RN SHETTY TRUST ®

RNS INSTITUTE OF TECHNOLOGY

Autonomous Institution affiliated to Visvesvaraya Technological University, Belagavi
Approved By AICTE, New Delhi. Accredited by NAAC 'A+' Grade
RR Nagar, Dr. Vishnuvardhan Road, Bengaluru - 560 098
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Dr. R N Shetty
Founder

ESTD.: 2001
An Institute with a Difference



25 RNSIT

DEPARTMENT OF ELECTRICAL & ELECTRONICS ENGINEERING

BACHELOR OF ENGINEERING

Scheme and Syllabus of III & IV Semesters

2025 SCHEME

www.rnsit.ac.in

Scheme and Syllabus
Batch 2025 – 2029
3rd and 4th Semesters

(As per NEP – 2020)
(Effective from the Academic year 2025 – 26)

About RNSIT

RNS Institute of Technology, familiar as RNSIT was established in the year 2001. It is the brainchild of Dr. R. N. Shetty, well known industrialist, and a great philanthropist. The institution was established with a sole purpose of imparting quality education in Engineering, Technology and Management. Being one of the premier engineering colleges in the country RNSIT is marching towards placing itself in the global map by excelling in academics and placements.

Lush green campus, state of the art infrastructure, well equipped laboratories, hundreds of activities, numerous new initiatives, consistent VTU ranks, path breaking placements, cultural extravaganza, Sports events, 4000 + students and 300 + faculty – with all these RNSIT has become dream destination for engineering aspirants across the country.

Founded by a great visionary Dr. R N Shetty, a renowned name in the industries viz construction, manufacturing, hotel, automobile, power & IT services, and education, RNSIT has been scripting history in the field of technical education. Right from its inception in the year 2001, the institution is showing exemplary growth with respect to academics, placements, sports and cultural activities. With 9 UG engineering branches, 4 PG courses and 9 R&D centres. RNSIT is aiming towards becoming the premier engineering institutes in the world.

Vision

Building RNSIT into a World Class Institution

Mission

To impart high quality education in Engineering, Technology and Management with a difference, enabling students to excel in their career by

- Attracting quality Students and preparing them with a strong foundation in fundamentals so as to achieve distinctions in various walks of life leading to outstanding contributions.
- Imparting value based, need based, choice based and skill based professional education to the aspiring youth and carving them into disciplined, World class Professionals with social responsibility.
- Promoting excellence in Teaching, Research and Consultancy that galvanizes academic consciousness among Faculty and Students.
- Exposing Students to emerging frontiers of knowledge in various domains and make them suitable for Industry, Entrepreneurship, Higher studies, and Research & Development.
- Providing freedom of action and choice for all the Stakeholders with better visibility.

About EEE Department

The Department of Electrical & Electronics Engineering at RNSIT was started in the year 2004 with a sanctioned intake of 60. The program is NBA accredited and the college is accredited by NAAC with an 'A+' grade. The department is headed by Dr. RoopaNayak who has specialized in the area of Industrial Drives, VLSI & Embedded System. The department has a total staff strength of 18, including teaching and non-teaching staff.

The well qualified and committed staff, along with the students of the department are working with the vision of making the department one of the best in India in both formal and non-formal education, and offering various research opportunities and services in Electrical Engineering over the next decade. The department provides an excellent learning environment supported by quality teaching with skilled faculty.

The students are well-trained with the support of the placement cell, subsequently paving the way for them in getting placed in top companies. The graduates have performed exceptionally well and achieved significant heights in their career prospects. The department has bagged a total of 13 VTU ranks (11 UG & 2 PG ranks) in VTU examinations till date.

The faculties of Electrical Engineering are involved in active research in the areas of Power Quality, Power System, Voltage Stability, Electric Drives, Power Electronics, Electric Vehicles and High Voltage Engineering. The focus of the department currently is to set up an R&D centre to enable teachers to work for their research purpose, along with undertaking industrial consultancy.

ESTD:2001
An Institute with a Difference

VISION

Pursuit of excellence in the field of Electrical & Electronics Engineering

MISSION

- To prepare students to achieve core competence and academic excellence.
- To provide necessary skills to design, develop and solve complex problem in the field of Electrical & Electronics Engineering and contribute to technological growth.
- To make them ethical professionals/entrepreneur capable of adapting to changes in technologies, and contribute to society.
- To support students to develop leadership qualities, self-learning abilities, communication skills and teamwork skills.

PROGRAM EDUCATIONAL OBJECTIVES (PEOs)

The Graduates of the Department shall

- **PEO 1** : have strong knowledge of core Electrical Engineering and Basic sciences to excel in their career
- **PEO 2:** be able to pursue career in multi-disciplinary areas involving core engineering subjects.
- **PEO 3** : have ability for lifelong learning, use modern tools, and contribute to Research and development in niche areas.
- **PEO 4 :** have positive attitude, good communication skills and professional ethics

PROGRAMSPECIFICOUTCOMES (PSOs)

The Graduates of the Department shall have the

- **PSO 1:** Ability to design, analyse, and model Electrical systems by applying the knowledge of Circuit Theory, Control Systems, Power Systems and Power Electronics.
- **PSO 2:** Ability to understand and apply latest technologies of Electrical Engineering to develop products useful for society and industry.
- **PSO 3:**Ability to provide eco friendly project solutions for Electrical Systems.

PROGRAM OUTCOMESREVISED (POs)

1. **PO1: Engineering Knowledge**: Apply knowledge of mathematics, natural science, computing, engineering fundamentals and an engineering specialization as specified in WK1 to WK4 respectively to develop to the solution of complex engineering problems.

2. **PO2: Problem Analysis**: Identify, formulate, review research literature and analyze complex engineering problems reaching substantiated conclusions with consideration for sustainable development. (WK1 to WK4)

3. **PO3: Design/Development of Solutions**: Design creative solutions for complex engineering problems and design/develop systems/components/processes to meet identified needs with consideration for the public health and safety, whole-life cost, net zero carbon, culture, society and environment as required. (WK5)

4. **PO4: Conduct Investigations of Complex Problems**: Conduct investigations of complex engineering problems using research-based knowledge including design of experiments, modelling, analysis & interpretation of data to provide valid conclusions. (WK8).

5. **PO5: Engineering Tool Usage**: Create, select and apply appropriate techniques, resources and modern engineering & IT tools, including prediction and modelling recognizing their limitations to solve complex engineering problems. (WK2 and WK6)

6. **PO6: The Engineer and The World**: Analyze and evaluate societal and environmental aspects while solving complex engineering problems for its impact on sustainability with reference to economy, health, safety, legal framework, culture and environment. (WK1, WK5, and WK7).

7. **PO7: Ethics**: Apply ethical principles and commit to professional ethics, human values, diversity and inclusion; adhere to national & international laws. (WK9)

8. **PO8: Individual and Collaborative Teamwork**: Function effectively as an individual, and as a member or leader in diverse/multi-disciplinary teams.

9. **PO9: Communication**: Communicate effectively and inclusively within the engineering community and society at large, such as being able to comprehend and write effective reports and design documentation, make effective presentations considering cultural, language, and learning differences

10. **PO10: Project Management and Finance**: Apply knowledge and understanding of engineering management principles and economic decision-making and apply these to one's own work, as a member and leader in a team, and to manage projects and in multidisciplinary environments.

11. **PO11: Life-Long Learning**: Recognize the need for and have the preparation and ability for i) independent and life-long learning ii) adaptability to new and emerging technologies and iii) critical thinking in the broadest context of technological change. (WK8)

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(Effective from the Academic Year 2025-26)

3rd SEMESTER

SL NO	COURSE	COURSE CODE	COURSE TITLE	TD/PSB		Teaching & Learning Scheme					Examination				CREDITS
						CI		LI	TW&SL	# TH/S	DURATION IN HOURS	CIE MARKS	SEE MARKS	TOTAL MARKS	
						L	T	P	SL						
1	ASC	25BEETH301	TRANSFORM CALCULUS AND PROBABILITY DISTRIBUTIONS	Mathematics		45	30	0	45	120	3	50	50	100	4
2	IPCC	25BEEIC302	ANALOG ELECTRONIC CIRCUITS	EEE		45	0	30	45	120	3	50	50	100	4
3	PCC	25BEETH303	ELECTRIC CIRCUIT ANALYSIS	EEE		45	30	0	45	120	3	50	50	100	4
4	PCC	25BEETH304	TRANSFORMERS AND GENERATORS	EEE		45	0	0	45	90	3	50	50	100	3
5	PCC	25BEETH305	DIGITAL LOGIC CIRCUITS	EEE		45	0	0	45	90	3	50	50	100	3
6	PCCL	25BEELB306	TRANSFORMERS AND GENERATORS LAB	EEE		0	0	30	00	30	3	50	50	100	1
7	AEC	25BEEAE307	* FROM THE LIST OF AEC LABS	EEE		0	0	30	00	30	3	50	50	100	1
8	SDC	25BCBPR308	Community Project (Project-Based Learning) / Societal Project	EEE		0	0	0	30	30	3	50	50	100	1
9	NCMC	25BNSSP309	National Service Scheme (NSS)	Campus	NSS coordinator	0	0	0	30	--	--	100	--	100	0
		25BPEDU309	Physical Education (PE) (Sports and Athletics)		Physical Education Director										
		25 BYOGA309	Yoga		Yoga Teacher										
		25BMUSK309	Music		Music Teacher										
									Total	**630**		**500**	**400**	**900**	**21**
10	NCMC	25BMADP310	ADDITIONAL MATHEMATICS -I	Mathematics		14	0	0	14	28	---	100	---	100	PP
									Total	**658**		**600**	**400**	**1000**	**21**
11	SKLAB	25BEESL001	Python for Electrical Engineering	EEE		0	0	30	0	30	3	50	50	100	1

ASC: Applied Science Course
PCC: Professional Core Course
PCCL: Professional Core Course laboratory
AEC: Ability Enhancement Course **SDC**: Skill Development Course,
NCMC: Non Credit Mandatory Course
IPCC: Integrated Professional Core Course (Refers to Professional Core Course Theory Integrated with practical of the same course)
CIE: Continuous Internal Evaluation
SEE: Semester End Evaluation.
L: Lecture, **T**: Tutorial, **P**: Practical
TW & SL: Term Work & Self Learning
 # TH/S: Total Hours per Semester
CI: Classroom Instruction
LI: Laboratory Instruction
PEC: Professional Elective Course
TD: Teaching Department
PSB: Question Paper Setting Board

ABILITY ENHANCEMENT COURSE (AEC)	
25BEEAE307A	**PYTHON PROGRAMMING LABORATORY**
25BEEAE307B	**MULTISM/PSPICE LAB FOR CIRCUIT ANALYSIS**
25BEEAE307C	**SCI LAB / MATLAB FOR ELECTRICAL AND ELECTRONIC MEASUREMENTS**
25BEEAE307D	**DIGITAL ELECTRONICS CIRCUITS LABORATORY**

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4th SEMESTER

SL NO	COURSE	COURSE CODE	COURSE TITLE	TD/PSB	Teaching & Learning Scheme					Examination				CREDITS
					CI		LI	TW&SL	# TH/S	DURATION IN HOURS	CIE MARKS	SEE MARKS	TOTAL MARKS	
					L	T	P	SL						
1	PCC	25BEETH401	ELECTRIC MOTORS	EEE	45	30	0	45	120	3	50	50	100	4
2	IPCC	25BEEIC402	MICROCONTROLLER & EMBEDDED SYSTEMS	EEE	45	0	30	45	120	3	50	50	100	4
3	PCC	25BEETH403	OP-AMP & LIC	EEE	45	30	0	45	120	3	50	50	100	4
4	PCC	25BEETH404	TRANSMISSION & DISTRIBUTION	EEE	45	30	0	45	120	3	50	50	100	4
5	PCCL	25BEELB405	ELECTRIC MOTORS LAB	EEE	0	0	30	00	30	3	50	50	100	1
6	AEC	25BEEAE406	* FROM THE LIST OF AEC LABS	EEE	0	0	30	00	30	3	50	50	100	1
7	BSC	25BFETH407	Biology for Engineers	Chemistry/Bio Tech	30	0	0	30	60	2	50	50	100	2
8	SDC	25BESPR408	Environmental Science Project	EEE	0	0	0	30	30	3	50	50	100	1
9	NCMC	25BNSSP409	National Service Scheme (NSS)	Campus 0	0	0	0	30	--	--	100	--	100	0
		25BPEDU409	Physical Education (PE) (Sports and Athletics)	Physical Education Director										
		25 BYOGA409	Yoga	Yoga Teacher										
		25BMUSK409	Music	Music Teacher										
								Total	**660**		**500**	**400**	**900**	**21**
10	NCMC	25BMADP410	ADDITIONAL MATHEMATICS - II	Mathematics	14	0	0	14	28	---	100	---	100	PP
								Total	**688**		**600**	**400**	**1000**	**21**
11	SKLAB	25BEESL002	Sill Lab - 2	EEE	0	0	30	0	30	3	50	50	100	1

ASC: Applied Science Course
PCC: Professional Core Course
PCCL: Professional Core Course laboratory
AEC: Ability Enhancement Course **SDC**: Skill Development Course,
NCMC: Non Credit Mandatory Course
IPCC: Integrated Professional Core Course (Refers to Professional Core Course Theory Integrated with practical of the same course)
CIE: Continuous Internal Evaluation
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L: Lecture, **T**: Tutorial, **P**: Practical
TW & SL: Term Work & Self Learning
 # TH/S: Total Hours per Semester
CI: Classroom Instruction
LI: Laboratory Instruction
PEC: Professional Elective Course
TD: Teaching Department
PSB: Question Paper Setting Board

ABILITY ENHANCEMENT COURSE (AEC)	
25BEEAE406A	ARDUINO & RASPBERRY PI BASED PROJECTS
25BEEAE406B	OP-AMP & LIC LABORATORY
25BEEAE406C	MATLAB FOR MACHINES
25BEEAE406D	JAVA PROGRAMMING LABORATORY

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III SEMESTER SUBJECTS

B.E. (EC / EE Engineering)
Outcome Based Education (OBE) and Choice Based Credit System (CBCS)
SEMESTER – III

Course Title:	**Transform Calculus and Probability Distributions**		
Course Code:	**25BEETH301**	**CIE MARKS**	**50**
L: T: P: SL	**45:30:0:45**	**SEE MARKS**	**50**
Credits:	**4**	**EXAM HOURS**	**3 Hours**

COURSE LEARNING OBJECTIVES:

The purpose of the course is to facilitate the learner to:

1. Learn to use Fourier series to represent periodical physical phenomena in engineering analysis.
2. Apply Fourier transforms techniques to transform functions from time domain to frequency domain and vice versa.
3. Apply Z transforms to solve difference equations.
4. Develop the knowledge of probability laws and distribution of discrete and continuous random variables.

Module 1: Fourier series **9 Hours**

Periodic functions, Dirichlet's condition. Importance of Fourier Series. Fourier series expansion of functions with period 2π and with arbitrary period: Rectangular wave, Half-wave rectifier, Rectangular pulse, Saw tooth wave. A word on Vector spaces. Half-range Fourier series. Practical harmonic analysis, variation of periodic current. Complex Fourier series. Limitations of Fourier Series.

Module 2: Fourier Transforms **9 Hours**

Importance of Fourier Transforms. Fourier Transforms from Fourier series - discussion. Fourier transforms, Fourier cosine and sine transforms, Inverse Fourier transforms, Inverse Fourier cosine and sine transforms. Fourier Transform from Fourier Series. Introduction to Discrete Fourier transform (DFT). Discussion of Limitations of Fourier Transforms and necessity of Wavelet Transforms.

Module 3: Z Transforms **9 Hours**

Definition, Z-transforms of basic sequences and standard functions. Properties: Linearity, scaling, damping and shifting. Initial and final value theorems. Inverse Z- transforms. Application to solve difference equations.

Module 4: Introduction to Probability **9 Hours**

Probability of an event, empirical and axiomatic definition, probability associated with set theory, addition law, conditional probability, multiplication law, Bayes' theorem. Application: Naive Bayes classifier.

Module 5: Probability Distributions **9 Hours**

Random variables (discrete and continuous), probability mass/density function, Binomial distribution, Poisson distribution, exponential distribution and normal distribution. (Derivation of Mean and Standard Deviation for Binomial and Poisson distributions only)

COURSE OUTCOMES:

After successfully completing the course, the student will be able to:

CO1	Apply Fourier series techniques to express periodic waveforms—such as rectangular, saw tooth, and half-wave rectified signals—in both standard and half-range functional domains.
CO2	Determine the Fourier, sine, and cosine transforms (and their inverses) for continuous signals, and compute discrete Fourier transforms (DFT) for digital signal representations.
CO3	Solve linear difference equations by applying the properties, theorems, and inverse operations of the Z-transform to discrete-time sequences.
CO4	Calculate probabilistic relationships among events and evaluate classification outcomes using the Naïve Bayes algorithm.
CO5	Determine real-world probabilistic scenarios by categorizing random variables and executing calculations using Binomial, Poisson, and exponential probability distributions.

ASSESSMENT DETAILS (Both CIE and SEE)

Assessment Type	**Maximum Marks**	**Minimum Passing Marks**	**Evaluation Details**
CIE – IA Tests (A)	30	-	Two tests each of 50 marks shall be conducted. Average of Two Internal Assessment Tests shall be scaled down to 30 marks.
Continuous and Comprehensive Evaluation (B)	20	-	Any two Assessment methods as per 24RNBE4.2 (*if it is project based, one assignment shall be given), scaled to 20 marks.
Total CIE (A+B)	**50**	**20**	**CIE Evaluation is done for a maximum of 50 marks**
SEE (C)	**50**	**18**	**SEE is a theory exam conducted for 100 marks and scaled down to 50 marks. Exam duration shall be for 3 hours.**
CIE + SEE (A+B+C)	**100**	**40**	Final marks shall be the sum of marks scored in Components **A, B and C.**

- The minimum marks to be secured in CIE is 20 (40%) out of allotted 50 marks to appear for SEE.
- **If any courses of 3 credits are of Integrated Course type, for such courses the method suggested for 4 credits IPCC shall be followed.**

Text Books:

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

Reference Books:

1. **B.V. Ramana,** "Higher Engineering Mathematics" McGraw-Hill Education, 11thEd., 2017
2. **N.P Bali and Manish Goyal**, "A Textbook of Engineering Mathematics" Laxmi Publications, 10thEd., 2022
3. **H.K. Dass and Er. Rajnish Verma,** "Higher Engineering Mathematics" S. Chand Publication, 3rdEd., 2014

Web links and Video Lectures (e-Resources):

1. https://onlinecourses.nptel.ac.in/e-learning/preview/noc26_ma120
2. https://onlinecourses.nptel.ac.in/e-learning/preview/noc26_ma107

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B.E (Electrical & Electronics Engineering) Outcome Based Education(OBE) and Choice Based Credit System(CBCS) SEMESTER – III			
Course Title:	**Analog Electronic Circuits**		
Course Code:	**25BEEIC302**	**CIE MARKS**	**50**
L:T:P:SL	**45:0:30:45**	**SEE MARKS**	**50**
Credits:	**4**	**EXAM HOURS**	**3**

COURSE LEARNING OBJECTIVES:

The purpose of the course is to facilitate the learner to:

1. Provide the knowledge for the analysis of transistor biasing and thermal stability circuits
2. Develop skills to design the electronic circuits like amplifiers, power amplifiers and oscillators
3. Understand the importance of FET and MOSFET and FET/MOSFET amplifiers

Module-1 **9 Hours**

Transistor Biasing and Stabilization: The operating point, load line analysis, DC analysis and design of voltage divider bias circuit and modified DC bias with voltage feedback. Bias stabilization and stability factors for voltage divider and collector to base bias circuit. Transistor switching circuits.

Small Signal Modeling of Transistor: Hybrid model, h-parameters for CE, CC and CB modes, analysis for voltage divider bias and collector to base bias circuit (bypassed and un bypassed R_E) using hybrid parameter model**.**

Module-2 **9 Hours**

Transistor frequency response: General frequency considerations, Low frequency response of BJT amplifier, Miller effect capacitance, high frequency response of BJT amplifier, multistage frequency effects.

Power Amplifiers: Classification of power amplifiers, Analysis of class A, Class B, class C and Class AB amplifiers, Distortion in power amplifiers, second harmonic distortion, harmonic distortion in Class B amplifiers.

