Course Title:	Basic Electronics		
Course Code:	BBEE103/203	CIE Marks	50
Course Type (Theory/Practical /Integrated)	Theory	SEE Marks	50
		Total Marks	100
Teaching Hours/Week (L:T:P: S)	03:00:00:00	Exam Hours	03
Total Hours of Pedagogy	40 hours	Credits	03
Teaching Department	ECE. Branch	QP setting	ECE

Course objectives

- Operation of Semiconductor diode, Zener diode and Special purpose diodes and their applications.
- Biasing circuits for transistor (BJT) as an amplifier.
- Study of linear Op-amps and its applications.
- Logic circuits and their optimization.
- Principles of Transducers and Communication

Teaching-Learning Process

These are sample Strategies, which teacher can use to accelerate the attainment of the various course outcomes and make Teaching –Learning more effective

1. Chalk and Talk
2. Power point presentation
3. Video Lecturing
4. E-sources
5. Self-learning

Module-1 (08 hours of pedagogy)

Semiconductor Diodes: Introduction, PN Junction diode, Characteristics and Parameters, Diode Approximations, DC Load Line analysis (Text 1: 2.1,2.2,2.3,2.4)

Diode Applications: Introduction, Half Wave Rectification, Full Wave Rectification, Full Wave Rectifier Power Supply: Capacitor Filter Circuit, RC π Filter (includes numerical)

(Text 1: 3.1,3.2,3.4,3.5)

Zener Diodes: Junction Breakdown, Circuit Symbol and Package, Characteristics and Parameters, Equivalent Circuit, Zener Diode Voltage Regulator. (Text1:2.9, 3.7)

Module-2 (08 hours of pedagogy)

Bipolar Junction Transistors: Introduction, BJT Voltages & Currents, BJT Amplification, Common Base Characteristics, Common Emitter Characteristics, Common Collector Characteristics, BJT Biasing: Introduction, DC Load line and Bias point (Text 1: 4.2, 4.3, 4.5,4.6, 5.1)

Field Effect Transistor: Junction Field Effect Transistor, JFET Characteristics, MOSFETs: Enhancement MOSFETs, Depletion Enhancement MOSFETs (Text 1: 9.1,9.2,9.5)

Module-3 (08 hours of pedagogy)

Operational Amplifiers: Introduction, The Operational Amplifier, Block Diagram Representation of Typical Op-Amp, Schematic Symbol, Op-Amp parameters - Gain, input resistance, Output resistance, CMRR, Slew rate, Bandwidth, input offset voltage, Input bias Current and Input offset Current, The Ideal Op-Amp, Equivalent Circuit of Op-Amp, Open Loop Op-Amp configurations, Differential Amplifier, Inverting & Non Inverting Amplifier

Op-Amp Applications: Inverting Configuration, Non-Inverting Configuration, Differential Configuration, Voltage Follower, Integrator, Differentiator (Text 2: 1.1, 1.2, 1.3, 1.5, 2.2, 2.3, 2.4, 2.6, 6.5.1, 6.5.2, 6.5.3, 6.12, 6.13).

Module-4 (07 hours of pedagogy)

Boolean Algebra and Logic Circuits: Binary numbers, Number Base Conversion, octal & Hexa Decimal Numbers, Complements, Basic definitions, Axiomatic Definition of Boolean Algebra, Basic Theorems and Properties of Boolean Algebra, Boolean Functions, Canonical and Standard Forms, Other Logic Operations, Digital Logic Gates (Text 3: 1.2, 1.3, 1.4, 1.5,2.1, 2.2, 2.3, 2.4, 2.5, 2.6, 2.7)

Combinational logic: Introduction, Design procedure, Adders- Half adder, Full adder (Text 3:4.1, 4.2, 4.3)

Module-5 (08 hours of pedagogy)

Introduction to Transducers: Introduction, Resistive Transducers, Inductive Transducers, Capacitive Transducers, Thermal transducers, Optoelectronic transducer, and Piezoelectric transducers (Text 4: Chapter 18: 18.1, 18.2, 18.3, 18.4, 18.5)

Communications: Introduction to communication, Communication System, Modulation (Text book 5: 1.1, 1.2, 1.3

Course outcome (Course Skill Set)

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

CO1	Develop the basic knowledge on construction, operation and characteristics of semiconductor devices. (Level: C3)
CO2	Apply the acquired knowledge to construct small scale circuits consisting of semiconductor devices (Level: C3)
CO3	Construct the conceptual blocks for basic communication system. (Level: C3)
CO4	Construct the conceptual blocks for basic communication system. (Level: C3)
CO5	Apply the knowledge of various transducers principle in sensor system. (Level: C3)

Assessment Details (both CIE and SEE)

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

Continuous Internal Evaluation(CIE):

- Three Tests each of **40 Marks** scale down to **25 Marks** and average of 3 test will be taken. The test will be after the completion of the syllabus of 35-40%, 65-70%, and 90-100% respectively.

  a) One Assignments and one quizzes/one seminars or b) one field survey and report presentation or c) one-course project with report totaling **25 Marks**.

Total Marks scored (Test + Assignments) will be for 25+25 = **50 Marks**

Semester End Examination (SEE):

Theory SEE will be conducted by Institute as per the scheduled timetable, with common question papers for the subject (**duration 03 hours)**

- The question paper shall be set for **100 Marks**. The medium of the question paper shall be English. The duration of SEE is 03 hours.
- The question paper will have 10 questions. Two questions per module. Each question is set for **20 Marks**. The students have to answer 5 full questions, selecting one full question from each module. The student has to answer for **100 Marks** and **marks scored out of 100 shall be proportionally reduced to 50 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.

Suggested Learning Resources:

Books (Title of the Book/Name of the author/Name of the publisher/Edition and Year)

1. Electronic Devices and Circuits, David A Bell, 5th Edition, Oxford, 2016
2. Op-amps and Linear Integrated Circuits, Ramakanth A Gayakwad, Pearson Education, 4th Edition
3. Digital Logic and Computer Design, M. Morris Mano, PHI Learning, 2008 ISBN-978-81-203-0417-8
4. Electronic Instrumentation and Measurements (3rd Edition) – David A. Bell, Oxford University Press, 2013
5. Electronic Communication Systems, George Kennedy, 4th Edition, TMH

Reference Books (Title of the Book/Name of the author/Name of the publisher/Edition and Year)

Web links and Video Lectures (e-Resources):

- https://nptel.ac.in/courses/122106025
- https://nptel.ac.in/courses/108105132
- https://nptel.ac.in/courses/117104072

Practical Based learning (Any 5 experiments x 2 hours = 10 practical hours)

COs and POs Mapping (Individual teacher has to fill up)

COs	POs											
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**
CO1	3	3	2		2	2						
CO2	3	2	3		2	1						
CO3	3	2	3		3				1			
CO4	2	1	1		2	1			1			1
CO5	2	1	1		2	1			1			1

Level 3- Highly Mapped, Level 2-Moderately Mapped, Level 1-Low Mapped, Level 0- Not Mapped

Course Title:	**Elements of Electrical Engineering**		
Course Code:	**BEEE103**	CIE Marks	50
Course Type (Theory/Practical /Integrated)	Theory	SEE Marks	50
		Total Marks	100
Teaching Hours/Week (L:T:P: S)	2:2:0:0	Exam Hours	03
Total Hours of Pedagogy	40 hours	Credits	03

Course objectives

- To explain the basic laws used in the analysis of DC circuits, electromagnetism.
- To explain the behavior of circuit elements in single-phase circuits.
- To explain three phase circuits, balanced loads and measurement of three phase power.
- To explain the measuring techniques, measuring instruments and domestic wiring.
- To explain electricity billing, equipment and personal safety measures.

Teaching-Learning Process

These are sample Strategies, which teacher can use to accelerate the attainment of the various course outcomes and make Teaching –Learning more effective

1. Chalk and talk
2. Animated/NPTEL videos
3. Cut sections
4. PPTs

Module-1 (08 Hrs)

DC circuits: Ohm's law and Kirchhoff's laws, analysis of series, parallel and series-parallel circuits. Power and energy.

Electromagnetism: Faraday's Laws of Electromagnetic Induction, Lenz's Law, Flemings rules, statically and dynamically induced EMF; concepts of self and mutual inductance. Coefficient of Coupling. Energy stored in magnetic field. Simple Numerical.

Module-2 (08 Hrs)

Single-phase AC circuits: Generation of sinusoidal voltage, frequency of generated voltage, average value, RMS value, form factor and peak factor of sinusoidal voltage and currents.

Phasor representation of alternating quantities. Analysis of R, L, C, R-L,R-C and R-L-C circuits with phasor diagrams, Real power, reactive power, apparent power, and Power factor. Series, Parallel and Series-Parallel circuits. Simple Numerical.

Module-3(08 Hrs)

Three-phase AC circuits: Necessity and advantage of 3-phase system. Generation of 3-phase power. Definition of phase sequence. Balanced supply and balanced load. Relationship between line and phase values of balanced star and delta connections. Power in balanced 3-phase circuits. Measurement of 3-phase power by 2-wattmeter method.Simple Numerical.

Module-4(08 Hrs)

Measuring instruments: construction and working principle of whetstone's bridge, Kelvin's double bridge, Megger, Maxwel's bridge for inductance, Schering's bridge for capacitance, concepts of current transformer and potential transformer. (Only balance equations and Excluding Vector diagram approach)

Domestic Wiring: Requirements, Types of wiring: casing, capping. Two way and three way control of load.

Module-5 (08 Hrs)

Electricity bill: Power rating of household appliances including air conditioners, PCs, laptops, printers, etc. Definition of "unit" used for consumption of electrical energy, two-part electricity tariff, calculation of electricity bill for domestic consumers.

Equipment Safety measures: Working principle of Fuse and Miniature circuit breaker (MCB), merits and demerits.

Personal safety measures: Electric Shock, Earthing and its types, Safety Precautions to avoid shock, and Residual Current Circuit Breaker (RCCB) and Earth Leakage Circuit Breaker (ELCB).

Course outcome (Course Skill Set)

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

CO1	Understand the concepts of DC circuits and Electromagnetism.
CO2	Understand the concepts of single phase and Three phase AC circuits.
CO3	Apply the basic Electrical laws to solve circuits.
CO4	Understand the concepts of measurements and measuring Instruments
CO5	Explain the concepts of domestic wiring, electricity billing, circuit protective devices and personal safety measures.

Assessment Details (both CIE and SEE)

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

Continuous Internal Evaluation(CIE):

- Three Tests each of **40 Marks** scale down to **25 Marks** and average of 3 test will be taken. The test will be after the completion of the syllabus of 35-40%, 65-70%, and 90-100% respectively.

  a) One Assignments and one quizzes/one seminars or b) one field survey and report presentation or c) one-course project with report totaling **25 Marks**.

