|| Jai Sri Gurudev ||
Sri Adichunchanagiri Shikshana Trust (R)

SJB Institute of Technology

An AUTONOMOUS INSTITUTION UNDER VISVESVARAYA TECHNOLOGICAL UNIVERSITY

Approved by AICTE, 2(f) and 12(B) recognized by UGC, New Delhi
Accredited by NAAC, Accredited by NBA, Certified by ISO 9001 - 2015

BACHELOR OF ENGINEERING [B.E.]

Electrical & Electronics Engineering

AUTONOMOUS
SCHEME & SYLLABUS

SECOND YEAR
III & IV SEMESTER

2023 SCHEME

SERVICE TO MANKIND IS SERVICE TO GOD

His Divine Soul Padmabhushana

Sri Sri Sri Dr. Balagangadharanath MahaSwamiji

Founder President, Sri Adichunchanagiri Shikshana Trust®

Belief in God is not ignorance or illusion. It is a belief that there is an unseen, ineffable Power that transcends all our powers of muscles, mind and lives.

His Holiness Parama Pujya

Sri Sri Sri Dr. Nirmalanandanatha MahaSwamiji

President, Sri Adichunchanagiri Shikshana Trust ®

True richness is the generosity of heart. Cultivate it and work to help the less fortunate ones in life.

Revered Sri Sri Dr. Prakashanatha Swamiji

Managing Director, BGS & SJB Group of Institutions & Hospitals

People and prosperity follow the path which the leaders take. So the elders and leaders should make sure that they give the right lead and take the right path.

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SJB INSTITUTE OF TECHNOLOGY

AN AUTONOMOUS INSTITUTION UNDER VISVESVARAYA TECHNOLOGICAL UNIVERSITY

Department of Electrical and Electronics Engineering

Vision and Mission

Department Vision

To become one among the best departments in engineering and research arena through professional faculty and state of art laboratories and to make the students successful engineers with good ethics.

Department Mission

1. M1: To provide learner-centric environment through quality education and training.
2. M2: To lay the foundation for research by fortifying peers & establishing incubation center.
3. M3: To develop the overall personality of the students to face the challenges of the real world.

2023 Scheme – UG

Syllabus for 3rd & 4th Semester

The syllabus, scheme and guidelines are provided in detail.
The syllabus, scheme and guidelines are subjected to changes if any needed.
The updates will be done timely.
Regularly access the institution website for the updated information.

The Syllabus book is available on	www.sjbit.edu.in
For any queries, please write to	academicdean@sjbit.edu.in

UPDATES

Release / Revision	Date	Remarks
Release	03/09/2024	First release

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Autonomous Scheme of Teaching & Examinations (ST&E) (Tentative) UG - BE 2nd Year EEE

SCHEME: 2023 **SEM: III** **Revision date:24/08/2024**

S. #	Course Type	Course type Series	Course Code	Course Title	Teaching Dept.	QP setting dept	Credits	Teaching Hrs/Week				Examinations				
								L	T	P	O	CIE Marks	SEE (Dur. & Marks)			
								Lecture	Tutorial	Practical	PBL/ABL / SL/etc.		Dur.	Th.	Lab	Tot.
1	IBSC	3	23EEI301	Transforms and Statistics	Maths	Maths	4	2	2	2	@	50	03	50	-	100
2	PCC	1	23EET302	Transformers and Generators	EE	EE	3	2	2	0	@	50	03	50	-	100
3	IPCC	1	23EEI303	Electric Circuit Analysis	EE	EE	4	3	0	2		50	03	50	-	100
4	IPCC	2	23EEI304	Analog & Digital Circuits	EE	EE	4	2	2	2	@	50	03	50	-	100
5	PCCL	1	23EEL305	Electrical Machines lab 1	EE	EE	1	0	0	2		50	03	-	50	100
6	ETC	1	23EEE31y	Emerging Technology Course - 1	EE	EE	3	3	0	0	@	50	03	50	-	100
7	AEC	3	23EEAE31	Troubleshooting on Electrical appliances, Wiring and Auto CAD	I.E.	I.E.	1	1	0	0	3	50	02	50	-	100
8	NCMC	3	23PDSN03	Skilful futures: Empowering Aptitude and Soft skills	I.E.	I.E.	**PP/NP**	0	0	0	2	50	-	-	-	50
9	NCMC	4	23PASN01	Physical Education - Sports and Athletics	PED	PED	**PP/NP**	-	-	-	2	50	-	-	-	50
			23YOGN02	Yoga	PED	PED										
			23NSSN03	NSS - National Service Scheme	NSS	NSS										
			23NCCN04	NCC - National Cadet Corps	NCC	NCC										
			23IKSN05	Indian Knowledge System	HSS	HSS										
						Total	**20**	**13**	**6**	**8**	**7**	**450**		**300**	**50**	**800**

BSC: Basic Science Course; PCC: Professional Course; IPCC: Integrated Professional Core Course; PCCL: Professional Core Course Laboratory; AEC: Ability Enhancement Course; {I.E.-Industry Experts};
{@ - Compulsory one activity}.
PBL: project Based learning; ABL: Activity Based Learning; SL: Self-Learning

ETC (Emerging Technology Course):

For ETC (L:T:P:O) can be plaanned by the depts considering practicality & possibility of conduction, same shall be indicated along with course title in the list, if altered than above. If planned altering the prescription, the same shall be approved at the department BOS & authorities. Atleast one activity is mandatory during the delivery of the course. The guidelines is applicable to all the semesters III to VI semesters (ETC-1 to ETC-4).

NCMC (Non Credit Mandatory Course): The following guidelines are applicable for the course type series-4 as mentioned above.

1) All students must register for any one of the course with the department during the first week of the III semester.
2) Once registered for a course in the III semester, the student shall continue and complete the same course in the remaining semesters. No provision for changing the courses after registration.
3) Activities shall be carried out by the students between III semester to VI semester (for 4 semesters).
4) The activities shall be organized, executed and monitored by the concerned department as mentioned above in coordination with the department level course coordinators. The same shall be reflected in the calendar of events of the above concerned departments.
5) Successful completion of the registered course and requisite CIE score (PP) is mandatory for the award of degree.
6) These courses are not considered for vertical progression, calculation of SGPA & CGPA, however it is mandatory for the award of degree.
7) The guidelines is applicable to all the remaining IV to VI semesters.

Additional courses for Lateral Entry students:

1) The lateral entry students getting admitted from the 2nd year of programme, shall register, study and complete additional courses prescribed & offered time to time.
2) Successful completion of the registered course and requisite CIE score (PP) is mandatory for the award of degree.
3) These courses are not considered for vertical progression, calculation of SGPA & CGPA, however it is mandatory for the award of degree.

Self-Learning Courses (SLC) as per the VIII Semester ST&E:

1) Offering and Registration of Self-learning Courses will commence from 3rd Semester itself and continues till the end of the duration of study.
2) Both regular & lateral entry students shall start registering for the self learning courses and complete as per the guidelines published separately. (Refer to the Self Learning Courses guidelines published).
3) These courses are not considered for vertical progression.
4) Calculation of SGPA & CGPA is considered for VIII Semester, irrespective of period or time of completion of the course.

Emerging Technology Course - 1	
Course Code	**Course Title**
23EEE311	Modern Measurements and Instrumentation
23EEE312	Introduction to Solar Photovoltaic systems
23EEE313	Micro & Nano Scale Sensors & Transducers
23EEE314	Programming in C++

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AUTONOMOUS SCHEME (Tentative) UG - BE 2nd Year

SCHEME: 2023 **Date of release: 29/06/2024**

SEM: III **Additional courses for Lateral Entry students**

Note:

1) For the fulillment of successful completion of degree, lateral entry students, shall study & complete additional courses as per the guidelines released time to time.
2) Regular courses (SL No 1 to 8) are same as applicable to all defined in the scheme of teaching & examinations (ST&E).
3) The below prescribed courses has to be registered whenever they are offered and successfully completed before the end of Seventh Semester End Examinations.

SL No	Course Type	Course type Count	Course Code	Course Title	Teaching Dept.	QP setting dept	Credits	Teaching Hrs/Week				Examinations				
								L	T	P	O	CIE Marks	SEE			Tot. Marks
								Lecture	Tutorial	Practical	PBL/ABL/ SL/othrs.		Dur.	Th. Mrks	Lab. Mrks.	
For CS stream (CSE/ISE/AIML/CSE(DS))																
9	BSC	-	23MAT31A	Additional mathematics-1	Maths	Maths	PP/NP	2	0	0	@	50	-	-	-	50
For EE stream (ECE & EEE)																
9	BSC	-	23MAT31B	Additional mathematics-1	Maths	Maths	PP/NP	2	0	0	@	50	-	-	-	50
For CV stream (Civil)																
9	BSC	-	23MAT31C	Additional mathematics-1	Maths	Maths	PP/NP	2	0	0	@	50	-	-	-	50
For ME stream (Mechanical)																
9	BSC	-	23MAT31D	Additional mathematics-1	Maths	Maths	PP/NP	2	0	0	@	50	-	-	-	50

Self Learning course list for UG BE - 2026-27

SCHEME: 2023 **Release date:25/06/2024**

Self-Learning course - 1 (NPTEL)			Self-Learning course - 2 (NPTEL)		
Course Code	Course Title	NPTEL Code	Course Code	Course Title	NPTEL Code
23EES101	An Introduction To Coding Theory	noc23-ee101	23EES201	Understanding Incubation And Entrepreneurship	noc23-de16
23EES102	Machine Learning And Deep Learning - Fundamentals And Applications	noc23-ee87	23EES202	Learning Analytics Tools	noc23-ge42
23EES103	Electrical Equipment And Machines: Finite Element Analysis	noc23-ee104	23EES203	Economics of IPR	noc24-hs92
23EES104	Design Of Photovoltaic Systems	noc23-ee107	23EES204	Deep Learning - IIT Ropar	noc23-cs110
23EES105	Electronic Systems For Cancer Diagnosis	noc23-ee110	23EES205	Big Data Computing	noc23-cs112
23EES106	Pattern Recognition And Application	noc23-ee119	23EES206	Privacy And Security In Online Social Media	noc23-cs69
23EES107	Dc Microgrid And Control Systems	noc23-ee123	23EES207	Artificial Intelligence : Search Methods For Problem Solving	noc23-cs92
23EES108	Applied Optimization For Wireless, Machine Learning, Big Data	noc23-ee99	23EES208	Cyber Security and Privacy	noc23-cs127
23EES109	Mathematical Aspects Of Biomedical Electronic System Design	noc23-ee90	23EES209	Entrepreneurship And IP Strategy	noc23-hs144
23EES110	Introductory Neuroscience & Neuro-Instrumentation	noc23-ee89	23EES210	Patent Law For Engineers And Scientists	noc23-hs97

HOD

HOD
Dept. of EEE
SJB Institute of Technology
BGS Health & Education City
Kengeri, Bengaluru-560060

Academic Dean

27/6/24

Dr. BABU. N.V
Prof. & Academic Dean
SJB Institute of Technology
BGS Health & Education City
Kengeri, Bengaluru-560060

Principal

Principal
SJB Institute of Technology
67, BGS Health & Education City,
Dr. Vishnuvardhan Road,
Kengeri, Bengaluru - 560 060.

Guidelines for Self-learning courses – Under Graduation (UG)

1) As per the Scheme of Teaching & Examinations (ST&E) the UG students to earn totally 06 credits by studying and completing 02 NPTEL/SWAYAM courses of 12 weeks each earning 03 credits.
2) The credits so earned by successful completion of the courses will be credited in the 8th SEM grade card.
3) The successful completion of the courses means earning of the course completion certificates from NPTEL/SWAYAM.
4) The courses shall be studied and completed starting from 3rd Semester and shall be completed before the announcement of 8th Semester End Examinations. However, it is advised to complete both the courses before the 7th SEM of their graduation.
5) The respective department BOS shall identify the professional courses related to the respective discipline either core or multidisciplinary from the list of courses released by NPTEL/SWAYAM every season. At least ten such courses shall be identified and finalized after the discussions in the respective BOS meetings, and the list shall be approved by the Academic Dean.
6) The approved list shall be published by the departments to the students at the beginning of the 3rd SEM itself and the student shall be given an option to choose up to 02 courses for the study and earn certificates of completion.
7) The practicing of studying and completion of NPTEL/SWAYAM courses starting from 3rd SEM itself has multi-fold effect:
   i) Enhances the self-learning ability of the students.
   ii) Study of self-learning courses will have impact on the learning of other courses in the scheme of teaching & examinations.
   iii) Will address the real time challenges/difficulties/differences in the calendars of NPTEL/SWAYAM & Institution.
8) The respective departments shall make holistic efforts to bring awareness to the students about the objectives and importance of self-learning courses. The departments shall thrive towards fulfilment of the objectives.
9) The departments shall continuously monitor & track the progress of the accomplishment of the courses by the students.
10) The departments shall assign course mentors as per the guidelines of the NPTEL/SWAYAM.

