDUCATIONAL OBJECTIVES (PEOs)

1. The graduates will acquire core competence in basic science and Electronics and Communication Engineering fundamentals necessary to formulate, analyze, and solve engineering problems and to pursue advanced study or research.
2. The graduates will engage in the activities that demonstrate desire for ongoing personal and professional growth and self-confidence to adapt to rapid and major changes.
3. The graduates will maintain high professionalism and ethical standards, effective oral and written communication skills, work as part of teams on multidisciplinary projects under diverse professional environments, and relate engineering issues to the society, global economy and to emerging technologies.

PROGRAM OUTCOMES (POs)

1. **Fundamentals of Engineering:** Graduates shall be able to understand and apply the basic mathematical and scientific concepts in the field of Electronics and Communication Engineering.
2. **Design of Experiments:** Graduates shall possess the ability to design and conduct experiments, analyse and interpret data.
3. **Social Engineering:** Graduates shall possess the ability to identify societal problems and meaningfully contribute with optimal solutions.
4. **Engineering Cognizance:** Graduates shall be able to stay abreast with recent developments in the field of Electronics and Communication Engineering.
5. **Modern tool Usage:** Graduates shall possess critical thinking abilities, problem solving skills and familiarity with the necessary computational tools and procedures.
6. **Impact of Engineering:** Graduates shall be able to understand the impact of engineering solutions in a global, economic, environmental and societal context.
7. **Ethics:** Graduates shall imbibe the professional and ethical responsibilities of their profession.
8. **Collaboration:** Graduates shall have the ability to collaborate productively in multidisciplinary teams with leadership attributes.
9. **Soft skills**: Graduates shall possess proficiency in oral and written communication skills.
10. **Entrepreneurship**: Graduates shall imbibe project management and finance skills to pursue entrepreneurial endeavours.
11. **Research and Innovation:** Graduates shall have the ability to pursue research and provide innovative solutions.
12. **Self-motivated Learning:** Graduates shall continue to upgrade the skills and possess the motivation for continuing education and professional growth.

PROGRAM SPECIFIC OUTCOMES (PSOs)

1. Understanding and applying the mathematical and scientific concepts, for analysis and design of basic Electronics and Communication systems.
2. Developing critical thinking abilities coupled with competence in use of computational tools for professional growth; complimented with communication skills and leadership attributes.
3. Identifying societal needs and sensitizing individuals towards finding innovative solutions to contemporary issues with multidisciplinary outlook.

Scheme of Teaching
Semester III (Regular)

S. No.	Code	Course		Credits L – T - P	Total credits	Contact Hours/ week	Marks CIE	Marks SEE	Marks Total
1.	16MAT31	Statistical – Numerical – Fourier Techniques	BS	3 – 1– 0	4	4	50	50	100
2.	16EC32	Analog Electronics	PC1	3 – 1 – 0	4	4	50	50	100
3.	16EC33	Digital Electronics	PC2	3 – 1 – 0	4	4	50	50	100
4.	16EC34	Signals and Systems	PC3	3 – 0 – 2	3	5	50	50	100
5.	16EC35	Network Analysis	PC4	3 – 0 – 0	3	3	50	50	100
6.	16ECL36	Analog Electronics Lab	L1	0 – 0 – 3	2	3	25	25	50
7.	16ECL37	Digital Electronics Lab	L2	0 – 0 – 3	2	3	25	25	50
8.	16ECL38	Network Analysis Lab	L3	0 – 0 – 3	2	3	25	25	50
		Total		**15 - 3 - 11**	**24**	**29**	**325**	**325**	**650**

***SEE: SEE (Theory exam) will be conducted for 100marks of 3 hours duration. It is reduced to 50 marks for the calculation of SGPA and CGPA**

- **Courses with L-T-P: 3-0-2: SEE – Theory (Lab related questions shall be set with 80T:20L)**
- **#Courses with L-T-P: 0-0-3: SEE- Laboratory (Only Lab Exam with 1 (a) Software &/or 1 (b) Hardware)**

Scheme of Teaching
Semester III (Diploma Lateral Entry)

S. No.	Code	Course		Credits L – T - P	Total credits	Contact Hours/ week	Marks CIE	Marks SEE	Marks Total
1.	16DIPMAT31#	Calculus, Fourier Analysis and Linear Algebra	BS	4 – 1 – 0	5	5	50	50	100
2.	16EC32	Analog Electronics	PC1	3 – 1 – 0	4	4	50	50	100
3.	16EC33	Digital Electronics	PC2	3 – 1 – 0	4	4	50	50	100
4.	16EC34	Signals and Systems	PC3	3 – 0 – 2	3	5	50	50	100
5.	16EC35	Network Analysis	PC4	3 – 0 – 0	3	3	50	50	100
6.	16EC36	Analog Electronics Lab	L1	0 – 0 – 3	2	3	25	25	50
7.	16ECL37	Digital Electronics Lab	L2	0 – 0 – 3	2	3	25	25	50
8.	16ECL38	Network Analysis Lab	L3	0 – 0 – 3	2	3	25	25	50
		Total		**16 – 3 – 11**	**25**	**30**	**325**	**325**	**650**

*** SEE: SEE (Theory exam) will be conducted for 100marks of 3 hours duration. It is reduced to 50 marks for the calculation of SGPA and CGPA**
#Only for Diploma lateral entry students

- **Courses with L-T-P: 3-0-2: SEE – Theory (Lab related questions shall be set with 80T:20L)**
- **#Courses with L-T-P: 0-0-3: SEE- Laboratory (Only Lab Exam with 1 (a) Software &/or 1 (b) Hardware)**

Statistical – Numerical – Fourier Techniques
(Common to all branches)
(ONLY FOR REGULAR STUDENTS)

Course Code	16MAT31	**Credits**	4
Course type	BS	**CIE Marks**	50
Hours/week: L-T-P	3-1-0	**SEE Marks**	50
Total Hours:	40	**SEE Duration**	3 Hours for 100 marks

Course Learning Objectives(CLO's)

Students should

1. Learn Numerical methods to solve Algebraic, Transcendental and Ordinary Differential Equations.
2. Understand the concept of Fourier series and apply when needed.
3. Get acquainted with Fourier Transforms and its properties.
4. Study the concept of Random variables and its applications.
5. Get acquainted with Joint Probability Distribution and Stochastic processes.

Pre-requisites :

1. Basic Differentiation and Integration.
2. Basic Probabilities.
3. Basic Statistics.

Unit - I **8 Hours**

Numerical solution of Algebraic and Transcendental equations:
Method of false position, Newton- Raphson method (with derivation), Fixed point iteration method (without derivation).
Numerical solution of Ordinary differential equations: Taylor's Series method, Euler and Modified Euler's method, Fourth order Runge–Kutta method

Unit - II **8 Hours**

Fourier Series: Convergence and Divergence of Infinite series of positive terms (only definitions), Periodic functions. Dirichlet's conditions, Fourier series, Half range Fourier sine and cosine series, Practical examples, Harmonic analysis.