Total Marks scored (Test + Assignments) will be for 25+25 = **50 Marks**

Semester End Examination (SEE):

Theory SEE will be conducted by Institution as per the scheduled timetable, with common question papers for the subject (**duration 03 hours)**

- The question paper shall be set for **100 Marks**. The medium of the question paper shall be English. The duration of SEE is 03 hours.
- The question paper will have 10 questions. Two questions per module. Each question is set for **20 Marks**. The students have to answer 5 full questions, selecting one full question from each module. The student has to answer for **100 Marks** and **marks scored out of 100 shall be proportionally reduced to 50 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.

Suggested Learning Resources:

Books (Title of the Book/Name of the author/Name of the publisher/Edition and Year)

Text Books:

1. Basic Electrical Engineering by D C Kulshreshtha, Tata McGraw Hill, First Edition 2019.
2. A text book of Electrical Technology by B.L. Theraja, S Chand and Company, reprint edition 2014.

Reference Books:

1. Basic Electrical Engineering, D. P. Kothari and I. J. Nagrath, Tata McGraw Hill 4th edition, 2019.
2. Principles of Electrical Engineering & Electronics by V. K. Mehta, Rohit Mehta, S. Chand and Company Publications, 2nd edition, 2015.
3. Electrical Technology by E. Hughes, Pearson, 12th Edition, 2016.
4. Electrical and electronic measurements and instrumentation by A K Sawhney, Dhanapat Rai and Co. edition, January 2015

Web links and Video Lectures (e-Resources):

- www.nptel.ac.in

Activity Based Learning (Suggested Activities in Class)/ Practical Based learning

Wherever required, faculty shall demonstrate the concepts through laboratory experiments.

COs and POs Mapping (Individual teacher has to fill up)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	2	1	0	1	1	1	1	0	0	0	1
CO2	3	3	2	1	1	1	0	0	0	0	0	1
CO3	3	2	1	1	1	1	1	1	0	0	0	1
CO4	3	2	2	1	0	1	1	1	0	0	0	1
CO5	3	1	2	0	1	2	1	1	0	0	1	1

Level 3- Highly Mapped, Level 2-Moderately Mapped, Level 1-Low Mapped, Level 0- Not Mapped

Course Title:	**Communicative English**		
Course Code:	**BENGK106-206**	CIEM arks	50
Course Type(Theory/Practical/Integrated)	Theory	SEE Marks	50
		Total Marks	100
Teaching Hours/Week(L:T:P:S)	1:0:0:0	Exam Hours	01Theory
Total Hours of Pedagogy	15hours	Credits	01

Course objectives: The course Communicative English (BENGK106/206) will enable the students,

1. To know about Fundamentals of Communicative English and Communication Skills in general.
2. Totra into identify the nuances of phonetics, into nation and enhance pronunciation skills for better Communication skills.
3. To impart basic English grammar and essentials of important language skills.
4. ToenhancewithEnglishvocabularyandlanguageproficiencyforbettercommunicationskills.
5. To learn about Techniques of Information Transfer through presentation.

Teaching-Learning Process:

These are sample Strategies, which teacher can use to accelerate the attainment of the various course outcomes and make Teaching –Learning more effective:

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

(i) Direct instructional method (Low/Old Technology), (ii)Flipped classrooms (High/advanced Technological tools), (iii) Blended learning (Combination of both), (iv) Enquiry and evaluation based learning, (v)Personalized learning, (vi)Problems based learning through discussion, (vii)Following the method of expeditionary learning Tools and techniques, (viii)Use of audio visual methods through language Labs in teaching of LSRWskills.

A part from conventional lecture methods, various type so innovative teaching techniques through videos, animation films may be adapted so that the delivered lesson can progress the students In theoretical applied and practical skills in teaching of communicative skills in general.

Language Lab : To augment LSRW, grammar and Vocabulary skills (Listening, Speaking, Reading, Writing and Grammar,Vocabulary)throughtests,activities,exercisesetc.,comprehensiveweb-basedlearningandassessmentsystems can be referred as per the AICTE / VTU guidelines.

Module-1 (03hoursofpedagogy)

Introduction to Communicative English: Communicative English, Fundamentals of Communicative English, Process of Communication, Barriers to Effective Communicative English, Different styles and levels in Communicative English. Interpersonal and Intrapersonal Communication Skills.

Module-2 (03hoursofpedagogy)

Introduction to Phonetics: Phonetic Transcription, English Pronunciation, Pronunciation Guidelines to consonants and vowels, Sounds Mispronounced, Silent and Non silent Letters, Syllables and Structure. Word Accent, Stress Shift and Intonation, Spelling Rules and Words of ten Miss pelt. Common Errors in Pronunciation.

Module-3 (03hoursofpedagogy)

Basic English Communicative Grammar and Vocabulary PART-I: Grammar: Basic English Grammar and Parts of Speech, Articles and Preposition. Question Tags, One Word Substitutes, Strong and Weak forms of words, Introduction to Vocabulary, All Types of Vocabulary – Exercises on it.

Module-4 (03hoursofpedagogy)

Basic English Communicative Grammar and Vocabulary PART-II: Words formation -Prefixes and Suffixes, Contractions and Abbreviations. Word Pairs (Minimal Pairs)– Exercises, Tense and Types of tenses , The Sequence of Tenses (Rules in use of Tenses) and Exercises on it.

Module-5 (03hoursofpedagogy)

Communication Skills for Employment: Information Transfer: Oral Presentation and its Practice. Difference between Extempore/Public Speaking, Communication Guidelines. Mother Tongue Influence (MTI), Various Techniques for Neutralization of Mother Tongue Influence. Reading and Listening Comprehensions– Exercises.

Course outcome (Course Skill Set)

At the end of the course Communicative English(BENGK106/206) the student will be able to

CO1	UnderstandandapplytheFundamentalsofCommunicationSkillsintheircommunicationskills.
CO2	Identify the nuances of phonetics, into nation and enhance pronunciation skills.
CO3	ToimpartbasicEnglishgrammarandessentialsoflanguageskillsasperpresentrequirement.
CO4	UnderstandandusealltypesofEnglishvocabularyandlanguageproficiency.
CO5	Adopt the Techniques of Information Transfer through presentation.

Assessment Details (both CIE and SEE)

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

Continuous Internal Evaluation(CIE):

- Two Tests each of **25 Marks** and average of both the test will be taken. The test will be after the

completion of the syllabus of 50% and 100% respectively.

a) One Assignments and one quizzes/one seminars or b) one field survey and report presentation or c) one-course project with report totaling **25 Marks**.

Total Marks scored (Test + Assignments) will be for 25+25 = **50 Marks**

Semester End Examinations (SEE)

SEE paper shall be set for 50 questions**,** each of the **01 Mark**. The pattern of the question paper is MCQ (multiple choice questions). The time allotted for SEE is 01hour**.**The student must secure a minimum of 35% of the maximum marks for SEE.

Suggested Learning Resources:

Textbook:

1) **Communication Skills** by Sanjay Kumar & Pushp Lata, Oxford University PressIndiaPvtLtd-2019.
2) **A Textbook of English Language Communication Skills,** (ISBN-978-81-955465-2-7), Published by Infinite Learning Solutions, Bengaluru - 2022.

Reference Books:

1. **Technical Communication** by GajendraSingh ChauhanandEtal, (ISBN-978-93-5350-050-4), Cengage learning India Pvt Limited [Latest Revised Edition] - 2019.
2. **English for Engineers** by N.P. Sudharshana and C Savitha, Cam bridge UniversityPress–2018.
3. **English Language Communication Skills–Lab Manual cum Workbook,** Cengage learning India Pvt Limited [Latest Revised Edition] – (ISBN-978-93-86668-45-5), 2019.
4. **A Course in Technical English–D Praveen Sam, K N Shoba,** Cambridge UniversityPress–2020.

Practical English Usage by Michael Swan, Oxford University Press–2016.

Activity Based Learning (Suggested Activities in Class)/Practical Based learning

- ✓ Contents related activities (Activity-based discussions)
- ✓ ForactiveparticipationofstudentsinstructthestudentstoprepareFlowchartsandHandouts
- ✓ Organising Group wise discussions Connecting to placement activities
- ✓ Quizzes and Discussions, Seminars and assignments

CourseTitle	**Introduction to C Programming**		
CourseCode:	**BESCK104E/204E**	CIEMarks	50
CourseType(Theory/Practical/Integrated)	Integrated	SEEMarks	50
		TotalMarks	100
TeachingHours/Week(L:T:P:S)	2:0:2:0	ExamHours	03
TotalHoursofPedagogy	40hours	Credits	03

Course Objectives:

CLO 1. Elucidate the basic architecture and functionalities of a Computer

CLO 2. Apply programming constructs of C language to solve the real-world problems

CLO 3. Explore user-defined data structures like arrays, structures and pointers in implementing solutions to problems

CLO 4. Design and Develop Solutions to problems using modular programming constructs such as functions and procedures

Teaching- Learning Process (General Instructions)

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

1. Lecturer method (L) need not to be only traditional lecture method, but alternative effective teaching methods could be adopted to attain the outcomes.
2. Use of Video/Animation to explain functioning of various concepts.
3. Encourage collaborative (Group Learning) Learning in the class.
4. Ask atleast three HOT (Higher order Thinking) questions in the class,which promotes criticalthinking.
5. Adopt Problem Based Learning (PBL), which fosters students' Analytical skills, develop design thinking skills such as the ability to design, evaluate, generalize, and analyze information rather than simply recall it.
6. Introduce Topics in manifold representations.
7. Show the different ways to solve the same problem and encourage the students to come up with their own creative ways to solve them.
8. Discuss how every concept can be applied to the real world-and when that's possible, it helps to improve the students' understanding.
9. Use https://pythontutor.com/visualize.html#mode=edit in order to visualize the operations of C Programs.

Module-1(6HoursofPedagogy)	
Introduction to C: Introduction to computers, input and output devices, designing efficient programs. Introduction to C, Structure of C program, Files used in a C program, Compilers, Compiling and executing C programs, variables, constants, Input/output statements in C, **Textbook:Chapter1.1-1.9,2.1-2.2,8.1–8.6,9.1-9.14**	
Teaching-Learning Process	Chalk and talk method/Power Point Presentation
Module-2(6HoursofPedagogy)	
Operators in C, Type conversion and typecasting. **Decision control and Looping statements:** Introduction to decision control, Conditional branching statements, iterative statements, nested loops, break and continue statements, go to statement. **Textbook:Chapter9.15-9.16,10.1-10.6**	
Teaching-Learning Process	Chalk and talk method/Power Point Presentation
Module-3(6HoursofPedagogy)	
Functions: Introduction using functions, Function definition, function declaration, function call, return statement, passing parameters to functions, scope of variables, storage classes, recursive functions. **Arrays:** Declaration of arrays, accessing the elements of an array, storing values in arrays, Operations on arrays, Passing arrays to functions, **Textbook:Chapter11.1-11.13,12.1-12.6**	
Teaching-Learning Process	Chalk and talk method/Power Point Presentation
Module-4(6HoursofPedagogy)	
Two dimensional arrays, operations on two-dimensional arrays, two-dimensional arrays to functions, multi-dimensional arrays. **Applications of arrays and introduction to strings:** Applications of arrays, case study with sorting techniques. **Introduction to strings:** Reading strings, writing strings, summary of functions used to read and write characters. Suppressing input using a Scanset. **Textbook:Chapter12.7-12.12**	
Teaching-Learning Process	Chalk and talk method/Power Point Presentation
Module-5(6HoursofPedagogy)	
Strings: String taxonomy, operations on strings, Miscellaneous string and character functions, arrays of strings. **Pointers:** Understanding the Computer's Memory, Introduction to Pointers, Declaring Pointer Variables **Structures**: Introduction to structures **Textbook:Chapter13.1-13.6,14.1-14.3,15.1**	
Teaching-Learning Process	Chalk and talk method/Power Point Presentation

Course Outcomes (Course Skill Set)

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

CO1. Elucidate the basic architecture and functionalities of a computer and also recognize the hardware parts.