11) The departments shall take care that the registered courses and the examinations shall be under the local chapter of the Institution.
12) Every care must be taken by the departments to guide, motivate, to help the students in completing the courses as the academic calendar of the institution and the calendar of the NPTEL/SWAYAM does not match. The faculty advisory system or Mentor System must play a significant role.
13) Every season new courses may be added to the identified list and a fresh list of courses shall be prepared based on the list announced by the NPTEL/SWAYAM every season. However, the courses published from the first list shall be maintained if the NPTEL/SWAYAM list has the courses.
14) If the students are unable to successfully complete the course, they shall be given an option to re-register for the same course multiple times if the courses are available during the respective seasons in NPTEL/SWAYAM list.
15) An option for making fresh choice shall be given to the students until the successful completion of the courses and earning of required number of credits within the defined time.
16) The list of students registered for the courses and completion of the courses shall be submitted to the dean office on completion of every season.
17) All the regulations such as "Dropping of courses", "Withdrawal of Courses", etc. as described in the academic regulations shall be applicable to the Self Learning Courses (SLC).
18) The performance of the students in the assignments and the certification exam of the NPTEL/SWAYAM shall be considered for awarding the grade points to the students in the self-learning courses.
19) If the students are successfully completing more than the prescribed number of courses in their period of study, best performed courses (group wise) may be considered for the award of credits.
20) The CIE & SEE marks as prescribed in the Scheme of Teaching & Examinations (ST&E) shall be considered as per the performance of the student in the successfully completed NPTEL/SWAYAM course. The obtained assignment marks in the successfully completed NPTEL/SWAYAM course shall be mapped to the CIE and obtained exam certification percentage in the successfully completed NPTEL/SWAYAM course shall be mapped for SEE marks.
21) The students unable to complete the self-learning courses and earn the required credits will not be awarded the degree. Degree shall be awarded only after successful completion and earning of credits.

Academic Dean
Dr. Babu N V

Principal
Dr. K V Mahendra Prashanth

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Autonomous Scheme of Teaching & Examinations (ST&E) (Tentative) UG - BE 2nd Year EEE

SCHEME: 2023 **SEM: IV** **Revision date:24/08/2024**

S. #	Course Type	Course type Series	Course Code	Course Title	Teaching Dept.	QP setting dept	Credits	Teaching Hrs/Week				Examinations				
								L	T	P	O	CIE Marks	SEE (Dur. & Marks)			
								Lecture	Tutorial	Practical	PBL/AB L/ SL/etc.		Dur.	Th.	Lab	Tot.
1	BSC	4	23EET401	Probability Distributions and Linear Algebra	Maths	Maths	**3**	2	2	0	@	50	03	50	-	100
2	PCC	2	23EET402	Electric Motors	EE	EE	**3**	3	0	0	@	50	03	50	-	100
3	IPCC	3	23EEI403	Microcontrollers	EE	EE	**4**	3	0	2		50	03	50	-	100
4	IPCC	4	23EEI404	Transmission & Distribution	EE	EE	**4**	3	0	2		50	03	50	-	100
5	PCCL	2	23EEL405	Electrical Machines lab 2	EE	EE	**1**	0	0	2		50	03	-	50	100
6	ETC	2	23EEE42y	Emerging Technology Course - 2	EE	EE	**3**	3	0	0	@	50	03	50	-	100
7	HSMC	5	23SFHH06/ 23UHVH07	Bioscience (or) UHV - Universal Human Values	any dept	any dept	**1**	0	2	0	@	50	02	50	-	100
8	AEC	4	23EEAE41	Network Security	I.E.	I.E.	**1**	1	0	0	3	50	02	50	-	100
9	NCMC	5	23PDSN04	Mindful Mastery: Aptitude and soft skill integration	I.E.	I.E.	**PP/NP**	0	0	0	2	50	-	-	-	50
10	NCMC	4	23PASN01	Physical Education - Sports and Athletics	PED	PED	**PP/NP**	-	-	-	2	50	-	-	-	50
			23YOGN02	Yoga	PED	PED										
			23NSSN03	NSS - National Service Scheme	NSS	NSS										
			23NCCN04	NCC - National Cadet Corps	NCC	NCC										
			23IKSN05	Indian Knowledge System	HSS	HSS										
Total							**20**	**15**	**4**	**6**	**7**	**500**		**350**	**50**	**900**

BSC: Basic Science Course; PCC: Professional Course; IPCC: Integrated Professional Core Course; PCCL: Professional Core Course Laboratory; AEC: Ability Enhancement Course; HSMC: Humanities, Social Sciences & Management Course; NCMC: Non Credit Mandatory Course;
{@ - Compulsory one activity during the semester}
{I.E.-Industry Experts}.
PBL: project Based learning; ABL: Activity Based Learning; SL: Self-Learning

ETC (Emerging Technology Course):

For ETC (L:T:P:O) can be plaanned by the depts considering practicality & possibility of conduction, same shall be indicated along with course title in the list, if altered than above. If planned altering the prescription, the same shall be approved at the department BOS & authorities. Atleast one activity is mandatory during the delivery of the course. The guidelines is applicable to all the semesters III to VI semesters (ETC-1 to ETC-4).

Bioscience & UHV-Universal Human Values:

1) Any one of the course will be offered by the departments in each semester of IV & VI based on the institutional planning.
2) Both the courses shall be studied and completed by the students registering each in the two semesters. For example, if Bioscience is offered in the IV semester, UHV-Universal Human Values is offered in the V semester.

NCMC (Non Credit Mandatory Course) for course type series-4: Refer to guidelines in III SEM.

Emerging Technology Course - 2	
Course Code	**Course Title**
23EEE421	Power Generation Techniques & Economics
23EEE422	Introduction to Electric Vehicle Technology
23EEE423	PLC & Electrical System Automation
23EEE424	Object Oriented Programming with Java

Table of Contents

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Autonomous Syllabus: III Semester

25/05/2024

Semester:	III	**Course Type:**	IBSC		
Course Title: Transforms and Statistics					
Course Code:	23EEI301			**Credits:**	4
Teaching Hours/Week (L:T:P:O)			2:2:2:@	**Total Hours:**	40+(10 to12 Lab slots)
CIE Marks:	50	**SEE Marks:**	50	**Total Marks:**	100
SEE Type:	Theory			**Exam Hours:**	3

I. Course Objectives:

This course will enable students to:

1. Have an insight into Laplace transforms, Fourier series, Fourier transforms, Z-transforms.
2. Develop knowledge of solving problems in engineering application using transforms.
3. Develop knowledge of Statistical methods and curve fitting arising in engineering.

II. Teaching-Learning Process (General Instructions):

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

1. In addition to the traditional lecture method, innovative teaching methods shall be adopted.
2. State the need for Mathematics with Engineering Studies and Provide real-life examples.
3. Grading assignments and quizzes and documenting students' progress.
4. Encourage the students for group learning to improve their creative and analytical skills. Encourage students to work in groups to promote collaborative learning.

III. COURSE CONTENT

III(a).Theory PART

Module-1: Laplace Transforms — 8 Hrs

Existence and Uniqueness of Laplace transform, transforms of elementary functions, Properties of Laplace transforms, Problems on Laplace's Transform of $e^{at}f(t)$, $t^n f(t)$, $\frac{f(t)}{t}$. Laplace transforms of Periodic functions, `and unit-step function – problems. (Textbook 1: Chapter 21.1to 21.5, 21.9, 21.10, 21.17)

Teaching-Learning Process: Chalk and Talk, PPT, videos.

Self Learning: Unit impulse function, applications.

RBT Levels: L1, L2, L3

Module-2: Inverse Laplace Transforms — 8 Hrs

Inverse Laplace transforms definition and problems, Convolution theorem to find the inverse Laplace transforms (without Proof) problems. Laplace transforms of derivatives, solution of ordinary linear differential equations , illustrative examples on applications in control system and network analysis.

*** Illustrative Problems on applications to be excluded for SEE**

. (Textbook 1: Chapter 21.12, 21.13, 21.14, 21.7, 21.15)

Teaching-Learning Process: Chalk and Talk, PPT, videos	
Self Learning: Laplace transform of Differentiation, Integration .	
RBT Levels:L1, L2, L3	
Module-3: Fourier Series	8 Hrs
Introduction, periodic function, even and odd functions. Dirichlet's conditions, Euler's formulae for Fourier series, problems on time periodic signals, Half range Fourier series. Practical harmonic analysis. (Textbook 1: 10.1, 10.2, 10.4, 10.6,10.7, 10.8, 10.11) **Teaching-Learning Process:** Chalk and Talk, PPT, videos	
Self Learning: Complex form of Fourier series, Typical waveforms.	
RBT Levels: L1, L2, L3	
Module-4: Fourier transforms and Z -transforms	8 Hrs
Infinite Fourier transforms: Definition, Properties, Fourier sine, and cosine transform. Inverse Fourier transforms Inverse Fourier cosine and sine transforms. Problems. **Z-transforms**: Definition, Standard z-transforms, Damping, and shifting rules, Problems. Inverse z-transform and applications to solve difference equations, illustrative examples of applications in signals and systems. *** Illustrative Problems on applications to be excluded for SEE** (Textbook 1: 22.1, 22.4, 22.5, 23.1 to 23.9, 23.15 (II), and 23.16) **Teaching-Learning Process**: Chalk and Talk, PPT, videos	
Self Learning: Convolution theorems of Fourier and z-transforms	
RBT Levels: L1, L2, L3	
Module-5: Statistical methods	8 Hrs
Principles of least squares, Curve fitting by the method of least squares in the form $y = a$ + bx, $y = a + bx + cx^2$, and $y = ax^b$. Correlation, Coefficient of correlation, Lines of regression, Angle between regression lines, rank correlation. (Textbook 1: 24.1, 24.4, 24.5, 24.6(1), 25.12 to 25.16) **Teaching-Learning Process**: Chalk and Talk, PPT, videos	
Self Learning: Fitting of curves in the form $y=ae^{bx}$	
RBT Levels: L1, L2, L3	

III(b). PRACTICAL PART

Using MATLAB /Simulink software, demonstrate the operation of the following.

Sl. No.	**Experiments / Programs / Problems** (insert rows as many required)
1	Write a programme to find the Laplace transform of cosat, sinat, e^{at},t^n and unit step function and its properties.
2	Write a programme to find the inverse Laplace transform and Solve RLC circuite using Laplace transform.
3	Write a programme to obtain Fourier series and its properties.
4	Implementation of Fourier transforms and its properties.
5	Implementation of Z transforms and its properties.
6	Write a programme to find the Correlation between two variables and Plot the Regression line.
7	Write a Programme to find the Fitting a straight line by the method of least square using MATLAB.
8	MATLAB programme to solve application problem using Laplace Transform.
9	MATLAB programme to solve application problem using Fourier Transform.

10	MATLAB programme to solve application problem using Z Transform

Instructions for conduction of practical part:

- Use software tools like MATLAB/Simulink or other simulation software for system modelling and analysis.

Learn to design, implement, and analyze.

IV. COURSE OUTCOMES

CO1	Illustrate the fundamental concepts of transforms and statistical techniques.
CO2	Apply the knowledge of transform calculus, Fourier series and statistical techniques to solve engineering problems.
CO3	Analyze the solution of the problems using suitable techniques of transform calculus, Fourier series and statistical methods.
CO4	Interpret the knowledge of transform calculus, Fourier series and statistical methods in practical situations.