Unit - III **8 Hours**

Fourier transforms: Infinite Fourier Transform and Properties. Fourier Sine and Cosine Transforms Properties and Problems.

Unit - IV **8 Hours**

Probability: Random Variables (RV), Discrete and Continuous Random variables, (DRV,CRV) Probability Distribution Functions (PDF) and Cumulative Distribution Functions(CDF), Expectations, Mean, Variance. Binomial, Poisson, Exponential and Normal Distributions. Practical examples.

Unit - V **8 Hours**

Joint PDF and Stochastic Processes: Discrete Joint PDF, Conditional Joint PDF, Expectations (Mean, Variance and Covariance). Definition and classification of stochastic processes. Discrete state and discrete parameter stochastic process, Unique fixed probability vector, Regular Stochastic Matrix, Transition probability, Markov chain.

Books

Text Books

1 B.S. Grewal – Higher Engineering Mathematics, Khanna Publishers, 42nd Edition, 2012 and onwards.

2. P.N.Wartikar & J.N.Wartikar– Applied Mathematics (Volume I and II) Pune Vidyarthi Griha Prakashan, 7th Edition 1994 and onwards.
3. B. V. Ramana- Higher Engineering Mathematics, Tata McGraw-Hill Education Private Limited, Tenth reprint 2010 and onwards.

Reference Books:

1. Erwin Kreyszig –Advanced Engineering Mathematics, John Wiley & Sons Inc., 9th Edition, 2006 and onwards.
2. Peter V. O' Neil – Advanced Engineering Mathematics, Thomson Brooks/Cole, 7th Edition, 2011 and onwards.
3. Glyn James – Advanced Modern Engineering Mathematics, Pearson Education, 4th Edition, 2010 and onwards.

Course Outcome (COs)

At the end of the course, the student will be able to	Bloom's Level
1. Use Numerical methods and Solve Algebraic, Transcendental and Ordinary differential equations.	L3
2. Develop frequency bound series from time bound functions using Fourier series.	L3
3. Understand Fourier Transforms and its properties.	L2
4. Understand the concept of Random variables, PDF, CDF and its applications	L2
5. Extend the basic probability concept to Joint Probability Distribution, Stochastic processes.	L2
6. Apply Joint Probability Distribution, Stochastic processes to solve relevant problems.	L3

Program Outcome of this course (POs)	PO No.
1. An ability to apply knowledge of Mathematics, science and Engineering.	1
2. An ability to identify, formulate and solve engineering problems.	5
3. An ability to use the techniques, skills and modern engineering tools necessary for engineering practice.	11

Course delivery methods	Assessment methods
1. Black Board Teaching	1. Internal Assessment
2. Power Point Presentation	2. Assignment
3. Scilab/Matlab/ R-Software	3. Quiz

Scheme of Continuous Internal Evaluation (CIE):

Components	Average of best two IA tests out of three	Average of two assignments / Mathematical/ Computational/ Statistical tools	Quiz	Class participation	Total Marks
Maximum Marks: 50	25	10	5	10	50
➢ Writing two IA test is compulsory. ➢ **Minimum marks required to qualify for SEE: Minimum IA test marks (Average) 10 out of 25 AND total CIE marks 20**					

Scheme of Semester End Examination (SEE):

1. It will be conducted for 100 marks of 3 hours duration. It will be reduced to 50 marks for the calculation of SGPA and CGPA.
2. **Minimum marks required in SEE to pass: 40**

3. Question paper contains 08 questions each carrying 20 marks. Students have to answer FIVE full questions. SEE question paper will have two compulsory questions (any 2 units) and choice will be given in the remaining three units.

Calculus, Fourier Analysis and Linear Algebra
(Common to all branches**)**
(ONLY FOR LATERAL ENTRY STUDENTS)

Course Code	16DIPMAT31	**Credits**	5
Course type	BS	**CIE Marks**	50
Hours/week: L-T-P	4 – 1 – 0	**SEE Marks**	50
Total Hours:	50	**SEE Duration**	3 Hours

Course Learning Objectives (CLOs)

1. Learn the concept of series expansion using Taylor's and Maclaurin's series and get acquainted with the polar curves and partial differentiation.
2. Learn Differential Equations of first order and higher order and apply them.
3. Get acquainted with Fourier Transforms and its properties.
4. Learn Numerical methods to solve Algebraic, Transcendental and Ordinary Differential Equations.
5. Understand and interpret the system of equations and various solutions.

Pre-requisites:

1. Basic Differentiation and Integration.
2. Trigonometry.
3. Matrix and Determinant operations.
4. Vector algebra.

Unit – I **10 Hours**

Differential Calculus: Taylor's and Maclaurin's Theorems for function of one variable (Statement only)-Problems, Angle between Polar curve Partial Differentiation: Definition and problems, Total Differentiation-Problems. Partial Differentiation of Composite functions-Problems.

Unit – II **10 Hours**

Differential Equations: Linear differential equation, Bernoulli's equation, Exact differential equation(without reducible forms)-Problems and Applications (Orthogonal Trajectories, Electrical circuits and derivation of escape velocity), Linear Differential Equation with constant coefficients-Solution of second and higher order Differential Equations, Inverse differential operator method and problems.

Unit – III **10 Hours**

Fourier Analysis: Fourier Series: Fourier Series, Half Range Fourier sine and cosine Series, Practical examples, Harmonic analysis.
Fourier Transforms: Infinite Fourier Transform and Properties. Fourier Sine and Cosine Transforms Properties and Problems.

Unit – IV **10 Hours**

Numerical Techniques: Numerical solution of Algebraic and Transcendental equations: Method of false position, Newton- Raphson method (with derivation), Fixed point iteration method (without derivation).
Numerical solution of Ordinary differential equations: Taylor's Series method, Euler and Modified Euler's method, Fourth order Runge–Kutta method.

Unit –V **10 Hours**

Linear Algebra:
Rank of a matrix by elementary transformation, Solution of system of linear equations-Gauss Jordan

method and Gauss-Seidal method. Eigen value and Eigen vectors – Rayleigh's Power method.

Text Books

1. B.S. Grewal, "Higher Engineering Mathematics", Khanna Publishers, 42nd Edition, 2012 and onwards.
2. P.N.Wartikar and J.N.Wartikar, "Applied Mathematics" (Volume I and II), Pune Vidyarthi Griha Prakashan, 7th Edition, 1994 and onwards.
3. B. V. Ramana,"Higher Engineering Mathematics", Tata McGraw-Hill Publishing Company Ltd., 43rd Edition, 2006 and onwards.