CO 2. Apply programming constructs of C language to solve the real world problem.

CO 3. Explore user-defined data structures like arrays in implementing solutions to problems like searching and sorting.

CO 4. Explore user-defined data structures like structures, unions and pointers in implementing solutions.

CO5.Design and Develop Solutions to problems using modular programming constructs using functions.

Assessment Details (both CIE and SEE)

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

Continuous Internal Evaluation(CIE):

The CIE marks for the theory component of the IC shall be **25 Marks** and for the laboratory component **25 Marks**.

CIE for the theory component of the IC

- Three Tests each of **40 Marks** scale down to **15 Marks** and average of 3 test will be taken. The test will be after the completion of the syllabus of 35-40%, 65-70%, and 90-100% respectively.

  a) One Assignments and one quizzes/one seminars or b) one field survey and report presentation or c) one-course project with report totaling **10 Marks**.

Total Marks scored (test + assignments) will be for 15+10 = **25 Marks**

CIE for the practical component of the IC

- On completion of every experiment/program in the laboratory, the students shall be evaluated and marks shall be awarded on the same day. The **15 Marks** are for conducting the experiment and preparation of the laboratory record, the other **10 Marks** shall be for the test conducted at the end of the semester.
- The CIE marks awarded in the case of the Practical component shall be based on the continuous evaluation of the laboratory report. Marks of all "experiments write- ups + conduction + lab record" = 10+10+10 = **30 Marks** respectively. the total marks for all the experiments are added and scaled down to **15 Marks**.

- The laboratory test **(duration 02 hours)** at the end of the 15th week of the semester /after completion of all the experiments (whichever is early) shall be conducted for **50 Marks** and scaled down to **10 Marks.**
- Total Marks scored for the laboratory component of IC/IPCC (Lab Conduction + Lab Test) will be for 15+10 = **25 Marks**
- The minimum marks to be secured in CIE to appear for SEE shall be **10 Marks** (40% of maximum marks) in the theory component and **10 Marks** (40% of maximum marks) in the practical component. The laboratory component of the IC/IPCC shall be for CIE only. However, in SEE, the questions from the laboratory component shall be included**.** The theory component of the IC shall be for both CIE and SEE.

Semester End Examination(SEE):

Theory SEE will be conducted by Institution as per the scheduled timetable, with common question papers for the subject (**duration 03 hours)**

- The question paper shall be set for **100 Marks**. The medium of the question paper shall be English. The duration of SEE is 03 hours.
- The question paper will have 10 questions. Two questions per module. Each question is set for **20 Marks**. The students have to answer 5 full questions, selecting one full question from each module. The student has to answer for **100 Marks** and **marks scored out of 100 shall be proportionally reduced to 50 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.

Suggested Learning Resources:

Textbooks

1. Computer fundamentals and programming in c, "Reema Thareja", Oxford University, Second edition, 2017.

Reference Books:

1. E. Balaguruswamy, Programming in ANSI C, 7th Edition, Tata McGraw-Hill.
2. Brian W. Kernighan and Dennis M. Ritchie, The 'C' Programming Language, Prentice Hall of India.

Web links and Video Lectures (e-Resources):

1. elearning.vtu.ac.in/econtent/courses/video/BS/15PCD23.html
2. https://nptel.ac.in/courses/106/105/106105171/ MOOC courses can be adopted for more clarity in Understanding the topics and verities of problem solving methods.

Activity Based Learning (Suggested Activities in Class)/ Practical Based learning

- Quizzes
- Assignments
- Seminars

Lab Assignments

1.	C Program to find Mechanical Energy of a particle using E = mgh+1/2 mv2.
2.	C Program to convert Kilometers into Meters and Centimeters.
3.	C Program To Check the Given Character is Lowercase or Uppercase or Special Character.
4.	Program to balance the given Chemical Equation values x, y, p, q of a simple chemical equation of the type: The task is to find the values of constants b1, b2, b3 such that the equation is balanced on both sides and it must be the reduced form.
5.	ImplementMatrixmultiplicationandvalidatetherulesofmultiplication.
6.	Computesin(x)/cos(x) using Taylor series approximation. Compare you result with the built-In library function. Print both the results with appropriate in references.
7.	Sort the given set of N numbers using Bubble sort.
8.	Writefunctionstoimplementstringoperationssuchascompare,concatenate,stringlength.Convinceth eparameterpassingtechniques.
9.	Implementstructurestoread,writeandcomputeaverage-MarksandthestudentsscoringaboveandbelowtheaveragemarksforaclassofN students.
10.	Developaprogramusingpointerstocomputethesum,meanandstandarddeviationofallelementsstoredI nanarrayofNrealnumbers.

Course Title:	Introduction to Nano Technology		
Course Code:	BETCK105C/205C	CIE Marks	50
Course Type (Theory/Practical /Integrated)	ETC (Integrated)	SEE Marks	50
		Total Marks	100
Teaching Hours/Week (L:T:P: S)	02:00:02:00	Exam Hours	03
Total Hours of Pedagogy	40 hours	Credits	03
Teaching Department	NT/Chem/Phys/Any Engg. Branch	QP setting	NT/Chem/Phys

Course objectives

- To provide a comprehensive overview of synthesis and characterization of nanoparticles, nanocomposites and hierarchical materials with nanoscale features.
- To provide the engineering students with necessary background for understanding various nanomaterials characterization techniques
- To develop an understanding of the basis of the choice of material for device applications
- To give an insight into complete systems where nanotechnology can be used to improve our everyday life

Teaching-Learning Process

These are sample Strategies, which teacher can use to accelerate the attainment of the various course outcomes and make Teaching –Learning more effective

1. Chalk and Talk
2. Power point presentation
3. Video Lecturing
4. E-sources
5. Self-learning

Module-1 (07 hours of pedagogy)

Introduction to Nanomaterials

Nanotechnology, Frontier of future-an overview, Length Scales, Variation of physical properties from bulk to thin films to nanomaterials, Confinement of electron in 0D, 1D, 2D and 3D systems, Surface to Volume Ratio, Synthesis of Nanomaterials: Bottom-Up approach: Chemical Routes for Synthesis of Nano Materials-Sol-gel, Precipitation, Solution Combustion synthesis, Hydrothermal, SILAR, Chemical Bath Deposition. Top-Down approach- Ball milling technique, Sputtering, Laser Ablation

Module-2 (07 hours of pedagogy)

Characterization of Nanomaterials

Basic principles and instrumentations of Electron Microscopy –Transmission Electron Microscope, Scanning Electron Microscope, Scanning Probes- Scanning Tunneling microscope, Atomic Force Microscope –different imaging modes, comparison of SEM and TEM, AFM and STM, AFM and SEM.

Basic principles of working of X-ray diffraction, derivation of Debye-Scherrer equation, numericals on Debye Scherrer equation, Optical Spectroscopy- Instrumentation and application of IR, UV/VIS (Band gap measurement)

Module-3 (07 hours of pedagogy)

Carbon Based Materials

Introduction, Synthesis, Properties (electrical, Electronic and Mechanical), and Applications of Graphene, SWCNT, MWCNT, Fullerenes and other Carbon Materials: Carbon nano composites, nanofibres, nanodiscs, nanodiamonds.

Module-4 (07 hours of pedagogy)

Nanotechnology in Energy storage and conversion

Solar cells: First generation, second generation and third generation solar cells: Construction and working of Dye sensitized and Quantum dot sensitized solar cells.

Batteries: Nanotechnology in Lithium ion battery- working, Requirements of anodic and cathodic materials, classification based on ion storage mechanisms, limitations of graphite anodes, Advances in Cathodic materials, Anodic materials, Separators

Fuel Cells: Introduction, construction, working of fuel cells and nanotechnology in hydrogen storage and proton exchange membranes

Self study for lifelong learning:

Super capacitors: Introduction, construction and working of super capacitor

Module-5 (07 hours of pedagogy)

Applications of Nanotechnology

Nanotech Applications and Recent Breakthroughs: Introduction, Significant Impact of Nanotechnology and Nanomaterial, Medicine and Healthcare Applications, Biological and Biochemical Applications (Nano biotechnology), Electronic Applications (Nano electronics), Computing Applications (Nano computers), Chemical Applications (Nano chemistry), Optical Applications (Nano photonics), Agriculture and Food Applications, Recent Major Breakthroughs in Nanotechnology.

Self-study for lifelong learning:

Nano coatings (Photocatalysts) and super hydrophobic coatings (Lotus effect)

Course outcome (Course Skill Set)

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

CO1	Demonstrate the synthesis of nanoparticles by various techniques. [L2]
CO2	Explain working of basic instruments used in characterization of nanoparticles. [L2]
CO3	Discuss the application of nanotechnology to mechanical and civil domains [L2]
CO4	Classify the nanomaterials based on the dimensions. [L3]
CO5	Assess the suitability of nanomaterials for various device applications. [L4]

Assessment Details (both CIE and SEE)

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

Continuous Internal Evaluation(CIE):

- Three Tests each of **40 Marks** scale down to **25 Marks** and average of 3 test will be taken. The test will be after the completion of the syllabus of 35-40%, 65-70%, and 90-100% respectively.
  a) One Assignments and one quizzes/one seminars or b) one field survey and report presentation or c) one-course project totaling **25 Marks**.

Total Marks scored (Test + Assignments) will be for 25+25 = **50 Marks**

Semester End Examination (SEE):

Theory SEE will be conducted by Institution as per the scheduled timetable, with common question papers for the subject (**duration 03 hours)**

- The question paper shall be set for **100 Marks**. The medium of the question paper shall be English. The duration of SEE is 03 hours.
- The question paper will have 10 questions. Two questions per module. Each question is set for **20 Marks**. The students have to answer 5 full questions, selecting one full question from each module. The student has to answer for **100 Marks** and **marks scored out of 100 shall be proportionally reduced to 50 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.