V. CO-PO-PSO MAPPING(mark H=3; M=2; L=1)

PO/PSO	1	2	3	4	5	6	7	8	9	10	11	12	PSO1	PSO2	PSO3
CO1	3	2	1		2							1	1	2	2
CO2	3	3	1		2							1	1	2	2
CO3	3	3	1		2							1	1	2	2
CO4	3	3	1		2							1	1	1	1

VI. Assessment Details (CIE & SEE)

General Rules: *Refer to Annexure Section 2*

Continuous Internal Evaluation (CIE) & Rubrics: *Refer to Annexure Section 2*

Semester End Examination (SEE) & Rubrics: *Refer to Annexure Section 2*

VII. Learning Resources

VII(a): Textbooks:

Sl. No.	Title of the Book	Name of the author	Edition and Year	Name of the publisher
1	Higher Engineering Mathematics	B.S. Grewal	44th Ed., 2018.	Khanna Publishers
VII(b): Reference Books:				
2	Advanced Engineering Mathematics	E. Kreyszig	4th Edition, 2002	Pearson Education Asia/ PHI
3	Introductory Methods of Numerical Analysis	S.S.Sastry	8th Edition, 2008	John Wiley India Pt. Ltd
4	Higher Engineering Mathematics	B.V.Ramana	2ndEdition 2007	Schaum'sOutlines, TMH

VII(c): Web links and Video Lectures (e-Resources):

1. http://nptel.ac.in/courses.php?disciplineID=111
2. http://www.class-central-central.com/subject/math(MOOCs)
3. http://academiccarth.org/
4. VTU EDUSAT programme

VIII: Activity Based Learning / Practical Based Learning/Experiential learning:

Assignments / Presentation/ Quiz.

Semester:	III	**Course Type:**	**PCC**		
Course Title: Transformers and Generators					
Course Code:	**23EET302**			**Credits:**	**03**
Teaching Hours/Week (L:T:P:O)			**2:2:0:@**	**Total Hours:**	**50**
CIE Marks:	**50**	**SEE Marks:**	**50**	**Total Marks:**	**100**
SEE Type:	**Theory**			**Exam Hours:**	**03 Hours**

I. Course Objectives: Students will be able to

- Understand the construction, working and various tests of single-phase Transformer & three phase transformers.
- Analyse the working of parallel operation and auto transformers.
- Understand the construction & working, perform various tests and analyze the operation of synchronous generator.
- Explain the various advances in transformers & generators.

II. Teaching-Learning Process (General Instructions):

Chalk and talk, PPT presentations, field visits, video lectures.

III. COURSE CONTENT

Module-1: Single phase Transformers **10 Hrs**

Single phase Transformers: Necessity of transformer, Ideal transformer, and equivalent circuit, Operation of practical transformer under no-load and on-load with phasor diagrams. Losses and methods of reducing losses, efficiency and condition for maximum efficiency, Predetermination of efficiency, voltage regulation and its significance. Numerical.

Textbook:Chapter:sections: Electric machines Ashfaq Hussain/Chapter 1-1.1,1.2,1.30,1.36,1.37, 1.4,1.5,1.7,1.8,1.10,1.14.

Pre-requisites (Self Learning): Transformer construction and types, concept of self and mutual inductance.

RBT Levels: L1, L2, L3

Module-2: Transformer Tests and Three Phase Transformers **10 Hrs**

Tests: Polarity test, Sumner's test. Open circuit and short circuit tests, calculation of equivalent circuit parameters.

Three-phase Transformers: Introduction, Constructional features of three-phase transformers. Transformer connection for three phase operation– star/star, delta/delta, star/delta, delta/star, zig zag, and V –V connection, comparative features. Phase conversion, Labelling of three-phase transformer terminals.

Textbook:Chapter:sections: Electric machines Ashfaq Hussain/Chapter-1 & Chapter-2/1.18,1.19,1.20,1.21,1.22,1.23,1.24,1.32,1.33,1.34,1.35,2.10,2.11,2.12,2.12,2.17,2.18,2.20

Pre-requisites (Self Learning): Transformer losses, condition for max efficiency, concept of star and delta connections.

RBT Levels: L1, L2, L3

Module-3: Parallel operation & Auto Transformers	**10 Hrs**

Parallel Operation of Transformers: Necessity of Parallel operation, conditions for parallel operation– Single phase and three phases. Load sharing in case of similar and dissimilar transformers. Numerical.
Auto transformers and Tap changing transformers: Introduction to autotransformer-copper economy, equivalent circuit, no load and on load tap changing transformers, Advantages & disadvantages. Numerical.

Textbook: Chapter: sections: Electric machines Ashfaq Hussain/Chapter2/2.1,2.4,2.5,2.6,2.39,2.40,2.41,2.42

Pre-requisites (Self Learning): Parallel circuit operation, single and three phase power supply,load calculations.

RBT Levels: L1, L2, L3

Module-4: Synchronous Generators	**10 Hrs**

Synchronous Generators: Types, Construction, working principle, Characteristics, Armature windings, winding factors, E.M.F equation. Armature reaction, Synchronous reactance, Equivalent circuit, Determination of Voltage regulation by EMF, MMF Method, hunting and damping.

Textbook: Chapter: sections: Electric machines Ashfaq Hussain /Chapter-3 & Chapter-6/3.1,3.2,3.3,3.4,3.5,3.6,3.7,3.10,3.11,3.12,3.16,3.17,3.18,3.19,3.20,3.22,3.23,3.25,3.26,3.31,3.35,3.38,3.42 .6.9,6.10.

Pre-requisites (Self Learning): Synchronous generators types and construction, effect of regulation.

RBT Levels: L1, L2, L3

Module-5: Advances in Transformers & AC Generators	**10 Hrs**

Advances in Transformers: Amorphous core distribution transformers, Advantages & Disadvantages of Amorphous Metal Transformers (AMT). Construction of amorphous transformers. Superconducting Transformers, construction and working, Applications.
Advances in AC Generators: PMG-Introduction, Working, Components of a Permanent Magnet Generator, Advantages, Applications and Limitations. Variable Speed Diesel Electric Generators-Technologies, Benefits, Limitations, Impact on Greenhouse Gases Emissions and Fuel Efficiency.

Textbook: Chapter: sections: 1.M. Carlen, David Xu, J. Clausen, T. Nunn, V. R. Ramanan and D. M. Getson, "Ultra high efficiency distribution transformers," *IEEE PES T&D 2010*, New Orleans, LA, USA, 2010, pp. 1-7, doi: 10.1109/TDC.2010.5484301.
2.teckglobal.com.au/, powerline.net.in/2017/12/09/transformer-technologies.
3.M. Yamamoto, M. Yamaguchi and K. Kaiho, "Superconducting transformers," in *IEEE Transactions on Power Delivery*, vol. 15, no. 2, pp. 599-603, April 2000, doi: 10.1109/61.852991.
4.electricity-magnetism.org/permanent-magnet-generators/
5.lidsen.com/journals/jept/jept-04-01-003

Pre-requisites (Self Learning): Recent Advancements in Transformer and generator technologies.

RBT Levels: L1, L2, L3

IV. COURSE OUTCOMES

CO1	Understand and explain the construction and operation of single-phase transformers and autotransformers.
CO2	Evaluate the performance of three phase transformers by various tests, phase conversion and parallel operation.

CO3	Analyze, explain and determine, working and performance of Synchronous Generator by various tests.
CO4	Summarize and interpret various advances of transformers and Generators.

V. CO-PO-PSOMAPPING (mark H=3; M=2; L=1)

PO/PSO	1	2	3	4	5	6	7	8	9	10	11	12	S1	S2	S3	S4
CO1	3	2				1	1	1				1	2	3		
CO2	3	2				1	1	1				1	2	3		
CO3	3	3				1	1	1				1	2	3		
CO4	3	3				1	1	1				1	2	3		

VI. Assessment Details (CIE & SEE)

General Rules: Refer annexure section 1

Continuous Internal Evaluation (CIE): Refer annexure section 1

Semester End Examination (SEE): Refer annexure section 1

VII. Learning Resources

VII(a): Textbooks:

Sl. No.	Title of the Book	Name of the author	Edition and Year	Name of the publisher
1	Electric Machines	Ashfaq Hussain	2nd Edition, 2013	Dhanpat Rai & Co
2	Electrical Machinery	Dr. P S Bimbra	3rd Edition,2021	Khanna Publishers

VII(b): Reference Books:

1	Electric Machines	D. P. Kothari, et al	4th Edition, 2011	Mc Graw Hill
2	Principals of Electrical Machines	V.K Mehta, Rohit Mehta	2nd edition, 2009	S Chand

VII(c): Web links and Video Lectures (e-Resources):

https://www.youtube.com/@eeedepartment4878

VIII: Activity Based Learning / Practical Based Learning/Experiential learning:

Seminars, assignments, quiz, industry visits.

Semester:	III	Course Type:	IPCC		
Course Title: Electric Circuit Analysis					
Course Code:	**23EEI303**			**Credits:**	**04**
Teaching Hours/Week (L:T:P:O)			**3:0:2:0**	**Total Hours:**	**40 (Theory)+ 14 (Lab Slots)**
CIE Marks:	**50**	**SEE Marks:**	**50**	**Total Marks:**	**100**
SEE Type:	**Theory**			**Exam Hours:**	**03**

I. Course Objectives:

- Apply knowledge of mathematics, science, and engineering to the analysis and design of electrical circuits.
- Apply the mesh & nodal analysis concepts to solve simple and complex networks using network theorems along with concept of dot convention in coupled circuits.
- Find the time constants, initial and final values, and complete responses for RLC circuits under ac and dc excitations.
- Analyse unbalanced loads connected to balanced three-phase supply and understand the concept of power factor and improvement techniques.

II. Teaching-Learning Process (General Instructions):

- Chalk and talk method
- Power point presentation
- Pre-recorded videos
- Animations
- Self-learning

III. COURSE CONTENT

III(a). Theory PART

Module-1: Circuit Analysis using Basic concepts	8 Hrs

Circuit Analysis using Basic concepts :
Active & Passive elements, Ideal & Practical sources, Source transformation, Network reduction using star-delta transformation, Analysis of network on Mesh & Node for AC and DC circuits, Super mesh and Super node for DC circuits with dependent and independent sources, numerical.

Textbook: Engineering Circuit Analysis- William H Hayt Chapter: 3,4, 5& 10 sections: 3.1 to 3.5, 4.1 to 4.4, 5.2, 5.5, 10.6

Pre-requisites (Self Learning) Concepts on KVL, KCL, addition and subtraction of voltage and currents, series and parallel circuits, current and voltage divider.

RBT Levels: L1,L2,L3

Module-2:Network Theorems	8 Hrs

Network Theorems:
Superposition theorem, Thevenin's theorem, Maximum Power Transfer theorem, Millman's Theorem. Analysis of networks with independent DC and AC source, numerical.

Textbook: Engineering Circuit Analysis- William H Hayt Chapter: 5 & 10 sections : 5.1, 5.3, 5.4, 10.7
Textbook: Introductory Circuit Analysis- Robert L. Boylestad Chapter: 9 & 19 sections : 9.2, 9.3, 9.4, 9.5, 9.8, 19.2 to 19.6 (19.6 only Reciprocity Theorem).

Pre-requisites (Self Learning): Concepts on KVL, KCL, mesh and node.

RBT Levels: L1,L2,L3

Module-3: Coupled and Resonance circuits	8 Hrs

Coupled Circuits: Mutual Inductance, Coefficient of Coupling, Equivalent inductance of series and parallel connected inductors with mutual inductance, Energy consideration, numerical.

Resonance: Introduction**,** Analysis of simple series and parallel RLC circuits under resonances. Resonant frequency, Bandwidth and Quality factor at resonance, numerical.