Reference Books

1. Erwin Kreyszig, "Advanced Engineering Mathematics", John Wiley & Sons Inc., 9th Edition, 2006 and onwards.
2. Peter V. O' Neil, "Advanced Engineering Mathematics", Thomson Brooks/Cole, 7th Edition, 2011 and onwards.
3. Glyn James, "Advanced Modern Engineering Mathematics", Pearson Education, 4th Edition, 2010 and onwards.

Course Outcome (COs)

At the end of the course, the student will be able to	Bloom's Level
1. Develop the Taylors and Maclaurins series using derivative concept.	L3
2. Demonstrate the concept and use of Partial Differentiation in various problems.	L3
3. Classify Differential Equations of First and Higher order and apply them to solve relevant problems.	L1, L3
4. Develop frequency bound series from time bound functions using Fourier series.	L3
5. Use Numerical methods and Solve Algebraic, Transcendental and Ordinary differential equations.	L3
6. Interpret the various solutions of system of equations and Solve them.	L2

Program Outcome of this course (POs)	PO No.
1. An ability to apply knowledge of Mathematics, science and Engineering.	1
2. An ability to identify, formulate and solve engineering problems.	5
3. An ability to use the techniques, skills and modern engineering tools necessary for engineering practice.	11

Course delivery methods	Assessment methods
1. Black Board Teaching	1. Internal Assessment
2. Power Point Presentation	2. Assignment
3. Scilab/Matlab/ R-Software	3. Quiz

Scheme of Continuous Internal Evaluation (CIE):

Components	Average of best two IA tests out of three	Average of two assignments / Mathematical/ Computational/ Statistical tools	Quiz	Class participation	Total Marks
Maximum Marks: 50	25	10	5	10	50

- Writing two IA test is compulsory.
- **Minimum marks required to qualify for SEE: Minimum IA test marks (Average) 10 out of 25 AND total CIE marks 20**

Scheme of Semester End Examination (SEE):

1. It will be conducted for 100 marks of 3 hours duration. It will be reduced to 50 marks for the calculation of SGPA and CGPA.
2. **Minimum marks required in SEE to pass: 40**
3. Question paper contains 08 questions each carrying 20 marks. Students have to answer FIVE full questions. SEE question paper will have two compulsory questions (any 2 units) and choice will be given in the remaining three units.

Analog Electronics

Course Code	16EC32	**Credits**	4
Course type	PC1	**CIE Marks**	50
Hours/week: L-T-P	3 – 1 – 0	**SEE Marks**	50
Total Hours:	40	**SEE Duration**	3 Hours

Course Learning Objectives (CLOs)

1. Study basic semiconductor diode parameters and equivalent circuits. Design circuit applications that involve diodes such as clippers, clampers etc. Explore into various transistor bias configurations; formulate expressions to establish the location of the quiescent point; describe methods for further maintaining the quiescent point stable.
2. Study the ac operation of the transistor at low and high frequencies via transistor modeling for all three configuration types.
3. Explain the construction and operation of JFETs and MOSFETs. Look into the various FET-biasing techniques.
4. Study the operation of FETs via small signal modeling and further apply it to design FET amplifier networks. Discuss the effects of varied factors that affect the nature of the frequency response of general amplifiers.
5. Study the various feedback connection types and discuss the effects of feedback on amplifier parameters. Explain the basic principle of operation and design of RC, LC and crystal oscillators. Differentiate between a range of power amplifiers based on their operation, efficiency and distortions.

Pre-requisites :

1. Basic Electronics (15ELN15/25).
2. Basic Electrical (15ELE13/23).

Unit – I 8 Hours

Semiconductor Diode and Applications*:* Diode Resistance, Diode equivalent circuits, practical Vs ideal diode, Transition and diffusion capacitance, Diode AC equivalent circuits, Clippers and clampers.
Transistor Biasing*:* Operating point, Fixed bias circuit, Emitter stabilized biased circuits, Voltage divider bias, DC bias with voltage feedback, Bias stabilization.
Self learning topics: Miscellaneous biasing circuits, Stability factors (S) derivations

Unit – II 8 Hours

BJT AC Analysis*:* BJT transistor modeling, Hybrid equivalent model, r_e transistor model, Hybrid pi model, AC analysis using h parameter models (case study: CE Voltage-divider bias circuit) , two port system approach, cascaded systems, Introduction to Darlington connection and feedback pair, current mirror circuits.
Amplifier Frequency Response*:* General frequency considerations, Miller effect capacitance, Single stage RC coupled amplifier.

Unit - III 8 Hours

Feedback and Oscillator Circuits: Feedback concept, feedback connection types, oscillator operation, Phase shift Oscillator, Tuned Oscillator circuits, Crystal Oscillator.
Power Amplifiers: Definitions and amplifier types, Class A amplifier circuits, Class B amplifier operation, Class B Push – Pull amplifier, Amplifier distortions, Class C and Class D amplifier.
Self learning topics: Study of harmonic distortions as applied to power amplifiers.

Unit – IV 8 Hours

Field Effect Transistors: Introduction, Construction, basic operation and characteristics of: JFET, Depletion-type MOSFET, Enhancement-type MOSFET, CMOS technology.

FET Biasing: Introduction, Fixed biased circuit for FETs.

Unit – V **8 Hours**

FET Amplifiers: Introduction, FET small signal model, Depletion-type MOSFET ac equivalent model, Enhancement type FET ac equivalent model, Comparison of BJT and FET.

Text Books

1. Robert L. Boylestad and Louis Nashelsky, "Electronic Devices and Circuit Theory", PHI/Pearson Education. 9th Edition, and onwards.
2. Jacob Millman& Christos C. Halkias, "Integrated Electronics", Tata-McGraw Hill, 2nd Edition, 2010 and onwards.
3. David A. Bell, "Electronic Devices and Circuits", PHI, 4th Edition, 2004 and onwards.

Reference Books

1. A.S. Sedra& K.C. Smith, "Microelectronic Circuits", Oxford Univ. Press, 5th Edition, 1999 and onwards.
2. Thomas L. Floyd, "Electronic devices", Pearson Education, 2002 and onwards.

