BMS INSTITUTE OF TECHNOLOGY AND MANAGEMENT

(Autonomous Institute affiliated to VTU)

Scheme of Teaching and Examination: Effective from AY 2021– 22
Choice Based Credit System (CBCS)

UG PROGRAM: ELECTRONICS AND COMMUNICATION ENGINEERING (ECE) | **Semester: III**

Sl. No	Course Category	Course Code	Course Title	Teaching Dept.	Teaching Hours /Week				Credits	Examination			
					L	T	P	PW		Duration in Hours	CIE Marks	SEE Marks	Total Marks
1	BS	21MTA31	Fourier Series, Numerical Methods, Statistics and Probability	MAT	3	1	1	0	4	3	50	50	100
2	HS	21CIP32	Constitution of India and Professional Ethics	HS	1	0	0	0	1	1	50	50	100
3	UHV	21UHV33	Universal Human Values-I	HS	1	0	0	0	1	1	50	50	100
4	INT	21INT34	Internship-I	ECE	0	0	0	4	2	3	100	--	100
5	PC	21EC35	Analog Electronics	ECE	2	2	0	0	3	3	50	50	100
6	PC	21EC36	Digital Electronics	ECE	2	2	0	0	3	3	50	50	100
7	PC	21EC37	Network Analysis	ECE	2	2	0	0	3	3	50	50	100
8	PC	21ECL38A	Analog Electronics Laboratory	ECE	0	1	2	0	1	3	50	50	100
9	PC	21ECL38B	Digital Electronics Laboratory	ECE	0	1	2	0	1	3	50	50	100
10	PC	21ECL38C	Object Oriented Programming Laboratory	ECE	0	0	2	0	1	3	50	50	100
TOTAL					**11**	**9**	**7**	**4**	**20**		**550**	**450**	**1000**

Course prescribed to Lateral entry Diploma holders admitted to III Semester B.E.													
1	NCMC	21DIP31A	Diploma Mathematics-I	MAT	3	0	0	0	--	3	100	--	100

- The Lateral entry students have to undergo Internship-I during the intervening vacation of III and IV semesters.
- The Assessment Pattern for 1/2/3 credit courses shall be done as per the VTU guidelines.
- BS-MTX (X-Variable) Eg: Core branches: ME, CV, EEE, ETE, ECE-**MTA**, Digital branches: CSE, ISE, AIML- **MTB** .
- Additional Mathematics I and II shall not be considered for vertical progression as well as for the calculation of SGPA and CGPA, but completion of the courses shall be mandatory for the award of degree.
- Successful completion of the course Additional Mathematics-II shall be indicated as satisfactory in the grade card. Non completion of the same shall be indicated as unsatisfactory.
- Numerical Methods, Complex Variable and Sampling Theory

B.E ELECTRONICS AND COMMUNICATION ENGINEERING

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SEMESTER – III

Fourier Series, Numerical Methods, Statistics and Probability (3:1:1) 4

(Common to ECE, ETE, EEE, MECH & CIVIL Branches)

(Effective from the academic year 2021-22)

Course Code	21MTA31	CIE Marks	50
Teaching Hours/Week (L:T:P)	3:1:1	SEE Marks	50
Total Number of Contact Hours	50	Exam Hours	3

Course Objectives:

This course will enable students to:

1. Apply the concepts of Fourier series, Fourier transforms, Difference equations and Z-transforms in the field of engineering.
2. Apply the concept of Numerical Techniques, and probability distribution to analyze problems arising in Science and Engineering field.
3. Apply the knowledge of interpolation/extrapolation and Numerical Integration technique whenever analytical methods fail or very complicated, to offer solutions.

Module – 1

Introduction: Understanding of Transform Calculus, Numerical methods &their applications in Engineering, Economics and Statistics.

Statistical Methods: Correlation-Karl Pearson's coefficient of correlation – problems, Regression lines-lines of regression (without proof) –Problems.

Curve fitting: Curve fitting by the method of least squares- fitting of the curves of the form, $y = ax + b, y = ax^2 + bx + c$ and $y = ae^{bx}$.

Calculus of variation: Variation of a function and a functional, Extremal of a functional, Euler's equation, Standard variational problems.

Self-Learning Component: Fitting of the curves $y = a\,x^b$ and $y = a\,b^x$.

Lab Session 1:

1. Determination of polynomial using method of Least Square Curve Fitting.
2. Relation between variables: correlation, Regression. (10 Hours)

Module – 2

Finite Differences: Forward and backward differences, Newton's forward and backward interpolation formulae, Divided differences- Newton's divided difference formula, Lagrange's interpolation formula and inverse interpolation formula (all formulae without proof) -problems.

Numerical Integration: Simpson's $(1/3)^{rd}$ and $(3/8)^{th}$ rules, Weddle's rule (without proof) – problems.

Self-Learning Component: Trapezoidal rule.

Lab Session 2:

1. Numerical solution using Newton's Forward / Backward interpolation formula.
2. Numerical integration using Simpson's One-third rule. (10 Hours)

Module – 3

Fourier Series: Dirichlet's conditions, Fourier Series of periodic functions of period 2π and arbitrary period. Half range Fourier Series, Practical harmonic analysis over the period 2π.

Self-Learning Component: Complex Fourier Series.

Lab Session 3:

1. Obtain the Fourier series of a function.
2. Finding Fourier series by practical Harmonic Analysis. (10 Hours)

Module – 4

Fourier Transforms: Infinite Fourier transforms, Fourier Sine and Cosine transforms. Inverse Fourier transforms - problems.