Module-3 **9 Hours**

Feedback Amplifiers: Concept of feedback, Classification of feedback amplifiers, general characteristics of negative feedback amplifiers, Input and output resistance with feedback of various feedback amplifiers

Oscillators: Concept of positive feedback, RC phase shift oscillator, Wien Bridge oscillator, Hartley oscillator, Colpitt's oscillator and crystal oscillator

Module-4 **9 Hours**

Multistage Amplifiers: Cascaded systems, cascode connection, Darlington Connections

FETs: Differences between BJT & FET, Construction and characteristics JFET, Depletion MOSFET and Enhancement MOSFET. Voltage divider biasing of JFET and Depletion MOSFET, Feedback biasing and voltage divider biasing of Enhancement MOSFET.

Module-5	**9 Hours**
Small Signal Model of FETs: Small signal model of JFET, gain, input impedance and output impedance of common source JFET amplifier using voltage divider bias. Small signal model of depletion type MOSFET and Enhancement type MOSFET, gain, input impedance and output impedance of E-MOSFET drain feedback configuration and voltage divider configuration, Designing FET amplifier Networks.	
Practical Component of IPCC	
Sl No.	**Experiment**
1.	a) Design, and Testing of Full wave – centre tapped transformer type and Bridge type rectifier circuits with and without Capacitor filter. Determination of ripple factor, regulation and efficiency. (b) Design and simulation of Full wave – centre tapped transformer type and Bridge type rectifier circuits with and without Capacitor filter using PSPICE. Determination of ripple factor, regulation and efficiency.
2.	(a)Frequency response of single stage BJT RC coupled amplifier and determination of half power points, bandwidth, input and output impedances. (b) Frequency response of a single stage FET RC coupled amplifier and determination of half power points, bandwidth, input and output impedances.
3.	Design and testing series, shunt and double ended clipper circuits
4.	Design and testing of positive and negative clamper
5.	(a) Design and testing of BJT -RC phase sift oscillator for given frequency of oscillation. (b)Design and simulation of BJT RC Phase shift oscillator for given frequency of oscillations using PSPICE.
6.	Design and testing of Hartley oscillator for given frequency of oscillation
7.	Design and testing of Colpitt's oscillator for given frequency of oscillation
8.	Design and testing of crystal oscillator for given frequency of oscillations
9.	Determination of gain, input and output impedance of BJT Darlington emitter follower with and without bootstrapping.
10.	Design and testing of Class B power amplifier and to determine conversion efficiency.

COURSE OUTCOMES:

After successfully completing the course, the student will be able to:

CO1	Design and analyse biasing circuits of BJT and FET
CO2	Design and analyse amplifiers using BJT and FET
CO3	Understand the concept of negative feedback, positive feedback and working of oscillators
CO4	Design and analyse rectifiers, clippers and clamper circuits using diode

ASSESSMENT DETAILS (Both CIE and SEE)

Assessment Type	Maximum Marks	Minimum Passing Marks	Evaluation Details
CIE- IA Tests (A)	20	-	Two tests each of 50 marks shall be conducted. Average of Two Internal Assessment Tests shall be scaled down to 20 marks.
Continuous and Comprehensive Evaluation (B)	10	-	Any one Assessment methods as per 24RNBE4.2 scaled to 10 marks.
Total CIE Theory (A+B)	**30**	**12**	**Marks of Tests and Assignments awarded for a maximum of 30.**
CIE Practical	12	-	Marks awarded for Weekly Conduction of Experiments and Submission of Laboratory records, scaled to 12 marks.
CIE Practical Test	8	-	Average of marks of Two tests, each conducted for 100 marks covering all experiments, scaled to 8.
Total CIE Practical (C)	**20**	**8**	**Marks of Experiments, Record and Test awarded for a maximum of 20 marks.**
CIE: Theory + Practical (A + B + C)	**50**	**20**	**CIE Evaluation is done for a maximum of 50 marks.**
SEE (D)	**50**	**18**	**SEE is a theory exam, conducted for 100 marks and scaled down to 50 marks. Exam duration shall be for 3 hours.**
CIE+SEE (A+B+C+D)	**100**	**40**	**Final marks shall be the sum of marks scored in Components A, B, C and D**

- The minimum marks to be secured in CIE is 20 (40%) out of allotted 50 marks to appear for SEE. The laboratory component of the IPCC shall be for CIE only. However, in SEE, the questions from the laboratory component shall be included in their respective modules only.

Question Paper for SEE for IPCC

Theory SEE will be conducted by the college as per the scheduled time table, with common question papers for the course (duration **03**hours)

1. The question paper will have 10 questions with a choice between every pair of questions set for each module. Each question is set for 20 Marks.
2. There will be 2 questions from each module. Each of the 2 questions under a module (with a maximum of 3 sub-questions), **should have a mix of topics** under that module.
3. The students have to answer 5 full questions, selecting one full question from each module.
4. Marks scored by the student shall be proportionately scaled down to 50 Marks
5. The number of question papers set shall be four, out of which two shall be from Internal and remaining two shall be from external examiners.

The theory portion of IPCC shall be for both CIE and SEE

Suggested Learning Resources:

Text Books

1. Electronic Devices and Circuit Theory, Robert L Boylestad Louis Nashelsky, Pearson, 11th Edition, 2015
2. Electronic Devices and Circuits, Millman and Halkias, McGraw Hill, 4th Edition, 2015
3. Electronic Devices and Circuits, David A Bell, Oxford University Press, 5th Edition, 2008

Reference Books

1. Microelectronics Circuits Analysis and Design, Muhammad Rashid, Cengage Learning, 2nd Edition, 2014
2. A Text Book of Electrical Technology, Electronic Devices and Circuits, B.L. Theraja, A.K. Theraja, S. Chand, Reprint, 2013
3. Electronic Devices and Circuits, Anil K. Maini, ,VashaAgarval, Wiley, 1st Edition, 2009
4. Electronic Devices and Circuits, S. Salivahanan, Suresh, McGraw Hill, 3rd Edition, 2013

B.E. (Electrical and Electronics Engineering) Outcome Based Education(OBE) and Choice Based Credit System(CBCS) SEMESTER – III			
Course Title	**Electric Circuit Analysis**		
Course Code	**25BEETH303**	**CIE Marks**	**50**
L:T:P:SL	**45:30:0:45**	**SEE Marks**	**50**
Credits	**04**	**Exam Hours**	**03**

COURSE LEARNING OBJECTIVES: The purpose of the course is to facilitate the learner

- To familiarize the basic laws, source transformations, and the various methods of analyzing electrical circuits.
- To explain the use of network theorems to solve electric circuits.
- To understand the concept of resonance in series and parallel electric circuits.
- To explain the importance of initial conditions, their evaluation and transient analysis of R-L and R-C circuits.
- To impart basic knowledge on network analysis using Laplace transforms.
- To familiarize the analysis of three-phase circuits.
- To evaluate the parameters of two port networks.

MODULE – 1 **9 Hours**

Basic Concepts: Active and passive elements, Concept of ideal and practical sources. Source transformation and source shifting. (Only Concepts), Star – Delta transformation. Analysis of networks by loop analysis and Nodal analysis methods for AC and DC circuits with independent sources. Super-Mesh and Super node analysis.

MODULE – 2 **9 Hours**

Network Theorems: Super Position theorem, Millman's theorem, Thevenin's theorem, Norton's theorem, and Maximum power transfer theorem. (Problems with independent AC and DC sources only).

MODULE – 3 **9 Hours**

Resonant Circuits: Analysis of simple series RLC and parallel RLC circuits under resonances. Problems on Resonant frequency, Bandwidth and Quality factor at resonance.

Transient Analysis: Behavior of circuit elements under switching action, Evaluation of initial conditions. Transient analysis of RL and RC circuits under DC excitations.

MODULE – 4 **9 Hours**

Laplace Transformation: Laplace transformation of step, ramp, impulse and sinusoidal functions, Initial and Final value theorems. Solution of RL and RC using LT for DC excitation, LT of periodic functions.

MODULE – 5 **9 Hours**

Unbalanced Three Phase Systems: Analysis of three phase unbalanced systems of balanced three phase supply. Evaluation of active and reactive powers.

Two Port networks:, Open circuit impedance, Short circuit admittance and Transmission parameters and their evaluation for simple circuits. (excluding relationship between two port parameters)

COURSE OUTCOMES:

After successfully completing the course, the student will be able to:

CO1	Apply basic laws and network reduction techniques to solve complex electric circuits.
CO2	Apply network theorems to solve complex electric circuits..
CO3	Analyze series and parallel electric circuits under resonant condition and to analyze behavior of the electric circuit with given initial conditions.
CO4	Apply Laplace Transformation to study the performance of electric circuits.
CO5	Solve unbalanced three phase systems and also to evaluate the parameters of two port networks.

ASSESSMENT DETAILS (Both CIE and SEE)

Assessment Type	**Maximum Marks**	**Minimum Passing Marks**	**Evaluation Details**
CIE – IA Tests (A)	30	-	Two tests each of 50 marks shall be conducted. Average of Two Internal Assessment Tests shall be scaled down to 30 marks.
Continuous and Comprehensive Evaluation (B)	20	-	Any two Assessment methods as per 24RNBE4.2 (*if it is project based, one assignment shall be given), scaled to 20 marks.
Total CIE (A+B)	**50**	**20**	**CIE Evaluation is done for a maximum of 50 marks**
SEE (C)	**50**	**18**	**SEE is a theory exam conducted for 100 marks and scaled down to 50 marks. Exam duration shall be for 3 hours.**
CIE + SEE (A+B+C)	**100**	**40**	Final marks shall be the sum of marks scored in Components **A, B and C.**

- The minimum marks to be secured in CIE is 20 (40%) out of allotted 50 marks to appear for SEE.

Suggested Learning Resources:

Text Books :

1. Engineering Circuit Analysis, William H Hayt et al, McGraw Hill,8th Edition,2014.
2. Network Analysis, M.E. Vanvalkenburg, Pearson, 3rd Edition,2014.
3. Fundamentals of Electric Circuits, Charles K Alexander Matthew N O Sadiku, McGraw Hill, 5th Edition, 2013.

Reference Books :

1. Engineering Circuit Analysis, J David Erwin et al, Wiley India, ,10th Edition,2014.
2. Electric Circuits, Mahmood Nahvi, McGraw Hill, 5th Edition,2009.

Web links and Video Lectures (e-Resources):
www.nptel.ac.in

RNS INSTITUTE OF TECHNOLOGY
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B.E. (Electrical & Electronics Engineering) Outcome Based Education (OBE) and Choice Based Credit System (CBCS) SEMESTER – III			
Course Title:	**Transformers and Generators**		
Course Code:	**25BEETH304**	**CIE MARKS**	**50**
L:T:P:SL	**45:0:0:45**	**SEE MARKS**	**50**
Credits:	**03**	**EXAM HOURS**	**03**

COURSE LEARNING OBJECTIVES:

The purpose of the course is to facilitate the learner to:

1. To understand the construction, working and various tests of Single phase Transformer.
2. To illustrate the construction, working and parallel operation of Three phase Transformer.
3. To demonstrate the construction, working and analysis of Synchronous Generator.
4. To summarize the construction and working of DC generators.

Module-1 **9 Hours**

Single-phase Transformers: Introduction , Transformer Construction and practical considerations , Ideal Transformer, Transformer on No-Load, Practical Transformer and Equivalent Circuit, Phasor diagrams under No-Load and ON-Load, Transformer Losses, Efficiency, Condition for maximum efficiency, voltage regulation, Introduction to distribution transformer, all-day efficiency. Numerical.

Transformer Testing: Polarity test, Open circuit and short circuit tests, Sumpner's test, Separtion of core losses in a transformer - Numerical.

Module-2 **9 Hours**

Parallel Operation of Single-phase Transformers: Necessity of Parallel operation, conditions for parallel operation of transformers. Load sharing in case of similar and dissimilar transformers. Numerical.

Three-phase Transformers: Introduction, Constructional features of three-phase transformers. Numerical

Three-phase transformer connections – star/star, delta/delta, delta/star and star/delta, comparative features. Choice between star and delta connections, Three-phase transformer groups. Parallel operation of three phase transformers. Numerical.

Auto transformers and Tap changing transformers: Introduction to autotransformer, comparison with two winding transformer, copper economy. No load and on load tap changing transformers. Numerical

Module-3 **9 Hours**

DC generators : Construction of a DC machine, Working principle EMF equation, types and applications, Numerical

Synchronous Generators: Construction, working, Armature windings, winding factor, Rating of alternators, EMF equation,, Armature reaction, Synchronous reactance, Equivalent circuit, Harmonics–causes, reduction and elimination. Numerical

Module-4 **9 Hours**

Synchronous Generators Analysis: Open circuit and short circuit characteristics, Assessment of reactance-short circuit ratio, Alternator on load. Voltage regulation by EMF and MMF methods. Load characteristics Numerical.

Module-5	**9 Hours**
Salient Pole Generators : Effects of saliency, two-reaction theory, Parallel operation of generators and load sharing. Determination of Xd and Xq by slip test, Methods of Synchronization, Synchronizing power. **Performance of Synchronous Generators:** :Power angle characteristics, capability curves of synchronous generators, Hunting and damper windings. Numerical	

COURSE OUTCOMES:

After successfully completing the course, the student will be able to:

CO1	Explain the construction, working and various tests of single phase Transformer.
CO2	Demonstrate the construction, working and parallel operation of three phase transformer.
CO3	Illustrate the construction, working and analysis of Synchronous Generator.
CO4	Analyse the performance of alternator.
CO5	Understand the construction and working of DC generator

ASSESSMENT DETAILS (Both CIE and SEE)

Assessment Type	**Maximum Marks**	**Minimum Passing Marks**	**Evaluation Details**
CIE – IA Tests (A)	30	-	Two tests each of 50 marks shall be conducted. Average of Two Internal Assessment Tests shall be scaled down to 30 marks.
Continuous and Comprehensive Evaluation (B)	20	-	Any two Assessment methods as per 24RNBE4.2 (*if it is project based, one assignment shall be given), scaled to 20 marks.
Total CIE (A+B)	**50**	**20**	**CIE Evaluation is done for a maximum of 50 marks**

SEE (C)	**50**	**18**	**SEE is a theory exam conducted for 100 marks and scaled down to 50 marks. Exam duration shall be for 3 hours.**
CIE + SEE **(A+B+C)**	**100**	**40**	Final marks shall be the sum of marks scored in Components **A, B and C.**
• The minimum marks to be secured in CIE is 20 (40%) out of allotted 50 marks to appear for SEE.			

Suggested Learning Resources:

Text Books :

1. Electric Machines, D. P. Kothari, I J Nagrath et al, 4th Edition, 2011.
2. Electric Machines, Ashfaq Hussain, Dhanpat Rai & Co, 2nd Edition, 2013.
3. Electrical Machinery by Dr. P. S .Bimbhra, 7th Edition, 2004

Reference Books:

1. Electric Machines, Mulukuntla S. Sarma, at el, Cengage, 1st Edition, 2009.
2. Electrical Machines, Drives and Power systems, Theodore Wildi, Pearson, 6th Edition, 2014.
3. Principals of Electrical Machines, V.K Mehta, Rohit Mehta, S Chand, 2nd edition, 2009
4. Theory and performance of Electrical Machines by J B Gupta, 14th Edition 2013

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B.E. (Electrical and Electronics Engineering) Outcome Based Education (OBE) and Choice Based Credit System (CBCS) SEMESTER – III			
Course Title	**Digital Logic Circuits**		
Course Code	**25BEETH305**	**CIE MARKS**	**50**
L:T:P:SL	**45:0:0:45**	**SEE MARKS**	**50**
Credits	**03**	**EXAM HOURS**	**03**

COURSE LEARNING OBJECTIVES:

The purpose of the course is to facilitate the learner to:

1. To illustrate simplification of algebraic equations using Karnaugh Maps.
2. To design decoders,encoders,digitalmultiplexer,adders,subtractorsandbinarycomparators.
3. To explain latches and flip-flops, registers and counters.
4. To analyze Mealy and Moore Models.
5. To develop state diagrams synchronous sequential circuits.
6. To understand the applications of sequential circuits.

Module – 1 **9 Hours**

Principles of Combinational Logic: Introduction to Basic gates, Definition of combinational logic, canonical forms, Generation of switching equations from truth tables, Karnaugh maps-3,4,5 variables, Incompletely specified functions (Don‘t care terms) Simplifying Max term equations, Quine-McCluskey minimization technique, Quine- McCluskey using don‘t care terms, Reduced prime implicants Tables.

Module – 2 **9 Hours**

Analysis and Design of Combinational logic: General approach to combinational logic design, Decoders, BCD decoders, Encoders, digital multiplexers, Using multiplexers as Boolean function generators, Adders and subtractors, Cascading full adders, Look ahead carry, Binary comparators.

Module – 3 **9 Hours**

Flip-Flops: Basic Bistable elements, Latches, Timing considerations, The master-slave flip-flops (pulse triggered flip-flops):SR flip-flops, JK flip-flops, Edge triggered flip- flops, Characteristic equations.

Module – 4 **9 Hours**

Flip-Flops Applications: Registers, binary ripple counters, synchronous binary counters, Counters based on shift registers, Design of asynchronous counter, Design of asynchronous mod-n counter using clocked T, JK, D and SR flip-flops.

Module – 5 **9 Hours**

Sequential Circuit Design: Mealy and Moore models, State machine notation, Synchronous Sequential circuit analysis, Construction of state diagrams, counter design. Memories: Read only and Read/Write Memories, Programmable ROM, EPROM, Flash memory.

Course outcomes :

After successfully completing the course, the student will be able to:

CO1	Understand the basics of combinational logic and simplify Boolean expressions using Karnaugh maps.
CO2	Design and analyze combinational circuits like decoders, encoders, multiplexers, adders, and comparators
CO3	Explain the operation of flip-flops and latches, and derive their characteristic equations.
CO4	Design and implement counters and registers using flip-flops
CO5	Analyze and design synchronous sequential circuits and understand memory types like ROM, PROM, and Flash memory.

ASSESSMENT DETAILS (Both CIE and SEE)

Continuous Internal Evaluation (CIE):

Assessment Type	Maximum Marks	Minimum Passing Marks	Evaluation Details
CIE – IA Tests (A)	30	-	Two tests each of 50 marks shall be conducted. Average of Two Internal Assessment Tests shall be scaled down to 30 marks.
Continuous and Comprehensive Evaluation (B)	20	-	Any two Assessment methods as per 24RNBE4.2 (*if it is project based, one assignment shall be given), scaled to 20 marks.
Total CIE (A+B)	**50**	**20**	**CIE Evaluation is done for a maximum of 50 marks**
SEE (C)	**50**	**18**	**SEE is a theory exam conducted for 100 marks and scaled down to 50 marks. Exam duration shall be for 3 hours.**
CIE + SEE (A+B+C)	**100**	**40**	Final marks shall be the sum of marks scored in Components **A, B and C.**

- The minimum marks to be secured in CIE is 20 (40%) out of allotted 50 marks to appear for SEE.

Suggested Learning Resources:

Text Books

1) Donald D Givone, Digital Principles and design, MC Graw Hill 2002
2) Charles H Roth Jr, Larry L Kinney, Fundamentals of logic design, Cengage Learning, 7th Edition
3) John M Yarbrough, Digital logic applications and design, Thomson Learning, 2001.

Reference books:

1) D.P.Kothari and J S Dhillon, -Digital circuits and design, Pearson, 2016
2) Morris Mano, Digital Design, PHI, 3rd edition
3] K.A. Navas, Electronics Lab Manual, Vol.1, PHI 5th edition, 2015.

Web links and Video Lectures (e-Resources):

- https://onlinecourses.nptel.ac.in/noc20_ee32/preview
- National Instruments: https://education.ni.com/teach/resources/1104/digital-electronics

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B.E. (Electrical and Electronics Engineering) Outcome Based Education (OBE) and Choice Based Credit System (CBCS) SEMESTER – III			
Course Title	**Transformers and Generators Lab**		
Course Code	**25BEELB306**	**CIE Marks**	**50**
L:T:P:SL	**0:0:30:0**	**SEE Marks**	**50**
Credits	**01**	**Exam Hours**	**03**

COURSELEARNINGOBJECTIVES: The purpose of the course is to facilitate the learner

- To conduct various tests on transformers and synchronous machines and evaluate their performance.
- To perform the parallel operation on two single phase transformers.
- To study and verify the performance of synchronous generator.
- To calculate the voltage regulation of an alternator using different methods for comparison.