Suggested Learning Resources:

Books (Title of the Book/Name of the author/Name of the publisher/Edition and Year)

1. Nano Materials – A.K. Bandyopadhyay/ New Age Publishers
2. Nanocrystals: Synthesis, Properties and Applications – C.N.R. Rao, P. John Thomas and G. U. Kulkarni, Springer Series in Materials Science
3. Nano Essentials- T. Pradeep/TMH
4. Peter J. F. Harris, Carbon nanotube science: synthesis, properties, and applications. Cambridge University Press, 2011
5. M.A. Shah, K.A. Shah, "Nanotechnology: The Science of Small", Wiley India, ISBN 13: 9788126538683

Reference Books (Title of the Book/Name of the author/Name of the publisher/Edition and Year)

1. Introduction to Nanotechnology, C. P. Poole and F. J. Owens, Wiley, 2003
2. Understanding Nanotechnology, Scientific American 2002
3. Nanotechnology, M. Ratner and D. Ratner, Prentice Hall 2003
4. Nanotechnology, M. Wildon, K. Kannagara, G. Smith, M. Simmons and B. Raguse, CRC Press Boca Raton 2002

Recent reviews on Li-ion batteries, solar cells and fuel cells

Web links and Video Lectures (e-Resources):

- https://nptel.ac.in/courses/118104008
- https://www.digimat.in/nptel/courses/video/118104008/L16.html
- https://archive.nptel.ac.in/courses/113/106/113106099/
- https://nptel.ac.in/courses/112107283
- https://onlinecourses.nptel.ac.in/noc22_me131/preview

Practical Based learning (Any 5 experiments x 2 hours = 10 practical hours)

- Preparation of silver nanoparticles and characterization of particle size by optical spectroscopy
- Preparation of ZnO nanoparticles by combustion technique
- Preparation of Al_2O_3 nanoparticles by precipitation method
- Preparation of Silica nanoparticles by sol-gel method
- Preparation of metal oxide nanoparticles by hydrothermal method
- Determination of thermal conductivity of nanofluids using a thermal analyser
- Preparation of thin films by SILAR method
- Determination of Band gap of given material using Tauc plot

COs and POs Mapping (Individual teacher has to fill up)

COs	POs											
	1	2	3	4	5	6	7	8	9	10	11	12
CO1	3	3	2						2	1		
CO2	3	3	2									
CO3	3	3										
CO4	3	3							2	1		2
CO5	3	3							2	1		2

Level 3- Highly Mapped, Level 2-Moderately Mapped, Level 1-Low Mapped, Level 0- Not Mapped

Course Title:	**Indian Constitution**		
Course Code:	**BICOK107/207**	CIE Marks	50
Course Type (Theory/Practical /Integrated)	Theory	SEE Marks	50
		Total Marks	100
Teaching Hours/Week (L:T:P: S)	1:0:0:0	Exam Hours	01 Theory
Total Hours of Pedagogy	15 hours	Credits	01

Course objectives:

The course **INDIAN CONSTITUTION (BICOK107/207)** will enable the students,

1. To know about the basic structure of Indian Constitution.
2. To know the Fundamental Rights (FR's), DPSP's and Fundamental Duties (FD's) of our constitution.
3. To know about our Union Government, political structure & codes, procedures.
4. To know the State Executive & Elections system of India.
5. To learn the Amendments and Emergency Provisions, other important provisions given by the constitution.

Teaching-Learning Process

These are sample Strategies, which teacher can use to accelerate the attainment of the various course outcomes and make Teaching –Learning more effective: Teachers shall adopt suitable pedagogy for effective teaching - learning process. The pedagogy shall involve the combination of different methodologies which suit modern technological tools.

(i) Direct instructional method (Low/Old Technology), (ii) Flipped classrooms (High/advanced Technological tools), (iii) Blended learning (Combination of both), (iv) Enquiry and evaluation based learning, (v) Personalizedlearning, (vi) Problems based learning through discussion.

(ii) Apart from conventional lecture methods, various types of innovative teaching techniques through videos, animation films may be adapted so that the delivered lesson can progress the students In theoretical applied and practical skills.

Module-1 (03 hours of pedagogy)

Indian Constitution: Necessity of the Constitution, Societies before and after the Constitution adoption. Introduction to theIndian constitution, Making of the Constitution, Role of the Constituent Assembly.

Module-2 (03 hours of pedagogy)

Salient features of India Constitution. Preamble of Indian Constitution & Key concepts of the Preamble. Fundamental Rights (FR's) and its Restriction and limitations in different Complex Situations. building.

Module-3 (03 hours of pedagogy)

Directive Principles of State Policy (DPSP's) and its present relevance in Indian society. Fundamental Duties and its Scope and significance in Nation, Union Executive : Parliamentary System, Union Executive – President, PrimeMinister, Union Cabinet.

Module-4 (03 hours of pedagogy)

Parliament - LS and RS, Parliamentary Committees, Important Parliamentary Terminologies. Judicial System of India, Supreme Court of India and other Courts, Judicial Reviews and Judicial Activism.

Module-5 (03 hours of pedagogy)

State Executive and Governer, CM, State Cabinet, Legislature - VS & VP, Election Commission, Elections & Electoral Process. Amendment to Constitution, and Important Constitutional Amendments till today. Emergency Provisions.

Course outcome (Course Skill Set)
At the end of the course BICOK107/207 the student will be able to:

CO1	Analyse the basic structure of Indian Constitution.
CO2	Remember their Fundamental Rights, DPSP's and Fundamental Duties (FD's) of our constitution.
CO3	know about our Union Government, political structure & codes, procedures.
CO4	Understand our State Executive & Elections system of India.
CO5	Remember the Amendments and Emergency Provisions, other important provisions given by the constitution.

Assessment Details (both CIE and SEE)

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

Continuous Internal Evaluation(CIE):

- Two Tests each of **25 Marks** and average of both the test will be taken. The test will be after the completion of the syllabus of 50% and 100% respectively.

a) One Assignments and one quizzes/one seminars or b) one field survey and report presentation or c) one-course project with report totaling **25 Marks**.

Total Marks scored (Test + Assignments) will be for 25+25 = **50 Marks**

Semester End Examinations (SEE)

SEE paper shall be set for 50 questions, each of the **01 Mark**. The pattern of the question paper is MCQ (multiple choice questions). The time allotted for SEE is 01hour.The student must secure a minimum of 35% of the maximum marks for SEE.

Suggested Learning Resources:

Textbook:

1. "Constitution of India" (for Competitive Exams) - Published by Naidhruva Edutech Learning Solutions, Bengaluru. – 2022.
2. "Introduction to the Constitution of India", (Students Edition.) by Durga Das Basu (DD Basu): Prentice –Hall, 2008.

Reference Books:

1. "Constitution of India, Professional Ethics and Human Rights" by Shubham Singles, Charles E. Haries, and et al: published by Cengage Learning India, Latest Edition – 2019.
2. "The Constitution of India" by Merunandan K B: published by Merugu Publication, Second Edition, Bengaluru.
3. "Samvidhana Odu" - for Students & Youths by Justice HN Nagamohan Dhas, Sahayana, kerekon. M. Govindarajan, S.Natarajan, V.S.Senthilkumar, "Engneering Ethics", Prentice – Hall, 2004.

Activity Based Learning (Suggested Activities in Class)/ Practical Based learning

- ✓ Contents related activities (Activity-based discussions)
- ✓ For active participation of students instruct the students to prepare Flowcharts and Handouts
- ✓ Organising Group wise discussions Connecting to placement activities
- ✓ Quizzes and Discussions Seminars and assignments

INNOVATION AND DESIGN THINKING			
Course Code	**BIDTK158/258**	CIE Marks	50
Teaching Hours/Week(L:T:P:S)	1:0:0	SEE Marks	50
Total Hours of Pedagogy	15	Total Marks	100
Credits	01	Exam Hours	01

Course Category: Foundation

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

Course objectives:

CLO 1: To explain the concept of design thinking for product and service development

CLO 2. To explain the fundamental concept of innovation and design thinking

CLO 3. To discuss the methods of implementing design thinking in the real world.

Teaching-Learning Process (General Instructions)

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

1. Lecturer method (L) does not mean only the traditional lecture method, but a different type of teaching method may be adopted to develop the outcomes.

2. Show Video/animation films to explain concepts.

3. Encourage collaborative (Group Learning) Learning in the class.

4. Ask at least three HOTS (Higher-order Thinking) questions in the class, which promotes critical thinking.

5. Adopt Problem Based Learning (PBL), which fosters students' Analytical skills, develops thinking skills such as the ability to evaluate, generalize, and analyse information rather than simply recall it.

6. Topics will be introduced in multiple representations.

7. Show the different ways to solve the same problem and encourage the students to come up with their own creative ways to solve them.

8. Discuss how every concept can be applied to the real world - and when that's possible, it helps improve the students' understanding.

Module-1	
PROCESS OF DESIGN **Understanding Design thinking** Shared model in team-based design – Theory and practice in Design thinking – Explore presentation signers across globe – MVP or Prototyping	
Teaching-Learning Process	Introduction about the design thinking: Chalk and Talk method Theory and practice through presentation MVP and Prototyping through live examples and videos.
Module-2	
Tools for Design Thinking Real-Time design interaction capture and analysis – Enabling efficient collaboration in digital space – Empathy for design – Collaboration in distributed Design	
Teaching-Learning Process	Case studies on design thinking for real-time interaction and analysis Simulation exercises for collaborated enabled design thinking Live examples on the success of collaborated design thinking.
Module-3	
Design Thinking in IT Design Thinking to Business Process modelling – Agile in Virtual collaboration environment – Scenario based Prototyping	
Teaching-Learning Process	Case studies on design thinking and business acceptance of the design Simulation on the role of virtual eco-system for collaborated prototyping.
Module-4	
DT For strategic innovations Growth – Story telling representation – Strategic Foresight - Change – Sense Making – Maintenance Relevance – Value redefinition - Extreme Competition – experience design - Standardization – Humanization - Creative Culture – Rapid prototyping, Strategy and Organization – Business Model design.	
Teaching-Learning Process	Business model examples of successful designs Presentation by the students on the success of design Live project on design thinking in a group of 4 students
Module-5	
Design thinking workshop Design Thinking Work shop Empathize, Design, Ideate, Prototype and Test	
Teaching-Learning Process	8 hours design thinking workshop from the expect and then presentation by the students on the learning from the workshop

Course Outcomes:

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

CO Nos.	Course Outcomes	Knowledge Level (Based on revised Bloom's Taxonomy)
CO1	Appreciate various design process procedure	K2
CO2	Generate and develop design ideas through different technique	K2
CO3	Identify the significance of reverse Engineering to Understand products	K2

Assessment Details (both CIE and SEE)

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

Continuous Internal Evaluation(CIE):

- Two Tests each of **25 Marks** and average of both the test will be taken. The test will be after the completion of the syllabus of 50% and 100% respectively.

a) One Assignments and one quizzes/one seminars or b) one field survey and report presentation or c) one-course project with report totaling **25 Marks**.