Z-transforms: Difference equations, basic definition, Z-transform-definition, Standard Z-transforms (only formula), Damping rule, Shifting rule (without proof) and problems, Inverse Z-transforms – problems, Solution of Difference equations using Z transforms.

Self-Learning Component: Proofs of Z-transformation of standard functions.

Lab Session 4:

1. Obtain the Fourier Transform of a function.
2. Obtain the solution of difference equation using Z Transforms. (10 Hours)

Module – 5

Probability Distributions: Random variables (discrete and continuous), probability mass/density functions. Binomial distribution, Poisson distribution. Exponential and Normal distributions, problems.

Self-Learning Component: Uniform distribution.

Lab Session 5:

1. Compute Pdf/pmf for given data.
2. Compute and Plot the probability density function for Normal Distribution, Binomial Distribution, Exponential Distribution, Poisson Distribution.

Recap/Summary of the Course. (10 Hours)

Course Outcomes:

The students will be able to:

CO1: Make use of the concepts of method of least squares, correlation and regression analysis to fit a suitable mathematical model for the statistical data

CO2: Apply the knowledge of Numerical Methods in the modeling of various physical and engineering phenomena.

CO3: Apply Fourier series to study the behavior of periodic functions and Fourier transforms and Z-transforms to illustrate discrete/continuous function arising in wave and heat propagation, signals, and systems.

CO4: Develop probability distribution of discrete, continuous random variables and joint probability distribution occurring in digital signal processing, information theory and design engineering.

Question paper pattern:

SEE will be conducted for 100 marks.

- The question paper will be set for 100 marks (duration of 03 hours) and marks scored will be proportionally scaled down to 50 marks.
- The question paper will have ten questions. Each question is set for 20 marks.
- There will be 2 questions from each module. Each of the two questions under a module (with a maximum of 3 sub-questions), should have a mix of topics under that module.
- The students have to answer 5 full questions, selecting one full question from each module.

CIE will be announced prior to the commencement of the course.

- Three Unit Tests each of **20 Marks** (Duration 01 hour).
- Two assignments each of 10 Marks.
- Two alternate assessment tools (AATs) for **20 Marks** (duration 01 hour).
- The sum of three tests, two assignments, and AATs will be out of 100 marks and will be scaled down to 50 marks.

Textbooks:

1. B.S. Grewal, "Higher Engineering Mathematics", 43rd Edition, Khanna Publishers, 2015.
2. E. Kreyszig, "Advanced Engineering Mathematics",10th Edition, John Wiley & Sons,

2015.
3. B.V. Ramana, “Higher Engineering Mathematics", 6th Edition, Tata McGraw-Hill, 2010.

References:

1. N.P. Bali, Manish Goyal, “A Text Book of Engineering Mathematics”, Laxmi Publishers, 2014.
2. H.K. Dass, Er. Rajnish Verma, “Higher Engineering Mathematics”, 3rd Edition, S. Chand publishers, 2014.
3. P. Kandasamy, K. Thilagavathi, K. Gunavathi, “Engineering Mathematics”, Vol. III, 2001.
4. S.S. Sastry, “Introductory Methods of Numerical Analysis”, 4th Edition, Prentice Hall of India, 2010.

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Choice Based Credit System (CBCS)

SEMESTER – III

Constitution of India and Professional Ethics (1:0:0) 1

(Common to all Branches)

(Effective from the academic year 2021-2022)

Course Code	21CIP32/42	CIE Marks	50
Teaching Hours/Week (L:T:P)	1-0-0	SEE Marks	50
Total Number of Lecture Hours	13	Exam Hours	02

Course objectives:

This course will enable students to

1. Familiarise with the Indian Constitution and have legal knowledge enabling them to take competitive exams and understand complex political issues.
2. Understand engineering ethics and responsibility and raise awareness and consciousness of the issues related to the profession, liability, risk and safety at work place.

Module – 1

Preamble: Significance and Scope of the course, Importance of the course in societal, political and economic growth of the nation.

Introduction and Basic information about the Indian Constitution:

Introduction, Definition and significance of the Indian Constitution, Historical Background of the Indian Constitution. Framing of the Indian constitution: Role of the Constituent Assembly, Preamble and Salient features of the Constitution of India. (2 Hours)

Module – 2

Fundamental Rights, Directive Principles of State Policy and Fundamental Duties:

Fundamental Rights and its limitations, Directive Principles of State Policy: Importance and its relevance. Fundamental Duties and their significance. Case Studies **(**3 Hours)

Module – 3

Union Administration:

The Union Executive-The President and The Vice President, The Prime Minister and The Council of Ministers, The Union Legislature -Lok Sabha & Rajya Sabha, The Union Judiciary- The Supreme Court of India and its jurisdiction. (3 Hours)

Module – 4

State Administration, Elections, Constitutional Amendments, Emergency Provisions and Special Constitutional Provisions:

The State Executive-The Governors, The Chief Ministers and The Council of Ministers, The State Legislature- Legislative Assembly and Legislative Council, The State Judiciary- The State High Courts and its jurisdiction.

Elections-Electoral Process in India, Election Commission of India: Powers & Functions, Constitutional Amendments- methods and Important Constitutional Amendments ie 42^{nd}, 44^{th}, 61^{st},74^{th}, 76^{th}, 77^{th}, 86^{th} ,91^{st}, 100, 101^{st}, 118^{th} , Emergency Provisions-types and its effect,

Special Constitutional Provisions for Schedule Castes, Schedule Tribes & Other Backward Classes Women & Children. (3 Hours)

Module – 5

Professional Ethics:

Definition of Ethics, Scope and Aim of Professional and Engineering Ethics, Code of ethics as defined in the Institution of Engineers (India), Responsibilities of Engineers and impediments to responsibilities, Honesty, Integrity and Reliability of Engineers, Risk, Safety and Liability in Engineering, Case Studies**.** **(**2 Hours)

Course outcomes: The students will be able to:

CO1. Understand and have constitutional knowledge and legal literacy

CO2. Understand Engineering and Professional ethics and responsibilities of Engineers.