Course Outcome (COs)

At the end of the course, the student will be able to	Bloom's Level
1. Develop and employ circuit models for elementary electronic components, e.g. diodes.	L3
2. Infer the terminal behavior of the devices such as diode, BJT & FETs, also identify the region of operation with its equivalent circuit model.	L3
3. Develop the capability to analyze and design simple circuits containing elements such as BJTs and FETs using the concepts of load lines, operating points and device modeling.	L3
4. Identify the need for small signal operation and evaluate the small signal model and the performance parameters of the device.	L1, L3
5. Understand the concepts of feedback in electronic circuits and compare the performance parameters of various feedback topologies. Design various types of oscillator circuits applying the concepts of positive feedback.	L2, L3
6. Differentiate and compare the types of power amplifiers depending on their working principle and conversion efficiency.	L2

Program Outcome of this course (POs)	PO No.
1. **Fundamentals of Engineering:** Graduates shall be able to understand and apply the basic mathematical and scientific concepts in the field of Electronics and Communication Engineering.	1
2. **Engineering Cognizance: G**raduates shall be able to stay abreast with recent developments in the field of Electronics and Communication Engineering.	4
3. **Design of Experiments**: Graduates shall imbibe the professional and ethical responsibilities of their profession.	7
4. **Soft skills**: Graduates shall possess proficiency in oral and written communication skills.	9

Course delivery methods	Assessment methods
1. Classroom Teaching (Blackboard)	1. IA test
2. Presentation	2. Assignment
3. Simulations	3. Quiz
	4. Activity

Scheme of Continuous Internal Evaluation (CIE):

Components	Average of best two IA tests out of three	Average of two assignments / activity	Quiz	Class participation	Total Marks
Maximum Marks: 50	25	10	5	10	50
➢ Writing two IA test is compulsory. ➢ **Minimum marks required to qualify for SEE : Minimum IA test marks (Average) 10 out of 25 AND total CIE marks 20**					

Self Study topics shall be evaluated during CIE (Assignments and IA tests) and 10% weightage shall be given in SEE question paper.

Scheme of Semester End Examination (SEE):

1. It will be conducted for 100 marks of 3 hours duration. It will be reduced to 50 marks for the calculation of SGPA and CGPA.
2. **Minimum marks required in SEE to pass: 40**
3. Question paper contains 08 questions each carrying 20 marks. Students have to answer FIVE full questions. SEE question paper will have two compulsory questions (any 2 units) and choice will be given in the remaining three units.

Digital Electronics

Course Code	16EC33	**Credits**	4
Course type	PC2	**CIE Marks**	50
Hours/week: L-T-P	3 – 1 – 0	**SEE Marks**	50
Total Hours:	40	**SEE Duration**	3 Hours

Course Learning Objectives (CLOs)

1. To study the various Boolean minimization techniques applied to digital circuits.
2. To gain knowledge in the design of combinational circuits with performance parameters.
3. To gain knowledge in the design of sequential circuits with the fundamental study of flip-flops.
4. To understand the design of sequential circuits using finite state machine diagram.
5. To analyze and design Mealy and Moore machines.

Pre-requisites :

1. Basic Electronics (15ELN15/25).

Unit – I 8 Hours

Design of combinational logic circuits: Review of Number systems and Codes, Boolean algebra, Definition of combinational logic, Canonical forms, Generation of switching equations from truth tables, Karnaugh maps- 4 and 5 variables, Incompletely specified functions (Don't Care terms), Map entered variables, Quine-McCluskey minimization technique, Realization of Boolean functions.

Unit – II 8 Hours

Elements of Combinational Logic System: Adders and Subtractors, Cascading full adders, Carry look-ahead adder, Analysis & design of-Encoders, Decoders, Multiplexers, Comparators.

Unit – III 8 Hours

Elements of Sequential Circuits: Basic bi-stable element, Latches, The gated latches, Master-Slave Flip-Flops, Edge triggered flip-flops, Characteristic Equations.

Unit – IV 8 Hours

Sequential Logic Circuits: Registers, Counters (Ripple, Synchronous counters), Counters based on Shift Registers, Design of Synchronous counters using JK, D, T, and SR flip flops.

Unit - V 8 Hours

Design of Sequential Circuits: Mealy and Moore models, State machine notation, State equivalence, State reduction, State reduction of incompletely specified state tables.

Text Books

1. Donald D. Givone, "Digital Principles and Design", McGraw-Hill, 1st Edition, 2002 and onwards.
2. John M Yarbrough, "Digital Logic Application and Design", Thomas Learning, 2001 and onwards.

Reference Books

1. Thomas L. Floyd, "Digital logic fundamentals", Pearson Education, 11th Edition, 2014 and onwards.
2. Ronald J. Tocci, Neal S. Widmer, Greg Moss, "Digital System Principles and Applications", Pearson Education, 11th Edition, 2010 and onwards.
3. Donald P. Leach, Albert Paul Malvino, GoutamSaha, "Digital Principles and Applications", McGraw-Hill, 2009 and onwards.

Course Outcome (COs)

At the end of the course, the student will be able to	Bloom's Level
1. Recognize the need of Boolean algebra and apply methods to simplify logical expressions for solving real time problems logically.	L2,L3
2. Apply the fundamentals of digital electronics to design optimal combinational logic circuits for the given specifications.	L3
3. Explain and illustrate the concepts of flip-flops at the gate level.	L2,L3
4. Paraphrase the concept of flip-flops and apply them in the design of sequential circuits.	L2,L3,L6
5. Design of sequential circuits using the concept of finite state machine.	L6

Program Outcome of this course (POs)	PO No.
1. **Fundamentals of Engineering:** Graduates shall be able to understand and apply the basic mathematical and scientific concepts in the field of Electronics and Communication Engineering.	1
2. **Design of Experiment:** Graduates shall posses the ability to design and conduct experiments, analyze and interpret data.	2
3. **Engineering Cognizance: G**raduates shall be able to stay abreast with recent developments in the field of Electronics and Communication Engineering.	4
4. **Soft skills**: Graduates shall possess proficiency in oral and written communication skills.	9
5. **Self motivated learning:** Graduates shall continue to upgrade the skills and possess the motivation for continuing education and professional growth.	12

Course delivery methods	Assessment methods
1. Classroom Teaching (Blackboard)	1. IA test
2. Presentation	2. Assignment
3. Simulations	3. Quiz
4. MOOC (Massive Open Online Courses) links	4. Activity

Scheme of Continuous Internal Evaluation (CIE):

Components	Average of best two IA tests out of three	Average of two assignments / activity	Quiz	Class participation	Total Marks
Maximum Marks: 50	25	10	5	10	50
➢ Writing two IA test is compulsory. ➢ **Minimum marks required to qualify for SEE : Minimum IA test marks (Average) 10 out of 25 AND total CIE marks 20**					

Self Study topics shall be evaluated during CIE (Assignments and IA tests) and 10% weightage shall be given in SEE question paper.

Scheme of Semester End Examination (SEE):

1. It will be conducted for 100 marks of 3 hours duration. It will be reduced to 50 marks for the calculation of SGPA and CGPA.
2. **Minimum marks required in SEE to pass: 40**

3. Question paper contains 08 questions each carrying 20 marks. Students have to answer FIVE full questions. SEE question paper will have two compulsory questions (any 2 units) and choice will be given in the remaining three units.