Total Marks scored (Test + Assignments) will be for **25+25 = 50 Marks**

Semester End Examinations (SEE)

SEE paper shall be set for 50 questions, each of the **01 Mark**. The pattern of the question paper is MCQ (multiple choice questions). The time allotted for SEE is 01hour.The student must secure a minimum of 35% of the maximum marks for SEE.

Suggested Learning Resources:

Text Books :

1. John.R.Karsnitz, Stephen O'Brien and John P. Hutchinson, "Engineering Design", Cengage learning (International edition) Second Edition, 2013.

2. Roger Martin, "The Design of Business: Why Design Thinking is the Next Competitive Advantage", Harvard Business Press , 2009.

3. HassoPlattner, ChristophMeinel and Larry Leifer (eds), "Design Thinking: Understand – Improve – Apply", Springer, 2011

4. IdrisMootee, "Design Thinking for Strategic Innovation: What They Can't Teach You at Business or Design School", John Wiley & Sons 2013.

References:

5. YousefHaik and Tamer M.Shahin, "Engineering Design Process", Cengage Learning, Second Edition, 2011.

6. Book - Solving Problems with Design Thinking - Ten Stories of What Works (Columbia Business School Publishing) Hardcover – 20 Sep 2013 by Jeanne Liedtka(Author), Andrew King (Author), Kevin Bennett (Author).

Web links and Video Lectures (e-Resources):

1. www.tutor2u.net/business/presentations/. /**productlifecycle**/default.html

2. https://docs.oracle.com/cd/E11108_02/otn/pdf/. /E11087_01.pdf

3. www.bizfilings.com › Home › Marketing › Product Developmen

4. https://www.mindtools.com/brainstm.html

5. https://www.quicksprout.com/. /how-to-**reverse-engineer**-your-competit

6. www.vertabelo.com/blog/documentation/**reverse-engineering**

https://support.microsoft.com/en-us/kb/273814

7. https://support.google.com/docs/answer/179740?hl=en

8. https://www.youtube.com/watch?v=2mjSDIBaUlM

thevirtualinstructor.com/foreshortening.html

https://dschool.stanford.edu/.../designresources/.../ModeGuideBOOTCAMP2010L.pdf

https://dschool.stanford.edu/use-our-methods/ 6. https://www.interactiondesign.

org/literature/article/5-stages-in-the-design-thinking-process 7.

http://www.creativityatwork.com/design-thinking-strategy-for-innovation/ 49 8.

https://www.nngroup.com/articles/design-thinking/ 9.

https://designthinkingforeducators.com/design-thinking/ 10.

www.designthinkingformobility.org/wp-content/.../10/NapkinPitch_Worksheet.pdf

Activity Based Learning (Suggested Activities in Class)/ Practical Based learning

http://dschool.stanford.edu/dgift/

Course Title:	**Mathematics-I for Electrical & Electronics Engineering Stream**		
Course Code:	**BMATE101**	CIE Marks	50
Course Type (Theory/Practical/Integrated)	Integrated	SEE Marks	50
		Total Marks	100
Teaching Hours/Week (L:T:P: S)	2:2:2:0	Exam Hours	03
Total Hours of Pedagogy	40 hours Theory + 10 to12 Lab slots	Credits	04

Course objectives: The goal of the course **Mathematics-I for Electrical & Electronics Engineering stream** (**BMATE101**) is to

- **Familiarize** the importance of calculus associated with one variable and multivariable for Electrical and Electronics engineering.
- **Analyze** Electrical and Electronics engineering problems by applying Ordinary Differential Equations.
- **Familiarize** the important tools in Integral Calculus that are essential in Electrical and Electronics engineering.
- **Develop** the knowledge of Linear Algebra to solve the system of equations.

Teaching-Learning Process

These are sample Strategies, which teacher can use to accelerate the attainment of the various course outcomes and make Teaching –Learning more effective

1. Flipped Class
2. Chalk and Talk
3. Blended Mode of Teaching and Learning
4. Simulations, Interactive Simulations and Animations
5. NPTEL and Other Videos for theory topics
6. Smart Class Room
7. Lab Experiment Videos

Module-1: Calculus (8 hours)

Introduction to polar coordinates and curvature relating to EC & EE Engineering applications. Polar coordinates, Polar curves, angle between the radius vector and the tangent, angle between two curves. Pedal equations. Curvature and Radius of curvature - Cartesian, Parametric, Polar and Pedal forms. Problems.

Self-study: Center and circle of curvature, evolutes and involutes.
Applications: Communication signals, Manufacturing of microphones, and Image processing.
(RBT Levels: L1, L2 and L3)

Module-2: Series Expansion and Multivariable Calculus (8 hours)

Introduction of series expansion and partial differentiation in EC & EE Engineering applications.

Taylor's and Maclaurin's series expansion for one variable (Statement only) – problems. Indeterminate forms – L Hospital's rule - Problems.

Partial differentiation, total derivative - differentiation of composite functions. Jacobian and problems. Maxima and minima for a function of two variables. Problems.

Self-study: Euler's Theorem and problems. Method of Lagrange's undetermined multipliers with single constraint.

Applications: Series expansion in communication signals, Errors and approximations, and vector calculus.

(RBT Levels: L1, L2 and L3)

Module-3: Ordinary Differential Equations (ODEs) of First Order (8 hours)

Introduction to first-order ordinary differential equations pertaining to the applications for EC & EE engineering.

Linear and Bernoulli's differential equations. Exact and reducible to exact differential equations-Integrating factors, Orthogonal trajectories, L-R and C-R circuits, Problems.

Non-linear differential equations: Introduction to general and singular solutions, Solvable for ponly, Clairaut's equations, reducible to Clairaut's equations. Problems.

Self-Study: Applications of ODEs, Solvable for x and y.

Applications of ordinary differential equations: Rate of Growth or Decay, Conduction of heat.

(RBT Levels: L1, L2 and L3)

Module-4:Integral Calculus (8 hours)

Introduction to Integral Calculus in EC & EE Engineering applications.

Multiple Integrals: Evaluation of double and triple integrals, evaluation of double integrals by change of order of integration, changing into polar coordinates. Applications to find Area and Volume by double integral. Problems.

Beta and Gamma functions: Definitions, properties, relation between Beta and Gamma functions. Problems.

Self-Study: Volume by triple integration, Center of gravity.

Applications: Antenna and wave propagation, Calculation of optimum power in electrical circuits, field theory.

(RBT Levels: L1, L2 and L3)

Module-5: Linear Algebra (8 hours)

Introduction of linear algebra related to EC & EE engineering applications.

Elementary row transformation of matrix, Rank of a matrix. Consistency and Solution of system of linear equations - Gauss-elimination method, Gauss-Jordan method and approximate solution by Gauss-Seidel method. Eigenvalues and Eigenvectors, Rayleigh's power method to find the dominant Eigenvalue and Eigenvector.

Self-Study: Solution of system of equations by Gauss-Jacobi iterative method. Inverse of a square matrix by Cayley- Hamilton theorem.

Applications of Linear Algebra: Network Analysis, Markov Analysis, Critical point of a network system. Optimum solution.

(RBT Levels: L1, L2 and L3)

List of Laboratory experiments (2 hours/week per batch/ batch strength 15) 10 lab sessions + 1 repetition class + 1 Lab Assessment

1	2D plots for Cartesian and polar curves
2	Finding angle between polar curves, curvature and radius of curvature of a given curve
3	Finding partial derivatives and Jacobian
4	Applications to Maxima and Minima of two variables
5	Solution of first-order ordinary differential equation and plotting the solution curves
6	Program to compute area, volume and centre of gravity
7	Evaluation of improper integrals
8	Numerical solution of system of linear equations, test for consistency and graphical representation
9	Solution of system of linear equations using Gauss-Seidel iteration
10	Compute eigenvalues and eigenvectors and find the largest and smallest eigenvalue by Rayleigh power method.

Course outcome (Course Skill Set)

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

CO1	Apply the knowledge of calculus to solve problems related to polar curves and learn the notion of partial differentiation to compute rate of change of multivariate functions
CO2	Analyze the solution of linear and nonlinear ordinary differential equations
CO3	Apply the concept of change of order of integration and variables to evaluate multiple integrals and their usage in computing area and volume
CO4	Make use of matrix theory for solving the system of linear equations and compute eigenvalues and eigenvectors
CO5	Familiarize with modern mathematical tools namely MATHEMATICA/ MATLAB/ PYTHON/SCILAB

Assessment Details (both CIE and SEE)

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

Continuous Internal Evaluation(CIE):

The CIE marks for the theory component of the IC shall be **25 Marks** and for the laboratory component **25 Marks**.

CIE for the theory component of the IC

- Three Tests each of **40 Marks** scale down to **15 Marks** and average of 3 test will be taken. The test will be after the completion of the syllabus of 35-40%, 65-70%, and 90-100% respectively.
  a) One Assignments and one quizzes/one seminars or b) one field survey and report presentation or c) one-course project with report totaling **10 Marks**.

Total Marks scored (test + assignments) will be for 15+10 = **25 Marks**

CIE for the practical component of the IC

- On completion of every experiment/program in the laboratory, the students shall be evaluated and marks shall be awarded on the same day. The **15 Marks** are for conducting the experiment and preparation of the laboratory record, the other **10 Marks** shall be for the test conducted at the end of the semester.
- The CIE marks awarded in the case of the Practical component shall be based on the continuous evaluation of the laboratory report. Marks of all "experiments' write- ups + conduction + lab record" = 10+10+10 = **30 Marks** respectively. the total marks for all the experiments are added and scaled down to **15 Marks**.
- The laboratory test **(duration 02 hours)** at the end of the 15^{th} week of the semester /after completion of all the experiments (whichever is early) shall be conducted for **50 Marks** and scaled down to **10 Marks.**
- Total Marks scored for the laboratory component of IC/IPCC (Lab Conduction + Lab Test) will be for 15+10 = **25 Marks**
- The minimum marks to be secured in CIE to appear for SEE shall be **10 Marks** (40% of maximum marks) in the theory component and **10 Marks** (40% of maximum marks) in the

practical component. The laboratory component of the IC/IPCC shall be for CIE only. However, in SEE, the questions from the laboratory component shall be included**.** The theory component of the IC shall be for both CIE and SEE.

Semester End Examination(SEE):

Theory SEE will be conducted by Institute as per the scheduled timetable, with common question papers for the subject (**duration 03 hours)**

- The question paper shall be set for **100 Marks**. The medium of the question paper shall be English. The duration of SEE is 03 hours.
- The question paper will have 10 questions. Two questions per module. Each question is set for **20 Marks**. The students have to answer 5 full questions, selecting one full question from each module. The student has to answer for **100 Marks** and **marks scored out of 100 shall be proportionally reduced to 50 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.