Question paper pattern:

SEE will be conducted for 50 marks.

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

CIE will be announced prior to the commencement of the course.

- Three Unit Tests each of **20 Marks** (Duration 01 hour).
- Two assignments each of 10 Marks.
- Two alternate assessment tools (AATs) for **20 Marks** (duration 01 hour).
- The sum of three tests, two assignments, and AATs will be out of 100 marks and will be scaled down to 50 marks.

Textbooks

1. Durga Das Basu, Introduction to the Constitution of India, Lexis Nexis, 20th Edn, 2011.

2. Shubham Singles, Charles E. Haries and Et al, Constitution of India and Professional Ethics, Cengage Learning India Private Limited, Latest Edition, 2018.

References

1. M.Govindarajan, S.Natarajan, V.S.Senthilkumar, Engineering Ethics, Prentice –Hall of India Pvt. Ltd. New Delhi, 2004.

2. M.V.Pylee, An Introduction to Constitution of India, Vikas Publishing,2002.

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Choice Based Credit System (CBCS)

SEMESTER – III

Universal Human Values- I (1:0:0) 1

(Effective from the academic year 2021-2022)

Course Code	21UHV33	CIE Marks	50
Teaching Hours/Week (L: T:P)	1-0-0	SEE Marks	50
Total Number of Lecture Hours	13	Exam Hours	02

Course objectives:

This introductory course is intended to

1. Develop a holistic perspective based on self-exploration about themselves (human being).
2. Understand harmony in the human being.
3. Strengthening of self-reflection.
4. Develop commitment and courage to act.

Module – 1

Preamble: Significance and Scope of the course, Importance of the course in societal, political and economic growth of the nation.

Introduction to Value Education: Understanding Value Education; Need and Basic guidelines for Value Education; Scope and Process.

Self-exploration as the Process for Value Education: What is self- exploration; Process of self-exploration.

Case study and Group Discussion **(**2 Hours)

Module – 2

Basic Human Aspirations: Continuous happiness and prosperity; Exploring happiness and prosperity; Methods to Fulfill the Basic Human Aspirations; Need for right understanding; Relationship and Physical Facilities.

Case study and Group Discussion **(**2 Hours)

Module – 3

Understanding human being as co-existence of the self and the Body: Understanding and distinguishing between the Needs of the Self and the Body- Quantitative, Qualitative, Knowing, Assuming, Recognizing and fulfilling in self and in body.

Case study and Group Discussion **(**3 Hours)

Module – 4

Harmony in self: Understanding self; Activities in self; Power of expectation, thought and desire; Conflicts or contradictions in self as a result of pre-conditioned desire; Realisation and Understanding.

Case study and Group Discussion **(**3 Hours)

Module – 5

Harmony with Body: Harmony of self with the body-Sanyama and Svasthya; Understanding and living with Sanyama; Nurturing of the body; Protection of the body; Right utilization of the body; Correct appraisal of our physical needs.

Case study and Group Discussion **(**3 Hours)

Course outcomes: The students will be able to:

1. Understand the role of value education, self-exploration and harmony in self and with body.
2. Distinguish between values and skills, Self and the Body, Intention and Competence of an individual.

Question paper pattern:

SEE will be conducted for 50 marks.

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

CIE will be announced prior to the commencement of the course.

- Three Unit Tests each of **20 Marks** (Duration 01 hour).
- Two assignments each of 10 Marks.
- Two alternate assessment tools (AATs) for **20 Marks** (duration 01 hour).
- The sum of three tests, two assignments, and AATs will be out of 100 marks and will be scaled down to 50 marks.

Textbooks

1. The Textbook *A Foundation Course in Human Values and Professional Ethics*, R R Gaur, R Asthana, G P Bagaria, 2nd Revised Edition, Excel Books, New Delhi, 2019. ISBN 978-93-87034-47-1

2. The Teacher's Manual for *A Foundation Course in Human Values and Professional Ethics*, R R Gaur, R Asthana, G P Bagaria, 2nd Revised Edition, Excel Books, New Delhi, 2019. ISBN 978-93-87034-53-2

References

1. Jeevan Vidya: Ek Parichaya, A Nagaraj, Jeevan Vidya Prakashan, Amar kantak, 1999.
2. Human Values, A.N. Tripathi, New Age Intl. Publishers, New Delhi, 2004.
3. Slow is Beautiful - Cecile Andrews
4. Vivekananda - Romain Rolland (English)

Relevant websites, documentaries

1. Value Education websites, http://uhv.ac.in,
2. Story of Stuff, *http://www.storyofstuff.com*

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SEMESTER – III

Internship - I (0:0:0:2) 2

(Common to ECE, ETE, EEE, MECH & CIVIL Branches)

(Effective from the academic year 2021-22)

Course Code	21INT34	CIE Marks	100
Teaching Hours/Week (L:T:P)	0:0:0:4	SEE Marks	--
Total Number of Contact Hours	--	Exam Hours	03

Course Objectives:

The internship will enable students to:

1. Enhance Critical thinking/Problem solving skills
2. Learn Organization/Planning and Time management
3. Adapt Leadership qualities and flexibility as a team member
4. Improve Verbal, Written and Interpersonal communication skills

- Internship-I Completed during the intervening period of II and III semesters by students admitted to first year of BE
- Lateral entry students have to undergo Internship-I during the intervening period of III and IV semesters.
- For lateral entry students the assessment of Internship-I takes place during IVth semester.