SLNO	Experiments
1	Open Circuit and Short circuit tests on single phase step up or step down transformer and pre- determination of (i) Efficiency and regulation (ii) Calculation of parameters for equivalent circuit.
2	Sumpner's test on similar transformers and determination of individual transformer efficiency.
3	Parallel operation of two dissimilar single-phase transformers of different kVA and determination of load.
4	Polarity test and connection of 3 single-phase transformers in star – delta and determination of efficiency and regulation under balanced resistive load.
5	Separation of hysteresis and eddy current losses in single phase transformer.
6	Load test on single phase multi-tapped Transformer (a) To investigate the voltage and current ratios (b) To determine the efficiency.
7	Voltage regulation of an alternator by EMF and MMF methods.
8	Load test on DC Shunt Generator
9	Performance of synchronous generator connected to infinite bus, under constant power and variable excitation & vice - versa.
10	Direct load test on three phase synchronous generator to determine efficiency and regulation.
11	Model transformer in Simscape for Automatic Voltage Regulation.
12	Simulate power angle curve of generator in MATLAB.

COURSE OUTCOMES:

After successfully completing the course, the student will be able to:

COURSE OUTCOMES: At the end of the course the student will be able to	
CO1	Make use of the test data obtained from various tests on transformers to analyze the performance of transformers.
CO2	Examine the sharing of load when two single phase transformers of different kVA rating connected in parallel.
CO3	Compare the efficiency by connecting three single phase transformers for three phase conversion and operation for different cases.
CO4	Analyze the voltage regulation of synchronous generator by different methods.
CO5	Assess the performance of synchronous generator connected to infinite bus.

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 marks). A student shall be deemed to have satisfied the academic requirements and earned the credits allotted to each course if the student secures 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):

Assessment Type	**Maximum Marks**	**Minimum Passing Marks**	**Evaluation Details**
CIE Practical (A)	30	-	Marks awarded for Weekly Conduction of Experiments and Submission of Laboratory records, scaled to 30 marks.
CIE Practical Test (B)	20	-	Average of marks of Two tests, each conducted for 100 marks covering all experiments, scaled to 20.
Total CIE Practical (A+B)	**50**	**20**	**Sum of Marks of Experiments, Record and Test shall be CIE marks awarded for a maximum of 50.**

SEE (C)	**50**	**20**	**SEE is a lab exam, conducted for 100 marks and scaled down to 50 marks. Exam duration shall be for 3 hours.**
CIE + SEE (A+B+C)	**100**	**40**	Final marks shall be the sum of marks scored in Components **A, B and C.**
• The minimum marks to be secured in CIE is 20 (40%) out of allotted 50 marks to appear for SEE.			

Continuous Internal Evaluation (CIE):

- CIE marks for the practical course is 50 Marks.
- The split-up of CIE marks for record/ journal and test are in the ratio 60:40.
- Each experiment to be evaluated for conduction with observation sheet and record write-up. Rubrics for the evaluation of the journal/write-up, conduction of experiments by the faculty who is handling the laboratory session and is made known to students at the beginning of the practical session.
- Marks awarded for weekly conduction of experiments and submission of laboratory records evaluated for 30 marks.
- Record should contain all the specified experiments in the syllabus.
- Total marks scored by the students are scaled down to 30 marks (60% of maximum marks).
- Weightage to be given for neatness and submission of record/write-up on time.
- Department shall conduct 02 tests, each for 100 marks, the first test shall be conducted after the 8th week of the semester and the second test shall be conducted after the 14th week of the semester.
- In each test, write-up, procedural knowledge, conduction of experiments and acceptable result will carry a weightage of 80% and the rest 20% for viva-voce.
- The suitable rubrics can be designed to evaluate each student's performance and learning ability.
- The average of 02 tests is scaled down to 20 marks (40% of maximum marks).
- The Sum of scaled-down marks scored in the report write-up/journal and average marks of two tests is thetotal CIE marks scored by the student.
- The minimum marks to be scored in CIE are 20 out of allotted 50 marks to appear for SEE, with minimum of 40% scored in every component of CIE.

Semester End Evaluation (SEE):

- SEE marks for the practical course is 50 Marks.
  All laboratory experiments are to be included for practical examination.
- Break up (Rubrics) of marks strictly adhered to by the examiners.
- Students can pick up one question (experiment) from the questions lot prepared by the internal/external examiners jointly.
- Evaluation of test write-up, conduction procedure, result and viva-voce will be conducted jointly by examiners. General rubrics suggested for SEE are, for write-up-20%, procedure, conduction and result – 60%, viva-voce-20% of maximum marks.
- SEE for practical shall be evaluated for 100 marks and scored marks shall be scaled down to 50 marks. (However, based upon course type, rubrics shall be decided by the examiners).
- Change of experiment is allowed only once and 20% marks allotted to the procedure part to be made zero.
- The duration of SEE is 03 hours.

Web links and Video Lectures (e-Resources):
www.nptel.ac.in

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B.E. (Electrical and Electronics Engineering)
Outcome Based Education (OBE) and Choice Based Credit System (CBCS)
SEMESTER – III

Course Title	**Python Programming Laboratory**		
Course Code	**25BEEAE307A**	**CIE MARKS**	**50**
L:T:P:SL	**0:0:30:0**	**SEE MARKS**	**50**
Credits	**01**	**EXAM HOURS**	**03**

COURSE LEARNING OBJECTIVES:

The purpose of the course is to facilitate the learner to:

1. Understand the fundamentals of Python programming, including syntax, data types, operators, control flow statements, functions, exception handling, and object-oriented programming concepts.
2. Develop Python programs using decision-making, looping constructs, functions, strings, lists, tuples, and dictionaries to solve engineering and real-world problems.
3. Apply file handling techniques, exception handling mechanisms, and standard Python modules for efficient data processing and automation tasks.
4. Implement object-oriented programming concepts such as classes, objects, inheritance, and methods to develop modular Python applications.
5. Demonstrate the use of scientific computing libraries such as NumPy for numerical data representation and analysis.
6. Enhance problem-solving and logical thinking skills by designing, coding, testing, and debugging Python programs for engineering application

Sl. No.	Introduction to Python Programming
	History of Python Programming Language, Installing Python Programming Language Parts of Python Programming Language: Identifiers, Keywords, Statements and Expressions, Variables, Operators, Precedence, Data Types, Indentation, Comments, Reading Input, Print Output, Type Conversions, the type ( ) Function and Is Operator Control Flow Statements: if statement, if-else statement, if...elif...else, Nested if statement, while Loop, for Loop, continue and break Statements, Catching Exceptions Using try and except Statement.
	Experiments
1	Write a program to demonstrate the following Operators in Python with suitable example for each (i) Arithmetic Operators ii) Relational Operators iii) Assignment Operators iv) Logical Operators v) Bit wise Operators vi) Ternary Operator vii) Membership Operators viii) Identity Operators
2	(a) Write a program to find the largest element among three given numbers. (b) Write a program to print multiplication table of a given number.
3	(a) Write a program to read the student details like Name, USN, and Marks in three subjects. Display the student details, total marks and percentage with suitable messages. (b) Write a program to read the name and year of birth of a person. Display whether the person is a senior citizen or not

4	(a) Write a program to find the length of the string without using any library functions. (b) Write a program to perform the given operations on a list: i. Addition ii. Insertion iii. Slicing
5	(a) Write a function named DivExp which takes TWO parameters a, b and returns a value c (c=a/b). Write suitable assertion for a>0 in function DivExp and raise an exception for when b=0. (b) Develop a suitable program which reads two values from the console and calls a function DivExp.
6	(a) Write a program to create tuples (name, age, address, college) for at least two members and concatenate the tuples and print the concatenated tuples. (b) Write a program to add a new key-value pair to an existing dictionary.
7	(a) Develop a program to print 10 most frequently appearing words in a text file. (b) Develop a program to sort the contents of a text file and write the sorted contents into a separate text file.
8	(a) Develop a program to backing Up a given Folder (Folder in a current working directory) into a ZIP File by using relevant modules and suitable methods. (b) Develop a program to demonstrate the path handling cpapbility of python using os.walk() function.
9	Write a program to create a class that represents a shape. Include methods to calculate its area and perimeter. Implement subclasses for different shapes like circle, triangle, and square.
10	(a) Write a program to demonstrate NumPy arrays creation using array ( ) function. (b) Write a program to demonstrate use of ndim, shape, size, dtype.

COURSE OUTCOMES:

After successfully completing the course, the student will be able to:

CO1	Explain the fundamental concepts of Python programming, including syntax, operators, data types, control structures, functions, and exception handling
CO2	Develop Python programs using control structures, strings, functions, and built-in data structures to solve computational problems
CO3	Apply file handling techniques, exception handling, and Python modules to perform data processing and automation tasks
CO4	Develop object-oriented Python programs using classes, inheritance, and methods to model engineering applications
CO5	Apply NumPy arrays and related operations for numerical computation and data manipulation in engineering applications

ASSESSMENT DETAILS (Both CIE and SEE)

Continuous Internal Evaluation (CIE):

Assessment Type	Maximum Marks	Minimum Passing Marks	Evaluation Details
CIE Practical (A)	30	-	Marks awarded for Weekly Conduction of Experiments and Submission of Laboratory records, scaled to 30 marks.
CIE Practical Test (B)	20	-	Average of marks of Two tests, each conducted for 100 marks covering all experiments, scaled to 20.
Total CIE Practical (A+B)	**50**	**20**	**Sum of Marks of Experiments, Record and Test shall be CIE marks awarded for a maximum of 50.**
SEE (C)	**50**	**20**	**SEE is a lab exam, conducted for 100 marks and scaled down to 50 marks. Exam duration shall be for3 hours.**
CIE + SEE (A+B+C)	**100**	**40**	Final marks shall be the sum of marks scored in Components **A, B and C.**

- The minimum marks to be secured in CIE is 20 (40%) out of allotted 50 marks to appear for SEE.

Learning Resources:

Text Books:

1. Gowri shankar S, Veena A., Introduction to Python Programming, CRC Press.
2. Python Programming, S Sridhar, J Indumathi, V M Hariharan, 2nd Edition, Pearson, 2024.
3. Introduction to Programming Using Python, Y. Daniel Liang, Pearson.

Online Learning Resources / Virtual Labs

https://www.coursera.org/learn/python-for-applied-data-science-ai

- https://www.coursera.org/learn/python?specialization=python#syllabus

B.E. (Electrical and Electronics Engineering) Outcome Based Education (OBE) and Choice Based Credit System (CBCS) SEMESTER – III			
Course Title	**MULTISIM/PSPICE LAB FOR CIRCUIT ANALYSIS**		
Course Code	**25BEEAE307B**	**CIE Marks**	**50**
L:T:P:SL	**0:0:30:0**	**SEE Marks**	**50**
Credits	**01**	**Exam Hours**	**03**

COURSE LEARNING OBJECTIVES: The purpose of the course is to facilitate the learner

- To provide opportunity to perform the experiments at their own time, at their own pace, at any place as per their convenience and repeat any number of times to understand the concept.
- To Provide unhindered access to perform whenever the students wish.

SL. NO.	Experiments
1	Simulate Series RL & RC circuit and observe phase difference between waveforms of voltage and current.
2	Simulation and verification of Kirchhoff's Current Law & Kirchhoff's Voltage Law.
3	Simulation of Mesh analysis for a given circuit.
4	Simulation of Nodal analysis for a given circuit.
5	Determination of Z & Y parameters of a given two-port network.
6	Simulate and verify Super Positions theorem.
7	Simulation and verification of Reciprocity theorem.
8	Simulation and verification of Thevenin's and Norton's theorem.
9	Simulation and verification of Maximum Power Transfer theorem.
10	Simulation and verification of Millman's theorem.
11	Simulation of Series and Parallel Resonance circuit.

COURSEOUTCOMES:

After successfully completing the course, the student will be able to:

CO1	Simulate and verify the analysis of electric circuits by different methods using Multisim/Pspice.

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 marks). A student shall be deemed to have satisfied the academic requirements and earned the credits allotted to each course if the student secures 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) :

Assessment Type	Maximum Marks	Minimum Passing Marks	Evaluation Details
CIE Practical (A)	30		Marks awarded for Weekly Conduction of Experiments and Submission of Laboratory records, scaled to 30 marks.
CIE Practical Test (B)	20		Average of marks of Two tests, each conducted for 100 marks covering all experiments, scaled to 20.
Total CIE Practical (A+B)	**50**	**20**	**Sum of Marks of Experiments, Record and Test shall be CIE marks awarded for a maximum of 50.**
SEE (C)	**50**	**20**	**SEE is a lab exam, conducted for 100 marks and scaled down to 50 marks. Exam duration shall be for 3 hours.**
CIE + SEE (A+B+C)	**100**	**40**	Final marks shall be the sum of marks scored in Components **A, B and C.**
• The minimum marks to be secured in CIE is 20 out of allotted 50 marks to appear for SEE, with minimum 40 % scored in every component of CIE.			

Continuous Internal Evaluation (CIE):

- CIE marks for the practical course is 50 Marks.
- The split-up of CIE marks for record/ journal and test are in the ratio 60:40.
- Each experiment to be evaluated for conduction with observation sheet and record write-up. Rubrics for the evaluation of the journal/write-up, conduction of experiments by the faculty who is handling the laboratory session and is made known to students at the beginning of the practical session.
- Marks awarded for weekly conduction of experiments and submission of laboratory records

evaluated for 30 marks.

- Record should contain all the specified experiments in the syllabus.
- Total marks scored by the students are scaled down to 30 marks (60% of maximum marks).
- Weightage to be given for neatness and submission of record/write-up on time.
- Department shall conduct 02 tests, each for 100 marks, the first test shall be conducted after the 8th week of the semester and the second test shall be conducted after the 14th week of the semester.
- In each test, write-up, procedural knowledge, conduction of experiments and acceptable result will carry a weightage of 80% and the rest 20% for viva-voce.
- The suitable rubrics can be designed to evaluate each student's performance and learning ability.
- The average of 02 tests is scaled down to 20 marks (40% of maximum marks).

- The Sum of scaled-down marks scored in the report write-up/journal and average marks of two tests is the total CIE marks scored by the student.
- The minimum marks to be scored in CIE are 20 out of allotted 50 marks to appear for SEE, with minimum of 40% scored in every component of CIE.

Semester End Evaluation (SEE):

- SEE marks for the practical course is 50 Marks.
- All laboratory experiments are to be included for practical examination.
- Break up (Rubrics) of marks strictly adhered to by the examiners.
- Students can pick up one question (experiment) from the questions lot prepared by the internal/external examiners jointly.
- Evaluation of test write-up, conduction procedure, result and viva-voce will be conducted jointly by examiners. General rubrics suggested for SEE are, for write-up-20%, procedure, conduction and result – 60%, viva-voce-20% of maximum marks.
- SEE for practical shall be evaluated for 100 marks and scored marks shall be scaled down to 50 marks. (However, based upon course type, rubrics shall be decided by the examiners).
- Change of experiment is allowed only once and 20% marks allotted to the procedure part to be made zero.
- The duration of SEE is 03 hours.

Web links and Video Lectures (e-Resources):

www.nptel.ac.in

B.E. (Electrical and Electronics Engineering) Outcome Based Education (OBE) and Choice Based Credit System (CBCS) SEMESTER – III			
Course Title	**Sci Lab / MATLAB for Electrical and Electronic Measurements**		
Course Code	**25BEEAE307C**	**CIE MARKS**	**50**
L:T:P:SL	**0:0:30:0**	**SEE MARKS**	**50**
Credits	**01**	**EXAM HOURS**	**03**

COURSE LEARNING OBJECTIVES:

The purpose of the course is to facilitate the learner to:

1. Perform the experiments/programmes at their own time, at their own pace, at any place as per their convenience and repeat any number of times to understand the concept.
2. Provide unhindered access to perform whenever the students wish.
3. Vary different parameters to study the behaviour of the circuit without the risk of damaging equipment/ device or injuring themselves.

Sl. No.	Experiments
1	Measurement of Resistance using Wheatstone and Kelvin's double bridge
2	Measurement of Capacitance using Schering and De-Sauty's Bridges.
3	Measurement of Inductance using Maxwell's and Anderson Bridges.
4	Measurement of Frequency in Single phase circuit.
5	Measurement of Real Power, Reactive and Power Factor in Three Phase Circuits.
6	Measurement of Energy in Three Phase Circuits.
7	Measurement of Flux and Flux density.
8	Analysis of Current Transformer using Silsbees Deflection Method.
9	Analysis of Voltage Transformer using Silsbees Deflection Method.
10	Design of True RMS Reading Volt Meters.
11	Design of Integrating and Successive approximation type Digital Volt Meters.
12	Analysis of Q Meter.

COURSE OUTCOMES:

After successfully completing the course, the student will be able to:

CO1	Understand Different bridges to measure DC and AC parameters such as resistance , inductance and capacitance
CO2	Realize and verify the measurement of frequency, power and energy ..
CO3	Implement the operation of Instrument transformers, Q meter and digital voltmeters

ASSESSMENT DETAILS (Both CIE and SEE)

Continuous Internal Evaluation (CIE):

Assessment Type	Maximum Marks	Minimum Passing Marks	Evaluation Details
CIE Practical (A)	30	-	Marks awarded for Weekly Conduction of Experiments and Submission of Laboratory records, scaled to 30 marks.
CIE Practical Test (B)	20	-	Average of marks of Two tests, each conducted for 100 marks covering all experiments, scaled to 20.
Total CIE Practical (A+B)	**50**	**20**	**Sum of Marks of Experiments, Record and Test shall be CIE marks awarded for a maximum of 50.**
SEE (C)	**50**	**20**	**SEE is a lab exam, conducted for 100 marks and scaled down to 50 marks. Exam duration shall be for3 hours.**
CIE + SEE (A+B+C)	**100**	**40**	Final marks shall be the sum of marks scored in Components **A, B and C.**
• The minimum marks to be secured in CIE is 20 (40%) out of allotted 50 marks to appear for SEE.			

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B.E. (Electrical and Electronics Engineering) Outcome Based Education (OBE) and Choice Based Credit System (CBCS) SEMESTER – III			
Course Title	**Digital Electronics Circuits Laboratory**		
Course Code	**25BEEAE307D**	**CIE MARKS**	**50**
L:T:P:SL	**0:0:30:0**	**SEE MARKS**	**50**
Credits	**01**	**EXAM HOURS**	**03**

COURSE LEARNING OBJECTIVES:

The purpose of the course is to facilitate the learner to:

1. To simplify and realize Boolean expressions using logic and universal gates.
2. To design and implement combinational circuits such as adders, subtractors, comparators, and code converters.
3. To understand and verify the operation of flip-flops and sequential circuits including counters and shift registers.
4. To use standard digital ICs (multiplexers, decoders, encoders, display drivers) in the design of arithmetic and logic circuits.

Sl. No.	Experiments
1	Simplification, realization of Boolean expressions using logic gates/Universal gates.
2	Realization of Half/Full adder and Half/Full Subtractors using logic gates.
3	(i) Realization of parallel adder/Subtractors using 7483 chip. **(ii)** BCD to Excess-3 code conversion and vice versa.
4	Realization of Binary to Gray code conversion and vice versa
5	MUX/DEMUX – use of 74153, 74139 for arithmetic circuits and code converter.
6	Realization of One/Two-bit comparator and study of 7485 magnitude comparator.
7	Use of a) Decoder chip to drive LED display and b) Priority encoder.
8	Design and implement the JK Master-Slave Flip-Flop and verify its truth table by simulating its operation for all possible input combinations.
9	Realization of 3-bit counters as a sequential circuit and MOD – N counter design (7476, 7490, 74192, 74193).
10	To perform Shift left, shift right, SIPO, SISO, PISO, PIPO operations using 74S95.
11	Wiring and testing Ring counter/Johnson counter.
12	Wiring and testing of Sequence generator.

COURSE OUTCOMES:

After successfully completing the course, the student will be able to:

CO1	Simplify and implement Boolean functions using basic and universal logic gates.
CO2	Design and realize arithmetic and code conversion circuits using standard ICs.
CO3	Implement combinational circuits using MUX/DEMUX, decoders, and encoders.
CO4	Analyze and verify the behavior of flip-flops and design basic sequential circuits.
CO5	Design and test counters, shift registers, and sequence generators using digital ICs.

ASSESSMENT DETAILS (Both CIE and SEE)

Continuous Internal Evaluation (CIE):

Assessment Type	Maximum Marks	Minimum Passing Marks	Evaluation Details
CIE Practical (A)	30	-	Marks awarded for Weekly Conduction of Experiments and Submission of Laboratory records, scaled to 30 marks.
CIE Practical Test (B)	20	-	Average of marks of Two tests, each conducted for 100 marks covering all experiments, scaled to 20.
Total CIE Practical (A+B)	**50**	**20**	**Sum of Marks of Experiments, Record and Test shall be CIE marks awarded for a maximum of 50.**
SEE (C)	**50**	**20**	**SEE is a lab exam, conducted for 100 marks and scaled down to 50 marks. Exam duration shall be for 3 hours.**
CIE + SEE (A+B+C)	**100**	**40**	Final marks shall be the sum of marks scored in Components **A, B and C.**
• The minimum marks to be secured in CIE is 20 (40%) out of allotted 50 marks to appear for SEE.			