Signals and Systems

Course Code	16EC34	**Credits**	3
Course type	PC3	**CIE Marks**	50
Hours/week: L-T-P	3 – 0 – 2	**SEE Marks**	50
Total Hours:	40	**SEE Duration**	3 Hours

Course Learning Objectives (CLOs)

1. To Understand the fundamental characteristics of signals and systems.
2. To Learn to solve problems involving convolution.
3. To study the representation of LTI systems using differential equations.
4. To appreciate the use of Z-transforms in system representation.
5. To Learn to transform the time domain signal into frequency domain and study the sampling theorem.

Pre-requisites :

1. Engineering Mathematics.

Unit – I — 8 Hours

Introduction: Definitions of a signal and a system, Classification of signals, Basic Operations on signals, Elementary signals, Systems viewed as Interconnections of operations, Properties of systems.

Lab Experiments:

1. Composite signal generation, scaling and shifting of signals using MATLAB.
2. Study of the signal properties using hardware.

Unit – II — 8 Hours

Time-domain representations for LTI systems-I: Convolution, impulse response representation, Convolution Sum and Convolution Integral.

Lab Experiments:

1. Convolution of given sequence using MATLAB.
2. Demonstration of convolution of signals using JAVA Applets.

Unit – III — 8 Hours

Time-domain representations for LTI systems- II: Properties of impulse response representation, Differential and difference equation Representations, Block diagram representations.

Lab Experiments:

1. Impulse response of system using MATLAB.
2. Solution of differential equation using MATLAB.

Unit – IV — 8 Hours

Z-Transforms: Introduction, Z – transform, properties of ROC, properties of Z – transforms, Inversion of Z transforms (Derivation of IZT using Contour integration): Transform analysis of LTI Systems, unilateral Z- Transform and its application to solve difference equations.

Lab Experiments:

1. Z-Transform of a given sequence and basic signals using MATLAB.
2. Inverse Z-transform using MATLAB with long division method.

Unit - V **8 Hours**

Fourier representation for signals: Discrete and continuous Fourier transforms and their properties, Sampling theory in time and frequency domain and Nyquist Criterion.

Lab Experiments:

1. Generation of square wave in frequency domain components using MATLAB.
2. Demonstration of sampling theorem using MATLAB.

Text Books

1. Simon Haykin and Barry Van Veen, "Signals and Systems", John Wiley & Sons, 2001, Reprint 2002 and onwards.

Reference Books

1. Alan V Oppenheim, Alan S, Willsky and A Hamid Nawab, "Signals and Systems" Pearson Education Asia / PHI, 2nd edition, 1997. Indian Reprint 2002 and onwards**.**
2. H. P Hsu, R. Ranjan, "Signals and Systems", Schaum's outlines, TMH, 2006 and onwards.

Course Outcome (COs)

At the end of the course, the student will be able to	Bloom's Level
1. Classify signals and systems and apply basic operations on signals [L2].	L2
2. Classify systems based on their properties and determine the response of LTI system using Convolution	L2
3. Analyze the systems using Differential and Difference equations.	L3
4. Analyze system properties based on impulse response and Fourier Transforms.	L3
5. Apply the Z- transform to analyze discrete-time signals and systems.	L3

Program Outcome of this course (POs)	PO No.
1. **Fundamentals of Engineering:** Graduates shall be able to understand and apply the basic mathematical and scientific concepts in the field of Electronics and Communication Engineering.	1
2. **Design of Experiments:** Graduates shall possess the ability to design and conduct experiments, analyse and interpret data.	2
3. **Engineering Cognizance:** Graduates shall be able to stay abreast with recent developments in the field of Electronics and Communication Engineering.	4
4. **Modern tool Usage:** Graduates shall possess critical thinking abilities, problem solving skills and familiarity with the necessary computational tools and procedures.	5

Course delivery methods	Assessment methods
1. Classroom Teaching (Blackboard)	1. IA test
2. Presentation	2. Assignment
3. Simulations	3. Quiz
4. Videos	4. Activity

Scheme of Continuous Internal Evaluation (CIE):

Components	Average of best two IA tests out of three	Average of two assignments / activity	Quiz	Class participation	Total Marks
Maximum Marks: 50	25	10	5	10	50

- Writing two IA test is compulsory.
- **Minimum marks required to qualify for SEE : Minimum IA test marks (Average) 10 out of 25 AND total CIE marks 20**

Self Study topics shall be evaluated during CIE (Assignments and IA tests) and 10% weightage shall be given in SEE question paper.

Scheme of Semester End Examination (SEE):

1. It will be conducted for 100 marks of 3 hours duration. It will be reduced to 50 marks for the calculation of SGPA and CGPA.
2. **Minimum marks required in SEE to pass: 40**
3. Question paper contains 08 questions each carrying 20 marks. Students have to answer FIVE full questions. SEE question paper will have two compulsory questions (any 2 units) and choice will be given in the remaining three units.

Network Analysis

Course Code	16EC35	**Credits**	3
Course type	PC4	**CIE Marks**	50
Hours/week: L-T-P	3 – 0 – 0	**SEE Marks**	50
Total Hours:	40	**SEE Duration**	3 Hours

Course Learning Objectives (CLOs)

1. To understand the three primary circuit elements (resistors, capacitor, inductor) series, parallel star and delta connections.
2. To understand DC and AC circuit analysis using Mesh and Node analysis techniques.
3. To study the network theorems.
4. To study resonance in RLC circuits.
5. To study Two port networks open and Short circuit parameters.

Pre-requisites :

1. Basic Electronics (15ELN15/25).
2. Basic Electrical (15ELE13/23).

Unit – I 8 Hours

Fundamentals: Resistive network reduction using Star-Delta transformation, Practical sources, source transformation, Mesh and node analysis for networks with DC, AC and dependent sources, Concepts of super mesh and super node. Concepts of Network Topology (Definitions of Graph, Tree and Co-tree, Incidence matrix, Tie set and Cut-set Schedule).

Unit – II 8 Hours

Network Theorems: Superposition theorem, maximum power transfer theorem, Thevinin's theorem, Norton's theorem, Millman's theorem, Reciprocity and Tellegen's theorem.

Unit – III 8 Hours

Introduction to resonance: Q-factor, Cut-off frequency, Bandwidth, Series and parallel resonant circuits - derivation of resonant frequency for each and problems solving.

Unit – IV 8 Hours

Transient Analysis: Behavior of circuit elements under switching condition, Evaluation of initial and final conditions in RL, RC and RLC circuits for AC and DC excitations.