Course Outcomes:

The students will be able to:

CO1: Understand specific functional areas like Product, Marketing, Finance, HR, IT, etc.
CO2: Find engineering solution based on a systems approach
CO3: Get the awareness of the social and environmental responsibility
CO4: Enhance the verbal, Written and Interpersonal skills
CO5: Inculcate the professional ethics
CO6: Acquire the awareness about time management and leadership skills
CO7: Updated with the latest changes in technological world

Indicator	Poor	Average	Good	Excellent
Acquired skills or knowledge (10 Marks) **(CO1)**	Not gained any skill / knowledge. OR Attended a few sessions. **0-1 Marks**	Partial skill/Knowledge gained. Only Block Diagram/Notes/ Description. **2-4 Marks**	Average skill/knowledge gained. Lack of Technical/ Knowledge. **5-7 Marks**	Complete skill/knowledge gained. All Skills Acquired. **8-10 Marks**
Weekly report (10 Marks) (CO6)	Weekly report not submitted. OR Few days report was submitted. **0-1 Marks**	One Weekly report submitted. **2-4 Marks**	Two weekly reports submitted. **5-7 Marks**	All three weekly reports submitted. **8-10 Marks**

Presentation (10 Marks) **(CO5)**	Absence for presentation. OR Presented after the due date. **0-1 marks**	Information is lacking/ unclear and communicated in such a way that the audience cannot understand the purpose of the evidence of work and internship experiences. **2-4 Marks**	Information is not presented in a clear manner and many details are missing related to the evidence work and internship experiences. **5-7 Marks**	Information is presented in such a way that the audience can understand the purpose of the evidence of work and internship experiences. **8-10 Marks**
Practical Knowledge (10 Marks) **(CO3)**	Not gained any practical knowledge. OR Able to define basic concepts. **0-1 Marks**	Partial practical Knowledge gained. Less hands-on experience. **2-4 Marks**	Average practical knowledge gained. Only few models are exhibited. **5-7 Marks**	Complete practical knowledge gained. **8-10 Marks**
Societal and environment al relevance (10 Marks) **(CO2)**	No relevance to society or environment (At- least one relevance). **0-1 Marks**	Partial relevance to society or environment. **2-4 Marks**	Average relevance to society or environment. **5-7 Marks**	Directly Relevant to society or environment. **8-10 Marks**
Viva (10 Marks) **(CO4)**	Does not know any information. OR Fair leadership quality/ teamwork/ cooperation. **0-1 Marks**	Provides irrelevant information for all questions. Good leadership quality/ teamwork/ cooperation. **2-4 Marks**	Provides incomplete information for all questions. Better leadership quality/ teamwork/ cooperation. **5-7 Marks**	Provides complete information for all questions. Outstanding leadership quality/ teamwork/ cooperation. **8-10 Marks**

Report (40 Marks)	Does not submit the report.	Report submitted does not fulfill the prescribed format/	Report submitted partially fulfills the prescribed format/	Report submitted fulfills the prescribed format/

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SEMESTER - III

Analog Electronics (2:1:0) 3

(Effective from the academic year 2021-22)

Course Code	21EC35	CIE Marks	50
Teaching Hours/Week (L:T:P)	2:2:0	SEE Marks	50
Total Number of Contact Hours	40	Exam Hours	03

Course objectives:

This course will enable students to:

1. Explain various BJT parameters, connections and configurations.
2. Understand BJT Amplifier, Hybrid Equivalent, Hybrid Models and Op-amp ICs.
3. Explain various types of FET biasing and amplifiers.
4. Examine Power amplifier circuits in different modes of operation
5. Make use of BJT, FET and Linear ICs to build Oscillator circuits.

Module – 1

Introduction: Significance and Scope of the course, Importance of the Course/Subject in Economic growth of Nation, Impact of the course to prInterovide solutions to Societal Problems, National Economy, Career Perspective and Innovations with current trends.

BJT Biasing: Fixed Bias, Collector to base bias, Voltage divider bias, DC Load line and Operating Point.

Small signal operation and Models: Collector current and transconductance, Base current and input resistance, Emitter current and input resistance, voltage gain, Separating the signal and the DC quantities, The hybrid Π model.

MOSFETs: Biasing in MOS amplifier circuits: Fixing V_{GS}, Fixing V_G, Drain to Gate feedback resistor.

(9 Hours)

Module – 2

MOSFET Amplifier configuration: Basic configurations, characterizing amplifiers, CS amplifier with and without source resistance, Source follower.

MOSFET internal capacitances and High frequency model: The gate capacitive effect, Junction capacitances, High frequency model.

Frequency response of the CS amplifier: The three frequency bands, high frequency response, Low frequency response.

Oscillators: BJT and FET based Phase shift oscillator, LC and Crystal Oscillators

(8 Hours)

Module – 3

Feedback Amplifier: General feedback structure, Properties of negative feedback, The Four Basic Feedback Topologies, The series-shunt, series-series, shunt-shunt and shunt-series amplifiers (Qualitative Analysis).

Output Stages and Power Amplifiers: Introduction, Classification of output stages, Class A output stage, Class B output stage, Transfer Characteristics, Power Dissipation, Power Conversion efficiency, Class AB output stage, Class C tuned Amplifier.