B.E. (Common to All Branches) Outcome Based Education (OBE) and Choice Based Credit System (CBCS) SEMESTER – III			
Course Title:	**NSS-National Service Scheme**		
Course Code:	**25BNSSP309**	**CIE MARKS**	**100**
L:T:P:SL	**0:0:0:30**	**SEE MARKS**	**0**
Credits:	**0**	**EXAM HOURS**	**-**

COURSE LEARNING OBJECTIVES:

The purpose of the course is to facilitate the learner to:

1. Identify the needs and problems of the community and involve the problem–solving.
2. Develop among them a sense of social & civic responsibility & utilize their knowledge in finding practical solutions to individual and community problems.
3. Develop competence required for group-living and sharing of responsibilities & gain skills in mobilising community participation to acquire leadership qualities and democratic attitudes.

Module-1
Introduction to NSS, Life Competencies, Youth Leadership and NSS
Module-2
Social connect and responsibilities.
Module-3
Activities -1 (Choose from Activity list)
Module-4
Activities -2 (Choose from Activity list)
Module-5
Activities -3 (Choose from Activity list)

COURSE OUTCOMES:

After successfully completing the course, the student will be able to:

CO1	Understand the motto and concepts of NSS
CO2	Develop overall personality of volunteers and make them as leaders and responsible citizens of our nation
CO3	Analyze the environmental and societal problems/issues and will be able to design solutions for the same.
CO4	Communicate effectively with the community and with the officials.

ACTIVITY LIST	
Plantation Drive: Adopt a Tree	Developing & managing an efficient garbage disposal system
Food Preservation/ Packaging awareness	Tourism Promotion: Innovative Approaches
Facilitating 100% digitized money transactions	Contribution to any national-level initiative of the Government of India. E.g. Digital India/ Skill India/ Swachh Bharat Internship etc.,

ASSESSMENT DETAILS (Both CIE and SEE)

Assessment Type	Maximum Marks	Minimum Passing Marks	Evaluation Details
Evaluation based on Reports (A)	100	-	5 modules Reports, 5 modules X 10 M each = 50 M
Total CIE Theory (A)	**100**	**40**	
SEE (B)	**-**	**-**	**-**
CIE+SEE (A+B)	**100**	**40**	**Final marks shall be the sum of marks scored in Components A, B**

- The minimum marks to be secured in CIE is 40 out of allotted 50 marks with minimum 40 % scored in every component of CIE.
- No SEE for this subject

Suggested Learning Resources:

Reference Books:

1) NSS Course Manual, Published by NSS Cell, VTU Belagavi.
2) Government of Karnataka, NSS cell, activities reports and its manual.
3) Government of India, NSS cell, Activities reports and its manual.

Web links:

1) https://nss.gov.in/
2) https://pledge.mygov.in/

B.E. (Common to All Branches) Outcome Based Education (OBE) and Choice Based Credit System (CBCS) SEMESTER – III			
Course Title:	**Physical Education (PE) (Sports and Athletics)**		
Course Code:	**25BPEDU309**	**CIE MARKS**	**100**
L: T: P: SL	**0:0:0:30**	**SEE MARKS**	**---**
Credits:	**0**	**EXAM HOURS**	**---**

COURSE LEARNING OBJECTIVES:

The purpose of the course is to facilitate the learner to:

1. Understand the fundamental concepts of Physical Education, games and sports skills, Health, Nutrition and Fitness
2. Familiarization of health-related Exercises, Sports for overall growth and development
3. Participate in the competition at regional/state / national / international levels.
4. Create consciousness among the students on Health, Fitness and Wellness in developing and maintaining a healthy lifestyle.

Module-1

Orientation

A. Meaning and Importance of Physical Education
B. Lifestyle
C. Health & Wellness

Module-2

General Fitness & Components of Fitness

A. Meaning and Importance of Fitness
B. Warming up (Free Hand exercises)
C. Strength – Push-up / Pull-ups

Module-3

Specific games (Anyone to be selected by the student)

A. Kabaddi

a) Fundamental skills

Hand touch, Toe Touch, Thigh Hold, Ankle hold and Bonus.

b) Offensive Skills:

Raiding, Hand Touch, Toe Touch, Dubki, Squat Thrust

c) Defensive Skills:

Tackling, Ankle Hold, Thigh Hold, Waist Hold, Blocking, Chain Tackle

d) Other Important Skills:

Agility, Speed, Breath Control, Breath Holding

e) Rules and their interpretation and duties of the officials

B. Kho-Kho

a) Fundamental skills

Giving Kho, Single Chain, Pole dive, Pole turning, 3-6 Up.

b) Skills in Chasing:

Sit on the box (Parallel & Bullet toe method), Get up from the box (Proximal & Distal foot method), Give Kho (Simple, Early, Late & Judgment), Pole Turn, Pole Dive, Tapping, Rectification of foul.

c) Skills in running:

Chain Play, Ring play and Chain & Ring mixed play.

d) Game practice with application of Rules and Regulations.

e) Rules and their interpretations and duties of the officials.

COURSE OUTCOMES:

After successfully completing the course, the student will be able to:

CO1	Understand the fundamental concepts of Physical Education, games and sports skills, Health, Nutrition and Fitness
CO2	Familiarization of health-related Exercises, Sports for overall growth and development
CO3	Participate in the competition at regional/state/national/international levels.
CO4	Create consciousness among the students on Health, Fitness and Wellness in developing and maintaining a healthy lifestyle.

ASSESSMENT DETAILS (Both CIE and SEE)

Assessment Type	Maximum Marks	Minimum Passing Marks	Evaluation Details
CIE – IA Tests (A)	60	-----	Sum of Two Internal Assessment Tests (MCQs) each conducted for 30 marks.
Quiz(B)	40	-----	Quiz for a maximum of 40 marks
Total CIE (A+B)	100	40	CIE Evaluation is done for a maximum of 100 marks
• The minimum marks to be secured in CIE is 40 (40%) out of 100 marks allotted to Pass.			

Text books

1. Saha, A. K. Sarir Siksher Ritiniti, Rana Publishing House, Kalyani.
2. Bandopadhyay, K. Sarir Siksha Parichay, Classic Publishers, Kolkata.

Reference Books

1. Saraswati Health and Physical Education Textbook
2. V.K. Sharma's Health and Physical Education

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B.E. (Common to All Branches)
Outcome Based Education (OBE) and Choice Based Credit System (CBCS)
SEMESTER – III

Course Title:	**Yoga**		
Course Code:	**25 BYOGA309**	**CIE MARKS**	**100**
L: T: P: SL	**0:0:0:30**	**SEE MARKS**	**---**
Credits:	**0**	**EXAM HOURS**	**---**

COURSE LEARNING OBJECTIVES:

The purpose of the course is to facilitate the learner to:

1. Physical, Mental & spiritual Objectives of Yoga
2. Explain the meaning of Yoga.
3. Discuss the importance of the Yoga and its scope.
4. Describe the aims and objectives of Yoga.
5. Clarify the misconceptions on Yoga

Module-1

Orientation

a) Introduction of Yoga
b) Aim, and Objectives of Yoga,
c) Yoga, its origin, history and development.

Module-2

Yoga

a) Yoga, its meaning, definitions.
b) Brief introduction of yogic practices for the common man
c) Rules and regulations
d) Misconceptions of Yoga
e) Suryanamaskara

Module-3

Asanas

Types of Asanas:

a) **Sitting-**1. Padmasana, 2. Vajrasana
b) **Standing-**1. Vrikshana, 2. Trikonasana
c) **Prone line-**1. Bhujangasana 2. Shalabh asana
d) **Supine line-** 1. Utthita dvipadasana 2. Ardha halasana

COURSE OUTCOMES:

After successfully completing the course, the student will be able to:

CO1	Understand the fundamental concepts of Yoga
CO2	Improves of health and related aspects, overall growth and development
CO3	Participate in the competition at regional/state/national/international levels.
CO4	Create consciousness among the students on Health, Fitness and Wellness in developing and maintaining a healthy lifestyle.

ASSESSMENT DETAILS (Both CIE and SEE)

Assessment Type	Maximum Marks	Minimum Passing Marks	Evaluation Details
CIE – IA Tests (A)	60	----	Sum of Two Internal Assessment Tests (MCQs) each conducted for 30 marks.
Quiz(B)	40	----	Quiz for a maximum of 40 marks
Total CIE (A+B)	100	40	CIE Evaluation is done for a maximum of 100 marks
• The minimum marks to be secured in CIE is 40 (40%) out of 100 marks allotted to Pass.			

Text books

1. The Yoga Sutras of Patanjali – Sri Swami Satchidananda.
2. Light on Yoga — B.K.S Iyengar.

Reference Books

1. The Heart of Yoga — T.K.V Desikachar.
2. "Asana Pranayama Mudra Bandha" bySwamiSatyanandaSaraswati.

B.E. (Common to All the Branches) Outcome Based Education (OBE) and Choice Based Credit System (CBCS) SEMESTER – III			
Course Title	**MUSIC**		
Course Code	**25BMUSK309**	**CIE Marks**	**100**
L:T:P:SL	**0:0:0:30**	**SEE Marks**	**--**
Credits	**0**	**Exam Hours**	**---**

Course Learning Objectives:

The purpose of the course is to facilitate the learner to:

1. Understand the origin, evolution, and fundamental concepts of Indian classical music.
2. Familiarize themselves with the basic forms of **Carnatic and Hindustani music compositions** and appreciate their musical structure and significance.
3. Identify and classify the major musical instruments used in **Carnatic and Hindustani music** and understand their construction and performance characteristics.
4. Recognize the contributions of eminent Indian composers and musicians to the development and preservation of Indian classical music.
5. Develop an appreciation for India's rich musical heritage, fostering creativity, cultural awareness, and lifelong interest in music.

Module-1		**3 hrs**
Origin of the Indian Music: Evolution of the Indian music system, Understanding of Shruthi, Nada, Swara, Laya, Raga Tala, Mela.		
Module-2		**3 hrs**
Compositions: Introduction to the few types of composition in Carnatic Music- Geethe, Swarajathi, Varna, Madhyama Kala Krithi,		
Module-3		**3 hrs**
Compositions: Introduction to the few types of composition in Hindustani Music : Khayal, Drupad, Tarana		
Module-4		**3 hrs**
Music Instruments: Classification and construction of string instruments, percussion instruments in both Carnatic and Hindustani Music.		
Module-5		**3 hrs**
Composers: Biography and contributions of of the following eminent personalities Purandaradasa, Thyagaraja,. Pt. Mallikarjun Mansur, Vidhushi Gangubhai Hangal		

Course Outcomes:

After successfully completing the course, the student will be able to:

CO1	Explain the origin, evolution, and fundamental concepts of Indian classical music. *(Bloom's Level: Understand – L2)*
CO2	Compare and distinguish the characteristics of selected Carnatic and Hindustani music compositions. *(Bloom's Level: Analyze – L4)*
CO3	Classify the major categories of Indian musical instruments and describe their construction and applications in Carnatic and Hindustani music. *(Bloom's Level: Analyze – L4)*
CO4	Examine the contributions of eminent Composers/Musicians and appreciate their role in preserving and promoting Indian classical music. *(Bloom's Level: Evaluate – L5)*

Assessment Details (CIE and SEE):

Assessment Type	Maximum Marks	Minimum Passing Marks	Evaluation Details
CIE – IA Tests (A)	60	-	Sum of Two Internal Assessment Tests (MCQs) each conducted for 30 marks.
Experimental Work(B)	40	-	Submission of report on a topic related to music.
CIE + SEE (A+B)	**100**	**40**	CIE Evaluation is done for a maximum of 100 marks
• The minimum marks to be secured in CIE is 40 (40%) out of 100 marks allotted to Pass.			

Text Books:

1.	Vidushi Vasantha Madhavi, "Theory of Music", Prism Publication, 2007.
2.	T Sachidevi and T Sharadha (Thirumalai Sisters), Karnataka Sangeetha Dharpana-Vol. 1 (English), Shreenivaas Prakaashana, 2018.
3.	B. Chaitanya Deva, An Introduction to Indian Music, Publications Division, Government of India, New Delhi.

Reference Books:

1.	Lakshminarayana Subramaniam, Viji Subramanaim, "Classical Music of India: A Practical Guige, Tranqueber 2018.
2.	R. Rangaramanuja Ayyangar, "History of South Indian (Carnatic) Music", Vipanci Charitable Trust; Third edition, 2019,
3	Vamanrao H. Deshpande, Indian Musical Traditions: An Aesthetic Study of the Gharanas in Hindustani Music, Popular Prakashan, Mumbai.

B E. (Common to All Branches) **Outcome Based Education (OBE) and Choice Based Credit System (CBCS)** **SEMESTER – III**			
ADDITIONAL MATHEMATICS – I (Mandatory Learning Course: Common to All Branches) (A Bridge course for Lateral Entry students under Diploma quota to BE/B. Tech.)			
Course Code	**25BMADP310**	CIE Marks	100
Teaching Hours/Week (L:T:P:SL)	14:0:0:14	SEE Marks	--
Credits	**PP**	Exam Hours	--

COURSE LEARNING OBJECTIVES: The purpose of the course is to facilitate the learner to:

- Apply the fundamental concepts of complex trigonometry, vector algebra, and differential and integral calculus to analyze mathematical and engineering problems.
- Apply the principles of vector differentiation and solve first-order ordinary differential equations in relevant scientific and engineering contexts.

Module-1

Complex Trigonometry: Complex Numbers: Definitions and properties. Modulus and amplitude of a complex number, Argand's diagram, De-Moivre's theorem (without proof).
Vector Algebra: Scalar and vectors. Addition and subtraction and multiplication of vectors- Dot and Cross products, problems.

Module-2

Differential Calculus: Review of successive differentiation-illustrative examples. Maclaurin's series expansions-Illustrative examples. Partial Differentiation: Euler's theorem problems on first order derivatives only. Total derivatives-differentiation of composite functions. Jacobians of order two-Problems.

Module-3

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

Module-4

Integral Calculus: Review of elementary integral calculus. Reduction formulae for $\sin^n x$, $\cos^n x$ (with proof) and $\sin^m x \cos^n x$ (without proof) and evaluation of these with standard limits-Examples.

Module-5

Ordinary differential equations (ODE's. Introduction-solutions of first order and first-degree differential equations: exact, linear differential equations. Equations are reducible to exact and Bernoulli's equation.

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

CO1: Apply concepts of complex numbers and vector algebra to analyze the problems arising in related areas.

CO2: Apply derivatives and partial derivatives to calculate rate of change of multivariate functions.

CO3: Solve problems involving position, velocity, and acceleration in two and three dimensions using vector-valued functions.

CO4: Apply the fundamental techniques of elementary integration to solve standard integrals

CO5: Identify and solve first order ordinary differential equations.

ASSESSMENT DETAILS (Both CIE and SEE)

Assessment Type	Maximum Marks	Minimum Passing Marks	Evaluation Details
CIE – IA Tests (A)	60	-	Two tests of each of 50 marks shall be conducted. Average of Two Internal Assessment Tests shall be scaled down to 60 marks.
Continuous and Comprehensive Evaluation (B)	40	-	Any two Assessment methods of each of 20 marks as per 24RNBE4.2 (*if it is project based, one assignment shall be given), scaled to 40 marks.
Total CIE (A+B)	**100**	**40**	**CIE Evaluation is done for a maximum of 50 marks**
SEE (C)	-	-	No SEE for this subject
CIE + SEE (A+B+C)	**100**	**40**	Final marks shall be the sum of marks scored in Components **A, B and C.**

Sl No	Title of the Book	Name of the Author/s	Name of the Publisher	Edition and Year
		Textbook		
1	Higher Engineering Mathematics	B. S. Grewal	Khanna Publishers	43rd Edition, 2015
		Reference Books		
1	Advanced Engineering Mathematics	E. Kreyszig	John Wiley & Sons	10th Edition, 2015
2	Engineering Mathematics	N. P .Bali and Manish Goyal	Laxmi Publishers	7th Edition, 2007
3	Engineering Mathematics Vol. I	Rohit Khurana	Cengage Learning	1st Edition, 2015

Additional Mathematics I and II:

(1) These courses are prescribed for III and IV semesters respectively to lateral entry Diploma holders admitted to III semester of B.E./B.Tech., programs. They shall attend the classes during the respective semesters to complete all the formalities of the course and appear for the Continuous Internal Evaluation (CIE). In case any student fails to register for the said course/fails to secure the minimum 40 % of the prescribed CIE marks, he/she shall be deemed to have secured an F grade. In such a case, the student has to fulfill the course requirements during subsequent semesters to earn the qualifying CIE marks. These courses are slated for CIE only and have no SEE.

(2) Additional Mathematics I and II shall not be considered for vertical progression as well as for the calculation of SGPA and CGPA, but completion of the courses shall be mandatory for the award of degree.

(3) Successful completion of the courses Additional Mathematics I and II shall be indicated as satisfactory in the grade card. Non-completion of the courses Additional Mathematics I and II shall be indicated as Unsatisfactory

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IV SEMESTER SUBJECTS

B.E. (Electrical & Electronics Engineering) Outcome Based Education (OBE) and Choice Based Credit System (CBCS) SEMESTER – IV			
Course Title:	**Electric Motors**		
Course Code:	**25BEETH401**	**CIE MARKS**	**50**
L:T:P:SL	**45:30:0:45**	**SEE MARKS**	**50**
Credits:	**04**	**EXAM HOURS**	**03**

COURSE LEARNING OBJECTIVES:

The purpose of the course is to facilitate the learner :

1. To understand the constructional features of motors and their applications.
2. To demonstrate the constructional features of three phase Induction motor and single phase induction motors.
3. To illustrate different tests to be conducted for the assessment of the performance characteristics of motors.
4. Explain the construction and operation of Synchronous motor and special motors.

Module-1	**9 Hours**
DC Motors: Principle of operation, significance of back EMF, Torque equation and power developed by armature, characteristics of DC motors, speed control of DC shunt motor, starters for DC motors, losses and efficiency in DC machine, condition for maximum efficiency. **Testing of DC Machines:** Brake test, Swinburne's test, regenerative test, applications of DC motors. Numerical.	
Module-2	**9 Hours**
Three Phase Induction Motor: Construction, Types – squirrel cage and slip-ring motor, working principle, Concept of Rotating magnetic field, Slip and its significance-Torque equation, starting torque and maximum torque and their relations, Torque –slip characteristics showing motoring, generating and braking regions of operation- Applications-Numerical	
Module-3	**9 Hours**
Performance of Three-Phase Induction Motor: Equivalent circuit, phasor diagrams (No – load and ON load) losses, efficiency, power flow diagram, No-load and blocked rotor tests, cogging and crawling, High torque cage rotors- deep-bar and double cage rotors. Numerical	
Module-4	**9 Hours**
Starting of Three-Phase Induction Motors: Necessity of starter, Starting of cage motors- direct on-line starter, star-delta starter, autotransformer starter. Slip ring induction motor starter. **Speed Control of three phase induction motor:** Methods employed for speed control- Autotransformer method and rotor resistance control method- Numerical **Single Phase Induction Motors:** Pulsating field as two rotating fields and principle of operation, construction and operation of resistance split-phase motor, capacitor-split phase motor, shaded pole motor, Performance and cost comparison and choice of single phase induction motors, Applications –Numerical	
Module-5	**9 Hours**
Synchronous Motors: Principle of operation, equivalent circuit and phasor diagrams, Torque	

equation, Power flow equations, V and Inverted V curves, Starting methods, applications of synchronous motors. Numerical **Special Machines:** Construction and operation of Universal motor, PMSM, SRM and BLDC motor.

COURSE OUTCOMES:

After successfully completing the course, the student will be able to:

CO1	Explain the construction, working and various tests of DC motors.
CO2	Demonstrate the construction, working and performance characteristics of three phase Induction motor.
CO3	Illustrate various starting methods of three phase Induction motor.
CO4	Understand the construction, working of different single phase induction motors.
CO5	Describe the construction, working and performance of synchronous motors and special motors.

ASSESSMENT DETAILS (Both CIE and SEE)

Assessment Type	Maximum Marks	Minimum Passing Marks	Evaluation Details
CIE – IA Tests (A)	30	-	Two tests each of 50 marks shall be conducted. Average of Two Internal Assessment Tests shall be scaled down to 30 marks.
Continuous and Comprehensive Evaluation (B)	20	-	Any two Assessment methods as per 24RNBE4.2 (*if it is project based, one assignment shall be given), scaled to 20 marks.
Total CIE (A+B)	**50**	**20**	**CIE Evaluation is done for a maximum of 50 marks**
SEE (C)	**50**	**18**	**SEE is a theory exam conducted for 100 marks and scaled down to 50 marks. Exam duration shall be for 3 hours.**

CIE + SEE **(A+B+C)**	**100**	**40**	Final marks shall be the sum of marks scored in Components **A, B and C.**
• The minimum marks to be secured in CIE is 20 (40%) out of allotted 50 marks to appear for SEE.			