Suggested Learning Resources:

Books (Title of the Book/Name of the author/Name of the publisher/Edition and Year)

Text Books

1. **B. S. Grewal**: "Higher Engineering Mathematics", Khanna Publishers, 44thEd., 2021.
2. **E. Kreyszig**: "Advanced Engineering Mathematics", John Wiley & Sons, 10thEd., 2018.

Reference Books

1. **V. Ramana:** "Higher Engineering Mathematics" McGraw-Hill Education, 11th Ed., 2017
2. **Srimanta Pal & Subodh C.Bhunia**: "Engineering Mathematics" Oxford University Press,
3. **N.P Bali and Manish Goyal**: "A Textbook of Engineering Mathematics" Laxmi Publications, 10th Ed., 2022.
4. **C. Ray Wylie, Louis C. Barrett:** "Advanced Engineering Mathematics" McGraw – Hill Book Co., New York, 6th Ed., 2017.
5. **Gupta C.B, Sing S.R and Mukesh Kumar:** "Engineering Mathematic for Semester I and II", Mc-Graw Hill Education(India) Pvt. Ltd 2015.
6. **H. K. Dass and Er. Rajnish Verma:** "Higher Engineering Mathematics" S. Chand Publication, 3rd Ed., 2014.
7. **James Stewart: "**Calculus" Cengage Publications, 7thEd., 2019.
8. **David C Lay:** "Linear Algebra and its Applications", Pearson Publishers, 4th Ed., 2018.
9. **Gareth Williams:** "Linear Algebra with Applications", Jones Bartlett Publishers Inc., 6th Ed., 2017.
10. **Gilbert Strang:** "Linear Algebra and its Applications", Cengage Publications, 4th Ed. 2022.

Web links and Video Lectures (e-Resources):

- http://nptel.ac.in/courses.php?disciplineID=111
- http://www.class-central.com/subject/math(MOOCs)
- http://academicearth.org/
- VTU e-Shikshana Program

VTU EDUSAT Program

Activity Based Learning (Suggested Activities in Class)/ Practical Based learning

- Quizzes
- Assignments
- Seminar

COs and POs Mapping (Individual teacher has to fill up)

COs	POs											
	1	**2**	**3**	**4**	**5**	**6**	**7**	8	9	10	11	12
CO1	**3**	**3**		**2**	**3**				**2**	**2**		
CO2	**3**	**3**		**2**	**3**				**2**	**2**		
CO3	**3**	**3**		**2**	**3**				**2**	**2**		
CO4	**3**	**3**		**2**	**3**				**2**	**2**		
CO5	**3**	**3**		**2**	**3**				**2**	**2**		

COs and POs Mapping (Individual teacher has to fill up)

Level 3- Highly Mapped, Level 2-Moderately Mapped, Level 1-Low Mapped,

Note : The CO-PO mapping values are indicative. The course coordinator can alter the mapping using **Competency and Performance Indicators** mentioned in the **AICTE Exam reforms.**

Course Title:	**Mathematics-II for Electrical & Electronics Engineering Stream**		
Course Code:	**BMATE201**	CIE Marks	50
Course Type (Theory/Practical/Integrated)	Integrated	SEE Marks	50
		Total Marks	100
Teaching Hours/Week(L:T:P:S)	2:2:2:0	Exam Hours	03
Total Hours of Pedagogy	40hoursTheory+10-12Labslots	Credits	04

Course objectives: The goal of the course **Mathematics-II for Electrical & Electronics Engineering Stream**(**BMATE201**) is to

- **Familiarize** the importance of Vector calculus, Vector Space and Linear transformation for electronics and electrical engineering.
- **Have an insight** in to solving ordinary differential equations by using Laplace transform techniques.
- **Develop** the knowledge of solving electronics and electrical engineering problems numerically.

Teaching-Learning Process

Pedagogy (General Instructions):

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

1. In addition to the traditional lecture method, different types of innovative teaching methods may be adopted so that the delivered lessons shall develop students' theoretical and applied mathematical skills.
2. State the need for Mathematics with Engineering Studies and Provide real-life examples. Support and guide the students for self–study.
3. You will also be responsible for assigning homework, grading assignments and quizzes, and documenting

   students' progress.
4. Encourage the students to group learning to improve their creative and analytical skills.
5. Show short related video lectures in the following ways:
   - As an introduction to new topics (pre-lecture activity).
   - As are vision of topics (post-lecture activity).
   - As additional examples (post-lecture activity).
   - As an additional material of challenging topics (pre- and post-lecture activity).
   - As a model solution of some exercises (post-lecture activity).

Module-1:VectorCalculus(8hours)
Introduction to Vector Calculus in EC&EE engineering applications. **Vector Differentiation:** Scalar and vector fields. Gradient, directional derivative, curl and divergence - physical interpretation, solenoidal and irrotational vector fields. Problems. **Vector Integration:** Line integrals, Surface integrals. Applications to work done by a force and flux. Statement of Green's theorem and Stoke's theorem. Problems. **Self-Study:** Volume integral and Gauss divergence theorem. **Applications:** Conservation of laws, Electrostatics, Analysis of streamlines and electric potentials. **(RBTLevels:L1,L2andL3)**
Module-2:VectorSpaceandLinearTransformations(8hours)
Importance of Vector Space and Linear Transformations in the field of EC & EE engineering applications. Vector spaces: Definition and examples, subspace, linear span, Linearly independent and dependent sets, Basis and dimension. **Linear transformations**: Definition and examples, Algebra of transformations, Matrix of a linear transformation. Change of coordinates, Rank and nullity of a linear operator, Rank-Nullity theorem. Inner product spaces and orthogonality. **Self-study:** Angles and Projections. Rotation, reflection, contraction and expansion. **Applications:** Image processing, AI&ML, Graphs and networks, Computer graphics. **(RBT Levels: L1, L2 and L3)**
Module-3:LaplaceTransform(8hours)
Importance of Laplace Transform for EC&EE engineering applications. Existence and Uniqueness of Laplace transform (LT), transform of elementary functions, region of convergence. Properties–Linearity, Scaling, t-shift property, s-domain shift, differentiation in the s-domain, division by t, differentiation and integration in the time domain. LT of special functions-periodic functions (square wave, saw-tooth wave, triangular wave, full & half wave rectifier), Heaviside Unit step function, Unit impulse function. **Inverse Laplace Transforms:** Definition, properties, evaluation using different methods, convolution theorem (without proof), problems, and applications to solve ordinary differential equations. **Self-Study:** Verification of convolution theorem. **Applications:** Signals and systems, Control systems, LR, CR&LCR circuits. **(RBTLevels:L1,L2andL3)**
Module-4:NumericalMethods-1(8hours)
Importance of numerical methods for discrete data in the field of EC & EE engineering applications. Solution of algebraic and transcendental equations: Regula-Falsi method and Newton-Raphson method (only formulae). Problems. Finite differences, Interpolation using Newton's forward and backward difference formulae, Newton's divided difference formula and Lagrange's interpolation

formula (All formulae without proof). Problems.

N**umerical integration**: Trapezoidal, Simpson's$(1/3)^{rd}$ and$(3/8)^{th}$ rules (without roof).Problems. S**elf-Study:** Bisection method, Lagrange's inverse Interpolation, Weddle's rule.

Applications: Estimating the approximate roots, extremum values, area, volume, and surface area.

(RBTLevels:L1,L2andL3)

Module-5:NumericalMethods-2(8hours)

IntroductiontovariousnumericaltechniquesforhandlingEC&EEapplications.

Numerical Solution of Ordinary Differential Equations (ODEs):

Numerical solution of ordinary differential equations of first order and first degree - Taylor's series method, Modified Euler's method, Runge-Kutta method of fourth order and Milne's predictor-corrector formula (No derivations of formulae). Problems.

Self-Study: Adam-Bashforth method.

Applications: Estimating the approximate solutions of ODE for electric circuits.

(RBTLevels:L1,L2andL3)

Course outcome (Course Skill Set)
At the end of the course the student will be able to:

CO1	Understand the applications of vector calculus refer to solenoidal, irrotational vectors, line integral and surface integral.
CO2	Demonstrate the idea of Linear dependence and independence of sets in the vector space and linear transformation
CO3	To understand the concept of Laplace transform and to solve initial value problems.
CO4	Apply the knowledge of numerical methods in solving physical and engineering phenomena.
CO5	Get familiarize with modern mathematical tools namely MATHEMATICA/MATLAB/PYTHON/SCILAB

Assessment Details (both CIE and SEE)

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

Continuous Internal Evaluation(CIE):

The CIE marks for the theory component of the IC shall be **25 Marks** and for the laboratory component **25 Marks**.

CIE for the theory component of the IC

- Three Tests each of **40 Marks** scale down to **15 Marks** and average of 3 test will be taken. The test will be after the completion of the syllabus of 35-40%, 65-70%, and 90-100% respectively.

a) One Assignments and one quizzes/one seminars or b) one field survey and report presentation or c) one-course project with report totaling **10 Marks**.

Total Marks scored (test + assignments) will be for 15+10 = **25 Marks**

CIE for the practical component of the IC

- On completion of every experiment/program in the laboratory, the students shall be evaluated and marks shall be awarded on the same day. The **15 Marks** are for conducting the experiment and preparation of the laboratory record, the other **10 Marks** shall be for the test conducted at the end of the semester.
- The CIE marks awarded in the case of the Practical component shall be based on the continuous evaluation of the laboratory report. Marks of all "experiments' write- ups + conduction + lab record" = 10+10+10 = **30 Marks** respectively. the total marks for all the experiments are added and scaled down to **15 Marks**.
- The laboratory test **(duration 02 hours)** at the end of the 15^{th} week of the semester /after completion of all the experiments (whichever is early) shall be conducted for **50 Marks** and scaled down to **10 Marks.**
- Total Marks scored for the laboratory component of IC/IPCC (Lab Conduction + Lab Test) will be for 15+10 = **25 Marks**
- The minimum marks to be secured in CIE to appear for SEE shall be **10 Marks** (40% of maximum marks) in the theory component and **10 Marks** (40% of maximum marks) in the practical component. The laboratory component of the IC/IPCC shall be for CIE only. However, in SEE, the questions from the laboratory component shall be included**.** The theory component of the IC shall be for both CIE and SEE.

Semester End Examination(SEE):

Theory SEE will be conducted by Institution as per the scheduled timetable, with common question papers for the subject (**duration 03 hours)**

- The question paper shall be set for **100 Marks**. The medium of the question paper shall be English. The duration of SEE is 03 hours.
- The question paper will have 10 questions. Two questions per module. Each question is set for **20 Marks**. The students have to answer 5 full questions, selecting one full question from each module. The student has to answer for **100 Marks** and **marks scored out of 100 shall be proportionally reduced to 50 Marks**.

There will be 2 questions from each module. Each of the two questions under a module (with a maximumof3sub- questions), **should have a mix of topics** under that module.