(7 Hours)

Module – 4

Op-Amp general applications: Inverting and Non-inverting Amplifiers, DC and AC Amplifiers, Summing, Scaling and Averaging Amplifiers, Instrumentation amplifier, Comparators, Zero Crossing Detector, Schmitt trigger.

(7 Hours)

Module – 5

Op-Amp Circuits: DAC - Weighted resistor and R-2R ladder, ADC- Successive approximation type, Small Signal half wave rectifier, Active Filters, First and second order low-pass and high pass Butterworth filters, Band-pass filters, Band reject filters.

555 Timer and its applications: 555 IC, Monostable and Astable Multivibrators, Applications of Astable Multivibrators.

Summary of the course: The student will be able to design analog circuits for various Applications by understanding the basic working principle of the electronic devices.

(9 Hours)

Course outcomes: The students will be able to:

CO1:	**Acquire** the knowledge of Working principles, characteristics, equivalent circuits and basic applications of BJT, FET and Linear ICs.
CO2:	**Apply** the knowledge of electronic devices in solving the problems related to amplifiers, Oscillators and Op-amp based circuits.
CO3:	**Analyze** the performance of BJT and FET based circuits.
CO4:	**Design** different electronic circuits for various applications
CO5:	**Interpret** the given case study situation related to applications of analog and Linear Integrated circuits
CO6:	**Perform** in a **group** to build an electronic application and submit the report for the same.

Question paper pattern:

SEE will be conducted for 100 marks.

- The question paper will be set for 100 marks (duration of 03 hours) and marks scored will be proportionally scaled down to 50 marks.
- The question paper will have ten questions. Each question is set for 20 marks.
- There will be 2 questions from each module. Each of the two questions under a module (with a maximum of 3 sub-questions), should have a mix of topics under that module.
- The students have to answer 5 full questions, selecting one full question from each module.

CIE will be announced prior to the commencement of the course.

- Three Unit Tests each of **20 Marks** (Duration 01 hour).
- Two assignments each of 10 Marks.
- Two alternate assessment tools (AATs) for **20 Marks** (duration 01 hour).
- The sum of three tests, two assignments, and AATs will be out of 100 marks and will be scaled down to 50 marks.

Textbooks*:*

1. Microelectronic Circuits, Theory and Applications, Adel S Sedra, Kenneth C Smith, Oxford,6th Edition, 2015.
2. Op-Amps and Linear Integrated Circuits, Ramakant A Gayakwad, Pearson Education,4th Edition. 2000.

References:

1. Analog and Digital Electronics, Charles H Roth, Larry L Kinney, Raghunandan G H, Cengage Learning First Edition,2019.
2. Integrated Electronics, J. Millman, C. C. Halkias, Chetan. D. Parekh, McGraw Hill,2010.

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Choice Based Credit System (CBCS)

SEMESTER – III

Digital Electronics (2:1:0) 3

(Effective from the academic year 2021-22)

Course Code	21EC36	CIE Marks	50
Teaching Hours/Week (L:T:P)	2:2:0	SEE Marks	50
Total Number of Contact Hours	40	Exam Hours	03

Course objectives:

This course will enable students to:

1. Acquire basic knowledge of logic gates, combinational circuits and designs related to it.
2. Analyse working of arithmetic circuits, code converters, logic arrays
3. Apply the knowledge of flips flops to circuits based on flip flops
4. Design combinational and sequential circuits for specific applications.
5. Design and Analyse state machine from truth table, state graphs and vice versa

Module – 1

Principles of Combinational logic: Definition of Combinational Logic, Canonical forms, Generation of switching equations, Karnaugh maps3,4,5 variables, incompletely specified functions, Simplifying Max term equations , Quine-McClusky techniques – 3 & 4 variables.

(9 Hours)

Module – 2

Analysis and design of combinational logic:

Introduction, circuit design and analysis procedure.

Arithmetic circuits: 2 bit multiplier**,** 2 bit Magnitude Comparator, Binary adder, binary subtractor, Carry Look Ahead Adder, Parallel Adder, Decoders, Encoders, Multiplexers, Decoders and multiplexers as Boolean function generators.

(7 Hours)

Module – 3

Sequential Circuits – I : SR Latch, The gated SR Latch, The Master-Slave Flip-Flops (Pulse-Triggered Flip-Flops): The Master-Slave SR Flip-Flops, The Master-Slave JK Flip-Flop, Edge Triggered Flip-Flop: The Positive Edge-Triggered D Flip.

Sequential Logic Circuits:, Characteristic Equations, Registers , Shift registers, Counters based on Shift Registers, Binary Ripple Counters, Synchronous Binary counters

(8 Hours)

Module – 4

Sequential Circuit Design: Design of a Synchronous counters, Design of a Synchronous Mod-6 Counter using clocked D, T, or SR Flip-Flops. Mealy and Moore models. State Machine notations, Construction of state diagrams

(8 Hours)

Module – 5

Applications of Digital Circuits :

Synchronous Sequential Circuit Analysis and Design. Construction of state graphs for a SR, JK, D, and T circuits. Construction of a SR, JK, D and T circuits using state graphs.

(8 Hours)

Course outcomes: The students will be able to:

CO1:	**Apply** the knowledge of digital circuits to provide optimized solutions.
CO2:	**Analyse** and Solve circuits based upon digital logic.
CO3:	**Design** digital circuits based on the given problem statement or application
CO4:	**Interpret** the given case study situation related to applications of digital electronics**.**
CO5:	**Develop** a simple digital system using modern tool and present it in a **team**.

Question paper pattern:

SEE will be conducted for 100 marks.