Suggested Learning Resources:

Text Books :

1. Electric Machines, D. P. Kothari, I J Nagrath et al, 4th Edition, 2011.

2. Electric Machines, Ashfaq Hussain, Dhanpat Rai & Co, 2nd Edition, 2013.

3. Electrical Machinery by Dr. P. S .Bimbhra, 7th Edition, 2004

Reference Books:

1. Electric Machines, Mulukuntla S. Sarma, at el, Cengage, 1st Edition, 2009.

2. Electrical Machines, Drives and Power systems, Theodore Wildi, Pearson, 6th Edition, 2014.

3. Principals of Electrical Machines, V.K Mehta, Rohit Mehta, S Chand, 2nd edition, 2009

4. Theory and performance of Electrical Machines by J B Gupta, 14th Edition 2013

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B.E. (Electrical & Electronics Engineering)
Outcome Based Education (OBE) and Choice Based Credit System (CBCS)
SEMESTER – IV

Course Title:	**Microcontroller and Embedded systems**		
Course Code:	**25BEEIC402**	**CIE MARKS**	**50**
L:T:P:SL	**45:0:30:45**	**SEE MARKS**	**50**
Credits:	**4**	**EXAM HOURS**	**3**

COURSE LEARNING OBJECTIVES:

The purpose of the course is to facilitate the learner to:

1. Understand the fundamentals of ARM based systems, basic hardware components, selection methods and attributes of an embedded system.
2. Program ARM controller using the various instructions.
3. Identify various components, their purpose, and their application to the embedded system's Applicability.
4. Understand the embedded system's real-time operating system and its application

Module-1 **9 Hours**

Prerequisites: Understanding of Micro Processor and Microcontrollers, Difference between Microprocessors and Microcontrollers, RISC and CISC

ARM Embedded Systems: The RISC design philosophy, The ARM Design Philosophy, Embedded System Hardware Embedded System Software.

ARM-32 bit Microcontroller: ARM Processor Fundamentals: Registers, Current Program Status Register, Pipeline, Exceptions, Interrupts, and the Vector Table, Core Extensions

Module-2 **9 Hours**

Prerequisites Basics of Assembler, Memory, types

Introduction to the ARM Instruction Set: Data Processing Instructions, Branch Instructions, Load store Instructions Software Interrupt Instructions, Program Status Register Instructions, Coprocessor Instructions, Loading Constants

ARM programming using Assembly language: Writing Assembly code, Profiling and cycle counting, instruction scheduling, Register Allocation, Conditional Execution, Looping Constructs

Module-3 **9 Hours**

Prerequisites: Basics of C Programming

C Compilers and Optimization : Basic C Data Types, C Looping Structures, Register Allocation, Function Calls, Pointer Aliasing,: Structure Arrangement, Bit-fields, Unaligned Data and Endianness, Division, Floating Point, Inline Functions and Inline Assembly, Portability Issues.

Exception and Interrupt Handling : Exception Handling, Interrupts, Interrupt Handling Schemes

Module-4 **9 Hours**

Embedded System Components: Embedded systems vs General computing systems, History of

embedded systems, Classification of Embedded systems, Major applications areas of embedded systems, purpose of embedded systems. Core of an Embedded System , Memory, Sensors, Actuators, LED, 7 segment LED display, optocoupler, stepper motor, Keyboard, Push button switch, Communication Interface (onboard and external types), Embedded firmware, Other system components.(excluding C language).
Module-5 **9 Hours**
RTOS and IDE for Embedded System Design: Operating System basics, Types of operating systems, Task, process and threads (Only POSIX Threads with an example program), Thread preemption, Multiprocessing and Multitasking, Task Communication (without any program). Embedded system Development Environment – Block diagram (excluding Keil),Disassembler/decompiler, simulator, emulator and debugging techniques, target hardware debugging, boundary scan.

Practical Component of IPCC

Sl No.	Experiments
1.	Using Keil software, observe the various registers, dump, CPSR, with a simple ALP program.
2.	Write an ALP to i) multiply two 16-bit binary numbers. ii) Add two 64-bit numbers.
3.	Write an ALP to find the i)sum of the first 10 integer numbers ii) add an array of 16-bit numbers and store the 32-bit result in internal RAM
4.	Write an ALP to find i)the factorial of a number, ii)square of a number (1 to 10) using a look-up Table
5.	Write an ALP to find i)the largest or smallest number in an array of 32 numbers ii) arrange a series of 32-bit numbers in ascending/descending order.
6.	Write an ALP to i)count the number of ones and zeros in two consecutive memory Locations ii) Scan a series of 32 bit numbers to find how many are negative
PART B: Conduct the following experiments on an ARM CORTEX M3 evaluation board using evaluation version of Embedded 'C' &Keil µvision-4 tool/compiler	
7.	Interface a Stepper motor and rotate it in clockwise and anti-clockwise direction.
8.	Interface a DAC and generate Triangular and Square waveforms.
9	Interface a simple Switch and display its status through Relay, Buzzer and LED.
10	Determine Digital output for a given Analog input using Internal ADC of ARM controller
11	Interface and Control a DC Motor
12	Display the Hex digits 0 to F on a 7-segment LED interface, with a suitable delay in between.

COURSE OUTCOMES:

After successfully completing the course, the student will be able to:

CO1	Describe the architectural features and instructions of ARM microcontroller.
CO2	Apply the knowledge gained for Programming ARM for different applications.

CO3	Interface external devices with ARM microcontroller and interpret the basic hardware components and their selection method based on the characteristics and attributes of an
CO4	Develop the hardware /software co-design, firmware design approaches and demonstrate the need of real time operating system for embedded system applications.

ASSESSMENT DETAILS (Both CIE and SEE)

Assessment Type	Maximum Marks	Minimum Passing Marks	Evaluation Details
CIE- IA Tests (A)	20	-	Two tests each of 50 marks shall be conducted. Average of Two Internal Assessment Tests shall be scaled down to 20 marks.
Continuous and Comprehensive Evaluation (B)	10	-	Any one Assessment methods as per 24RNBE4.2 scaled to 10 marks.
Total CIE Theory (A+B)	**30**	**12**	**Marks of Tests and Assignments awarded for a maximum of 30.**
CIE Practical	12	-	Marks awarded for Weekly Conduction of Experiments and Submission of Laboratory records, scaled to 12 marks.
CIE Practical Test	8	-	Average of marks of Two tests, each conducted for 100 marks covering all experiments, scaled to 8.
Total CIE Practical (C)	**20**	**8**	**Marks of Experiments, Record and Test awarded for a maximum of 20 marks.**
CIE: Theory + Practical (A + B + C)	**50**	**20**	**CIE Evaluation is done for a maximum of 50 marks.**
SEE (D)	**50**	**18**	**SEE is a theory exam, conducted for 100 marks and scaled down to 50 marks. Exam duration shall before 3 hours.**
CIE+SEE	**100**	**40**	**Final marks shall be the sum of marks**

(A+B+C+D)			**scored in Components A, B, C and D**

- The minimum marks to be secured in CIE is 20 (40%) out of allotted 50 marks to appear for SEE. The laboratory component of the IPCC shall be for CIE only. However, in SEE, the questions from the laboratory component shall be included in their respective modules only.

Question Paper for SEE for IPCC

Theory SEE will be conducted by the college as per the scheduled time table, with common question papers for the course (duration 03hours)

1. The question paper will have 10 questions with a choice between every pair of questions set for each module. Each question is set for 20 Marks.
2. There will be 2 questions from each module. Each of the 2 questions under a module (with a maximum of 3 sub-questions), should have a mix of topics under that module.
3. The students have to answer 5 full questions, selecting one full question from each module.
4. Marks scored by the student shall be proportionately scaled down to 50 Marks
5. The number of question papers set shall be four, out of which two shall be from Internal and remaining two shall be from external examiners.

The theory portion of IPCC shall be for both CIE and SEE

Suggested Learning Resources:

Text Books

1. ARM System Developer's Guide, Sloss, Symes, Wright Morgan Kaufmann Publishers, Elsevier,2005
2. Shibu K V, "Introduction to Embedded Systems", Tata McGraw Hill Education, Private Limited,2nd Edition

Reference Books:-

1. Computer Organisation& Architecture , William Stallings, PHI , 2010
2. Raghunandan. G.H, Microcontroller (ARM) and Embedded System, Cengage learning Publication,2019
3. The Insider's Guide to the ARM7 Based Microcontrollers, Hitex Ltd., 1st edition, 2005.
4. Steve Furber, ARM System-on-Chip Architecture, Second Edition, Pearson, 2015.
3. Raj Kamal, Embedded System, Tata McGraw-Hill Publishers, 2nd Edition, 2008.

B.E. (Electrical and Electronics Engineering) Outcome Based Education (OBE) and Choice Based Credit System (CBCS) SEMESTER – IV			
Course Title:	**Op-Amp and LIC**		
Course Code:	**25BEETH403**	**CIE MARKS**	**50**
L:T:P:SL	**45:30:0:45**	**SEE MARKS**	**50**
Credits:	**4**	**EXAM HOURS**	**3**

COURSE LEARNING OBJECTIVES:

The purpose of the course is to facilitate the learner to:

1. Explain the basics of Linear ICs such as Op-amp, Regulator, Timer & PLL
2. Explain various circuits such as adder, subtractor, integrator, differentiator using linear ICs.
3. Use these linear ICs for specific applications such as comparators, converters, signal processing circuits.
4. Learn active filters using Opamps.
5. Learn pulse generator circuits using timers.

Module-1: Operational Amplifier Basics **9 Hours**

Introduction: Block diagram representation of a typical Op-amp, schematic symbol, characteristics of an Op-amp, Ideal op-amp, Equivalent circuit, Ideal voltage transfer curve, Open loop configuration

Parameters of opamp- CMRR, PSRR, slew rate etc., biasing methods.

Operational amplifiers with feedback: Differential amplifier, Inverting & non – inverting amplifier, Op-amp with negative feedback, voltage series feedback amplifier gain, Input resistance, Output resistance, Voltage shunt feedback amplifier- gain, Input resistance, Output resistance.

General Linear ICs applications: Peaking amplifier, Summing, Scaling & averaging amplifier Inverting and non-inverting configuration, Differential configuration, Instrumentation amplifier, Integrator and Differentiator circuits.

Module-2:Filters and Regulators **9 Hours**

Active Filters: First & Second order high pass & low pass Butterworth filters, Higher order filters Band pass filters, Band reject filters & all pass filters.

DC Voltage Regulators: Voltage regulator basics, Voltage follower regulator, Adjustable output regulator, LM317 & LM337 Integrated circuit regulators.

Module-3: Waveform Generators, Non-Linear circuits **9 Hours**

Signal generators: Triangular / rectangular wave generator, Phase shift oscillator, Wien bridge oscillator, Oscillator amplitude stabilization, Signal generator output controls.

Comparators & Converters: Basic comparator, Zero crossing detector, Inverting & noninverting Schmitt trigger circuit, Voltage to current converter with grounded load, Current to voltage converter and basics of voltage to frequency and frequency to voltage converters.

Module-4: Signal Processing and Converter circuits **9 Hours**

Signal processing circuits: Precision half wave & full wave rectifiers, Precision clipping &clamping circuits, Peak detectors, Sample & hold circuits. **A/D & D/A Converters:** Basics, R–2R ladder D/A Converter, Integrated circuit 8-bit D/A, successive approximation ADC, Linear ramp ADC, Dual slope ADC, Digital ramp ADC.
Module-5: Pulse Generators and Phase Locked Loop **9 Hours**
Phase Locked Loop (PLL): Basic PLL, Components, Performance factors, Applications of PLL IC 565. **Timer:** Internal architecture of 555 timer, Mono stable, Astable multivibrators and applications

COURSE OUTCOMES:

After successfully completing the course, the student will be able to:

CO1	Understand the basics of Linear ICs such as Op-amp, Regulator, Timer & PLL
CO2	Analyze various Op-Amp based circuits such as adder, subtractor, integrator, differentiator using linear ICs.
CO3	Analyze working of comparators, converters, signal processing circuits using Opamps.
CO4	Analyze& design active filters using Opamps.
CO5	Analyze the working of pulse generator circuits using timers.

ASSESSMENT DETAILS (Both CIE and SEE)

Assessment Type	**Maximum Marks**	**Minimum Passing Marks**	**Evaluation Details**
CIE – IA Tests (A)	30	-	Two tests each of 50 marks shall be conducted. Average of Two Internal Assessment Tests shall be scaled down to 30 marks.
Continuous and Comprehensive Evaluation (B)	20	-	Any two Assessment methods as per 24RNBE4.2 (*if it is project based, one assignment shall be given), scaled to 20 marks.
Total CIE (A+B)	**50**	**20**	**CIE Evaluation is done for a maximum of 50 marks**

SEE (C)	**50**	**18**	**SEE is a theory exam conducted for 100 marks and scaled down to 50 marks. Exam duration shall be for 3 hours.**
CIE + SEE **(A+B+C)**	**100**	**40**	Final marks shall be the sum of marks scored in Components **A, B and C.**

- The minimum marks to be secured in CIE is 20 (40%) out of allotted 50 marks to appear for SEE.
- **If any courses of 3 credits are of Integrated Course type, for such courses the method suggested for 4 credits IPCC shall be followed.**

Suggested Learning Resources:

Text Books

1. "Op-Amps and Linear Integrated Circuits" by Ramakant A Gayakwad Pearson 4th edition 2015.
2. "Operational Amplifiers and Linear ICs" by David A. Bell Oxford University Press 3rd edition 2011.

Reference Books

1. "Electronic Devices & Circuits", by J. Nagarath, PHI, 2007.
2. "Linear Integrated Circuits", by RoyChoudhary, New Age International, 2003

B.E. (Electrical & Electronics Engineering) Outcome Based Education (OBE) and Choice Based Credit System (CBCS) SEMESTER – IV			
Course Title:	**Transmission and Distribution**		
Course Code:	**25BEETH404**	**CIE MARKS**	**50**
L:T:P:SL	**45:30:0:45**	**SEE MARKS**	**50**
Credits:	**4**	**EXAM HOURS**	**3**

COURSE LEARNING OBJECTIVES:

The purpose of the course is to facilitate the learner to:

1. To understand the structure of transmission and distribution systems, mechanical design and the types of insulators.
2. To compute the line parameters in the transmission system
3. To analyse the performance of the transmission and distribution systems
4. To understand the construction of cables and insulations.
5. To classify the distribution systems and the distributor schemes

Module-1	**9 Hours**

Introduction: Structure of power systems, General Introduction to power transmission by DC and AC overhead lines, single line diagram- EHVAC and HVDC transmission advantages and disadvantages ACSR conductors and its properties.

Mechanical Overhead design: Sag and Tension- Sag calculation for equal and unequal level supports – effect of wind and ice – Consideration in mechanical design of lines.

Insulators: Types - advantages voltage distribution in suspension insulators – string efficiency – method of improving string efficiency.

Module-2	**9 Hours**

Line Parameters: Resistance, inductance and capacitance calculations in single and three phase transmissions lines - symmetrical and unsymmetrical spacing, transposition- self and mutual GMD.

Module-3	**9 Hours**

Transmission Line Performance: Voltage regulation, Transmission efficiency - Representation of transmission lines: Short, medium and long lines - ABCD constants - Ferranti effect.

Module-4	**9 Hours**

Insulated Cables: Underground cables – types, construction – capacitance of the cables – insulation resistance – dielectric stresses and grading – dielectric losses –thermal characteristics – capacitance of three core cable.

Corona: Critical Disruptive Voltage (CDV), practical importance – Advantages and disadvantages of corona, factors affecting corona, visual critical voltage, power loss due to corona.

Module-5	**9 Hours**

Distribution System: Classification, section and size of feeders, schemes of distributor connections AC distributors; DC Distributors, Reliability and Power quality.

COURSE OUTCOMES:

After successfully completing the course, the student will be able to:

CO1	Summarize the advantages of high voltage AC and DC transmission and apply the concept of sag calculation and methods to improve insulators string efficiency.
CO2	Analyze and compute the parameters of the transmission line for different configurations.
CO3	Assess the performance of transmission lines by different methods.
CO4	Understand the phenomenon of corona and necessity of underground cables.
CO5	Distinguish different types of distribution systems and explain the power quality & reliability.

ASSESSMENT DETAILS (Both CIE and SEE)

Assessment Type	Maximum Marks	Minimum Passing Marks	Evaluation Details
CIE – IA Tests (A)	30	-	Two tests each of 50 marks shall be conducted. Average of Two Internal Assessment s shall be scaled down to 30 marks.
Continuous and comprehensive evaluation (B)	20	-	Any two Assessment methods as per 24RNBE4.2 (*if it is project based, one assignment shall be given), scaled to 20 marks.
Total CIE (A+B)	**50**	**20**	**CIE Evaluation is done for a maximum of 50 marks**
SEE (C)	**50**	**18**	**SEE is a theory exam conducted for 100 marks and scaled down to 50 marks. Exam duration shall be for 3 hours**
CIE + SEE (A+B+C)	**100**	**40**	Final marks shall be the sum of marks scored in Components **A, B and C.**

- **The minimum marks to be secured in CIE is 20 (40%) out of allotted 50 marks to appear for SEE.**
- **If any courses of 3 credits are of Integrated Course type, for such courses the method suggested for 4 credits IPCC shall be followed.**

Suggested Learning Resources:

Text Books

1 I.J.Nagrath, D.P.Kothari, Power System Engineering, Tata McGraw Hill Ltd, New Delhi, 2017.
2 CL Wadhwa, Electrical Power Systems, 2017,7th Edition, New Age publication
3 B.R. Gupta Generation of Electrical Energy-7th edition, S.Chand Publishers, New Delhi,2017.

Reference Books:-

1 S.N. Singh, 'Electric Power Generation, Transmission and Distribution', Prentice Hall of India Pvt. Ltd, New Delhi, Second Edition, 2011

2 Ailson P. de Moura, Adriano Aron F. de Moura, Ednardo P. da Rocha, Transmission of Electrical Energy-Overhead Lines, CRC Press, 2020.

3 Leonard L. Grigsby , Electric Power Generation, Transmission, and Distribution, CRC Press, 2018

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B.E. (Electrical & Electronics Engineering)
Outcome Based Education (OBE) and Choice Based Credit System (CBCS)
SEMESTER – IV

Course Title	**Electric Motors Lab**		
Course Code:	**25BEELB405**	**CIE MARKS**	**50**
L:T:P:SL	**0:0:30:0**	**SEE MARKS**	**50**
Credits:	**01**	**EXAM HOURS**	**03**

Course objectives:

- To perform tests on DC Machines to determine their characteristics.
- To study the different control methods for DC Motors.
- To conduct test for pre-determination of the performance characteristics of DC Machines.
- To conduct load test on single-phase and three-phase Induction Motor.
- To conduct test on Induction Motor to determine performance characteristics.
- To conduct test on synchronous motor to draw performance curves.

Sl.NO	Experiments
1	Load test on DC shunt motor to draw speed–torque and efficiency characteristics.
2	Speed control of DC shunt motor by armature and field control.
3	Swinburne's Test on DC motor.
4	Regenerative test on DC shunt machines.
5	Load test on three phase induction motor.
6	No-load and Blocked rotor test on three phase induction motor todraw(i)equivalent circuit and (ii)Pre-determination of performance parameters at different load conditions.
7	Load test on induction generator.
8	Load test on single phase induction motor to draw output versus torque, current, power and efficiency characteristics.
9	Conduct suitable tests to draw the equivalent circuitofsingle phase induction motor and determine performance parameters.
10	Conduct an experiment to draw V and Inverted V curves of synchronous motor at no load and load conditions.
11	Study of performance characteristics of DC Shunt Motor using PSCAD software

12	Study of performance characteristics of induction motor using MATLAB and Simulink

Course outcomes :

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

1. Perform tests on DC Machines to determine their characteristics.
2. Control the DC Motors using different methods.
3. Pre-determination of the performance characteristics of DC Machines.
4. Conduct load test on single-phase and three-phase Induction Motor and draw performance characteristics.
5. Conduct test on synchronous motor to draw performance curves.