Unit - V 8 Hours

Two port parameters: Impedance (Z) and Admittance(Y) parameters, Introduction to Hybrid and Transmission parameters.

Text Books

1. D. Roy Choudhury, "Networks and Systems", New Age International. , 1st Edition, 1998 and onwards.
2. P. M. Chandrashekharaiah, "Network Analysis",Rajeshwari Publications, 5th Edition,2007 and onwards.
3. M. E. Van Valkenburg, "Network Analysis", Prentice-Hall, 1964 and onwards.

Reference Books

1. Franklin Kuo, "Network Analysis and Synthesis", 2nd edition, Wiley International, 2008 and onwards.
2. A. Chakrabarti, "Circuit Theory", 3rd edition, Dhanpat Rai and Sons, 2004 and onwards.

Course Outcome (COs)

At the end of the course, the student will be able to	Bloom's Level
1. Explain series, parallel star and delta connection of resistors and their simplification.	L1
2. Discuss Application of Mesh and Node Voltage techniques to DC and AC circuits.	L2
3. Apply the knowledge of Network theorems in circuit simplification and circuit analysis.	L3
4. Explain the Resonance phenomenon in RLC circuits.	L5
5. Measure two port network parameters.	L4, L5
6. Design/solve real life networks.	L6

Program Outcome of this course (POs)	PO No.
1. **Fundamentals of Engineering:** Graduates shall be able to understand and apply the basic mathematical and scientific concepts in the field of Electronics and Communication Engineering.	1
2. **Design of Experiments:** Graduates shall possess the ability to design and conduct experiments, analyse and interpret data.	2
3. **Self motivated Learning:** Graduates shall continue to upgrade the skills and possess the motivation for continuing education and professional growth.	12

Course delivery methods	Assessment methods
1. Classroom Teaching (Blackboard)	1. IA test
2. Presentation	2. Assignment
3. Simulations	3. Quiz
	4. Activity

Scheme of Continuous Internal Evaluation (CIE):

Components	Average of best two IA tests out of three	Average of two assignments / activity	Quiz	Class participation	Total Marks
Maximum Marks: 50	25	10	5	10	50

- Writing two IA test is compulsory.
- **Minimum marks required to qualify for SEE : Minimum IA test marks (Average) 10 out of 25 AND total CIE marks 20**

Self Study topics shall be evaluated during CIE (Assignments and IA tests) and 10% weightage shall be given in SEE question paper.

Scheme of Semester End Examination (SEE):

1. It will be conducted for 100 marks of 3 hours duration. It will be reduced to 50 marks for the calculation of SGPA and CGPA.
2. **Minimum marks required in SEE to pass: 40**
3. Question paper contains 08 questions each carrying 20 marks. Students have to answer FIVE full questions. SEE question paper will have two compulsory questions (any 2 units) and choice will be given in the remaining three units.

Analog Electronics Lab

Course Code	16ECL36	**Credits**	2
Course type	L1	**CIE Marks**	25
Hours/week: L-T-P	0 – 0 – 3	**SEE Marks**	25
Total Hours:	36	**SEE Duration**	3 Hours

Course Learning Objectives (CLOs)

1. To acquaint with all the equipments necessary to conduct the experiments during the entire lab course.
2. To provide hands-on experience in the design, analysis, testing, and comprehension of electronic circuits comprising of diodes, BJTs and FETs.
3. To introduce principles of circuit design for practical applications.
4. To identify the significance and inter-dependency of the circuit elements for each circuit application.
5. To design and verify the expected outcomes as per the given specifications.

Design of experiments on

1. Half wave rectifier circuit with and without Capacitive filter.
2. Full wave bridge rectifier circuit with and without Capacitive filter.
3. Clipping Circuits.
4. Clamping Circuits.
5. BJT RC coupled amplifier.
6. BJT Colpitts oscillator.
7. Class B push-pull amplifier.
8. Characteristics of JFET.
9. Characteristics of MOSFET.
10. FET amplifier.

Text Books

1. Robert L. Boylestad and Louis Nashelsky, "Electronic Devices and Circuit Theory", PHI/Pearson Education. 9th Edition and onwards.
2. A.S. Sedra & K.C. Smith, "Microelectronic Circuits", Oxford Univ. Press, 5th Edition, 1999 and onwards.
3. David A. Bell, "Electronic Devices and Circuits", PHI, 4th Edition, 2004 and onwards.

Reference Books

1. Jacob Millman & Christos C. Halkias , "Integrated Electronics", Tata-McGraw Hill, 2nd Edition, 2010 and onwards.
2. Thomas L. Floyd, "Electronic devices", Pearson Education, 2002 and onwards.

Course Outcome (COs)

At the end of the course, the student will be able to	Bloom's Level
1. Emphasize diode rectifier fundamentals and justify the importance of capacitor in rectification process	L3
2. Demonstrate diode applications such as clippers and clampers, design, analyze and explain its working	L2, L3
3. Demonstrate diode applications such as clippers and clampers, design, analyze and explain its working.	L2, L3
4. Demonstrate the characteristics of JFET and MOSFET.	L3

5. Design a phase shift oscillator using BJT for specified frequency L3

	Program Outcome of this course (POs)	PO No.
1.	**Fundamentals of Engineering:** Graduates shall be able to understand and apply the basic mathematical and scientific concepts in the field of Electronics and Communication Engineering.	1
2.	**Design of Experiments:** Graduates shall possess the ability to design and conduct experiments, analyze and interpret data.	2
3.	**Soft skills:** Graduates shall possess proficiency in oral and written communication skills.	9
4.	**Self motivated Learning:** Graduates shall continue to upgrade the skills and possess the motivation for continuing education and professional growth.	12

Assessment methods

1. Internal Test
2. Quiz
3. Activity

Scheme of Continuous Internal Evaluation (CIE):

Components	Conduct of the lab	Journal submission	Total Marks
Maximum Marks: 25	10	15	25
➢ Submission and certification of lab journal is compulsory to qualify for SEE. ➢ **Minimum marks required to qualify for SEE : 13 marks out of 25**			

Scheme of Semester End Examination (SEE):

1. It will be conducted for 50 marks of 3 hours duration. **It will be reduced to 25 marks for the calculation of SGPA and CGPA.**
2. Only one experiment to be conducted.
3. **Minimum marks required in SEE to pass: 20/50 (10/25)**
4.

Initial write up	10 marks	50 marks
Conduct of experiments, results and conclusion	20 marks	
Viva- voce	20 marks	

5. **Viva-voce shall be conducted for individual student and not in a group.**

Digital Electronics Lab

Course Code	16ECL37	**Credits**	2
Course type	L2	**CIE Marks**	25
Hours/week: L-T-P	0 – 0 – 3	**SEE Marks**	25
Total Hours:	36	**SEE Duration**	3 Hours

Course Learning Objectives (CLOs)

1. Verify the fundamental circuits using basic gates and TTL IC's.
2. Design and implement Combinational Logic Circuits.
3. Design and implement Sequential Circuits.