- The question paper will be set for 100 marks (duration of 03 hours) and marks scored will be proportionally scaled down to 50 marks.
- The question paper will have ten questions. Each question is set for 20 marks.
- There will be 2 questions from each module. Each of the two questions under a module (with a maximum of 3 sub-questions), should have a mix of topics under that module.
- The students have to answer 5 full questions, selecting one full question from each module.

CIE will be announced prior to the commencement of the course.

- Three Unit Tests each of **20 Marks** (Duration 01 hour).
- Two assignments each of 10 Marks.
- Two alternate assessment tools (AATs) for **20 Marks** (duration 01 hour).
- The sum of three tests, two assignments, and AATs will be out of 100 marks and will be scaled down to 50 marks.

TEXT BOOKS:

1. **"Digital Logic Applications and Design"**, John M Yarbrough, Thomson Learning, 2001.
2. **"Digital Principles and Design ",** Donald D Givone, Tata McGraw Hill Edition, 2002.

REFERENCE BOOKS:

1. **"Fundamentals of logic design",** Charles H Roth, Jr; Thomson Learning, 2004.
2. **"Logic and computer design Fundamentals",** Mono and Kim, Pearson, Second edition, 2001.
3. **"Logic Design",** Sudhakar Samuel, Pearson/Saguine, 2007

B.E. ELECTRONICS AND COMMUNICATION ENGINEERING

Choice Based Credit System (CBCS)

SEMESTER - III

Network Analysis (2:1:0) 3

(Effective from the academic year 2021-22)

Course Code	21EC37	CIE Marks	50
Teaching Hours/Week (L:T:P)	2:2:0	SEE Marks	50
Total Number of Contact Hours	40	Exam Hours	3

Course Objectives:

This course will enable students to:

1. Describe basic network concepts emphasizing source transformation, source shifting, mesh and nodal techniques to solve for resistance/impedance, voltage, current and power.
2. Discuss network Superposition, Thevenin's and Norton's theorems, Maximum Power transfer theorem and apply them in solving the problems related to Electrical Circuits.
3. Interpret the behaviour of networks subjected to transient conditions.
4. Use applications of Laplace transforms to network problems.
5. Compute two port network parameters like Z, Y, T and h and their inter-relationships and applications

Module – 1

Introduction to the network theory, Significance and Scope of network theory, Impact of the network theory on Societal Problems/ Sustainable Solutions/ National Economy.

Basic Concepts: Practical sources, Source transformations, Network reduction using Star–Delta transformation, Loop and node analysis with linearly dependent and independent sources for DC and AC networks, Concept of super node and super mesh.

(9 Hours)

Self study Component: Students are expected to verify the principle of KCL and KVL using Multisim Tool.

Module – 2

Network Theorems: Superposition, Milliman's theorems, Thevenin's and Norton 's theorems, Maximum Power transfer theorem**.**

(7 Hours)

Module – 3

Transient behaviour and initial conditions: Behaviour of circuit elements under switching condition and their Representation, evaluation of initial and final conditions in RL, RC Circuits.

(8 Hours)

Module – 4

Laplace Transformation & Applications: Solution of networks, step, ramp and impulse responses, waveform Synthesis.

Self Study: Initial and Final value Theorem.

(7 Hours)

Module – 5

Two port network parameters: Definition of Z, Y, h and ABCD parameters, modelling with these parameters, and relationship between parameters sets.

Resonance: Definition, Characteristics of Series and Parallel Resonance.

Summary/Recap of all the modules:

Applications: Circuit Creation and Simulation using Multisim Tool, Verification of Thevenin's, Norton's and Maximum power Transfer Theorem.

(9 Hours)

Course outcomes:

The students will be able to:

CO1: **Apply** the knowledge of KVL and KCL to solve the problems related to different electrical circuits.

CO2: **Analyse** given electrical circuit to arrive at a suitable conclusion.

CO3: **Interpret** the given case study material related to the application of circuit analysis
CO4: Perform in a **group** to simulate a given electrical circuit using **Modern tool** and submit the report for the same.

Question paper pattern:

SEE will be conducted for 100 marks.

- The question paper will be set for 100 marks (duration of 03 hours) and marks scored will be proportionally scaled down to 50 marks.
- The question paper will have ten questions. Each question is set for 20 marks.
- There will be 2 questions from each module. Each of the two questions under a module (with a maximum of 3 sub-questions), should have a mix of topics under that module.
- The students have to answer 5 full questions, selecting one full question from each module.

CIE will be announced prior to the commencement of the course.

- Three Unit Tests each of **20 Marks** (Duration 01 hour).
- Two assignments each of 10 Marks.
- Two alternate assessment tools (AATs) for **20 Marks** (duration 01 hour).
- The sum of three tests, two assignments, and AATs will be out of 100 marks and will be scaled down to 50 marks.

Text books:

1. Charles K Alexander and Mathew N O Sadiku, "Fundamentals of Electric Circuits", Tata McGraw-Hill, 3rd Edition, 2003.
2. M.E. Van Valkenberg, "Network analysis", Prentice Hall of India, 3rd Edition, 2000.

Reference:

1. Roy Choudhury: "Networks and systems", New Age International Publications, 2rd Edition, 2006.
2. Hayt, Kemmerly and Durbin, "Engineering Circuit Analysis", Tata McGraw-Hill, 7th Edition, 2010.
3. J. David Irwin /R. Mark Nelms, "Basic Engineering Circuit Analysis", John Wiley, 8th Edition, 2006.
4. Syed A. Nasar, "3000 Solved Problems in Electric Circuit " Schaum's solved problem series, Tata McGraw-Hill Publication.