ASSESSMENT DETAILS (BOTH CIE AND SEE)

Assessment Type	Maximum Marks	Minimum Passing Marks	Evaluation Details
CIE Practical (A)	30	-	Marks awarded for Weekly Conduction of Experiments and Submission of Laboratory records, scaled to 30 marks.
CIE Practical Test (B)	20	-	Average of marks of Two tests, each conducted for 100 marks covering all experiments, scaled to 20.
Total CIE Practical (A+B)	**50**	**20**	**Sum of Marks of Experiments, Record and Test shall be CIE marks awarded for a maximum of 50.**
SEE (C)	**50**	**20**	**SEE is a lab exam, conducted for 100 marks and scaled down to 50 marks. Exam duration shall be for 3 hours.**
CIE + SEE (A+B+C)	**100**	**40**	Final marks shall be the sum of marks scored in Components **A, B and C.**
• The minimum marks to be secured in CIE is 20 (40%) out of allotted 50 marks to appear for SEE.			

B.E. (Electrical & Electronics Engineering)
Outcome Based Education (OBE) and Choice Based Credit System (CBCS)
SEMESTER – IV

Course Title	**ARDUINO & RASPBERRY-PI BASED PROJECTS**		
Course Code	**25BEEAE406A**	**CIE Marks**	**50**
L:T:P:SL	**0:0:30:0**	**SEE Marks**	**50**
Credits	**1**	**Exam Hours**	**03**

Course objectives:

- To impart necessary and practical knowledge of components of Internet of Things
- To develop skills required to build real-life IoT based projects

Sl.No	Experiments
1	i) To interface LED/Buzzer with Arduino/Raspberry Pi and write a program to 'turn ON' LED for1secafterevery2seconds. ii) To interface Pushbutton and LED with Arduino/RaspberryPi and write a Program to' turn ON' LED when push button is pressed
2	i) To interface DHT11 sensor with Arduino/RaspberryPi and write a program to print temperature and humidity readings. ii) To interface OLED with Arduino/RaspberryPi and write a program to print temperature and Humidity readings on it.
3	To interface motor using relay with Arduino/RaspberryPi and write a program to' turn ON' motor when push button is pressed
4	To interface Bluetooth with Arduino/RaspberryPi and write a program to send sensor data to Smart phone using Bluetooth
5	To interface Bluetooth with Arduino/RaspberryPi and write a program to turnLED ON/OFF when'1'/'0' is received from Smart phone using Bluetooth
6	Write a program on Arduino/RaspberryPi to upload temperature and humidity data to thing Speak cloud
7	Write a program on Arduino/RaspberryPi to retrieve temperature and humidity data from thing Speak cloud
8	Write a program on Arduino/RaspberryPi to publish temperature data to MQTT broker
9	Write a program to create UDP server on Arduino/RaspberryPi and respond with humidity data To UDP client when requested.
10	Write a program to create TCP server on Arduino/RaspberryPi and respond with humidity data to TCP client when requested.
11	Write a program to interface smoke sensor with Arduino/RaspberryPi and alert on fire

	detection.
12	Write a program to interface moisture sensor with Arduino/RaspberryPi and switch on the water motor during low moisture detection for watering plants.

Course outcomes (Course Skill Set):

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

1. Understand the concepts of Internet of Things and its hardware and software components
2. Understand Interface I/O devices, sensors & communication modules
3. Understand the Remotely monitor data and control devices
4. Develop real life IoT based projects.

Assessment Details (both CIE and SEE)

Assessment Type	Maximum Marks	Minimum Passing Marks	Evaluation Details
CIE Practical (A)	30	-	Marks awarded for Weekly Conduction of Experiments and Submission of Laboratory records, scaled to 30 marks.
CIE Practical Test (B)	20	-	Average of marks of Two tests, each conducted for 100 marks covering all experiments, scaled to 20.
Total CIE Practical (A+B)	**50**	**20**	**Sum of Marks of Experiments, Record and Test shall be CIE marks awarded for a maximum of 50.**
SEE (C)	**50**	**20**	**SEE is a lab exam, conducted for 100 marks and scaled down to 50 marks. Exam duration shall be for 3 hours.**
CIE + SEE (A+B+C)	**100**	**40**	Final marks shall be the sum of marks scored in Components **A, B and C.**

- The minimum marks to be secured in CIE is 20 (40%) out of allotted 50 marks to appear for SEE.

Suggested Learning Resources:

1. https://www.arduino.cc
2. https://www.raspberrypi.org/
3. Coursein InternetofThings(IOT)UsingArduino –NIEITDelhi Centre
4. Vijay Madisetti, ArshdeepBahga, Internet of Things. "A Hands on Approach", University Press
5. Dr. SRN Reddy, RachitThukral and Manasi Mishra, "Introduction to Internet of Things: A practical Approach", ETI Labs

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B.E. (Electrical and Electronics Engineering) Outcome Based Education (OBE) and Choice Based Credit System (CBCS) SEMESTER – IV			
Course Title:	**Op-Amp and LIC Laboratory**		
Course Code:	**25BEEAE406B**	**CIE MARKS**	**50**
L:T:P:SL	**0:0:30:0**	**SEE MARKS**	**50**
Credits:	**1**	**EXAM HOURS**	**3**

COURSE LEARNING OBJECTIVES:

The purpose of the course is to facilitate the learner to:

1. Understand design aspects of opamp based inverting and non inverting amplifier circuits and its applications.
2. Understand design aspects of opamp based oscillator & filter circuits.
3. Understand design aspects of opamp based switching circuits.
4. Understand design aspects of pulse generator circuits using IC555 timer.
5. Understand design aspects of voltage regulator using IC78XX &79XX series.

Pre Requisites to be covered in 2 Lab sessions

1. Study of pin details, specifications, application features of IC741 (LM741) and IC555 (Timer) through corresponding datasheets.
2. Plot of input and output transfer characteristics to analyze and conclude that op-amps are rarely used in open-loop.
3. Comparison of output performance quantity of an Operational Amplifier obtained by rigging up the circuit with the ideal value of

   (i) A Non – Inverting Amplifier (ii) An Inverting Amplifier (iii) A Difference Amplifier (iv) A Non -Inverting Amplifier with negative feedback (v) An Inverting Amplifier with negative feedback (vi) A Differential Amplifier with negative feedback.

Sl. No	Experiments
1	Design and realize to analyze the frequency response of an op – amp amplifier under inverting and non - inverting configuration for a given gain.
2	Design and verify the output waveform of an op – amp RC phase shift oscillator for a desired frequency.
3	Design and verify the operation of op – amp as an (a) adder (b) subtractor (c) integrator and (d) differentiator.
4	Verify the operation of an op – amp as (a) voltage comparator circuit and (b) zero crossing detector (both inverting and non-inverting configurations, positive and negative reference voltages)
5	Design and realize Inverting Schmitt trigger circuit using an op – amp for (i) Equal values of upper triggering point (UTP) and lower triggering point (LTP) (ii) Unequal values of UTP,LTP (iii) UTP=0V & LTP = 0V
6	Design and realize an op – amp based first order Butterworth (a) low pass (b) high pass

	filters for a given cut off frequency.
7	Design and realize an Opamp based function generator to generate sine, square and triangular waves of desired frequency.
8	Design and realization of opamp based R-2R ladder DAC.
9	Design and verify an IC 555 timer based (i) Monostable multivibrator (ii) Astable multivibrator.
10	Designing of Fixed voltage power supply (voltage regulator) using IC regulators 78 series and 79 series.
11	Design of opamp based instrumentation amplifier.
12	Realization of Two bit Flash ADC using LM324 & basic gates.

COURSE OUTCOMES:

After successfully completing the course, the student will be able to:

CO1	Understand the characteristic parameters of an opamp in open loop.
CO2	Design Opamp based adder, subtractor, differentiator and integrator circuits.
CO3	Design and verify the oscillator and filter circuits using an opamp.
CO4	Design multivibrators and power supplies using Linear ICs.
CO5	Design comparator and converter circuits using an opamp.

ASSESSMENT DETAILS (Both CIE and SEE)

Assessment Type	Maximum Marks	Minimum Passing Marks	Evaluation Details
CIE Practical (A)	30	-	Marks awarded for Weekly Conduction of Experiments and Submission of Laboratory records, scaled to 30 marks.
CIE Practical Test (B)	20	-	Average of marks of Two tests, each conducted for 100 marks covering all experiments, scaled to 20.
Total CIE Practical (A+B)	**50**	**20**	**Sum of Marks of Experiments, Record and Test shall be CIE marks awarded for a maximum of 50.**
SEE (C)	**50**	**20**	**SEE is a lab exam, conducted for 100 marks and scaled down to 50 marks. Exam duration shall be for 3 hours.**
CIE + SEE	**100**	**40**	Final marks shall be the sum of marks scored
(A+B+C)			in Components A, B and C.
• The minimum marks to be secured in CIE is 20 (40%) out of allotted 50 marks to appear for SEE.			

B.E. (Electrical & Electronics Engineering) Outcome Based Education (OBE) and Choice Based Credit System (CBCS) SEMESTER – IV			
Course Title	**MATLAB FOR MACHINES**		
Course Code	**25BEEAE406C**	**CIE Marks**	**50**
L:T:P:SL	**0:0:30:0**	**SEE Marks**	**50**
Credits	**1**	**Exam Hours**	**03**

COURSE LEARNING OBJECTIVES: The purpose of the course is to facilitate the learner

- To provide opportunity to perform the experiments at their own time, at their own pace, at any place as per their convenience and repeat any number of times to understand the concept.
- To Provide unhindered access to perform whenever the students wish.

SL. NO.	Experiments
1	Open Circuit and Short circuit tests on single phase, step up or step down transformer and predetermination of (i) Efficiency and regulation(ii)Calculation of parametersof equivalent circuit.
2	Sumpner's test on similar transformers and determination of efficiency.
3	Parallel operation of two dissimilar single-phase transformers of different kVA and Determination of load sharing and analytical verification given the Short circuit test data.
4	Separation of hysteresis and eddy current losses in single phase transformer.
5	Voltage regulation of an alternator by EMF and MMF methods.
6	Voltage regulation of an alternator by ZPF method
7	Power angle curve of synchronous generator.
8	Slip test–Measurement of direct and quadrature axis reactance and predetermination of regulation of salient poles synchronous machines.
9	Load test on single phase transformer to determine efficiency and voltage regulation

COURSEOUTCOMES:

After successfully completing the course, the student will be able to:

CO1	Develop a program that intelligently uses the SCIlab software package to carry out various tests on transformers and generators in order to assess their performance characteristics.

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 marks). A student shall be deemed to have satisfied the academic requirements and earned the credits allotted to each course if the student secures 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) :

Assessment Type	Maximum Marks	Minimum Passing Marks	Evaluation Details
CIE Practical (A)	30		Marks awarded for Weekly Conduction of Experiments and Submission of Laboratory records, scaled to 30 marks.
CIE Practical Test (B)	20		Average of marks of Two tests, each conducted for 100 marks covering all experiments, scaled to 20.
Total CIE Practical (A+B)	**50**	**20**	**Sum of Marks of Experiments, Record and Test shall be CIE marks awarded for a maximum of 50.**
SEE (C)	**50**	**20**	**SEE is a lab exam, conducted for 100 marks and scaled down to 50 marks. Exam duration shall be for 3 hours.**
CIE + SEE (A+B+C)	**100**	**40**	Final marks shall be the sum of marks scored in Components **A, B and C.**
• The minimum marks to be secured in CIE is 20 out of allotted 50 marks to appear for SEE, with minimum 40 % scored in every component of CIE.			

Continuous Internal Evaluation (CIE):

- CIE marks for the practical course is 50 Marks.
- The split-up of CIE marks for record/ journal and test are in the ratio 60:40.
- Each experiment to be evaluated for conduction with observation sheet and record write-up. Rubrics for the evaluation of the journal/write-up, conduction of experiments by the faculty who is handling the laboratory session and is made known to students at the beginning of the practical session.
- Marks awarded for weekly conduction of experiments and submission of laboratory records evaluated for 30 marks.
- Record should contain all the specified experiments in the syllabus.
- Total marks scored by the students are scaled down to 30 marks (60% of maximum marks).
- Weightage to be given for neatness and submission of record/write-up on time.
- Department shall conduct 02 tests, each for 100 marks, the first test shall be conducted after the 8th week of the semester and the second test shall be conducted after the 14th week of the semester.
- In each test, write-up, procedural knowledge, conduction of experiments and acceptable result will carry a weightage of 80% and the rest 20% for viva-voce.
- The suitable rubrics can be designed to evaluate each student's performance and learning ability.
- The average of 02 tests is scaled down to 20 marks (40% of maximum marks).
- The Sum of scaled-down marks scored in the report write-up/journal and average marks of two tests is the total CIE marks scored by the student.
- The minimum marks to be scored in CIE are 20 out of allotted 50 marks to appear for SEE, with minimum of 40% scored in every component of CIE.

Semester End Evaluation (SEE):

- SEE marks for the practical course is 50 Marks.
- All laboratory experiments are to be included for practical examination.
- Break up (Rubrics) of marks strictly adhered to by the examiners.
- Students can pick up one question (experiment) from the questions lot prepared by the internal/external examiners jointly.
- Evaluation of test write-up, conduction procedure, result and viva-voce will be conducted jointly by examiners. General rubrics suggested for SEE are, for write-up-20%, procedure, conduction and result – 60%, viva-voce-20% of maximum marks.
- SEE for practical shall be evaluated for 100 marks and scored marks shall be scaled down to 50 marks. (However, based upon course type, rubrics shall be decided by the examiners).
- Change of experiment is allowed only once and 20% marks allotted to the procedure part to be made zero.
- The duration of SEE is 03 hours.

B.E. (Electrical & Electronics Engineering) Outcome Based Education (OBE) and Choice Based Credit System (CBCS) SEMESTER – IV			
Course Title	**Java Programming Laboratory**		
Course Code	**25BEEAE406D**	**CIE MARKS**	**50**
L:T:P:SL	**0:0:30:0**	**SEE MARKS**	**50**
Credits	**01**	**EXAM HOURS**	**03**

COURSE LEARNING OBJECTIVES:

The purpose of the course is to facilitate the learner to:

1. To understand Object Oriented Programming.
2. To understand standard Java Technologies.
3. To understand advanced Java topics like J2EE, J2ME, Javascript.
4. To understand the concepts of Java to solve real life problems.

Sl. No.	Experiments
1	Write a java program to find. the Fibonacci series using recursive and non recursive functions.
2	Write a java program to multiply two given matrices.
3	Write a java program that reads a line of integers and displays each integers and the sum of all integers use StringTokenizer.
4	Write a Java program compute factorial value using Applet.
5	Write a java program that works as a simple calculator. Use a Grid Layout to arrange Buttons for digits and for the + - * % operations. Add a text field to display the result.
6	Write a Java program for display the exception in a message dialog box.
7	Write a Java program that implements a multi-thread application that has three threads.
8	Write a java program to connect to a database using JDBC, insert and delete values into it.
9	Write a java program to simulate a traffic light.
10	Write a Java program loads phone no, name from a text file using hash table.
11	Write a Java program that takes tab separated data from a text file and inserts them into a database.
12	Write a Java program that prints the meta-data of a given table.

COURSE OUTCOMES:

After successfully completing the course, the student will be able to:

CO1	To understand Object Oriented Programming.
CO2	To analyze and demonstrate standard Java Technologies.
CO3	To analyze and demonstrate advanced Java topics like J2EE, J2ME, Javascript.
CO4	To understand the concepts of Java to solve real life problems.

ASSESSMENT DETAILS (Both CIE and SEE)

Continuous Internal Evaluation (CIE):

Assessment Type	Maximum Marks	Minimum Passing Marks	Evaluation Details
CIE Practical (A)	30	-	Marks awarded for Weekly Conduction of Experiments and Submission of Laboratory records, scaled to 30 marks.
CIE Practical Test (B)	20	-	Average of marks of Two tests, each conducted for 100 marks covering all experiments, scaled to 20.
Total CIE Practical (A+B)	**50**	**20**	**Sum of Marks of Experiments, Record and Test shall be CIE marks awarded for a maximum of 50.**
SEE (C)	**50**	**20**	**SEE is a lab exam, conducted for 100 marks and scaled down to 50 marks. Exam duration shall be for 3 hours.**
CIE + SEE (A+B+C)	**100**	**40**	Final marks shall be the sum of marks scored in Components **A, B and C.**
• The minimum marks to be secured in CIE is 20 (40%) out of allotted 50 marks to appear for SEE.			

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B.E. (Common to all branches) Outcome Based Education (OBE) and Choice Based Credit System (CBCS) SEMESTER – IV			
Course Title:	**BIOLOGY FOR ENGINEERS**		
Course Code:	**25BFETH407**	**CIE MARKS**	**50**
L:T:P:SL	**30:0:0:30**	**SEE MARKS**	**50**
Total hours of pedagogy	**25**	**TOTAL MARKS**	**100**
Credits:	**2**	**EXAM HOURS**	**2**

COURSE LEARNING OBJECTIVES:

The purpose of the course is to facilitate the learner to:

1. Familiarize the students with the basic biological concepts and their engineering applications.
2. Enable the students with an understanding of bio-design principles to create novel devices and structures.
3. Provide the students with an appreciation of how biological systems can be re-designed as substitute products for natural systems.
4. Motivate the students to develop interdisciplinary vision of biological engineering.

Module-1	**5 hrs**
Introduction to fundamentals of life: Structure and functions of a cell. Biomolecules: Properties and functions of Carbohydrates, Nucleic acids, Proteins, Enzymes and Lipids,	
Module-2	**5 hrs**
Introduction to applications of biomolecules: Carbohydrates in cellulose-based water filters production, PHA and PLA in bioplastics, Nucleic acids in vaccines and diagnosis, Proteins in food production, Enzymes in biosensors fabrication, Genome & protein data types.	
Module-3	**5 hrs**
Introduction to adaptations of anatomical principles for bioengineering design - Brain as a CPU system. Eye as a Camera system. Heart as a pump system. Lungs as purification system. Kidney as a filtration system.	
Module-4	**5 hrs**
Introduction to nature inspired biomaterials and mechanisms - Echolocation, Photosynthesis, Bird flying, Lotus leaf effect, Shark skin, Kingfisher beak. Artificial blood - haemoglobin-based oxygen carriers (HBOCs).	
Module-5	**5 hrs**
Introduction to trends in bioengineering, Bioprinting techniques and materials. Electrical tongue and electrical nose in food science, DNA origami and Biocomputing, Bioimaging and Artificial Intelligence for disease diagnosis. Bio-concrete.	

COURSE OUTCOMES:

After successfully completing the course, the student will be able to:

CO1	Corroborate the concepts of biomimetics for specific requirements.
CO2	Understand the basic biological concepts for relevant industrial applications & adaptations.
CO3	Evaluate the principles of design and development for exploring engineering knowledge in biological stream.
CO4	Explore innovative biobased solutions for socially relevant problems.

ASSESSMENT DETAILS (Both CIE and SEE)

Assessment Type	Maximum Marks	Minimum Passing Marks	Evaluation Details
CIE – IA Tests (A)	30		Average of Two Internal Assessment Tests (MCQs) each conducted for 30 marks.
Continuous and Comprehensive Evaluation (B)	20		Poster presentation to satisfy SDG goals & coursera certification (10 + 10).
Total CIE **(A+B)**	50	20	CIE Evaluation is done for a maximum of 50 marks
SEE **(C)**	50	18	Question papers having 50 MCQs with each question carrying 01 mark, and Exam duration shall be for 2 hours.
CIE + SEE **(A+B+C)**	100	40	Final marks shall be the sum of marks scored in Components **A, B and C.**
The minimum marks to be secured in CIE is 20 out of 50 allotted marks to appear for SEE, with minimum 40 % scored in every component of CIE.			

Suggested Learning Resources:

Textbooks

- Basuchandra's Biology for Engineers, Chandra shekara. B.M, Basavaraju B.C, 2025.
- Biology for Engineers, Rajendra Singh C and Rathnakar Rao N, Rajendra Singh C and Rathnakar Rao N Publishing, Bengaluru, 2023.

Reference Books: -

- Human Physiology, Stuart Fox, Krista Rompolski, McGraw-Hill eBook. 16th Edition, 2022
- Biology for Engineers, Thyagarajan S., Selvamurugan N., Rajesh M.P., Nazeer R.A., Thilagaraj W.
- Barathi S., and Jaganthan M.K., Tata McGraw-Hill, New Delhi, 2012.
- Biology for Engineers, Arthur T. Johnson, CRC Press, Taylor and Francis, 2011
- Biomedical Instrumentation, Leslie Cromwell, Prentice Hall 2011.
- Biology for Engineers, Sohini Singh and Tanu Allen, Vayu Education of India, New Delhi, 2014.
- Biomimetics: Nature-Based Innovation, Yoseph Bar-Cohen, 1st edition, 2012, CRC Press.
- Bio-Inspired Artificial Intelligence: Theories, Methods and Technologies, D. Floreano and C. Mattiussi, MIT Press, 2008.
- Bioremediation of heavy metals: bacterial participation, by C R Sunil kumar, N Geetha, A C Udaya shankar, Lambert Academic Publishing, 2019.