Textbook: Engineering Circuit Analysis- William H Hayt Chapter: 13 sections : 13.1, 13.2
Textbook: Introductory Circuit Analysis- Robert L. Boylestad Chapter: 21 sections : 21.1, 21.2, 21.3, 21.9, 21.10, 21.11, 21.12, 21.4 & 21.5

Pre-requisites (Self Learning) Basic concepts of self and mutual induction, related equations, energy stored in magnetic circuit. Behaviour of R,L,C under ac supply.

RBT Levels: L1,L2,L3

Module-4:Transient Analysis	8 Hrs

Transient Analysis
Behaviour of circuit elements under switching conditions and their representations, transient analysis of RL and RC circuits under DC excitations, Evaluation of initial conditions, numerical.

Textbook: Engineering Circuit Analysis- William H Hayt Chapter: 8 sections: 8.1, 8.2, 8.3, 8.4

Pre-requisites (Self Learning) voltage and current associated with capacitance and inductance, Characteristics of voltage and current source, first order and second differential equation.

RBT Levels: L1,L2,L3

Module-5: Unbalanced three phase and Two port system	8 Hrs

Unbalanced Three Phase Systems: Analysis of unbalanced three phase systems (3-wire and 4 wire systems), calculation of real and reactive Powers. Disadvantage and causes of (low power factor) LPF, Power factor improvement equipment's, numerical.
Two Port networks: Definition z, y, and transmission parameters, Open circuit impedance, short circuit admittance and Transmission parameters and their evaluation for simple circuits, relationship between parameters, numerical.

Textbook: Engineering Circuit Analysis- William H Hayt Chapter: 16 sections : 16.2, 16.4, 16.6
Textbook: Introductory Circuit Analysis- Robert L. Boylestad Chapter:24 sections : 24.13, 24.14

Pre-requisites (Self Learning) Basics of three phase systems, build equations for mesh, nodal, identification of series/parallel/start/delta network and respected solutions.

RBT Levels: L1,L2,L3,L4

III(b). PRACTICAL PART

Sl. No.	Experiments
1	To verify network reduction using star-delta transformation
2	To verify the given circuit using Mesh-Current and Node Voltage Method with independent source
3	Verification of Maximum Power Transfer Theorem
4	Determination of Resonant Frequency, Bandwidth and Quality Factor of a RLC Circuit.
5	To perform Steady State Analysis of Mutually Coupled Circuits.
6	To verify transient and steady state analysis of RL and RC circuits
7	Design the value of capacitance to improve the power factor in a three phase circuit.
8	Verification of ABCD parameter and condition of symmetry of a given two port network.

Instructions for conduction of practical part: Experiments 1, 2 & 3 to be performed by discreet components. Experiments 3 to 8 be performed through PSPICE software package.

IV. COURSE OUTCOMES

At the end of the course students will be able to

CO1	Demonstrate the theoretical and practical aspects of mesh & node analysis, Theorems, Resonance, coupled circuits, three phase system and two port circuits in electric circuits
CO2	Solve electric circuits by applying network theorems and verify using simulation tools.
CO3	Analyze behaviour of RLC elements, their frequency response and demonstrate the same using any simulation tool.
CO4	Find the time constants, initial and final values, and complete responses for RL & RC circuits under dc excitations using simulation tool.
CO5	Analyze and demonstrate unbalanced three phase circuits and two port networks.

V. CO-PO-PSO MAPPING(mark H=3; M=2; L=1)

PO/PSO	1	2	3	4	5	6	7	8	9	10	11	12	S1	S2	S3	S4
CO1	3	3	1	1	1				1	1		1	1		2	
CO2	3	3	1	1	3				1	1		1	1		2	
CO3	3	3	1	1	3				1	1		1	1		2	
CO4	3	3		1	3				1	1		1	1		2	
CO5	3	3		1	3				1	1		1	1		2	

VI. Assessment Details (CIE & SEE)

General Rules: Refer Annexure section 2

Continuous Internal Evaluation (CIE): Refer Annexure section 2

Semester End Examination (SEE): Refer Annexure section 2

VII. Learning Resources

VII(a): Textbooks:

Sl. No.	Title of the Book	Name of the author	Edition and Year	Name of the publisher
1	Engineering Circuit Analysis	William H. Hayt, Jack Kemmerly, Steven M. Durbin	9th and 2020	MCGraw Hill
2	Electrical Circuit Analysis and Synthesis	D P Kothari, Akhilesh A Nimje	1st and 2017	NEW AGE International
3	Introductory Circuit Analysis	Robert L. Boylestad	13th and 2016	Pearson

VII(b): Reference Books:

1	Circuit Theory	K Channa Venkatesh , D Ganesh Rao	1st and 2018	Cengage Learning India Pvt. Ltd.
2	Circuits and Networks: Analysis and Synthesis	Sudhakar A and Shyam Mohan SP	5th and 2015	MCGraw Hill

VII(c): Web links and Video Lectures (e-Resources):

https://www.youtube.com/playlist?list=PLkeOqogma9vhAYH2Oyyesp5HmHovYGPoL

VIII: Activity Based Learning / Practical Based Learning/Experiential learning:

Seminar, assignments, quiz, case studies, mini projects, industry visit, self-study activities, group discussions, etc

Semester:	III	Course Type:	IPCC

Course Title: Analog and Digital Circuits

Course Code:	23EEI304		Credits:	4
Teaching Hours/Week (L:T:P:O)		2:2:2:@	Total Hours:	40 Theory + 14 lab slots
CIE Marks:	50	SEE Marks: 50	Total Marks:	100
SEE Type:	Theory		Exam Hours:	3

I. Course Objectives:

- To provide the knowledge for the analysis of diode and transistor circuits.
- To enable students to understand the working and design basic circuits using Diodes, and BJTs.
- To design and analyse the different Multistage and power amplifers.
- The properties of basic gates and simplifications of Boolean expressions using K Maps andQuine- McClusky Techniques.
- The fundamentals of combinational & sequential circuits with design examples.
- Illustrate Decoders, Encoders, Digital Multiplexer, Adders, Subtractors and Binary Compactors.

II. Teaching-Learning Process (General Instructions):

- Chalk and talk method
- Power point presentation / keynotes
- Videos
- Animations

III. COURSE CONTENT

III(a).Theory PART

Module-1: Diode and BJT applications	08 Hrs

Diode applications: Diode models, Diode Clippers (shunt type) and diode clampers (Positive & Negative), Bridge wave rectification (with filter), Special purpose diodes - light emitting diodes, Varactor diode, Numerical.

Bipolar Junction Transistor (BJT): Working, DC load line analysis, Biasing techniques- Voltage divider bias, stability factor for voltage divider bias.

Textbook:Electronic Devices and Circuit Theory- Robert L Boylestad Louis Nashelsky: Chapter 1 & 2: Section: 1.6 to 1.15, 2.1 to 2.11

Pre-requisites (Self Learning) Knowledge on semiconductors, energy levels and doping process, Diodeworking, VI characteristics, Diode biasing

RBT Levels:L1,L2 & L3

Module-2: Power & Multistage Amplifiers:	08 Hrs

Multistage Amplifiers: Transistor Amplifiers, Cascade and Cascade connections, Darlington transistor, Darlington emitter follower circuit(Av and Ai) - design and analysis, numerical. **Power amplifiers**: Introduction, Transformer coupled class Amplifier, class B amplifieroperation, class B amplifier circuits: Transformer Coupled Push-Pull Circuits, numerical.

Textbook: Electronic Devices and Circuit Theory- Robert L Boylestad Louis Nashelsky: Chapter: 16 & 18: section: 16.1 to 16.5, 16.8, 18.1 to 18.3 & 18.5 to 18.9.

Pre-requisites (Self Learning):

Knowledge on Voltage and current gains, KVL & KCL, Series and Parallel circuits, advantages of

closedloop circuits, Understanding of Bark hausen's criteria, working of transformers.	
RBT Levels: L1,L2,L3	
Module-3: Introduction to Digital Circuits and Combinational circuits	08 Hrs
Combinational logic, canonical forms, Generation of switching equations from truth tables, Karnaugh maps-3,4,5 variables, Simplifying Max term equations,Simplifying Min term equations, Quine-McCluskey minimization technique, Quine-McCluskey using don‘t care terms, prime implicants Tables.Gate properties. **Textbook:Digital Principles and Design by Donald D. Givone : Chapter 3: section 3.1 to section3.10 Chapter4: section 4.1 to 4.16**	
Pre-requisites (Self Learning): Basics of logic gates, Tabular method of simplification	
RBT Levels:L1,L2,L3	
Module-4: Combinational circuits and Introduction to sequential circuits	08 Hrs
Multiplexers (Mux) : Implementation of 4:1, 8:1 Mux, Realization of Boolean expression usingMux **Decoders:** Implementation of 2:4, 3:8 decoders, Realizing higher order decoder using lower order decoders, realization of Boolean expression using Decoders. **Adders:** Binary adder, Decimal adder, Adder cum subtractor using binary adder and carry look ahead adders, Programable logical arrays, Programmable Logic Devices and Programable Array Logic. **Textbook:Digital Principles and Design byDonald D. Givone : Chapter 5: section 5.1 to 5.10**	
Pre-requisites (Self Learning): Basics of logic gates, Boolean expressions.	
RBT Levels: L1,L2 &L3	
Module-5: Sequential Circuits	08 Hrs
Flip Flops: Basic bi stable element, Gated SR Latch, Edge triggered D-flip flop, JK-flip flops andT-flip flops Characteristic equation of flip flops, Excitation table for all flip flops. **Registers:** Types of registers, Shift registers, 4-bit PIPO, PISO, SISO,SIPO registers, Universalshift registers, **Counters:** Binary ripple counters, Synchronous Binary counters, Counters based on Registers,Design of Synchronous counters. **Textbook: Digital Principles and Design by Donald D. Givone: Chapter 6 : section 6.1 to 6.9**	
Pre-requisites (Self Learning): Basics of logic gates, Boolean expression and combinationallogic circuits.	
RBT Levels: L1,L2 &L3	

III(b). PRACTICAL PART

Sl. No.	Experiments / Programs / Problems
1	Design of clipper circuits.
2	Design of clamper circuits.
3	Design and analysis of Darlington Emitter Follower.
4	Design and analysis of Single stage RC coupled amplifier.
5	Static characteristics of Transistor for CB, CE Mode and determination of h-parameters.
6	Simplification and realization of a given Boolean expression using logic gates
7	Realization of 4-bit adder/subtractor using Adder IC
8	Design and realization of 3-bit random sequence generator using JK Flip flops

9	Realization of 3-bit mod-N counter using counter IC
10	Realization of Johnson and Ring counter

Instructions for conduction of practical part: All experiments are conducted by discreet components

IV. COURSE OUTCOMES

CO1	Study of fundamentals of diode application and BJT
CO2	Build and verify the multistage amplifiers, and power amplifiers using BJT
CO3	Apply the knowledge of K Maps for simplification of Boolean expressions and describe
CO4	Design combinational circuits for code conversion, multiplexer, decoder, adders
CO5	Analyse sequential circuits using flip flops for registers and counter operations

V. CO-PO-PSO MAPPING(mark H=3; M=2; L=1)

PO/PSO	1	2	3	4	5	6	7	8	9	10	11	12	S1	S2	S3	S4
CO1	3	3				2	2								3	
CO2	3	3				2	2								3	
CO3	3	3				2	2								3	
CO4	3	3				2	2								3	
CO5	3	3				2	2								3	

VI. Assessment Details (CIE & SEE)

General Rules: Refer Annexure section 2

Continuous Internal Evaluation (CIE): Refer Annexure section 2

Semester End Examination (SEE): Refer Annexure section 2

Sl. No.	Title of the Book	Name of the author	Edition and Year	Name of thepublisher
1	Digital Principles and Design	Donald D. Givone,	Tata McGraw-Hill Edition 2017	TATA McGraw-hill Edition
2	Fundamentals of Digital circuits	A.Anand Kumar	4th edition 2016	PHI
3	Electronic Devices and Circuit Theory	Robert L Boylestad Louis Nashelsky	11th Edition, 2015.	Pearson

VII(b): Reference Books: (Insert or delete rows as per requirement)

1	Logic Design	R D Sudhakar Samuel	Revised 2004	Sanguine technical Publishers
2	Electrical Technology, Electronic Devices and Circuits	B.L. Theraja, A.K. Theraja, S. Chand	Reprint, 2013	

VII(c): Web links and Video Lectures (e-Resources):

1. https://www.youtube.com/@eeedepartment4878
2. https://www.youtube.com/@VTUeShikshanaProgramme
3. Switching Circuits and Logic Design by Prof.IndranilSengupta (youtube)
4. NPTEL

VIII: Activity Based Learning / Practical Based Learning/Experiential learning:

Assignments, quiz, case studies, mini projects, industry visit, self-study activities, groupdiscussions, etc.