B.E ELECTRONICS AND COMMUNICATION ENGINEERING

Choice Based Credit System (CBCS)

SEMESTER - III

Analog Electronics Laboratory (0:0:1) 1

(Effective from the academic year 2020-21)

Course Code	21ECL38A	CIE Marks	50
Teaching Hours/Week (L:T:P)	0:1:2	SEE Marks	50
Total Number of Contact Hours	30	Exam Hours	03

Course objectives:

This laboratory course enables students to get practical experience in design, assembly, testing and evaluation of

1. Rectifiers and Voltage Regulators.
2. Transistor amplifiers
3. Oscillators
4. Op-amp and Timer applications

List of Experiments

1. Conduct an experiment on diode clipping and clamping circuits for the given design specifications
2. Conduct an experiment on Rectifiers and Filters for the given design specifications
3. Conduct an experiment on Voltage regulators using Zener Diode
4. Design and implement Hartley and crystal oscillators
5. Design and implement the BJT common emitter amplifier using voltage divider bias with and without feedback and determine the gain bandwidth product from its frequency response.
6. Design and implement the FET amplifier and determine the gain bandwidth product from its frequency response.
7. Conduct an experiment on adder, integrator, and differentiator circuits
8. Design and implement Schmitt trigger for the given UTP and LTP values and obtain hysteresis.
9. Conduct an Experiment to Generate Oscillations using Astable Multivibrator Using IC 555 Timer.

Open Ended Experiments (samples)- using simulation tool:

1. Design and implement a Regulated power supply for charging a mobile phone.
2. Demonstrate a Simple Touch Operated Call Bell using 555 Timer IC.
3. Conduct an experiment on Simple Day Night Street Lamp Controller using circuit.

Course outcomes: The students will be able to:

CO1:	**Design** and conduct experiment using electronic circuit for given specifications
CO2:	Write a **report** for the conducted experiment
CO3:	**Conduct** open ended experiments to real time application and write a report on the same.

Semester End Exam pattern:

- The SEE will be conducted for 100 marks and reduced to 50 Marks
- Write up carries 15% of the maximum marks
- Conduction of the experiment with tabulation and graphs carries 70% of the maximum marks
- Viva-voce carries 15% of the maximum marks

B.E ELECTRONICS AND COMMUNICATION ENGINEERING

Choice Based Credit System (CBCS)

SEMESTER - III

Digital Electronics Laboratory (0:0:1) 1

(Effective from the academic year 2021-22)

Course Code	21ECL38B	CIE Marks	50
Teaching Hours/Week (L:T:P)	0:1:2	SEE Marks	50
Total Number of Contact Hours	30	Exam Hours	03

Course objectives:

This course will enable students to:

1. Understand the SOP and POS expressions of digital circuits
2. Realize various combinational and sequential circuits.

List of Experiments

Part-A

1. Conduct an experiment to Verify:
   i. Demorgan's Theorem for 2 variables.
   ii. The sum-of product and product-of-sum expressions using universal gates.
2. Design and verify
   i. Half Adder & Full Adder using i) Basic gates ii) Universal gates.
   ii. Half subtractor & Full subtractor using i) Basic gates ii) Universal gates.
3. Design and verify
   i. 4-bit Parallel Adder/Subtractor using IC 7483.
   ii. BCD to Excess-3 code conversion and vice-versa.
4. Design and verify
   i. 1-bit Comparator
   ii. 5-bit Magnitude Comparator using IC 7485.
5. Realize
   i. Adder & Subtractor using IC 74153.
   ii. 4-variable function using IC74151(8:1MUX).
6. Realize the JK, Master-Slave JK, D & T flip-flops using NAND gates
7. Realize the following shift registers using IC7474/7495
   SISO, SIPO, PISO, PIPO, Ring and Johnson counters.
8. Design and realize the following counters:
   i. Mod-N Counter using IC7490 / 7476
   ii. Synchronous/Asynchronous counter using IC74192
9. Design Pseudo random sequence generator using IC 7495.

Part-B

Simulation experiments using any Open-source tool.

10. Design and verify Serial adder with accumulator
11. Design and verify Binary Multiplier and simulate using Simulation tool.
12. Design and verify Parity Generator.

Open Ended Experiments (Samples):

1. Conduct an experiment to demonstrate the working of Traffic Light Controller
2. Seven segment display

Course outcomes: The students will be able to:

CO1:	**Conduct** experiments to realize the truth table of various combinational circuits, sequential circuits of digital electronics.
CO2:	**Write** the report for the conducted experiments.
CO3:	**Perform open ended experiments** related to applications of digital electronics.

Semester End Exam pattern:

- The SEE will be conducted for 100 marks and reduced to 50 Marks
- Write up carries 15% of the maximum marks
- Conduction of the experiment with tabulation and graphs carries 70% of the maximum marks
- Viva-voce carries 15% of the maximum marks

B.E ELECTRONICS AND COMMUNICATION ENGINEERING

Choice Based Credit System (CBCS)

SEMESTER - III

Object Oriented Programming Laboratory (0:0:1) 1

(Effective from the academic year 2020-21)

Course Code	21ECL38C	CIE Marks	50
Teaching Hours/Week (L:T:P)	0:0:2	SEE Marks	50
Total Number of Contact Hours	30	Exam Hours	03

Course objectives:

This course will enable students to:

1. Demonstrate use of C++ IDE
2. Demonstrate class object concepts by using C++.
3. To design applications using object-oriented features.
4. To implement object-oriented concepts.