Design of experiments on

1. Adders and Subtractors.
2. Code converters.
3. Multiplexers and de-multiplexers.
4. Comparators.
5. Flip-flops.
6. Synchronous counters.
7. Asynchronous / Ripple counters.
8. Shift registers.
9. Sequence generators.
10. Sequence detectors.

Enhanced Learning with Simulation:
Experiments on combinational and sequential circuits with truth table and FSM entry may be conducted to analyze the performance parameters namely timing, delay and area using simulation tools (Mentor Graphics HDL designer, Questasim / NI Multisim / LabVIEW).

Text Books

1. Donald D. Givone, "Digital Principles and Design", McGraw-Hill, 1st Edition, 2002 and onwards.
2. John M Yarbrough, "Digital Logic Application and Design", Thomas Learning, 2001 and onwards.

Reference Books

1. Thomas L. Floyd, "Digital logic fundamentals", Pearson Education, 11th Edition, 2014 and onwards.
2. Ronald J. Tocci, Neal S. Widmer, Greg Moss, "Digital System Principles and Applications", Pearson Education, 11th Edition, 2010 and onwards.

Course Outcome (COs)

At the end of the course, the student will be able to	Bloom's Level
1. Interpret IC data sheets to build digital circuits**.**	L2
2. Design digital circuits and verify using digital IC Trainer kit**.**	L3
3. Analyze design problems and implement to meet specification**.**	L3
4. Simulate digital circuits using simulation tool**.**	L3
5. Measure and record the experimental data, analyze the results and prepare a formal laboratory report.	L4
6. Engage in **self-study** to formulate, design, implement, analyze and demonstrate an application of digital electronic circuits through an **open ended experiment.**	L4

Program Outcome of this course (POs)	PO No.
1. **Fundamentals of Engineering:** Graduates shall be able to understand and apply the basic mathematical and scientific concepts in the field of Electronics and Communication Engineering.	1
2. **Design of Experiments:** Graduates shall possess the ability to design and conduct experiments, analyze and interpret data.	2
3. **Engineering Cognizance:** Graduates shall be able to stay abreast with recent developments in the field of Electronics and Communication Engineering.	4
4. **Soft skills:** Graduates shall possess proficiency in oral and written communication skills.	9
5. **Self motivated Learning:** Graduates shall continue to upgrade the skills and possess the motivation for continuing education and professional growth.	12

Assessment methods

1. Internal Test
2. Quiz
3. Activity

Scheme of Continuous Internal Evaluation (CIE):

Components	Conduct of the lab	Journal submission	Total Marks
Maximum Marks: 25	10	15	25
➢ Submission and certification of lab journal is compulsory to qualify for SEE. ➢ **Minimum marks required to qualify for SEE : 13 marks out of 25**			

Scheme of Semester End Examination (SEE):

1. It will be conducted for 50 marks of 3 hours duration. **It will be reduced to 25 marks for the calculation of SGPA and CGPA.**
2. Only one experiment to be conducted.
3. **Minimum marks required in SEE to pass: 20/50 (10/25)**
4.

Initial write up	10 marks	
Conduct of experiments, results and conclusion	20 marks	50 marks
Viva- voce	20 marks	

5. **Viva-voce shall be conducted for individual student and not in a group.**

Network Analysis Lab

Course Code	16ECL38	**Credits**	2
Course type	L3	**CIE Marks**	25
Hours/week: L-T-P	0 – 0 – 3	**SEE Marks**	25
Total Hours:	36	**SEE Duration**	3 Hours

Course Learning Objectives (CLOs)

1. To acquaint the students with all the equipments necessary to conduct the experiments during the entire lab course.
2. To provide the students with hands-on experience in the design and analysis of electronic circuits comprising of resistors, capacitors, inductors, power supplies.
3. To introduce principles of circuit analysis from practical perspective.
4. Identify the significance and inter-dependency of the circuit elements.
5. To enable the students to design and verify the circuits for the given voltage and current specifications.

Design of experiments on

1. Resistive networks: a) series & parallel combination b) Star to Delta conversion and vice versa.
2. Practical Sources: a) series connection b) Parallel connection.
3. Mesh Analysis for DC circuits.
4. Node Analysis for DC circuits.
5. Mesh analysis for AC circuits.
6. Node analysis for AC circuits.
7. Verification of a) Thevinin's theorem b) Norton's theorem.
8. Verification of Maximum Power Transform theorem.
9. Verification of Superposition theorem.
10. Series resonant circuits.
11. Parallel resonant circuits.
12. Two-port network parameters.

Text Books

1. D. Roy Choudhury, "Networks and Systems", New Age International. , 1st Edition, 1998 and onwards.
2. P. M. Chandrashekharaiah, "Network Analysis",Rajeshwari Publications, 5th Edition, 2007 and onwards.
3. M. E. Van Valkenburg, "Network Analysis", Prentice-Hall, 1964 and onwards.

Reference Books

1. Franklin Kuo, "Network Analysis and Synthesis", 2nd Edition, Wiley International, 2008 and onwards.
2. A. Chakrabarti, "Circuit Theory", 3rd Edition, Dhanpat Rai and Sons, 2004 and onwards.

Course Outcome (COs)

At the end of the course, the student will be able to		Bloom's Level
1.	Emphasize the significance of sources and circuit elements.	L3
2.	Demonstrate and analyze the current and voltage variations with circuit elements.	L2, L4
3.	Design and analyze AC and DC circuits using Network Theorems.	L2, L4
4.	Build and Utilize series and parallel resonant circuits.	L3
5.	Measure and Compare Z and Y parameters.	L5

	Program Outcome of this course (POs)	PO No.
1.	**Fundamentals of Engineering:** Graduates shall be able to understand and apply the basic mathematical and scientific concepts in the field of Electronics and Communication Engineering.	1
2.	**Design of Experiments:** Graduates shall possess the ability to design and conduct experiments, analyze and interpret data.	2
3.	**Self motivated Learning:** Graduates shall continue to upgrade the skills and possess the motivation for continuing education and professional growth.	12

Assessment methods

1. Internal Test
2. Quiz
3. Activity

Scheme of Continuous Internal Evaluation (CIE):

Components	Conduct of the lab	Journal submission	Total Marks
Maximum Marks: 25	10	15	25
➢ Submission and certification of lab journal is compulsory to qualify for SEE. ➢ **Minimum marks required to qualify for SEE : 13 marks out of 25**			

Scheme of Semester End Examination (SEE):

1. It will be conducted for 50 marks of 3 hours duration. **It will be reduced to 25 marks for the calculation of SGPA and CGPA.**
2. Only one experiment to be conducted.
3. **Minimum marks required in SEE to pass: 20/50 (10/25)**
4.