Suggested Learning Resources:

Books(TitleoftheBook/Nameoftheauthor/Nameofthepublisher/EditionandYear) Text Books

1. **B.S.Grewal**:"Higher Engineering Mathematics", Khanna Publishers,44thEd., 2021.
2. **E.Kreyszig**:"Advanced Engineering Mathematics", John Wiley&Sons,10thEd.,2018.

Reference Books

3. **V.Ramana:**"HigherEngineeringMathematics"McGraw-HillEducation,11thEd., 2017
4. **Srimanta Pal & Subodh C.Bhunia**: "Engineering Mathematics" Oxford University Press, 3rdEd., 2016.
5. **N.PBali and Manish Goyal**:"A Text book of Engineering Mathematics" Laxmi Publications, 10thEd., 2022.
6. **C.Ray Wylie, LouisC.Barrett:** "Advanced Engineering Mathematics"McGraw–Hill Book Co., New York, 6th Ed., 2017.
7. **Gupta C.B, Sing S.R and Mukesh Kumar:** "Engineering Mathematic for Semester I and II",Mc-Graw Hill Education(India) Pvt. Ltd 2015.
8. **H.K.DassandEr.RajnishVerma:**"HigherEngineeringMathematics"S.ChandPublication, 3rd Ed.,2014.
9. **James Stewart:"**Calculus"CengagePublications,7thEd., 2019.
10. **David CLay:**"LinearAlgebraanditsApplications",PearsonPublishers,4thEd.,2018.
11. **Gareth Williams:**"LinearAlgebrawithapplications",JonesBartlettPublishersInc.,6th Ed., 2017.
12. **GilbertStrang:**"LinearAlgebraanditsApplications",CengagePublications,4thEd.,2022.

WeblinksandVideoLectures(e-Resources):

WeblinksandVideoLectures(e-Resources):

- http://nptel.ac.in/courses.php?disciplineID=111
- http://www.class-central.com/subject/math(MOOCs)
- http://academicearth.org/
- VTUe-ShikshanaProgram VTUEDUSATProgram

Activity-Based Learning (Suggested Activities in Class)/Practical-Based Learning

- Quizzes/Assignments/Seminar

1	Finding gradient, divergent, curl and their geometrical interpretation and Verification of Green's theorem
2	Computation of basis and dimension for a vector space and Graphical representation of linear transformation
3	Visualization in time and frequency domain of standard functions
4	Computing inverse Laplace transform of standard functions
5	Laplace transform of convolution of two functions
6	Solution of algebraic and transcendental equation by Regula-Falsi and Newton – Raphson method.
7	Interpolation/Extrapolation using Newton's forward and backward difference formula
8	Computation of area under the curve using Trapezoidal, Simpson's $(1/3)^{rd}$ and Simpson's $(3/8)^{th}$ rule.
9	Solution of ODE of first order and first degree by Taylor's series and Modified Euler's method.
10	Solution of ODE of first order and first degree by Runge-Kutta 4^{th} order method and Milne's corrector method

Cos and Pos Mapping (Individual teacher has to fill up)

COs	POs											
	1	**2**	**3**	**4**	**5**	**6**	**7**	8	9	10	11	12
CO1	**3**	**3**		**2**	**2**				**2**	**2**		**2**
CO2	**3**	**3**		**2**	**2**				**2**	**2**		**2**
CO3	**3**	**3**		**2**	**2**				**2**	**2**		**2**
CO4	**3**	**3**		**2**	**2**				**2**	**2**		**2**
CO5	**3**	**3**		**2**	**2**				**2**	**2**		**2**

Level3-Highly Mapped, Level2-Moderately Mapped, Level1-Low Mapped,

Note: The CO-PO mapping values are indicative. The course coordinator can alter the mapping using **Competency and Performance Indicators** mentioned in the **AICTE Exam reforms.**

Course Title:	**Applied Physics for EEE Stream**		
Course Code:	**BPHYE102/202**	CIE Marks	50
Course Type (Theory/Practical/Integrated)	Integrated	SEE Marks	50
		Total Marks	100
Teaching Hours/Week (L:T:P: S)	2:2:2:0	Exam Hours	03
Total Hours of Pedagogy	40 hours Theory + 10-12 Lab slots	Credits	04

Course objectives

- To study the principles of quantum mechanics
- To understand the properties of dielectrics and superconductors
- To study the essentials of photonics for engineering applications.
- To understand fundamentals of vector calculus and EM waves.
- To study the knowledge about semiconductors and devices.

Teaching-Learning Process

These are sample Strategies, which teacher can use to accelerate the attainment of the various course outcomes and make Teaching –Learning more effective

1. Flipped Class
2. Chalk and Talk
3. Blended Mode of Learning
4. Simulations, Interactive Simulations and Animations
5. NPTEL and Other Videos for theory topics
6. Smart Class Room
7. Lab Experiment Videos

Module-1 (08 Hours)

Quantum Mechanics:

de Broglie Hypothesis and Matter Waves, de Broglie wavelength and derivation of expression by analogy, Phase Velocity and Group Velocity, Heisenberg's Uncertainty Principle and its application (Nonexistence of electron inside the nucleus-Non Relativistic), Principle of Complementarity, Wave Function, Time independent Schrödinger wave equation, Physical Significance of a wave function and Born Interpretation, Expectation value, Eigen functions and Eigen Values, Particle inside one dimensional infinite potential well, Waveforms and Probabilities. Numerical Problems

Pre-requisite: Wave–Particle dualism
Self-learning: de Broglie Hypothesis

Module-2 (08 hours)

Electrical Properties of Solids:

Conductors:

Quantum Free Electron Theory of Metals: Assumptions, Fermi-energy, Fermi factor, Variation of Fermi Factor with Temperature and Energy, Mention of expression for electrical conductivity.

Dielectric Properties: Polar and non-polar dielectrics, Electrical Polarization Mechanisms, internal fields in solids, Clausius-Mossotti equation (Derivation), Solid, Liquid and Gaseous dielectrics. Application of dielectrics in transformers, Capacitors, Electrical Insulation. Numerical Problems.

Superconductivity:

Introduction to Superconductors, Temperature dependence of resistivity, Meissner Effect, Critical Field, Temperature dependence of Critical field, Types of Super Conductors, BCS theory (Qualitative), High Temperature superconductivity, SQUID, MAGLEV, Numerical problems.

Pre-requisites: Classical Free Electron

Theory Self-learning: Dielectrics Basics

Module-3 (08 hours)

Lasers and Optical Fibers:

Lasers: Characteristics of LASER, Interaction of radiation with matter, Expression for Energy Density and its significance. Requisites of a Laser System. Conditions for Laser action. Principle, Construction and Working of Carbon Dioxide Laser. Application of Lasers in Defense (Laser range finder) and Laser Printing. Numerical Problems

Optical Fibers: Total Internal Reflection**,** Propagation mechanism, Angle of Acceptance, Numerical Aperture, Fractional Index Change, Modes of Propagation, Number of Modes and V Number, Types of Optical Fibers. Attenuation and Mention of Expression for Attenuation coefficient, Attenuation Spectrum of an Optical Fiber with Optical Windows. Discussion of Block Diagram of Point to Point Communication, Intensity based Fiber Optic Displacement Sensor, Merits and Demerits, Numerical problems.

Pre-requisite: Properties of light

Self-learning: Total Internal Reflection

Module-4 (08 hours)

Maxwell's Equations and EM waves:

Maxwell's Equations: Fundamentals of Vector Calculus. Divergence and Curl of Electric field and Magnetic field (static), Gauss' divergence theorem and Stoke's theorem. Description of laws of Electrostatics, Magnetism, Faraday's laws of EMI, Current Density, Equation of Continuity, Displacement Current (with derivation), Maxwell's equations in vacuum, Numerical Problems

EM Waves: The wave equation in differential form in free space (Derivation of the equation using Maxwell's equations), Plane Electromagnetic Waves in vacuum, their transverse nature.

Pre-requisite: Electricity & Magnetism

Self-learning: Fundamentals of vector calculus.

Module-5 (08 hours)

Semiconductors and Devices:

Fermi level in Intrinsic & Extrinsic Semiconductor, Expression for concentration of electrons in conduction band & holes concentration in valance band (only mention the expression) Relation between Fermi energy & Energy gap in intrinsic semiconductors(derivation), Law of mass action, Electrical conductivity of a semiconductor (derivation), Hall effect, Expression for Hall coefficient (derivation) and its application. Photo-diode and Power responsivity, Construction and working of Semiconducting Laser, four probe method to determine resistivity, Phototransistor, Numerical problems.

Pre-requisite: Basics of Semiconductors
Self-learning: Fermi level in Intrinsic & Extrinsic Semiconductor

Course outcome (Course Skill Set)

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

CO1	Describe the fundamental principles of the Quantum Mechanics and the essentials of Photonics.
CO2	Elucidate the concepts of conductors and dielectrics
CO3	Discuss the fundamentals of magnetic materials
CO4	Summarize the properties of semiconductors and the working principles of semiconductor devices.
CO5	Practice working in groups to conduct experiments in physics and Perform precise and honest measurements.

Assessment Details (both CIE and SEE)

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

Continuous Internal Evaluation(CIE):

The CIE marks for the theory component of the IC shall be **25 Marks** and for the laboratory component **25 Marks**.

CIE for the theory component of the IC

- Three Tests each of **40 Marks** scale down to **15 Marks** and average of 3 test will be taken. The test will be after the completion of the syllabus of 35-40%, 65-70%, and 90-100% respectively.

  a) One Assignments and one quizzes/one seminars or b) one field survey and report presentation or c) one-course project with report totaling **10 Marks**.

Total Marks scored (test + assignments) will be for 15+10 = **25 Marks**

CIE for the practical component of the IC

- On completion of every experiment/program in the laboratory, the students shall be evaluated and marks shall be awarded on the same day. The **15 Marks** are for conducting the experiment and preparation of the laboratory record, the other **10 Marks** shall be for the test conducted at the end of the semester.
- The CIE marks awarded in the case of the Practical component shall be based on the continuous evaluation of the laboratory report. Marks of all "experiments' write- ups + conduction + lab record" = 10+10+10 = **30 Marks** respectively. the total marks for all the experiments are added and scaled down to **15 Marks**.
- The laboratory test **(duration 02 hours)** at the end of the 15th week of the semester /after completion of all the experiments (whichever is early) shall be conducted for **50 Marks** and scaled down to **10 Marks.**
- Total Marks scored for the laboratory component of IC/IPCC (Lab Conduction + Lab Test) will be for 15+10 = **25 Marks**
- The minimum marks to be secured in CIE to appear for SEE shall be **10 Marks** (40% of maximum marks) in the theory component and **10 Marks** (40% of maximum marks) in the practical component. The laboratory component of the IC/IPCC shall be for CIE only. However, in SEE, the questions from the laboratory component shall be included**.** The theory component of the IC shall be for both CIE and SEE.