List of Experiments

1. Introduce the OOPS fundamentals, datatypes, operators in C++.
   - Write a C++ program to find the sum of individual digits of a positive integer.
   - Write a C++ program to generate the first n terms of the sequence.
2. Introduce friend function concepts, Inline functions, abstract function, Virtual function.
   - Write a C++ program to demonstrate the concept of friend functions
   - Write a C++ program to demonstrate the concept of inline functions
3. Introduce classes, abstract class and objects
   - Write a C++ program to create n Student objects and print the USN, Name, Branch, and Phone of these objects with suitable headings.
   - Write a C++ program to implement stack using class
4. Demonstrate the concept of constructor, parameterized constructor and copy constructors and destructor.
   - Write a C++ Program to illustrate default constructor, parameterized constructor and copy constructors.
5. Demonstrate the concept of operator overloading, function overloading
   - Write a C++ Program to illustrate operator overloading.
   - Write a C++ Program to illustrate function overloading.
6. Demonstrate the core object-oriented concept of Inheritance, polymorphism
   - Write a C++ Program that illustrate single inheritance.
   - Write a C++ Program that illustrate multiple inheritance.

Open ended experiment:

Student should develop an algorithm, program and execute the program for real world applications.

Course Outcomes:

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

CO 1. Execute C++ programs to demonstrate the various concepts of OOPS

CO 2. Write the report for the conducted experiments.

CO 3. Perform open ended experiments related to the selected real world applications.

Text Books:

1. Object Oriented Programming with C++ by Balagurusamy, 8th Edition, McGraw-Hill.
2. C++, the Complete Reference, 4th Edition, Herbert Schildt, TMH.

References:

1. C++ Primer, 3rd Edition, S.B.Lippman and J.Lajoie, Pearson Education.
2. The C++ Programming Language, 3rd Edition, B.Stroutstrup, Pearson Education

Semester End Exam pattern:

- The SEE will be conducted for 100 marks and reduced to 50 Marks
- Write up carries 15% of the maximum marks
- Conduction of the experiment with tabulation and graphs carries 70% of the maximum marks
- Viva-voce carries 15% of the maximum marks

B.E ELECTRONICS AND COMMUNICATION ENGINEERING

Choice Based Credit System (CBCS)

SEMESTER – III

Diploma Mathematics- I (0:0:0) NIL

COMMON TO ALL BRANCHES

(Effective from the academic year 2021-22)

Course Code	21DIP31A	CIE Marks	100
Teaching Hours/Week (L:T:P)	3:0:0	SEE Marks	-
Total Number of Contact Hours	30	Exam Hours	3

Course Objectives:

This course will enable students to:

1. To enable students to apply knowledge of mathematics in various engineering fields by making them to learn the basic tools of vector differentiation, calculus and elementary Linear Algebra.
2. To familiarize the important tools of Differential and Integral Calculus required to analyze the engineering problems.

Module – 1

Introduction: Understanding the importance of the study of Complex Trigonometry, Calculus, Linear algebra and its applications in the field of Science, Engineering and Economics.

Differential Calculus-I: Differentiation: Polar curves: angle between the radius vector and tangent, angle between two curves, pedal equation-problems; Maclaurin's series of single variable. (6 Hours)

Module – 2

Differential Calculus-II: Partial differentiation, Total derivatives-differentiation of composite functions, Jacobians-simple problems. (6 Hours)

Module – 3

Vector Differentiation: Velocity and acceleration of a particle moving on a space curve. Scalar and vector point functions. Gradient, Divergence, Curl-simple problems. Solenoidal and irrotational vector fields-Problems. (6 hours)

Module – 4

Linear Algebra: Introduction - Rank of matrix by elementary row operations - Echelon form. Gauss elimination method and approximate solution by Gauss-Seidel method. Eigen values and Eigen vectors of a square matrix of 2×2 & Rayleigh's power method -problems. (6 hours)

Module – 5

Integral Calculus: Reduction formulae for $\int Sin^n x dx$, $\int Cos^n x dx$ (proofs with limits between 0 and π/2), $\int Sin^m x Cos^n x dx$ (m & n are positive integers) (proof without limits) and problems on these Reduction formulae with limits. Double and triple integration-Simpleexamples. **Recap**/Summary of the Course**.** (6 hours)

Course outcomes:

The students will be able to:

CO1: Use derivatives to calculate rate of change of functions of a single and multivariate variable.

CO2: Analyze position, velocity and acceleration in two and three dimensions of vector Valued functions.

CO3: Learn techniques of integration including the evaluation of double and triple integrals.

CO4: Solve system of Linear equations by using Matrix Algebra.

Question paper pattern:

CIE will be announced prior to the commencement of the course.

- 75 marks for test. Average of three tests will be taken.
- 25 marks for Alternate Assessment Method.

Textbooks:

1. B.S. Grewal, Higher Engineering Mathematics, 43rd Edition, Khanna Publishers, 2015.
2. B.V. Ramana, Higher Engineering Mathematics, Tata McGraw-Hill, 2010.
3. C. Pandurangappa, Advanced Mathematics II (Lateral entry bridge course textbook), 3rd Edition, Sanguine Publishers, 2015.

References:

1. N.P. Bali, Manish Goyal, A Text Book of Engineering Mathematics, Laxmi Publishers, 2014.
2. E. Kreyszig, Advanced Engineering Mathematics, 10th Edition, John Wiley & Sons, 2015.
3. H.K. Dass, Er. Rajnish Verma, Higher Engineering Mathematics, S. Chand Private Ltd. , 2014.
4. S. Pal and S.C. Bhunia, Engineering Mathematics, 3rd edition, Oxford University Press, 2016.