Semester:	III	Course Type:	PCCL		
Course Title: Electrical Machines Lab 1					
Course Code:	**23EEL305**			**Credits:**	**01**
Teaching Hours/Week (L:T:P:O)			**0:0:2:0**	**Total Hours:**	**28**
CIE Marks:	**50**	**SEE Marks:**	**50**	**Total Marks:**	**100**
SEE Type:	**Practical**			**Exam Hours:**	**03**

I. Course Objectives: At the end of the course student will be able to

- Conduct various tests on transformers and synchronous machines and evaluate their performances.
- Perform the parallel operation & phase conversion on transformers.
- Calculate and compare the voltage regulation of an alternator using different methods

II.COURSE CONTENT

Sl. No.	Experiments / Programs / Problems(insert rows as many required)
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 parameters of equivalent circuit.
2.	Sumpner's test on similar transformers and determination of combined and 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.	Comparison of performance of 3 single-phase transformers in delta – delta and V – V (open delta) connection under load.
6.	Scott connection with balanced and unbalanced loads.
7.	Separation of hysteresis and eddy current losses in single phase transformer.
8.	Voltage regulation of an alternator by EMF method.
9.	Voltage regulation of an alternator by MMF method.
10.	Slip test – Measurement of direct and quadrature axis reactance
Experiments to be done Using SCI LAB	
11.	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.
12.	Power angle curve of synchronous generator

Instructions for conduction of practical part: Refer Annexure section 4

III.COURSE OUTCOMES

CO1	Conduct different tests on transformers to evaluate the performance characteristics of the 1-phase and 3-phase transformers.
CO2	Connect and operate transformers of different KVA rating in parallel and connect three transformers for three phase operation and phase conversion.

CO3	Compute the voltage regulation of synchronous generator using the test data obtained in the laboratory and also evaluate the performance of synchronous generators from the test data.

IV.CO-PO-PSO MAPPING(mark H=3; M=2; L=1)

PO/PSO	1	2	3	4	5	6	7	8	9	10	11	12	S1	S2	S3	S4
CO1	3	2	1	2		1		1	1	1		1	2	3		
CO2	3	2	1	2		1		1	1	1		1	2	3		
CO3	3	2	1	2		1		1	1	1		1	2	3		

V. Assessment Details (CIE & SEE)

General Rules: Refer Annexure section 4

Continuous Internal Evaluation (CIE): Refer Annexure section 4

Semester End Examination (SEE): Refer Annexure section 4

VI. Learning Resources

Web links and Video Lectures (e-Resources):

Mention the links of the online resources, video materials, etc.
https://www.youtube.com/@eeedepartment4878

VII: Activity Based Learning / Practical Based Learning/Experiential learning:

Industry visits

Semester:	III	Course Type:	ETC		
Course Title: Modern Measurements and Instrumentation					
Course Code:	**23EEE311**			**Credits:**	03
Teaching Hours/Week (L:T:P:O)			3:0:0:@	**Total Hours:**	40
CIE Marks:	50	**SEE Marks:**	50	**Total Marks:**	100
SEE Type:	Theory			**Exam Hours:**	03

I. Course Objectives:

At the end of the course, students will be able to

- Understand and measure electrical systems parameters.
- Study and understand current and potential transformers.
- Study different types of sensors, transducers, and their applications.
- Explain the data acquisition system and virtual instrumentation

II. Teaching-Learning Process (General Instructions):

- Chalk & Talk Method,
- Presentation/Keynote
- Videos

III. COURSE CONTENT

Module-1: Measurement of electrical circuit parameters — 8Hrs

Introduction: Measurements, significance of measurements, methods of measurements, Elements of a generalized measurement systems, errors, types of errors, statistical treatment of data.
Measurement of resistance, inductance, and capacitance: Wheatstone's bridge, bridge sensitivity, limitations. Kelvin's double bridge, Sources and detectors, Maxwell's LC bridge,
Schering bridge, Errors in ac bridges and method of minimization, numerical.

Textbook:A Course in Electrical & Electronic measurements & instrumentation-A.K.Sawhney
Chapter:1, 3, 13 , 16 sections: 1.1 to 1.5.3 , 3.1 to 3.10, 13. 5 to 13.17, 16.1 to 16.10

Pre-requisites (Self Learning)
Basic Principles of Kirchhoff's laws, Behavior of R, L and C

RBT Levels:L1, L2, L3

Module-2: Instrument Transformers — 8Hrs

Instrument Transformers: Introduction, terms relating to instrument transformers, Current transformer-Relationships, errors, characteristics, clip-on type current transformer. Potential transformer-comparison of CT and PT, relationships, characteristics, reduction of errors in instrument transformers. capacitor potential transformer, testing of instrument transformer-absolute method, numerical.

Textbook: Electrical Measurements and Measuring Instruments, by R K Rajput
Chapter: 4 Sections:4.1 to 4.6

Pre-requisites (Self Learning)
Basics of Transformers

RBT Levels: L1, L2, L3

Module-3: Digital instruments — 8Hrs

Digital measurements of electrical quantities: Basic concepts of digital instruments-binary counters, display devices, frequency counters, period counters, A/D and D/A converters, characteristics of digital meters. Digital Voltmeters-Introduction, advantages, characteristics, applications, classification of DVMs-RAM type. Digital LCR meter, digital multimeter. Microprocessor based instruments.

Textbook: Electrical Measurements and Measuring Instruments, by R K Rajput
Chapter: 10 Sections:10.1 to 10.6

Pre-requisites (Self Learning)
Analog and digital systems

RBT Levels: L1, L2

Module-4: Sensors & Transducers	8Hrs

Sensors: Introduction to sensor, sensor Characteristics, Types of Sensors-Temperature, position sensors, proximity sensor, IR-Sensor (Infrared Sensor), Pressure Sensor, Light Sensor, Ultrasonic Sensor, Smoke, Gas and Alcohol Sensor.
Transducers: classification of transducers, basic requirement of transducers, temperature transducers-RTD, Thermocouple, Piezo electric transducer.

Textbook:
1) **"Advances in modern sensors" by G R Sinha, Chapter: 1, Sections:1.1 to 1.3**
2) **"Transducer Engineering" by Renganathan. S, Allied Publishers, Chennai, 2003- , Chapter 2, 4, 7: Sections : 2.1 to 2.2.3,4.4.5 to 4.4.8, 7.1 to 7.7.1.**

Pre-requisites (Self Learning)
Basics of force, motion, and energy.

RBT Levels: L1, L2

Module-5: Data Acquisition system and Virtual instrumentation	8Hrs

Data Acquisition System (DAS): Introduction, Components of an Analog Data Acquisition Systems, Components of Digital data acquisition system, Uses of Data Acquisition Systems.
Virtual instrumentation (VI): Introduction, traditional and virtual measurements, hardware and software, VI for test, control and design, VI in the engineering process.

Textbook:
1. **A Course in Electrical and Electronic Measurements and Instrumentation- A.K.Sawheney: Chapter-30 Sections: 30.1 to 30.5**
2. **Virtual Instrumentation using Labview- Jovitha Jerome , Chapter: 1, Sections: 1.1, 1.4 to 1.8**.

Pre-requisites (Self Learning)
Instrumentation systems

RBT Levels: L1, L2

IV. COURSE OUTCOMES

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

CO1	Understand the significance of measurements, errors, types to identify and select suitable bridges for the measurement of electrical circuit parameters.
CO2	Explain the various aspects of instrument transformers.
CO3	Analyse and explain the working of digital instruments.
CO4	Explain the different types of sensors and transducers with applications.
CO5	Understand the data acquisition system and virtual instrumentation.

V. CO-PO-PSO MAPPING

PO/PSO	1	2	3	4	5	6	7	8	9	10	11	12	S1	S2	S3	S4
CO1	3	2				1		2					3			
CO2	3	2				1		1					3			

CO3	3	2				1		1					3			
CO4	3	2				1		1					3			
CO5	3	2			1	1		1					3			

VI. Assessment Details (CIE & SEE)

General Rules: Refer Annexure section 1

Continuous Internal Evaluation (CIE): Refer Annexure section 1

Semester End Examination (SEE): Refer Annexure section 1

VII. Learning Resources

VII(a): Textbooks:

Sl. No.	Title of the Book	Name of the author	Edition and Year	Name of the publisher
1	A Course in Electrical & Electronic measurements & instrumentation	A.K.Sawhney,	Nineteenth revised edition 2011.	Dhanpat Rai and company (Pvt) limited, New – Delhi.
2	Electrical Measurements and Measuring Instruments	R K Rajput	Second edition, reprint 2021	S Chand and company
3	Transducer Engineering	Renganathan. S	2003	Allied Publishers
4	Advances in modern sensors	G R Sinha	2020	IOP Publishing
5	Virtual Instrumentation using Labview	Jovitha Jerome	2010	PHI Learning

VII(b): Reference Books:

1	Electronic instrumentation & measurements	David.A.Bell,	3rd edition 2013	Oxford University.
2	Basic Electrical Measurements	M B Stout	2020	Prentice-hall Inc., Englewood Cliffs, N. J.
3	Electrical Measurements and Measuring Instruments	E.W Golding, F.C Widdis	2017	Engineering Degree Series Pitman

VII(c): Web links and Video Lectures (e-Resources):

NPTEL :: Electrical Engineering - NOC:Electrical Measurement and Electronic Instruments

VIII: Activity Based Learning / Practical Based Learning/Experiential learning:

Seminar, assignments, quiz, self-study activities, group discussions, etc

Semester:	III	Course Type:	ETC		
Course Title: Introduction to Solar Photovoltaic Systems					
Course Code:	**23EEE312**			**Credits:**	**3**
Teaching Hours/Week (L:T:P:O)			**3:0:0:@**	**Total Hours:**	**40**
CIE Marks:	50	**SEE Marks:**	**50**	**Total Marks:**	**100**
SEE Type:	**Theory**			**Exam Hours:**	**3 Hours**

I. Course Objectives:

This course will enable students:

- To discuss basics of solar resource data, its acquisition and usage.
- To discuss PV technology, characteristics and interconnections of modules.
- To discuss batteries, converters and inverters, system components for standalone SPV system and designing of standalone SPV system.
- To explain the functioning of grid connected system and different applications of SPV systems.
- To explain maintenance of PV systems

II. Teaching-Learning Process (General Instructions):

- Chalk and talk method
- Power point presentation / keynotes
- Videos
- Field Visit

III. COURSE CONTENT

Module-1: Solar energy fundamentals. — 8 Hrs

Introduction, Need for Sustainable energy sources, Environmental impact of fossil fuels, Energy Security and potential for conflicts, Classification of non-conventional energy sources, Sustainable Sun Energy, Sun energy-advantages, Conversion challenges, other energy alternatives, solar thermal technologies, Silicon solar technologies, Solar Cell Parameters-current, voltage, fill factor and efficiency. Losses in solar cells.

Textbook: Chapter: sections: "Solar Photovoltaics Fundamentals, Technologies and Application", Chapter 1, Section 1.1,1.2,1.3,1.4.2,1.5. Chapter 5: Section 5.1 and 5.2.

Pre-requisites (Self Learning): Basics of Electrical engineering and physics fundamentals.

RBT Levels: L1, L2

Module-2 Solar Geometry — 8 Hrs

Introduction, Sun and the earth, extra terrestrial solar radiation, solar spectrum at the earth surface, sun-earth movement, Declination angle, Angle of sunrays on solar collector, Local apparent time (LAT), Sun tracking, vertical axis tracking, Solar radiation on Tilted Surfaces, definitions, Measurement of Solar Radiation-pyranometer and pyrheliometer. Simple Numerical.