Semester End Examination(SEE):

Theory SEE will be conducted by Institution as per the scheduled timetable, with common question papers for the subject (**duration 03 hours)**

- The question paper shall be set for **100 Marks**. The medium of the question paper shall be English. The duration of SEE is 03 hours.
- The question paper will have 10 questions. Two questions per module. Each question is set for **20 Marks**. The students have to answer 5 full questions, selecting one full question from each module. The student has to answer for **100 Marks** and **marks scored out of 100 shall be proportionally reduced to 50 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.

Suggested Learning Resources:

Books (Title of the Book/Name of the author/Name of the publisher/Edition and Year)

1. A Textbook of Engineering Physics- M.N. Avadhanulu and P.G. Kshirsagar, 10th revised Ed, S. Chand. & Company Ltd, New Delhi.
2. An Introduction to Lasers theory and applications by M.N.Avadhanulu and P.S. Hemne revised Edition 2012. S. Chand and Company Ltd -New Delhi.
3. Engineering Physics-Gaur and Gupta-Dhanpat Rai Publications-2017.
4. Concepts of Modern Physics-Arthur Beiser: 6th Ed;Tata McGraw Hill Edu Pvt Ltd- New Delhi 2006.
5. Fundamentals of Fibre Optics in Telecommunication & Sensor Systems, B.P. Pal, New Age International Publishers.
6. Introduction to Electrodynamics, David Griffith, 4th Edition, Cambridge University Press 2017.
7. Lasers and Non Linear Optics – B.B. Laud, 3rd Ed, New Age International Publishers 2011.
8. LASERS Principles, Types and Applications by K.R. Nambiar-New Age International Publishers.

Solid State Physics-S O Pillai, 8th Ed- New Age International Publishers-2018.

Web links and Video Lectures (e-Resources):

Laser:https://www.britannica.com/technology/laser,k
Laser:https://nptel.ac.in/courses/115/102/115102124/
Quantum mechanics:https://nptel.ac.in/courses/115/104/115104096/
Physics:http://hyperphysics.phy-astr.gsu.edu/hbase/hframe.html
Numerical Aperture of fiber:https://bop-iitk.vlabs.ac.in/exp/numerical-aperture-measurement

Activity Based Learning (Suggested Activities in Class)/ Practical Based learning

http://nptel.ac.in https://swayam.gov.in
https://www.vlab.co.in/participating-institute-amrita-vishwa-vidyapeetham
https://vlab.amrita.edu/index.php?sub=1&brch=189&sim=343&cnt=1
https://virtuallabs.merlot.org/vl_physics.html
https://phet.colorado.edu
https://www.myphysicslab.com

Laboratory Component:

Any Ten Experiments have to be completed from the list of experiments Note: The experiments have to be classified into

a) Exercise
b) Demonstration
c) Structured Inquiry
d) Open Ended

Based on the convenience classify the following experiments into above categories selecting at least three experiments for each type. Select at least one simulation/spreadsheet activity.

List of Experiments

1. Determination of wavelength of LASER using Diffraction Grating.
2. Determination of acceptance angle and numerical aperture of the given Optical Fiber.
3. Determination of Magnetic Flux Density at any point along the axis of a circular coil.
4. Determination of resistivity of a semiconductor by Four Probe Method
5. Study the I-V Characteristics of the Given Bipolar Junction Transistor.
6. Determination of dielectric constant of the material of capacitor by Charging and Discharging

method.

7. Study the Characteristics of a Photo-Diode and to determine the power responsivity/
8. Verification of Inverse Square Law of Intensity of Light.
9. Study the frequency response of Series & Parallel LCR circuits.
10. Determination of Plank's Constant using LEDs.
11. Determination of Fermi Energy of Copper.
12. Identification of circuit elements in a Black Box and determination of values of the components.
13. Determination of Energy gap of the given Semiconductor.
14. Step Interactive Physical Simulations.
15. Study of motion using spread Sheets
16. Study of Application of Statistics using spread sheets
17. PHET Interactive Simulations(https://phet.colorado.edu/en/simulations/filter?subjects=physics&type=html,prototype)

COs and POs Mapping (Individual teacher has to fill up)

COs	POs											
	1	**2**	**3**	**4**	**5**	**6**	**7**	8	9	10	11	12
CO1	**3**	**2**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**2**
CO2	**3**	**2**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**2**
CO3	**3**	**2**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**2**
CO4	**3**	**2**	**-**	**-**	**1**	**-**	**-**	**-**	**-**	**-**	**-**	**2**
CO5	**3**	**2**	**1**	**-**	**2**	**-**	**-**	**3**	**3**	**-**	**-**	**2**

Level 3- Highly Mapped, Level 2-Moderately Mapped, Level 1-Low Mapped,

Note : The CO-PO mapping values are indicative. The course coordinator can alter the mapping using **Competency and Performance Indicators** mentioned in the **AICTE Exam reforms.**

Course Title:	**Professional Writing Skills in English**		
Course Code:	BPWSK206-106	CIE Marks	50
Course Type (Theory/Practical /Integrated)	Theory	SEE Marks	50
		Total Marks	100
Teaching Hours/Week (L:T:P: S)	1:0:0:0	Exam Hours	01 Theory
Total Hours of Pedagogy	15 hours	Credits	01

Course objectives:

The course Professional Writing Skills in English (BPWSK206) will enable the students,

1. To Identify the Common Errors in Writing and Speaking of English.
2. To Achieve better Technical writing and Presentation skills for employment.
3. To read Technical proposals properly and make them to write good technical reports.
4. To Acquire Employment and Workplace communication skills.
5. To learn about Techniques of Information Transfer through presentation in different level.

Teaching-Learning Process

These are sample Strategies, which teacher can use to accelerate the attainment of the various course outcomes and make Teaching –Learning more effective: Teachers shall adopt suitable pedagogy for effective teaching - learning process. The pedagogy shall involve the combination of different methodologies which suit modern technological tools and software's to meet the present requirements of the Global employment market.

(i) Direct instructional method (Low/Old Technology), (ii) Flipped classrooms (High/advanced Technological tools), (iii) Blended learning (Combination of both), (iv) Enquiry and evaluation based learning,

(v) Personalized learning, (vi) Problems based learning through discussion, (vii) Following the method of expeditionary learning Tools and techniques, (viii) Use of audio visual methods through language Labs in teaching of of LSRW skills.

Apart from conventional lecture methods, various types of innovative teaching techniques through videos, animation films may be adapted so that the delivered lesson can progress the students In theoretical applied and practical skills in teaching of communicative skills in general.

Language Lab : To augment LSRW, grammar and Vocabulary skills (Listening, Speaking, Reading, Writing and Grammar, Vocabulary) through tests, activities, exercises etc., comprehensive web-based learning and assessment systems can be referred as per the AICTE / VTU guidelines.

Module-1 (03 hours of pedagogy)

Identifying Common Errors in Writing and Speaking English: Common errors identification in parts of speech, Use of verbs and phrasal verbs, Auxiliary verbs and their forms, Subject Verb Agreement (Concord Rules), Common errors

in Subject-verb agreement, Sequence of Tenses and errors identification in Tenses. Words Confused/Misused.

Module-2 (03 hours of pedagogy)

Nature and Style of sensible writing: Organizing Principles of Paragraphs in Documents, Writing Introduction and Conclusion, Importance of Proper Punctuation, Precise writing and Techniques in Essay writing, Sentence arrangements

and Corrections activities. Misplaced modifiers, Contractions, Collocations, Word Order, Errors due to the Confusion of words.

Module-3 (03 hours of pedagogy)

Technical Reading and Writing Practices: Technical writing process, Introduction to Technical Reports writing, Significance of Reports, Types of Reports. Introduction to Technical Proposals Writing, Types of Technical Proposals, Characteristics of Technical Proposals. Scientific Writing Process. Grammar – Voices and Reported Speech, Spotting Error & Sentence Improvement, Cloze Test and Theme Detection Exercises.

Module-4 (03 hours of pedagogy)

Professional Communication for Employment: Listening Comprehension, Types of Listening, Listening Barriers, Improving Listening Skills. Reading Comprehension, Tips for effective reading. Job Applications, Types of official/employment/business Letters, Resume vs. Bio Data, Profile, CV. Writing effective resume for employment, Emails,

Blog Writing and Memos.

Module-5 (03 hours of pedagogy)

Professional Communication at Workplace: Group Discussion and Professional Interviews, Characteristics and Strategies

of a GD and PI's, Intra and Interpersonal Communication Skills at workplace, Non-Verbal Communication Skills and its importance in GD and Interview. Presentation skills and Formal Presentations by Students, Strategies of Presentation Skills.

Course outcome (Course Skill Set)

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

CO1	To understand and identify the Common Errors in Writing and Speaking.
CO2	To Achieve better Technical writing and Presentation skills.
CO3	To read Technical proposals properly and make them to Write good technical reports.
CO4	Acquire Employment and Workplace communication skills.
CO5	To learn about Techniques of Information Transfer through presentation in different level.

Assessment Details (both CIE and SEE)

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

Continuous Internal Evaluation(CIE):

- Two Tests each of **25 Marks** and average of both the test will be taken. The test will be after the completion of the syllabus of 50% and 100% respectively.

  a) One Assignments and one quizzes/one seminars or b) one field survey and report presentation or c) one-course project with report totalling **25 Marks**.

Total Marks scored (Test + Assignments) will be for 25+25 = **50 Marks**

Semester End Examinations (SEE)

SEE paper shall be set for 50 questions, each of the 01 mark. The pattern of the question paper is MCQ (multiple choice questions). The time allotted for SEE is 01 hour. The student must secure a minimum of 35% of the maximum marks for SEE.

Suggested Learning Resources:

Textbook:

1) **"Professional Writing Skills in English"** published by Fillip Learning – Education (ILS), Bangalore – 2022.
2) **"Functional English"** (As per AICTE 2018 Model Curriculum) (ISBN-978-93-5350-047-4) Cengage learning India Pvt Limited [Latest Edition 2019].

Reference Books:

1) **English for Engineers** by N.P.Sudharshana and C.Savitha, Cambridge University Press – 2018.
2) **Technical Communication** by Gajendra Singh Chauhan and Et al, (ISBN-978-93-5350-050-4), Cengage learning India Pvt Limited [Latest Revised Edition] - 2019.
3) **Technical Communication** – Principles and Practice, Third Edition by Meenakshi Raman and Sangeetha Sharma, Oxford University Press 2017.
4) **High School English Grammar & Composition** by Wren and Martin, S Chandh & Company Ltd – 2015.

Effective Technical Communication – Second Edition by M Ashraf Rizvi, McGraw Hill Education (India) Private

Activity Based Learning (Suggested Activities in Class)/ Practical Based learning

- ✓ Contents related activities (Activity-based discussions)
- ✓ For active participation of students instruct the students to prepare Flowcharts and Handouts
- ✓ Organising Group wise discussions Connecting to placement activities
- ✓ Quizzes and Discussions, Seminars and assignments