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B.E. (Common to All Branches) Outcome Based Education (OBE) and Choice Based Credit System (CBCS) SEMESTER – IV			
Course Title:	**NSS-National Service Scheme**		
Course Code:	**25BNSSP409**	**CIE MARKS**	**100**
L :T:P:SL	**0:0:0:30**	**SEE MARKS**	**0**
Credits:	**0**	**EXAM HOURS**	**-**

COURSE LEARNING OBJECTIVES:

The purpose of the course is to facilitate the learner to:

1. Identify the needs and problems of the community and involve the problem–solving.
2. Develop among them a sense of social & civic responsibility & utilize their knowledge in finding practical solutions to individual and community problems.
3. Develop competence required for group-living and sharing of responsibilities & gain skills in mobilising community participation to acquire leadership qualities and democratic attitudes.

Module-1
Environment Issues and Role of NSS
Module-2
Disaster Management and Role of NSS
Module-3
Activities -1 (Choose from Activity list)
Module-4
Activities -2 (Choose from Activity list)
Module-5
Activities -3 (Choose from Activity list)

COURSE OUTCOMES:

After successfully completing the course, the student will be able to:

CO1	Understand the motto and concepts of NSS
CO2	Develop overall personality of volunteers and make them as leaders and responsible citizens of our nation
CO3	Analyze the environmental and societal problems/issues and will be able to design solutions for the same.
CO4	Communicate effectively with the community and with the officials.

ACTIVITY LIST	
Helping local schools achieve good results and enhance their enrolment in Higher/technical/Vocational Education.	Preparing an actionable business proposal for enhancing the village income.
Reduction in energy consumption	Preparing an actionable business proposal for enhancing the village's income
Creating awareness about rainwater harvesting in urban and rural areas.	Developing Sustainable Water Management system

ASSESSMENT DETAILS (Both CIE and SEE)

Assessment Type	Maximum Marks	Minimum Passing Marks	Evaluation Details
Evaluation based on Reports (A)	100	-	5 modules Reports, 5 modules X 10 M each = 50 M
Total CIE Theory (A)	**100**	**40**	
SEE (B)	**-**	**-**	**-**
CIE+SEE (A+B)	**100**	**40**	**Final marks shall be the sum of marks scored in Components A, B**
• The minimum marks to be secured in CIE is 40 out of allotted 50 marks with minimum 40 % scored in every component of CIE. • No SEE for this subject			

Suggested Learning Resources:

Reference Books:

4) NSS Course Manual, Published by NSS Cell, VTU Belagavi.
5) Government of Karnataka, NSS cell, activities reports and its manual.
6) Government of India, NSS cell, Activities reports and its manual.

Web links:

3) https://nss.gov.in/
4) https://pledge.mygov.in/

E. (Common to All Branches)
Outcome Based Education (OBE) and Choice Based Credit System (CBCS)
SEMESTER – IV

Course Title:	**Physical Education (PE) (Sports and Athletics)**		
Course Code:	**25BPEDU409**	**CIE MARKS**	**100**
L: T: P:SL	**0:0:0:30**	**SEE MARKS**	**---**
Credits:	**0**	**EXAM HOURS**	**---**

COURSE LEARNING OBJECTIVES:

The purpose of the course is to facilitate the learner to:

1. Understand the fundamental concepts of Physical Education, games and sports skills, Health, Nutrition and Fitness
2. Familiarization of health-related Exercises, Sports for overall growth and development
3. Participate in the competition at regional/state / national / international levels.
4. Create consciousness among the students on Health, Fitness and Wellness in developing and maintaining a healthy lifestyle.

Module-1 **5 Hours**

Athletics

A. Track - Sprints
B. Throws - Shotput
C. Jumps - Long jump

A.Track Events

i. Starting Techniques: Standing start and Crouch start (its variations) use of Starting Block.
ii. Acceleration with proper running techniques.
iii. Finishing technique: Run Through, Forward Lunging and Shoulder Shrug, Torso Finish.

B. Long Jump

Approach Run, Take-off, Flight in the air (Hang Style/Hitch Kick) and Landing

C. Shot put

Holding the Shot, Placement, Initial Stance, Glide, Delivery Stance and Recovery (Perry O'Brien Technique)

Module-2 **5 Hours**

Volleyball

A. Fundamental skills

1. Service: Underarm Service, Side arm Service, Tennis Service, Floating Service
2. Pass: Under arm Pass, Overhead Pass
3. Spiking & Blocking
4. Game Practice with application of Rules & Regulations

B. Rules and their interpretation and duties of the officials	
Module-3	**5 Hours**
Throwball **A. Fundamental skills** Overhand service, Side arm service, two hand catching, one hand overhead return, side arm return. **B. Rules and their interpretation and duties of the officials**	

COURSE OUTCOMES:

After successfully completing the course, the student will be able to:

CO1	Understand the fundamental concepts of Physical Education, games and sports skills, Health, Nutrition and Fitness
CO2	Familiarization of health-related Exercises, Sports for overall growth and development
CO3	Participate in the competition at regional/state/national/international levels.
CO4	Create consciousness among the students on Health, Fitness and Wellness in developing and maintaining a healthy lifestyle.

ASSESSMENT DETAILS (Both CIE and SEE)

Zero-credit NCMC courses (MCQs for assessment)			
Assessment Type	**Maximum Marks**	**Minimum Passing Marks**	**Evaluation Details**
CIE – IA Tests (A)	60	---	Sum of Two Internal Assessment Tests (MCQs) each conducted for 30 marks.
Quiz(B)	40	---	Quiz for a maximum of 40 marks
Total CIE (A+B)	100	40	CIE Evaluation is done for a maximum of 100 marks
• The minimum marks to be secured in CIE is 40 (40%) out of 100 marks allotted to Pass.			

Text books

1. Saha, A. K. Sarir Siksher Ritiniti, Rana Publishing House, Kalyani.
2. Bandopadhyay, K. Sarir Siksha Parichay, Classic Publishers, Kolkata

Reference Books :

1. Saraswati Health and Physical Education
2. V.K. Sharma's Health and Physical Education
3. Oswaal Books: Educart Chapterwise Question Bank: Offers detailed coverage of concepts and questions by chapter.

B.E. (Common to All Branches)
Outcome Based Education (OBE) and Choice Based Credit System (CBCS)
SEMESTER – IV

Course Title:	**Yoga**		
Course Code:	**25 BYOGA409**	**CIE MARKS**	**100**
L: T: P: SL	**0:0:0:30**	**SEE MARKS**	**---**
Credits:	**0**	**EXAM HOURS**	**---**

COURSE LEARNING OBJECTIVES:

The purpose of the course is to facilitate the learner to:

1. Physical, Mental & spiritual Objectives of Yoga
2. Explain the meaning of Yoga.
3. Discuss the importance of the Yoga and its scope.
4. Describe the aims and objectives of Yoga.
5. Clarify the misconceptions on Yoga

Module-1 **5 Hours**

Patanjali Ashtanga Yoga

A. Yama: Ahimsa, satya, asteya, brahmacarya, aparigraha

B. Niyama: shoucha, santosh, tapa, svaadhyaya, Eshvarapranidhan

C. Suryanamaskara: 12 Counts, 4 Rounds

Module-2 **5 Hours**

Asana

a) Meaning, Need & Importance of Asana
b) **DifferentTypesofAsanas:**
   i. **Sitting**- 1. Sukhasana, 2. Paschimottanasana
   ii. **Standing** - 1. ArdhakatiChakrasana 2. Parshva Chakrasana
   iii. **Prone line** -Dhanurasana
   iv. **Supine line**- Halasana
c) Asana Technique
d) Precautionary measures and benefits of each Asana

Module-3 **5 Hours**

Pranayama

A. Meaning, Need & importance of Pranayama.
Different types of pranayama, technique, precautionary measures and benefits of each Pranayama.
   1. **Suryanuloma -Viloma**
   2. **Chandranu loma-Viloma**

B. Kapalabhati
Meaning, importance and benefits of Kapalabhati.

COURSE OUTCOMES

After successfully completing the course, the student will be able to:

CO1	Understand the fundamental concepts of Yoga
CO2	Improves of health and related aspects, overall growth and development
CO3	Participate in the competition at regional/state/national/international levels.
CO4	Create consciousness among the students on Health, Fitness and Wellness in developing and maintaining a healthy lifestyle.

ASSESSMENT DETAILS (Both CIE and SEE)

Assessment Type	Maximum Marks	Minimum Passing Marks	Evaluation Details
CIE – IA Tests (A)	60	----	Sum of Two Internal Assessment Tests (MCQs) each conducted for 30 marks.
Quiz(B)	40	----	Quiz for a maximum of 40 marks
Total CIE (A+B)	100	40	CIE Evaluation is done for a maximum of 100 marks
• The minimum marks to be secured in CIE is 40 (40%) out of 100 marks allotted to Pass.			

Text books

1. The Yoga Sutras of Patanjali – Sri Swami Satchidananda.
2. Light on Yoga — B.K.S Iyengar.

Reference Books: -

1. The Heart of Yoga — T.K.V Desikachar.
2. "Asana Pranayama Mudra Bandha" bySwamiSatyanandaSaraswati.

B.E. (Common to All the Branches) Outcome Based Education (OBE) and Choice Based Credit System (CBCS) SEMESTER – IV			
Course Title	**MUSIC**		
Course Code	**25BMUSK409**	**CIE Marks**	**100**
L: T: P:SL	**0: 0: 0 : 30**	**SEE Marks**	**--**
Credits	**0**	**Exam Hours**	**--**

Course Learning Objectives:

The purpose of the course is to facilitate the learner to:

1. Understand the significance of music in daily life and gain an overview of Indian folk, contemporary, and Western music traditions.
2. Acquire basic knowledge of introductory Carnatic music exercises and compositions,
3. Compare the fundamental features of Carnatic and Hindustani music.
4. Recognize the classification of wind instruments and appreciate the contributions of eminent composers to Indian classical music.

Module-1		**3 hrs**
Importance of music in daily life ,Indian folk, and contemporary music. Introduction to Western music		
Module-2		**3 hrs**
Compositions: Introduction to the few types of composition in Carnatic Music- Nottu Swara, Sarale and janti varase, Alakara		
Module-3		**3 hrs**
Comparative Study of Carnatic and Hindustani Music based on Geographical origin and development , Musical structure and style ,Raga and Tala systems		
Module-4		**3 hrs**
Music Instruments: Classification and construction of wind instrurnents in both Carnatic and Hindustani Music.		
Module-5		**3 hrs**
Composers: Biography and contributions of of the following eminent personalities Muttuswami Dikshitaru , Shyama Shastri, Mysore Vasudevacharya, Pt. Bheemasen Joshi		

Course Outcomes:

After successfully completing the course, the student will be able to:

CO1	Explain the importance of music in daily life and the characteristics of Indian folk, contemporary, and Western music traditions. *(Bloom's Level: L2 – Understand)*
CO2	Illustrate the basic concepts and structure of introductory Carnatic music exercises and compositions*(Bloom's Level: L3 – Apply)*
CO3	Compare the distinguishing features of Carnatic and Hindustani music *(Bloom's Level: L4 – Analyze)*
CO4	Analyze the contributions of eminent composers in enriching and preserving the heritage of Indian classical music. *(Bloom's Level: L4 – Analyze)*

Assessment Details (CIE and SEE):

Assessment Type	Maximum Marks	Minimum Passing Marks	Evaluation Details
CIE – IA Tests (A)	60	-	Sum of Two Internal Assessment Tests (MCQs) each conducted for 30 marks.
Experimental Work(B)	40	-	Submission of report on a topic related to music.
CIE + SEE (A+B)	**100**	**40**	CIE Evaluation is done for a maximum of 100 marks
• The minimum marks to be secured in CIE is 40 (40%) out of 100 marks allotted to Pass.			

Text Books:

1.	T Sachidevi and T Sharadha (Thirumalai Sisters), Karnataka Sangeetha Dharpana-Vol. 1 (English), Shreenivaas Prakaashana, 2018.
2.	B. Chaitanya Deva, An Introduction to Indian Music, Publications Division, Government of India, New Delhi.

Reference Books:

1.	Lakshminarayana Subramaniam, Viji Subramanaim, "Classical Music of India: A Practical Guige, Tranqueber 2018.
2	Vamanrao H. Deshpande, Indian Musical Traditions: An Aesthetic Study of the Gharanas in Hindustani Music, Popular Prakashan, Mumbai.

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Outcome Based Education (OBE) and Choice Based Credit System (CBCS)
SEMESTER – IV

ADDITIONAL MATHEMATICS – II

(Mandatory Learning Course: Common to All Branches)
(A Bridge course for Lateral Entry students under Diploma quota to BE/B. Tech.)

Course Code	**25BMADP410**	CIE Marks	100
L:T:P: SL	14:0:0:14	SEE Marks	--
Credits	**PP**	Exam Hours	--

COURSE LEARNING OBJECTIVES: The purpose of the course is to facilitate the learner to:

- Apply the essential concepts of linear algebra to solve systems of linear equations and analyze mathematical models.
- Solve second- and higher-order ordinary differential equations using appropriate analytical methods in engineering contexts.
- Develop the knowledge and problem-solving skills required to evaluate multiple integrals, apply change of order of integration.
- Apply numerical methods to obtain approximate solutions to mathematical problems arising in science and engineering.

Module-1

Linear Algebra: Introduction - rank of matrix by elementary row operations - Echelon form. Consistency of system of linear equations - Gauss elimination method. Eigen values and Eigen vectors of a square matrix. Problems.

Module-2

Numerical Methods: Finite differences. Interpolation/extrapolation using Newton's forward and backward difference formulae (Statements only)-problems. Solution of polynomial and transcendental equations – Newton-Raphson and Regula-Falsi methods (only formulae)- Illustrative examples. Numerical integration: Simpson's one third rule (without proof) Problems.

Module-3

Higher order ODE's: Linear differential equations of second and higher order equations with constant coefficients. Homogeneous /non-homogeneous equations. Inverse differential operators. *[Particular Integral restricted to* $R(x)=e^{ax}$, $\sin ax$ /$\cos ax$ *for* $f(D)y = R(x)$.]

Module-4

Double integrals: Definition, evaluation of rectangular and general regions, Change of order of integration.

Module-5

Triple integrals: Definition and evaluation over simple regions, Applications of triple integrals to the evaluation of volumes.

Course Outcomes: At the end of the course the student will be able to: CO1:
Solve systems of linear equations using matrix algebra.
CO2: Apply the knowledge of numerical methods in modelling and solving engineering problems. CO3:
Apply analytical methods to solve higher order differential equations.
CO4: Solve double integrals, including change of order of integration,
CO5: Solve triple integrals, volumes of geometrical regions.

ASSESSMENT DETAILS (Both CIE and SEE)

Assessment Type	Maximum Marks	Minimum Passing Marks	Evaluation Details
CIE – IA Tests (A)	60	-	Two tests of each of 50 marks shall be conducted. Average of Two Internal Assessment Tests shall be scaled down to 60 marks.
Continuous and Comprehensive Evaluation (B)	40	-	Any two Assessment methods of each of 20 marks as per 24RNBE4.2 (*if it is project based, one assignment shall be given), scaled to 40 marks.
Total CIE (A+B)	**100**	**40**	**CIE Evaluation is done for a maximum of 50 marks**
SEE (C)	**-**	**-**	No SEE for this subject
CIE + SEE (A+B+C)	**100**	**40**	Final marks shall be the sum of marks scored in Components **A, B and C.**

Sl No	Title of the Book	Name of the Author/s	Name of the Publisher	Edition and Year
Textbook				
1	Higher Engineering Mathematics	B.S. Grewal	Khanna Publishers	43rd Edition, 2015
Reference Books				
1	Advanced Engineering Mathematics	E. Kreyszig	John Wiley & Sons	10th Edition, 2015
2	Engineering Mathematics	N. P. Bali and Manish Goyal	Laxmi Publishers	7th Edition, 2007
3	Engineering Mathematics Vol. I	Rohit Khurana	Cengage Learning	1st Edition, 2015

Additional Mathematics I and II:

(2) These courses are prescribed for III and IV semesters respectively to lateral entry Diploma holders admitted to III semester of B.E./B.Tech., programs. They shall attend the classes during the respective semesters to complete all the formalities of the course and appear for the Continuous Internal Evaluation (CIE). In case any student fails to register for the said course/fails to secure the minimum 40 % of the prescribed CIE marks, he/she shall be deemed to have secured an F grade. In such a case, the student has to fulfill the course requirements during subsequent semesters to earn the qualifying CIE marks. These courses are slated for CIE only and have no SEE.

(2) Additional Mathematics I and II shall not be considered for vertical progression as well as for the calculation of SGPA and CGPA, but completion of the courses shall be mandatory for the award of degree.

(4) Successful completion of the courses Additional Mathematics I and II shall be indicated as satisfactory in the grade card. Non-completion of the courses Additional Mathematics I and II shall be indicated as Unsatisfactory

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B.E. Electrical and Electronics Engineering			
Course Title :	**Community Project (Project Based Learning) Societal Project**		
Course Code	**25BCBPR308**	CIE Marks	50
L :T : P : SL	0:0:0:30	SEE Marks	50
Credits	1	Exam Hours	03

Course objective:

Rapid urbanization, population growth, environmental concerns, energy demand, water scarcity, waste management, transportation issues and rural development challenges have created practical problems affecting communities and public welfare. This course aims to integrate technical knowledge, field exposure and societal engagement so that students identify real community issues, frame problem statements and attempt appropriate, feasible and sustainable engineering responses within the scope of a one-semester project.

Course outcome (Course Skill Set):

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

1. **CO1 (L2 – Understand):** Identify and analyse societal problems through field interaction and technical assessment.
2. **CO2 (L3 – Apply):** Develop skills in project planning, field survey, data collection, implementation, documentation and reporting.
3. **CO3 (L4 – Analyse):** Formulate feasible engineering problem statements and solutions considering practical constraints and sustainability aspects.
4. **CO4 (L3 – Apply):** Apply principles of environmental responsibility, ethics and societal welfare in engineering practice through community-oriented interventions.
5. **CO5 (L4 – Analyse):** Exhibit multidisciplinary learning and problem-solving ability based on collected data, user feedback and baseline conditions.
6. **CO6 (L5 – Evaluate):** Demonstrate teamwork and communication skills while interacting with technical and non-technical stakeholders and reflect on project impact on society.

Restrictions and professional conduct:

Community / Societal Projects shall remain **academic, socially responsible, technically focused, and politically neutral**. Students and faculty shall maintain professionalism, ethical conduct, public respect and institutional integrity while interacting with communities, public groups, organizations and stakeholders.

Students and faculty **shall avoid** the following during project execution:

- Association with political party activities, campaigns or propaganda.
- Participation in activities that may disturb communal harmony, public order or institutional reputation.

- Use of the project platform for personal, political, ideological or commercial promotion.
- Disrespectful, discriminatory or unethical interaction with community members or stakeholders.

Sustainable Development Goals

The faculty shall encourage students to undertake community projects that align with and contribute towards satisfying the National Board of Accreditation (NBA) Criterion 3.6, namely,

Evidence of Addressing Sustainable Development Goals (SDGs), which is a major emphasis of the United Nations (UN). The Sustainable Development Goals (SDGs) are illustrated in the figure shown below:



SET OF PROJECT ACTIVITIES (TW/SL = 30 HOURS)

Methods for project identification:

Students may identify the project topic using one or more of the following methods:

- Interaction with local rural or urban stakeholders such as local leaders, corporation/municipality personnel, NGOs, panchayat representatives, etc.
- Review of issues highlighted in print and electronic media, and social networks (WhatsApp,

After selecting a broad topic, students shall collect data, conduct a feasibility survey, estimate timelines and resources, approximate expenditure, and then define the problem statement and objectives clearly.

List of Project Topics and Engineering Outcomes:

The following structured sequence of activities is to be carried out during the semester:

Projects must also recognize constraints related to **cost, resources, environment and safety, and stakeholder behavior /cooperation/acceptance** when planning and implementing activities.