Textbook: Chapter: sections: "Solar Photovoltaics Fundamentals, Technologies and Application", Chapter 12, Section 12.1, 12.1.1, 12.1.2, 12.2, 12.2.1, 12.3, 12.3.1, 12.3.2, 12.4, 12.5.4, 12.6

Pre-requisites (Self Learning): Fundamentals of Physics.

RBT Levels: L1, L2, L3

Module-3: Solar PV Modules and its characteristics	8 Hrs

Introduction, PV modules from Solar Cells, Series Parallel connection of Cells, Mismatch in Cell/Module, Mismatch in Series connection & parallel connection, Hot spots in the module, Fabrication of PV modules, ratings of PV Modules, I-V and Power curve of module, Effect of Solar Irradiation and Effect of Temperature.

Textbook: Chapter: sections: "Solar Photovoltaics Fundamentals, Technologies and Application", Chapter 13, Section 13.1, 13.1.1,13.1.2, 13.2, 13.2.1, 13.2.2, 13.3, 13.4.3, 13.5.2, 13.5.3, 13.5.4, 13.5.5.

Pre-requisites (Self Learning): Basics of Electrical engineering and physics fundamentals**.**

RBT Levels: L1, L2, L3

Module-4: Balance of Solar PV Systems.	8 Hrs

Introduction, Basics of Electrochemical Cell, Elements and Operation of Electrochemical cell, Theoretical cell voltage and capacity, Losses in a cell, Battery classification, Battery parameters, Factors affecting battery performance, Battery charging and Discharging Methods, Battery for PV Systems, Lead-acid Batteries, Nickel-Cadmium (Ni-Cd) batteries, comparison of Batteries, DC to DC Converters, Buck and Boost type DC to DC Converter. Charge controllers, types of charge controllers. Maximum power point Tracking (MPPT).

Textbook: Chapter: sections: "Solar Photovoltaics Fundamentals, Technologies and Application", Chapter 14, Section 14.1, 14.1.1 to 14.1.8, 14.2, 14.2.1 to 14.2.5, 14.3, 14.3.1 to 14.3.3, 14.4, 14.4.1 to14.4.3, 14.5, 14.5.2 and 14.7.

Pre-requisites (Self Learning): Fundamentals of Chemistry and physics

RBT Levels: L1, L2

Module-5: Design of Solar PV System.	8 Hrs

Introduction to Solar PV Systems, Classification, Stand alone PV Systems, Grid- connected PV systems and Hybrid PV Systems. Design methodology of PV Systems, Design of PV water Pumping system, Design of Stand-alone system with battery and AC or DC load. Numerical.

Textbook: Chapter: sections: "Solar Photovoltaics Fundamentals, Technologies and Application", Chapter 15, Section 15.1, 15.2, 15.2.1 to 15.2.5, 15.3, 15.3.1 to 15.3.4, 15.4, 15.5 and 15.6.

Pre-requisites (Self Learning): Basics of Electrical engineering and physics fundamentals**.**

RBT Levels: L1, L2, L3

IV. COURSE OUTCOMES

CO1	Discuss the Necessity and importance of Solar energy fundamentals.
CO2	Explain the importance of solar geometry in solar PV power generation.
CO3	Discuss the role of Solar PV module and Balance of Solar PV system.
CO4	Design the simple Solar PV systems for domestic applications.

V. CO-PO-PSO MAPPING (mark H=3; M=2; L=1)

PO/PSO	1	2	3	4	5	6	7	8	9	10	11	12	S1	S2	S3
CO1	3						3						2		
CO2	3	1					2						3		
CO3	3	2					2						3		
CO4	3	2					3						3		

VI. Assessment Details (CIE & SEE)

General Rules: Refer Annexure Section 1

Continuous Internal Evaluation (CIE): Refer Annexure Section 1

Semester End Examination (SEE): Refer Annexure Section 1

VII. Learning Resources

VII(a): Textbooks:

Sl. No.	Title of the Book	Name of the author	Edition and Year	Name of the publisher
1	Solar Photovoltaics Fundamentals, Technologies and Application	Chethan Singh Solanki	Third Edition	PHI
2	Solar Photovoltaics Technology and Systems	Chethan Singh Solanki	9th Edition, April 2018	PHI

VII(b): Reference Books: (Insert or delete rows as per requirement)

1	Non- Conventional Sources of energy.	G D Rai	6th Edition 2017	Khanna Publishers
2	Solar Energy	S P Sukhatme	4th Edition,	Mc Graw Hill Publication

VII(c): Web links and Video Lectures (e-Resources):

1. NPTEL course on Design of Photovoltaic Systems by Prof. L Umanand, IISc Bangalore. (NPTEL:: Electronics & Communication Engineering - NOC:Design of photovoltaic systems)

VIII: Activity Based Learning / Practical Based Learning/Experiential learning:

Activities like seminar, assignments, quiz, case studies, mini projects, industry visit, self-study activities, group discussions, etc

Semester:	III	Course Type:	ETC		
Course Title: Micro and Nano-Scale Sensors and Transducers					
Course Code:	23EEE313			**Credits:**	**3**
Teaching Hours/Week (L:T:P:O)			**3:0:0:@**	**Total Hours:**	**40**
CIE Marks:	**50**	**SEE Marks:**	**50**	**Total Marks:**	**100**
SEE Type:	**Theory**			**Exam Hours:**	**3 Hours**

I. Course Objectives:

- To explain measurement of pressure using sensors, based nanotechnology, their structure, theory of operation.
- To explain structure, theory of operation of sensors based on nanotechnology for Motion, acceleration, measurement, gas and smoke detection.
- To explain sensors based on nanotechnology for the measurement of atmospheric moisture and moisture inside the electronic components.
- To explain Optoelectronic and Photonic Sensors used in optical microphones, fingerprint readers, and highly sensitive seismic sensors.
- To explain classification of transducers, advantages and disadvantages of electrical transducers, transducers actuating mechanism, resistance, variable inductance and capacitive transducers.

II. Teaching-Learning Process (General Instructions):

Mention the planned/proposed sample Strategies, which teachers can use to accelerate the attainment of the various course outcomes.

- Chalk and talk method
- Power point presentation / keynotes
- Videos
- Field Visit

III. COURSE CONTENT

Module-1: Pressure Sensors: 8 Hours

Capacitive Pressure Sensors- Structure, Theory and experimental results, Inductive Pressure Sensors- Structure, Theory and experimental results, Ultrahigh Sensitivity Pressure Sensors- Structure, Theory and experimental results.

Textbook: Chapter: sections: Micro and Nano scale sensors and Transducers: Chapter 1, section 1.1,1.2,1.3

Pre-requisites (Self Learning)
Sensor technology

RBT Levels: L1, L2

Module-2: Motion and Acceleration Sensors 8 Hours

Motion and Acceleration Sensors: Ultrahigh Sensitivity Wide Dynamic Range Sensors - Structure, Theory and experimental results, Other Motion and Acceleration Microsensors.

Gas and Smoke Sensors:
A CO Gas Sensor Based on Nanotechnology – Structure, Theory, Assembly of the Sensor, Experimental Results, Auxiliary Experimental Results, Smoke Detectors – Structure, Qualitative Description of the Detector, Theory, Experimental Results.

Textbook:Chapter:sections: : **Micro and Nano scale sensors and Transducers: Chapter 2, section 2.1,2.2, Chapter 3, section 3.1, 3.2**	
Pre-requisites (Self Learning) Motion Sensor technology	
RBT Levels: L1, L2	
Module-3: Moisture Sensors and Optoelectronic and Photonic Sensors	8 Hours
Moisture Sensors: Structure, Theory, Main Experimental Results, Auxiliary Experimental Results. **Optoelectronic Microphone**- Introduction and Principle of Operation, Theory, Description of the Image Acquisition/Pattern Recognition Hardware and Software, Experimental Results, Other Optoelectronic and Photonic Micro Sensors. **Textbook:Chapter:sections: Micro and Nano scale sensors and Transducers :Chapter 4, section 4.1 to 4.6, Chapter 5, section 5.1, 5.2**	
Pre-requisites (Self Learning) Moisture & Photonic sensor technology	
RBT Levels: L1, L2	
Module-4: Biological, Chemical, and "Lab on a Chip" Sensors	8 Hours
Biological, Chemical, and "Lab on a Chip" Sensors: Lab on a Chip Sensors, Other Biochemical Micro- and Nano-Sensors. Electric, Magnetic, and RF/Microwave Sensors: **Magnetic Field Sensors**: Introduction and Principle of Operation, Theory, Manufacturing and Assembly of the Prototype Sensor, Numerical Data and Experimental Results, Other Important Electromagnetic/RF Micro- and Nano-Sensors. **Textbook:Chapter:sections: Micro and Nano scale sensors and Transducers :Chapter 6, section 6.1, 6.2 Chapter 7, section 7.1, 7.2**	
Pre-requisites (Self Learning) Biochemical, Electro, Magnetic sensors	
RBT Levels: L1, L2	
Module-5: Transducers and Special Purpose Sensors	8 Hrs
Transducers: Introduction, Classification of Transducers, Advantages and Disadvantages of Electrical Transducers, Transducers Actuating Mechanisms, Resistance Transducers, Variable Inductance Transducers, Capacitive Transducers **Special Purpose Small-Scale Devices:** Aircraft Icing Detectors - Introduction and Principle of Operation, Theory, Performance Data and Experimental Results, Conclusion. Microfluidic, Microactuators. **Textbook:Chapter:sections: Electrical and Electronic Measurements and Instrumentation- R K Rajput, Chapter-16 section 16.1 to 16.8, Micro- and Nano-Scale Sensors and Transducers Chapter 8, section 8.1 to 8.2**	
Pre-requisites (Self Learning) Special purpose devices	
RBT Levels: L1, L2	

IV. COURSE OUTCOMES

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

CO1	Outline the differences between the sensor and transducer technology based on nanotechnology and nanofabrication and the classical sensor technologies
CO2	Explain the informed selection of a sensor or transducer for a particular application;
CO3	Explain the knowledgeable about the technologies that are available commercially at the present time.

V. CO-PO-PSO MAPPING (mark H=3; M=2; L=1)

PO/PSO	1	2	3	4	5	6	7	8	9	10	11	12	S1	S2	S3
CO1	2	2				2	2							2	
CO2	2	2				2	2							2	
CO3	2	2				2	2							2	

VI. Assessment Details (CIE & SEE)

General Rules: Refer annexure section 1

Continuous Internal Evaluation (CIE): Refer annexure section 1

Semester End Examination (SEE): Refer annexure section 1

VII. Learning Resources

VII(a): Textbooks:

Sl. No.	Title of the Book	Name of the author	Edition and Year	Name of the publisher
1	Micro- and Nano-Scale Sensors and Transducers,	Ezzat G. Bakhoum	2015	CRC Press

VII(b): Reference Books:

1	Electrical and Electronic Measurements and Instrumentation	R K Rajput	3rd Edition	S Chand

VII(c): Web links and Video Lectures (e-Resources):

Mention the links of the online resources, video materials, etc.
https://www.youtube.com/watch?v=vjpUFF51taU&list=PLp6ek2hDcoNBrYuh8TYc3YNQUvKanqiRa
https://www.youtube.com/watch?v=9qh_7spq6sw
https://www.youtube.com/watch?v=j9y0gfN9WMg&list=PL5873EDBDFB69BAD8

VIII: Activity Based Learning / Practical Based Learning/Experiential learning:

Mention suggested Activities like seminar, assignments, quiz, case studies, mini projects, industry visit, self-study activities, group discussions, etc

Semester:	III	**Course Type:**	ETC		
Course Title:	**Programming in C++**				
Course Code:	**23EEE314**			**Credits:**	3
Teaching Hours/Week (L:T:P:O)			3:0:0:@	**Total Hours:**	40
CIE Marks:	50	**SEE Marks:**	50	**Total Marks:**	100
SEE Type:	Theory			**Exam Hours:**	3 Hours

I. Course Objectives: At the end of the course student will be able to

- Understand about object-oriented programming to acquire knowledge about the capability to store data together in an object.
- Develop technique to represent entity as a real time object using Class, object, and Inheritance.
- Understand about functions and special type of functions constructors which are special type of.
- Create and handle data in files using file I/O operations.
- Apply the concepts of Exception handling to develop robust programs.