Initial write up	10 marks	50 marks
Conduct of experiments, results and conclusion	20 marks	
Viva- voce	20 marks	

5. **Viva-voce shall be conducted for individual student and not in a group.**

Calculus, Fourier Analysis and Linear Algebra
(Common to all branches**)**
(ONLY FOR LATERAL ENTRY STUDENTS)

Course Code	16DIPMAT31	**Credits**	5
Course type	BS	**CIE Marks**	50
Hours/week: L-T-P	4 – 1 – 0	**SEE Marks**	50
Total Hours:	50	**SEE Duration**	3 Hours

Course Learning Objectives (CLOs)

1. Learn the concept of series expansion using Taylor's and Maclaurin's series and get acquainted with the polar curves and partial differentiation.
2. Learn Differential Equations of first order and higher order and apply them.
3. Get acquainted with Fourier Transforms and its properties.
4. Learn Numerical methods to solve Algebraic, Transcendental and Ordinary Differential Equations.
5. Understand and interpret the system of equations and various solutions.

Pre-requisites:

1. Basic Differentiation and Integration.
2. Trigonometry.
3. Matrix and Determinant operations.
4. Vector algebra.

Unit – I **10 Hours**

Differential Calculus: Taylor's and Maclaurin's Theorems for function of one variable (Statement only)-Problems. Angle between Polar curve Partial Differentiation: Definition and problems, Total Differentiation-Problems. Partial Differentiation of Composite functions-Problems.

Unit – II **10 Hours**

Differential Equations: Linear differential equation, Bernoulli's equation, Exact differential equation (without reducible forms)-Problems and Applications (Orthogonal Trajectories, Electrical circuits and derivation of escape velocity). Linear Differential Equation with constant coefficients-Solution of second and higher order Differential Equations, Inverse differential operator method and problems.

Unit – III **10 Hours**

Fourier Analysis: Fourier Series: Fourier Series, Half Range Fourier sine and cosine Series, Practical examples, Harmonic analysis.
Fourier Transforms: Infinite Fourier Transform and Properties. Fourier Sine and Cosine Transforms Properties and Problems.

Unit – IV **10 Hours**

Numerical Techniques: Numerical solution of Algebraic and Transcendental equations: Method of false position, Newton- Raphson method (with derivation), Fixed point iteration method (without derivation).
Numerical solution of Ordinary differential equations: Taylor's Series method, Euler and Modified Euler's method, Fourth order Runge–Kutta method.

Unit –V **10 Hours**

Linear Algebra:
Rank of a matrix by elementary transformation, Solution of system of linear equations-Gauss Jordan method and Gauss-Seidal method. Eigen value and Eigen vectors – Rayleigh's Power method.

Text Books

1. B.S. Grewal, "Higher Engineering Mathematics", Khanna Publishers, 42nd Edition, 2012 and onwards.
2. P.N.Wartikar and J.N.Wartikar, "Applied Mathematics" (Volume I and II), Pune Vidyarthi Griha Prakashan, 7th Edition, 1994 and onwards.
3. B. V. Ramana,"Higher Engineering Mathematics", Tata McGraw-Hill Publishing Company Ltd., 43rd Edition, 2006 and onwards.

Reference Books

1. Erwin Kreyszig, "Advanced Engineering Mathematics", John Wiley & Sons Inc., 9th Edition, 2006 and onwards.
2. Peter V. O' Neil, "Advanced Engineering Mathematics", Thomson Brooks/Cole, 7th Edition, 2011 and onwards.
3. Glyn James, "Advanced Modern Engineering Mathematics", Pearson Education, 4th Edition, 2010 and onwards.

Course Outcome (COs)

At the end of the course, the student will be able to	Bloom's Level
1. Develop the Taylors and Maclaurins series using derivative concept.	L3
2. Demonstrate the concept and use of Partial Differentiation in various problems.	L3
3. Classify Differential Equations of First and Higher order and apply them to solve relevant problems.	L1, L3
4. Develop frequency bound series from time bound functions using Fourier series.	L3
5. Use Numerical methods and Solve Algebraic, Transcendental and Ordinary differential equations.	L3
6. Interpret the various solutions of system of equations and Solve them.	L2

Program Outcome of this course (POs)	**PO No.**
1. An ability to apply knowledge of Mathematics, science and Engineering.	1
2. An ability to identify, formulate and solve engineering problems.	5
3. An ability to use the techniques, skills and modern engineering tools necessary for engineering practice.	11

Course delivery methods	**Assessment methods**
1. Black Board Teaching	1. Internal Assessment
2. Power Point Presentation	2. Assignment
3. Scilab/Matlab/ R-Software	3. Quiz

Scheme of Continuous Internal Evaluation (CIE):

Components	Average of best two IA tests out of three	Average of two assignments / Mathematical/ Computational/ Statistical tools	Quiz	Class participation	Total Marks
Maximum Marks: 50	25	10	5	10	50

- Writing two IA test is compulsory.
- **Minimum marks required to qualify for SEE: Minimum IA test marks (Average) 10 out of 25 AND total CIE marks 20**

Scheme of Semester End Examination (SEE):

1. It will be conducted for 100 marks of 3 hours duration. It will be reduced to 50 marks for the calculation of SGPA and CGPA.
2. **Minimum marks required in SEE to pass: 40**
3. Question paper contains 08 questions each carrying 20 marks. Students have to answer FIVE full questions. SEE question paper will have two compulsory questions (any 2 units) and choice will be given in the remaining three units.

Bloom's Taxonomy of Learning Objectives

Bloom's Taxonomy in its various forms represents the process of learning. It was developed in 1956 by Benjamin Bloom and modified during the 1990's by a new group of cognitive psychologists, led by Lorin Anderson (a former student of Bloom's) to make it relevant to the 21st century. The **revised taxonomy** given below emphasizes what a learner "Can Do".

Lower order thinking skills (LOTS)		
L1	Remembering	Retrieve relevant knowledge from memory.
L2	Understanding	Construct meaning from instructional material, including oral, written, and graphic communication.
L3	Applying	Carry out or use a procedure in a given situation – using learned knowledge.
Higher order thinking skills (HOTS)		
L4	Analyzing	Break down knowledge into its components and determine the relationships of the components to one another and then how they relate to an overall structure or task.
L5	Evaluating	Make judgments based on criteria and standards, using previously learned knowledge.
L6	Creating	Combining or reorganizing elements to form a coherent or functional whole or into a new pattern, structure or idea.