Sl. No.	Project title	Measurable engineering outcome	Mapped POs	SDGs
1	Rural and urban water conservation and management systems	Prepare a site-specific water-saving plan, estimate water demand–supply gap, and propose a feasible conservation intervention with quantified savings.	PO1, PO2, PO3, PO4, PO10, PO11	SDG 6, SDG 11, SDG 12
2	Waste management and recycling	Conduct waste audit, classify waste streams, and design a segregation/recycling workflow with measurable reduction in mixed waste.	PO2, PO3, PO4, PO6, PO8, PO10	SDG 11, SDG 12, SDG 13

3	Afforestation	Identify a degraded area, prepare plantation layout, and demonstrate survival-rate tracking and maintenance schedule for saplings.	PO2, PO3, PO4, PO6, PO7, PO11	SDG 11, SDG 13, SDG 15
4	Biogas generation and power generation	Estimate organic waste availability, size a small biogas system, and document expected gas output or energy yield.	PO1, PO2, PO3, PO4, PO5, PO10	SDG 7, SDG 11, SDG 12
5	DPR for solar power rural plant	Prepare a DPR with load assessment, panel sizing, cost estimate, and projected energy generation and payback.	PO1, PO2, PO3, PO4, PO5, PO10	SDG 7, SDG 9, SDG 11
6	DPR for Electrification of village/tribal community	Map unserved / underserved households, propose electrification layout, and estimate coverage, losses, and implementation cost.	PO1, PO2, PO3, PO4, PO10, PO11	SDG 7, SDG 9, SDG 10
7	DPR for rural drainage system	Survey drainage bottlenecks, develop a drainage layout, and estimate runoff handling capacity and flood-risk reduction.	PO1, PO2, PO3, PO4, PO6, PO10	SDG 6, SDG 9, SDG 11
8	Sustainability and environmental health projects	Assess local environmental health issues and propose interventions with measurable improvement in hygiene, safety, or resource use.	PO2, PO3, PO4, PO6, PO7, PO8	SDG 3, SDG 6, SDG 11, SDG 12
9	Plastic free campaigns	Measure plastic usage before and after awareness intervention and report percentage reduction or behavioural change.	PO2, PO3, PO6, PO7, PO8, PO10	SDG 11, SDG 12, SDG 13
10	Health and nutrition awareness	Conduct baseline and post - program awareness survey and document improvement in awareness score or adoption of healthier practices.	PO2, PO6, PO7, PO8, PO9, PO10	SDG 2, SDG 3, SDG 11
11	Societal projects involving health wellness	Identify a community health need and develop an awareness/service module with measurable participation and feedback outcomes.	PO2, PO3, PO6, PO8, PO9, PO10	SDG 3, SDG 11, SDG 17
12	Air quality monitoring system	Collect air-quality data, compare with reference limits, and present trends along with possible mitigation suggestions.	PO2, PO3, PO4, PO5, PO6, PO10	SDG 3, SDG 11, SDG 13
13	Plastic waste reduction campaign	Track collection, segregation, and replacement actions, and quantify reduction in plastic waste generation or littering.	PO2, PO3, PO6, PO7, PO8, PO10	SDG 11, SDG 12, SDG 13
14	Urban greening projects	Prepare greening plan, identify planting locations, and assess environmental benefits such as shade, aesthetics, or heat mitigation.	PO2, PO3, PO4, PO6, PO7, PO11	SDG 11, SDG 13, SDG 15

Sl. No.	Project title	Measurable engineering outcome	Mapped POs	SDGs
15	Smart agriculture solution	Design a low-cost monitoring or irrigation support solution and estimate improvement in water use efficiency or crop support.	PO1, PO2, PO3, PO4, PO5, PO10	SDG 2, SDG 6, SDG 9
16	Smart irrigation system	Estimate crop water requirement, propose control logic, and quantify water savings compared with conventional irrigation.	PO1, PO2, PO3, PO4, PO5, PO10	SDG 2, SDG 6, SDG 12
17	Youth mentoring Programs	Deliver a structured mentoring activity and measure participation, engagement, and skill/awareness improvement.	PO6, PO8, PO9, PO10, PO11	SDG 4, SDG 10, SDG 17
18	Adult education	Conduct learner-needs assessment, prepare instructional content, and measure improvement in basic literacy or numeracy indicators.	PO6, PO8, PO9, PO10, PO11	SDG 4, SDG 10, SDG 17
19	Food security initiatives / cold storage system	Estimate storage need, design a simple cold-chain concept, and document reduction in spoilage or wastage.	PO1, PO2, PO3, PO4, PO5, PO10	SDG 2, SDG 9, SDG 12
20	Human rights awareness with legal systems	Prepare and deliver an awareness module and assess increase in legal awareness and access-to-rights understanding.	PO6, PO7, PO8, PO9, PO10	SDG 5, SDG 10, SDG 16
21	House tax collection through digital media	Develop a simple digital workflow or awareness support and measure improvement in compliance, convenience, or response time.	PO2, PO3, PO4, PO5, PO10, PO11	SDG 9, SDG 11, SDG 16
22	Use of application / application program	Build or demonstrate a useful community app and measure usability, adoption, or efficiency improvement.	PO1, PO3, PO4, PO5, PO9, PO10	SDG 9, SDG 11, SDG 17
23	Creation of Panchayat library	Plan the library model, catalogue resources, and measure usage, accessibility, or participation outcomes.	PO6, PO8, PO9, PO10, PO11	SDG 4, SDG 10, SDG 11, SDG 17

Suggested Learning Resources:

Textbooks:

1. **Phadke, N. D**. Community Engagement and Social Innovation. 1st ed., Oxford University Press, New Delhi.
2. **Garg, N. R**. Project-Based Learning in Engineering Education. 1st ed., Pearson India Education Services, Noida.
3. **Gupta, A. and P. Singh.** Service Learning and Community Projects. 1st ed., McGraw-Hill Education (India), New Delhi.
4. **Wilson, G.** Practical Guide to Community Development Projects. 2nd ed., Routledge, London.

Reference books:

1. NPTEL courses on Project-Based Learning and Social Innovation.
2. SWAYAM courses on community engagement and sustainability.
3. UN Sustainable Development Goals portal: https://sdgs.un.org
4. MyGov India and local civic body portals for community initiatives.
5. YouTube resources on design thinking, social innovation, and community service learning.
6. NGO and government field-action case studies related to sanitation, water, health, education, and environment.

Weblinks and Video Lectures (e-Resources):

1. NPTEL courses on Engineering Geology (IIT Roorkee, IIT Kharagpur).
2. NPTEL courses on Soil Mechanics and Foundation Engineering (IIT Delhi, IIT Bombay).
3. Virtual Labs – Geotechnical Engineering Virtual Lab (IIT Kanpur): https://vlab.co.in
4. Geological Survey of India (GSI) – Maps, reports, and publications: https://www.gsi.gov.in
5. YouTube channels: Civil Engineering Essentials, The Engineering Classroom (soil mechanics experiments).
6. American Society of Civil Engineers (ASCE) – Geotechnical resources and standards

Teaching Learning Process:

The suggested TLP for Community / Societal Project is as follows;

Week/ Phase	Teaching–Learning Activity	Faculty Role	Student Activity	Output / Evidence
1	Course introduction, objectives, ethics, conduct, and assessment briefing	Explain course scope, rules, rubrics, and expected deliverables	Understand course requirements and form teams	Team list, course plan
2	Community problem identification and topic selection	Guide topic framing and feasibility	Identify local issues through discussion and observation	Shortlisted project topic
3	Stakeholder interaction and preliminary survey	Demonstrate survey methods and stakeholder engagement	Collect initial data from community/users	Survey notes, interview record
4	Problem statement and objective formulation	Review and refine problem statement	Prepare problem statement, scope, and objectives	Approved problem statement

5	Literature/case study review and baseline analysis	Suggest relevant references and examples	Study existing solutions and compare approaches	Baseline analysis summary

- Students who fail to earn the required CIE marks may be given additional opportunities before closure of the semester; no re-doing of CIE is permitted after the end of the semester.

B. Semester End Examination (SEE) – 100 marks (scaled to 50)

- Examination duration: 2 hours.
- Maximum examination marks: 100 (entered as 100 in the VTU portal; the ITI-SMU module automatically scales 100 → 50 for result processing).
- The SEE shall be conducted batch-wise by a committee of three faculty: project guide, one faculty from the same department and one from a different department.

SEE pass requirement and overall passing rule:

- For a pass in SEE, a student shall secure minimum 35 marks out of 100.
- For declaration of a pass grade, the sum of CIE marks (out of 50) and scaled SEE marks (out of 50) shall be ≥ 40; otherwise, the student is awarded grade F (Fail).

CIE Rubric — Continuous Internal Evaluation (Total 50 marks):

Criterion	Weight (marks)	Excellent (Full marks)	Good	Fair	Needs Improvement
Problem identification & Relevance to society/industry /community	8	Problem is clearly identified with strong evidence of societal relevance and well-defined scope.	Problem is Relevant and scope is clear with adequate supporting evidence.	Problem defined but defined but evidence is weak.	Problem unclear or not relevant; little/no Supporting evidence.
Formation of problem statement; Engineering approach, innovation & feasibility	10	Problem statement is precise; approach is sound, innovative and clearly feasible.	Problem statement adequate; approach feasible with minor gaps	Problem statement partial; approach feasibility is marginal.	Problem statement missing or approach not feasible.
Interaction with stakeholders; Data collection, analysis & interpretation	8	Thorough stakeholder engagement; data collection is comprehensive; analysis is well-interpreted.	Good engagement; data and analysis adequate with minor gaps.	Limited engagement; data incomplete and analysis superficial.	Little/no stakeholder contact; insufficient or no data/ analysis.

Project documentation; Clarity, organization & problem- solving demonstrated	10	Documentation is complete, well-organized, analytical, and shows strong problem-solving.	Documentation complete and clear with some analytical content.	Documentation basic with omissions; problem-solving limited.	Documentation missing/poorly organized; no clear Problem - solving
Communication & Presentation skills	6	Presentation is confident, structured, and answers queries fully; visuals effective.	Presentation clear and satisfactory; responds to most queries.	Presentation acceptable but lacks clarity or confidence; weak responses.	Presentation poor or absent; unable to respond.
Contribution & Benefit to society (impact, sustainability)	8	Clear, demonstrable societal benefit and sustainability; realistic path to implementation.	Benefit plausible; sustainability considered with minor gaps.	Limited or unclear societal benefit; sustainability not well addressed.	No evident benefit or sustainability; project not community-oriented.

Notes for CIE rubric:

- Minimum CIE pass requirement: 20/50 to be eligible for SEE. [Use departmental committee (HoD/guide + senior faculty) to apply the rubric and record marks.]

SEE Rubric — Semester End Examination (Enter marks out of 100; scaled to 50 later):

Criterion	Weight (marks)	Excellent (Full marks)	Good	Fair	Needs Improvement
Problem identification & Relevance to society/industry/ community	16	Problem and relevance are articulated clearly with strong evidence and context.	Problem relevanceclear with reasonable evidence.	Problem stated but evidence/ context weak.	Problem poorly defined or irrelevant.
Formation of problem statement; Engineering approach, innovation & feasibility	20	Problem statement is precise; approach demonstrates engineering depth, novelty and feasibility.	Approach is technically sound and feasible with minor limitations.	Approach basic; limited technical depth or feasibility concerns.	No viable engineering approach or infeasible plan.

Interaction with stakeholders; Data collection, analysis & interpretation	16	Excellent stakeholder engagement; rigorous data collection and insightful analysis.	Good engagement and acceptable analysis.	Superficial data collection and limited analysis.	Inadequate or no data; poor analysis.
Project documentation; Clarity, technical rigor & Problem - solving demonstrated	20	Report is comprehensive, technically rigorous, and demonstrates systematic problem-solving.	Report is complete and technically correct with minor gaps.	Report lacks technical depth or has notable omissions.	Report missing key elements or technically incorrect.
Communication, Presentation & Viva-voce responses	12	Candidate presents expertly, defends work persuasively and answers all queries correctly.	Good presentation and Satisfactory answers to most queries.	Presentation adequate but fails to answer some technical questions.	Poor presentation and unable to defend work.
Contribution & Benefit to society; Impact assessment & sustainability	16	Clear, evidence-based assessment of social impact and Sustainability with scaling recommendations.	Reasonable impact discussion and sustainability considerations.	Limited evaluation of impactor sustainability.	No coherent assessment of impact or sustainability.

SEE pass rule:

- Student must secure at least 35/100 in SEE itself to be eligible for pass consideration.
- Final passing is based on CIE (out of 50) + SEE (scaled to 50) >= 40. Otherwise, grade F (Fail) is awarded.

Suggested implementation notes (for BoS / exam committees):

- Use numerical scores from the rubric and keep brief evaluator comments for each criterion.
- For team projects: record individual contribution within the documentation and adjust individual marks using a peer-evaluation sheet or guide's assessment.
- Maintain evidence (field notes, photos, questionnaires, DPRs, reports) as annexures for SEE moderation.
- Use standardized score sheet (spreadsheet) mapping rubric items to columns for easy aggregation and archival.

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B.E. (EE Engineering)
Outcome Based Education (OBE) and Choice Based Credit System (CBCS)
SEMESTER – III

Course Title:	**Python for Electrical Engineering**		
Course Code:	**25BEEL001**	**CIE MARKS**	**50**
L: T: P : SL	**0:0:30:0**	**SEE MARKS**	**50**
Credits:	**1**	**EXAM HOURS**	**3 Hours**

COURSE LEARNING OBJECTIVES:

The purpose of the course is to facilitate the learner to:

1. Explain core Python syntax, modular parameters, and file manipulation protocols for parsing structural electrical log streams.
2. Apply vectorized computation methods and ordinary differential equation solvers to execute complex multi-loop circuit network tracking.
3. Analyze continuous AC waveforms and electrical transient behaviors through configured visualization tracking environments.
4. Evaluate dynamic operating Q-points and operating cutoffs for nonlinear electronic parts and configurations via automated calculation routines.
5. Evaluate the functionality of digital logic systems and state transitions by establishing automated truth tables and logic verification routines.

Module 1: : Python Core Foundations for Engineers (SPN) **6 Hours**

Basics: Variables, data types, conditional statements, and loops applied to repetitive calculations (e.g., calculating power across varying resistors). Data Structures for Signals: Storing waveform samples using lists, tuples, and dictionaries. File I/O operations: Reading and parsing sensor data from .txt and .csv logger files. Functions & Modular Programming: Writing reusable code blocks for electrical formulas (e.g., parallel impedance, power factor).

Programs:

- Build a Python script that reads a multi-column text file containing Voltage and Current logger data, calculates instantaneous power while handling missing values using try-except blocks, and exports the clean data to a .csv file.
- Read a temperature sensor over a Serial port and write a script to trigger a Windows notification if it exceeds 45°C.

Module 2: Numerical Computing & Circuit Mathematics (VG)	**6 Hours**

Vectorized Engineering: Introduction to NumPy arrays for handling large voltage/current datasets.Linear Algebra for Network Analysis: Solving multi-loop mesh and nodal equations using matrix inversion. Signal & Complex Math: Handling complex numbers, phase angles, and polar-to-rectangular conversions. SciPy Modules: Solving ordinary differential equations (ODEs) for transient states in RC, RL, and RLC circuits.

Programs:

- Write a modular Python tool consisting of a formula file and an execution file that prompts a user for AC circuit load parameters R, X_L, X_C calculates total complex impedance, and returns whether the power factor is leading or lagging.
- Build a Python script that sets up a complex-valued admittance matrix representing a 3-loop AC mesh network and solves for the unknown mesh currents using numpy.linalg.solve.
-

Module 3: Signal Visualization & Waveform Plotting (Matplotlib) (SPN & VG)	**6 Hours**

2D Plotting Foundations: Plotting alternating current (AC) voltage and current waveforms. Advanced Plot Layouts: Adding grids, multi-axis tracking (Voltage vs. Current), legends, and phase shift labels. Electrical Transient Analysis: Plotting the charging and discharging curves of capacitors and inductors (RC, RL, and RLC circuits) over time. Dynamic Data: Generating real-time, self-updating plots for simulated active systems.

Programs:

- Write a Python script using scipy.integrate.solve_ivp to simulate and solve the transient state differential equations of a series RLC circuit subjected to a sudden DC step-voltage input.
- Write a Python script using matplotlib. animation. FuncAnimation to create a real-time, animated oscilloscope simulation showing the exponential charging curve of a capacitor over five time constants (5τ).

Module 4: Python for Analog Electronic Circuits (AEC Modeling) (SV)	**6 Hours**

Diode Characteristic Simulation: Modeling and plotting the non-linear Shockley diode equation; finding the dynamic resistance and Q-point graphically. BJT & FET Biasing Automation: Writing scripts to automatically calculate resistor values for fixed-bias, emitter-stabilized, and voltage-divider biasing circuits. Amplifier Frequency Response: Using Python to simulate and plot the low-frequency and high-frequency cutoff zones of a Common Emitter (CE) amplifier. Operational Amplifier (Op-Amp) Solvers: Building interactive scripts to calculate outputs for ideal/non-ideal Op-Amp configurations (Inverting, Non-Inverting, Integrators, and Differentiators).

Programs

- Build a Python script using scipy.optimize.fsolve that solves the non-linear Shockley equation to locate and plot the exact operating Q-point of a PN-junction diode connected to a DC load line.
- Write a Python script that automates the component design of a BJT voltage-divider biasing circuit by matching calculated theoretical resistor values against an internal array of standard commercial E24 series resistors.

Module 5: Python for Digital Logic Circuits (DLC Verification) BKM	**6 Hours**

Bitwise Operations & Logic Gates: Utilizing Python's native bitwise operators (&, |, ^, ~) to mimic physical AND, OR, XOR, and NOT gate configurations. Combinational Logic Emulation: Writing code blocks to simulate the truth tables of HalfAdders, Full-Adders, Multiplexers, and Decoders. Automated Truth Table Generators: Designing a script that accepts a Boolean expression string and prints out its complete operational truth table.
Sequential Logic Foundations: Simulating clock pulses and state transitions for basic latches and Flip-Flops (SR, JK, and D Flip-Flops).

Programs

- Build a Python script that accepts a raw text Boolean expression string from a user, parses it into bitwise operations, and automatically prints out its complete 3-variable logic truth table.
- Write a Python script that emulates the clock-driven state transitions of a rising-edge triggered D Flip-Flop, incorporating conditional logic to handle an overriding active-low asynchronous Clear line

COURSE OUTCOMES:

After successfully completing the course, the student will be able to:

CO1	Apply core Python features, data structures, and file I/O operations to parse raw sensor logs and solve modular electrical engineering formulas.
CO2	Utilize NumPy and SciPy libraries to compute multi-loop mesh/nodal matrix equations and solve ordinary differential equations (ODEs) for transient circuit behaviors.
CO3	Design static and real-time waveforms using Matplotlib to visually analyze alternating current (AC) patterns and capacitor/inductor transient states.
CO4	Develop automation solvers for analog electronics to evaluate nonlinear diode equations, automate transistor biasing, and simulate amplifier frequency responses.
CO5	Synthesize digital logic emulators using native bitwise operators to programmatically verify truth tables, combinational circuits, and sequential flip-flop state transitions.

Text Books:

1. Squire, J. C., & English, A. E. (2024). *Introduction to Python and Spice for Electrical and Computer Engineers* (1st ed.). Butterworth-Heinemann. ISBN: 9780443190070.
2. Bora, A., & Changmai, P. (2025). *Python for Electrical and Electronics Engineering*. Cambridge Scholars Publishing. ISBN: 9781036441241.
3. Gupta, N., & Nayak, R. (2025). *Python for Engineers and Scientists: Concepts and Applications* (1st ed.). CRC Press.

Link From Code infinity https://codefinity.com/courses/v2/092e2b56-99e3-4f3b-a726-3b6777ca2d8a

ASSESSMENT DETAILS

Assessment Type	Maximum Marks	Minimum Passing Marks	Evaluation Details
CIE (A)	50	**20**	**CIE is a lab exam, conducted for 100 marks and scaled down to 50 marks. Exam duration shall be for 3 hours.**
SEE (B)	**50**	**20**	**SEE is a lab exam, conducted for 100 marks and scaled down to 50 marks. Exam duration shall be for 3 hours.**
CIE + SEE (A+B)	**100**	**40**	Final marks shall be the sum of marks scored in Components **A, B and C.**



VISION

Building RNSIT into a World Class Institution.

MISSION

To impart high quality education in Engineering, Technology and Management with a difference, enabling students to excel in their career by

- Attracting quality students and preparing them with a strong foundation in fundamentals so as to achieve distinctions in various walks of life leading to outstanding contributions.
- Imparting value based, need based, choice based and skill based professional education to the aspiring youth and carving them into disciplined, World class professionals with social responsibility.
- Promoting excellence in Teaching, Research and Consultancy that galvanizes academic consciousness among Faculty and Students.
- Exposing Students to emerging frontiers of knowledge in various domains and make them suitable for Industry, Entrepreneurship, Higher studies, and Research & Development.
- Providing freedom of action and choice for all the Stakeholders with better visibility.

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