II. Teaching-Learning Process (General Instructions):

- Chalk and talk method.
- Power point presentation / keynotes
- Videos

III. COURSE CONTENT

Module-1: Principles of OOP — 8 Hrs

Principles of object-oriented programming - Basic Concepts of OOPS, Benefits of OOP, Structure of C++ program, Tokens, keywords, identifiers, Basic datatypes and user defined datatypes in C++, Declaration of variables, Operators: Scope resolution operator, Member dereferencing operators and memory management operators, manipulators, A simple C++ program

Textbook: "Object Oriented Programming with C++" - Balagurusamy E Chapter 1: Section: 1.5, 1.6 Chapter 2: Section: 2.3, 2.6 Chapter 3: Section: 3.2, 3.3,3.4,3.5,3.6, 3.11 to 3.18

Pre-requisites (Self Learning) : Structure of C Programming

RBT Levels: L1, L2, L3

Module-2 : Control Structures and Functions in C++ — 8 Hrs

Control Structures: Sequence, Selection and Loop control structures.

Functions in C++: Introduction, Main function, Function prototype, Functions call by value, call by address, call by reference & return by reference, Default arguments, inline functions, Recursion, Function Overloading.

Textbook: "Object Oriented Programming with C++" - Balagurusamy E Chapter 4: Section: 4.1, 4.2, 4.3, 4.4, 4.5, 4.6, 4.7, 4.8 and 4.9

Pre-requisites (Self Learning): Concepts of Functions in C Programming.

RBT Levels: L1, L2, L3

Module-3: Introduction to Classes and Objects — 8 Hrs

Classes and Objects – Specifying a class, Access Specifiers: Public, Private and Protected, Data members and Data member functions in a class, memory allocation for objects, Static data member and Static member functions,

Textbook: "Object Oriented Programming with C++" - Balagurusamy E Chapter 5: Section: 5.3, 5.4, 5.5, 5.10, 5.11 and 5.12

Pre-requisites (Self Learning): Basic implementation of Structure in C Programming

RBT Levels: L1, L2, L3

Module-4: Concept on Special type of Functions and Code reusability	8 Hrs

Constructors and Destructors: Constructors, parameterized constructors, multiple constructors in a class, copy constructor, dynamic constructors, and destructors.

Inheritance: Introduction, defining derived classes, Types of inheritance: Single inheritance, multilevel inheritance, multiple inheritance, hierarchical inheritance, and hybrid inheritance.

Textbook: "Object Oriented Programming with C++" - Balagurusamy E Chapter 6: Section: 6.1, 6.2, 6.3, 6.4, 6.7, 6.8 ,6.11 Chapter 8: Section: 8.1, 8.2, 8.3, 8.5, 8.6, 8.7, 8.8

Pre-requisites (Self Learning): Knowledge in C Programming

RBT Levels: L1, L2, L3

Module-5: Introduction to Pointers, Polymorphism and File Operations	8 Hrs

Pointers, Virtual and Polymorphism: Pointers, this pointer, Dynamic Polymorphism – Introduction to Virtual functions (Function overriding) and Friend Functions

File operations: Introduction to file, create, read, and write operations in files (Text File), End of file.

Textbook: "Object Oriented Programming with C++" - Balagurusamy E Chapter 9: Section: 9.1, 9.2, 9.4 and 9.6 Chapter 11: Section: 11.1,11.2,11.3 and 11.4

Pre-requisites (Self Learning): Basic coding knowledge in any language

RBT Levels: L1, L2, L3

IV. COURSE OUTCOMES

At the end of the course students will be able to

CO1	Understand the code with extensible Class types, User-defined operators, and functions to provide the solution to a problem using OOP concepts
CO2	Achieve code reusability and extensibility by means of Inheritance and Polymorphism
CO3	Analyse the concepts of Pointers, Static and Dynamic Polymorphism for effective programming in C++
CO4	Implement the features of C++ in file handling for providing programmed solutions to complex problems.

V. CO-PO-PSO MAPPING (mark H=3; M=2; L=1)

PO/PSO	1	2	3	4	5	6	7	8	9	10	11	12	S1	S2	S3
CO1	3	3	2			2						2	3		
CO2	3	3	2			2						2	3		
CO3	3	3	2			2						2	3		
CO4	3	3	2			2						2	3		

VI. Assessment Details (CIE & SEE)

General Rules: Refer Annexure section 1

Continuous Internal Evaluation (CIE): Refer Annexure section 1

Semester End Examination (SEE): Refer Annexure section 1

VII. Learning Resources

VII(a): Textbooks:				
Sl. No.	**Title of the Book**	**Name of the author**	**Edition and Year**	**Name of the publisher**
1	Object Oriented Programming with C++	Balagurusamy E	Seventh Edition, 2018	Tata McGraw Hill Education Pvt. Ltd
VII(b): Reference Books:				
1	C++ the Complete Reference	Herbert Schildt	12th Edition, 2023	McGraw Hill
2	Programming with ANSI C++	Bhushan Trivedi	2nd Edition, 2012	Oxford Press
3	Object Oriented Programming With C++	Bhave	4th Edition, 2004.	Pearson Education

VII(c): Web links and Video Lectures (e-Resources):

1. Introduction to C++ - https://www.youtube.com/watch?v=BClS40yzssA
2. Different Functions in C++ - https://www.youtube.com/watch?v=p8ehAjZWjPw

Tutorial Link:

1. https://www.w3schools.com/cpp/cpp_intro.asp
2. https://www.edx.org/course/introduction-to-c-3

VIII: Activity Based Learning / Practical Based Learning/Experiential learning:

Activities like seminar, assignments, quiz, mini projects, self-study activities, group discussions, Activity Based Learning, Practical Based learning, Project Based learning, Demonstration of simple projects, etc

Semester:	3	**Course Type:**	AEC		
Course Title: Troubleshooting on Electrical appliances, Wiring and Auto CAD					
Course Code:	**23EEAE31**			**Credits:**	01
Teaching Hours/Week (L:T:P:O)			1:0:0:3	**Total Hours:**	40 HRS
CIE Marks:	50	**SEE Marks:**	50	**Total Marks:**	100
SEE Type:	Theory			**Exam Hours:**	3 hrs

I. Course Objectives:

This course will enable students to:

- Attain the basic principles and conventions of engineering drawing
- Gain familiarity with AutoCAD Electrical interface, Including toolbars, menus and command specific to design
- Learn to Create electrical schematics, Panel layouts and other drawings commonly used in electrical engineering.
- Troubleshooting of Electrical appliances.
- Understand the conduit wiring for commercial building.

II. Teaching-Learning Process (General Instructions):

Adopt different types of teaching methods to develop the outcomes through Power point presentations and Video demonstrations.

• Adopt teaching methods by using working models

• Adopt collaborative (Group Learning) Learning in the class.

• Adopt Problem Based Learning (PBL), which foster student's Analytical skills and develops thinking skills such as evaluating, generalizing, and analysing information with the use of modern tools.

III. COURSE CONTENT

III (a) Theory

Module-1: Basic Skills for Electrical Troubleshooting	8 Hrs

Basic Skills for electrical troubleshooting, safety first, OSHA requirements regarding troubleshooting and qualified persons, using electrical drawings for troubleshooting, using electrical meters to perform circuit measurements, developing a logical, systematic approach to troubleshooting.

Reference book: Basic Electrical Trouble shooting by D. Philipp Kaiser.

Pre-requisites (Self Learning)

RBT Levels: L1, L2

Module-2: Troubleshooting Control Circuits	12 Hrs

Building a circuit from a ladder diagram, control circuit industrial applications, control relay logic circuits, automatic motor control circuits, timer sequence circuits, testing field components, control relays, motor starter contactors, overload devices, solid state timers, limit switches, auxiliary contact blocks, indicator lamps, push buttons and selector switches, circuit breakers and fuses Reference book: Practical Troubleshooting of Electrical Equipment and Control Circuits Mark Brown, Jawahar Rawtani, Dinesh Patil	
Pre-requisites (Self Learning)	
RBT Levels: L2	
Module-3: Troubleshooting Motors	8 Hrs
Troubleshooting motors, most common motor problems, electrical and mechanical concerns, performing electrical tests on a motor, using the megohmmeter on a motor, testing windings for shorts, opens and ground faults, phase unbalance, phase rotation testing, forward/reverse motor starters **Reference book:** Troubleshooting Motors and Controls by Ken Dickson	
Pre-requisites (Self Learning)	
RBT Levels: L2	
Module-4: Troubleshooting Lighting Circuits	8 Hrs
Troubleshooting lighting circuits, lighting terminology, types of lighting circuits, incandescent lighting, fluorescent lighting, hid lighting, led lighting. **Reference book:** Basic Electrical Trouble shooting by D. Philipp Kaiser	
Pre-requisites (Self Learning)	
RBT Levels: L1, L2	
Module-5: Schematic Wiring & Editing	4 Hrs
Exposure to CAD Commands like Draw basic entities like Line, Circle, Arc, Polygon, Ellipse, Rectangle, Multiline, Dimensioning, Inserting text, Apply copy, mirroring, array, fillet and trim on the object created Using Auto CAD prepare a layout diagram, circuit schematic diagram, installation plan and wiring diagram for the following: a) A bed room with 2 Lamps, 1 fan and one 5A socket. b) A living room with 4 Lamps, 2 fans and three 5A socket. c) A Kitchen with one 15A socket, one 5A socket, one light point and one Exhaust fan. d) A bathroom with one 15A socket, one 5A socket and one light point. **Reference book:** Auto cad-electrical-black-book- Gaurav Verma	
Pre-requisites (Self Learning)	
RBT Levels: L1	

III(b). PRACTICAL PART

Sl. No.	**Experiments / Programs / Problems** (insert rows as many required)
1	Concept of Phase wire, Neutral wire, Earth wire and Half wire and determining the size of Conductors, Testing domestic wiring Continuity test (OC & SC Test)
2	Conduit wiring –Bending procedure of conduits, Drawing of cables through conduits, straight Joint, T joint of wire, Junction box Loop in.
3	Conduit Wiring for a Two lamps controlled independently and series controlled by one switch.

4	Using Auto CAD prepare a layout diagram, circuit schematic diagram, installation plan and wiring diagram for the following: a) A bed room with 2 Lamps, 1 fan and one 5A socket. b) A living room with 4 Lamps, 2 fans and three 5A socket. c) A Kitchen with one 15A socket, one 5A socket, one light point and one Exhaust fan. d) A bathroom with one 15A socket, one 5A socket and one light point.

IV. COURSE OUTCOMES

CO1	Students should be proficient in basic electrical troubleshooting.
CO2	Students should be able to troubleshooting control circuits
CO3	Students should be able to troubleshooting motors
CO4	Students should be able to troubleshooting lighting circuits
CO5	Students should be able to create various types of electrical drawings, including schematics, panel layouts, and wiring diagrams.

V. CO-PO-PSO MAPPING (mark H=3; M=2; L=1)

PO/PSO	1	2	3	4	5	6	7	8	9	10	11	12	S1	S2	S3	S4
CO1	2				2											
CO2	2	2	2	1												
CO3	2		2		2											
CO4	1	2	2		1											
CO5	2	2	2		1	1	2									

VI. Assessment Details (CIE & SEE)

General Rules: Refer Annexure section 5

Continuous Internal Evaluation (CIE): Refer Annexure section 5

Semester End Examination (SEE): Refer Annexure section 5

VII. Learning Resources

VII(a): Text Books:

Basic Electrical Trouble shooting	D. Philipp Kaiser	2014	CreateSpace Independent Publishing Platform

VII(b): Reference Books:

1	Auto cad-electrical-black-book	Gaurav Verma	2015	CADCAMCAE Works, USA.
2	AutoCAD	David Byrnes	2011	Wiley Publishing
3	Troubleshooting of Electrical Motors	Glen A. Mazur	5th Edition	2017

4	Practical Troubleshooting of Electrical Equipment and Control Circuits	Mark Brown, Jawahar Rawtani, Dinesh Patil	Science Direct	2004

VII(c): Web links and Video Lectures (e-Resources):

Mention the links of the online resources, video materials, etc.
https://www.youtube.com/watch?v=Fa5gYiapD1E&t=168s&pp=ygUSYXV0b2NhZCBlbGVjdHJpY2Fs
https://www.youtube.com/watch?v=7QQRG2sLbYk&pp=ygUSYXV0b2NhZCBlbGVjdHJpY2Fs

VIII: Activity Based Learning / Practical Based Learning/Experiential learning:

Mention suggested Activities like seminar, assignments, quiz, mini projects, self-study activities, group discussions, etc

Semester:	III	**Course Type:**	NCMC		
Course Title: SKILLFULL FUTURES: EMPOWERING APTITUDE AND SOFTSKILLS					
Course Code:	**23PDSN03**			**Credits:**	PP/NP
Teaching Hours/Week (L:T:P:O)			0:0:0:2	**Total Hours:**	30
CIE Marks:	50	**SEE Marks:**	----	**Total Marks:**	50
SEE Type:	---			**Exam Hours:**	00

I. Course Objectives:

- Strengthen logical and analytical thinking skills required to solve quantitative problems.
- Discuss the importance of ethical considerations in leadership and negotiation, emphasizing integrity, fairness, and accountability in decision-making and interactions.
- Apply problem-solving strategies to real-world situations.
- Crafting Effective Openings and Closings.
- Develop a systematic approach to creative problem solving

II. Teaching-Learning Process (General Instructions):

Mention the planned/proposed sample Strategies, which teachers can use to accelerate the attainment of the various course outcomes.

III. COURSE CONTENT

III(a). Theory PART

Module-1: Quantitative Aptitude-1	06 Hrs
Problems on Permutation and Combination. Problems on Surds and Indices	
Pre-requisites (Self Learning)	
Module-2: Leadership and Negotiation skills	06 Hrs
Leader skills, Persuasion Skills, Negotiation Skills and Conflict Resolving Skills	
Pre-requisites (Self Learning)	
Module-3: Quantative aptitude - 2	06 Hrs
Problems on Percentage, Problems on Profit and Loss , Problems on cubes and Dices	
Pre-requisites (Self Learning)	
Module-4: Letter and Writing Skills	06 Hrs
Writing Skills, Formal, Informal Letters, Sample Letters, Business Professional writings and Adaptability in writing style	
Pre-requisites (Self Learning)	
Module-5: Logical Reasoning	06 Hrs
Syllogism Concepts and Logical Deduction	
Pre-requisites (Self Learning)	

IV. COURSE OUTCOMES

CO1	Understand Mathematical Concepts such as Arithmetic, algebra, geometry and Statistics
CO2	Develop decision-making abilities by learning techniques for making informed and timely decisions, considering various factors and perspectives.
CO3	Develop problem-solving skills to tackle various quantitative problems efficiently and accurately.
CO4	Develop skills in writing clear and concise letters, conveying the intended message effectively without ambiguity or unnecessary details.
CO5	Understanding Syllogistic Reasoning

V. CO-PO-PSO MAPPING (mark H=3; M=2; L=1)

PO/PSO	1	2	3	4	5	6	7	8	9	10	11	12	S1	S2	S3	S4
CO1	2	2						2				1				
CO2								2	2			2				
CO3	2	2						2				2				
CO4										2		2				
CO5	2	2										1				

VI. Assessment Details of CIE

Continuous Internal Evaluation (CIE): Refer annexure section-8
CIE will be conducted by Ethnotech as per the scheduled timetable, with common question papers for the subject.

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

VII. Learning Resources

VII(b): Reference Books:

1	Quantitative Aptitude for Competitive examination	R S Agarwal	2017	S Chand
2	Are we leading ?	Kaushik Mahaputhra	2020	Notion press
3	A modern approach to logical reasoning	R S Agarwal	2019	S Chand

VII(c): Web links and Video Lectures (e-Resources):

https://swayam.gov.in/explorer
https://nptel.ac.in/courses

VIII: Activity Based Learning / Practical Based Learning/Experiential learning:

Mention suggested Activities like
Seminar
Assignments
Quiz
Mini projects

Autonomous Syllabus: IV Semester

Semester:	IV	**Course Type:**	BSC		
Course Title: Probability Distributions and Linear Algebra					
Course Code:	23EET401			**Credits:**	3
Teaching Hours/Week (L:T:P:O)			2:2:0:@	**Total Hours:**	40
CIE Marks:	50	**SEE Marks:**	50	**Total Marks:**	100
SEE Type:	Theory			**Exam Hours:**	3

VIII. Course Objectives:

This course will enable students to:

4. Understand the concepts of linear algebra, probability distributions, sampling distributions
5. Develop the knowledge of probability, joint probability distribution and sampling theory occurring in digital signal processing, design engineering.
6. Recognize and apply linear algebra concepts in various fields of engineering.

IX. Teaching-Learning Process (General Instructions):

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

5. In addition to the traditional lecture method, innovative teaching methods shall be adopted.
6. State the need for Mathematics with Engineering Studies and Provide real-life examples.
7. Grading assignments and quizzes and documenting students' progress.
8. Encourage the students for group learning to improve their creative and analytical skills. Encourage students to work in groups to promote collaborative learning.

X. COURSE CONTENT

III(a).Theory PART

Module-1: Probability Distributions	8 Hrs

Review of basic probability theory. Random variables (discrete and continuous), probability mass and density functions. Mathematical expectation, mean and variance. Binomial, Poisson, Exponential and normal distributions- Illustrative examples. (Textbook 1: Chapter 26-Section 26.7 to 26.10, 26.14 to 26.17)

Teaching-Learning Process: Chalk and Talk, PPT, videos.

Self Learning: Exponential distribution.

RBT Levels: L1, L2, L3

Module-2: Joint probability distribution & Markov Chain	8 Hrs

Joint probability distribution: Joint Probability distribution for two discrete random variables, expectation, covariance and correlation.

Markov Chain: Introduction to Stochastic Process, Probability Vectors, Stochastic matrices, Regular stochastic matrices, Markov chains, Higher transition probabilities, Stationary distribution of Regular Markov chains and absorbing states.. (Textbook 2: Chapter 31-[Section 31.1 and 31.2])

Teaching-Learning Process: Chalk and Talk, PPT, videos

Self Learning: Conditional density function.

RBT Levels:L1, L2, L3

Module-3: Sampling Theory	8 Hrs
Sampling, Sampling distributions, standard error, test of significance for large samples: test of hypothesis for means and proportions, Test of Significance for means of two small samples: students 't' distribution, Chi-square distribution as a test of goodness of fit. F-Distribution. (Textbook 1: Chapter 27 [Section 27.1 to 27.8, 27.10 to 27.12, 27.14, 27.15, 27.17 and 27.18]) **Teaching-Learning Process:** Chalk and Talk, PPT, videos	
Self Learning: Point estimation and interval estimation.	
RBT Levels: L1, L2, L3	
Module-4: Vector Spaces and Linear transformation	8 Hrs
Vector spaces, subspaces, linear span, linearly independent and dependent sets, basis and dimension. Linear transformations- Matrix of a linear transformation, kernel and range of linear transformation, rank-nullity theorem. (Textbook 3: Chapter 4[Section 4.1 to 4.6]) **Teaching-Learning Process**: Chalk and Talk, PPT, videos	
Self Learning: Angles and Projections. Rotation, reflection, contraction and expansion	
RBT Levels: L1, L2, L3	
Module-5: Inner Product Spaces	8 Hrs
Inner products, orthogonal matrices, orthogonal and orthonormal bases, Gram-Schmidt process, QR factorization. Least squares solution. Eigen values and Eigen vectors , diagonalization of symmetric matrices and singular value decomposition (Textbook 3: Chapter 5 ,6 and 7-[Section 5.1 , 6.1 to 6.5, 7.1,7.4]) **Teaching-Learning Process**: Chalk and Talk, PPT, videos	
Self Learning: Quadratic forms	
RBT Levels: L1, L2, L3	

XI. COURSE OUTCOMES

CO1	Illustrate the fundamental concepts of probability distribution, sampling theory , Markov chain and linear algebra
CO2	Apply the knowledge of probability distribution, sampling theory , Markov chain and linear algebra to solve engineering problems.
CO3	Analyze the solution of the problems using suitable techniques of probability distribution, sampling theory , Markov chain and linear algebra to the real world problems.
CO4	Interpret the knowledge of probability distribution, sampling theory , Markov chain and linear algebra to solve the problems arising in practical situations.

XII. CO-PO-PSO MAPPING (mark H=3; M=2; L=1)

PO/PSO	1	2	3	4	5	6	7	8	9	10	11	12	PSO1	PSO2	PSO3
CO1	3	2	1									1	1	2	2
CO2	3	2	1									1	1	2	2
CO3	3	2	1									1	1	2	2
CO4	3	2	1									1	1	1	1

XIII. Assessment Details (CIE & SEE)

General Rules: *Refer Annexure Section 1*

Continuous Internal Evaluation (CIE) & Rubrics: *Refer Annexure Section 1*

Semester End Examination (SEE) & Rubrics: *Refer Annexure Section 1*

XIV. Learning Resources

VII(a): Textbooks:

Sl. No.	Title of the Book	Name of the author	Edition and Year	Name of the publisher
1	Higher Engineering Mathematics	B.S. Grewal	44th Ed., 2018.	Khanna Publishers
2	Higher Engineering Mathematics	B.V. Ramana	11th Ed., 2017	Tata Mc Graw-Hill
3	Linear Algebra and its Applications	David C Lay	4th Ed.,.	Pearson Publishers

VII(b): Reference Books:

1	Advanced Engineering Mathematics	E. Kreyszig	10th Ed., 2016	John Wiley & Sons
2	Advanced Engineering Mathematics	C. Ray Wylie, Louis C. Barrett	6th Ed., 2017	McGraw – Hill Book Co.,
3	Probability & Statistics for Engineers & Scientists	Ronald E. Walpole, Raymond H Myers, Sharon L Myers & Keying Ye	9th Ed., 2023.	Pearson Education
4	Linear Algebra and its Applications	Gilbert Strang	4th Ed., 2022.	Cengage Publications
5	Linear Algebra Done Right	Sheldon Axler	4th Ed., 2024	Springer

VII(c): Web links and Video Lectures (e-Resources):

5. http://nptel.ac.in/courses.php?disciplineID=111
6. http://www.class-central-central.com/subject/math(MOOCs)
7. http://academiccarth.org/
8. VTU EDUSAT programme

VIII: Activity Based Learning / Practical Based Learning/Experiential learning:

Assignments / Presentation/ Quiz.

Semester:	IV	Course Type:	PCC		
Course Title: Electric Motors					
Course Code:	**23EET402**			**Credits:**	**3**
Teaching Hours/Week (L:T:P:O)			**3:0:0:@**	**Total Hours:**	**40**
CIE Marks:	**50**	**SEE Marks:**	**50**	**Total Marks:**	**100**
SEE Type:	**Theory**			**Exam Hours:**	**3 Hours**

I. Course Objectives:

- Aims in imparting fundamental knowledge of construction, types of electric motors.
- Operation of AC motors and DC motors required for electrical engineers.

II. Teaching-Learning Process (General Instructions):

- Chalk and talk method
- Power point presentation / keynotes
- Videos
- Animations

III. COURSE CONTENT

Module-1: DC Motor and Testing — 8 Hrs

DC Motors: Introduction**,** Classification, Back emf, Principle of operation, Torque equation, Types, characteristics, Losses, power flow diagram, efficiency, condition for maximum efficiency, Speed control and starters. Numerical.

DC Motor Testing: Swinburne's Test, Hopkinson's Test, Field Test and Numerical.

Textbook: Chapter: sections: Theory & performance of Electrical Machines, J B Gupta: Part I: Sections 8.1-8.4, 8.7, 8.10, 8.12 to 8.15, 8.17 to 8.21, 8.25, 9.1 to 9.5, 10.1 to 10.5, 10.7, 10.8, 10.10.

Pre-requisites (Self Learning)
Faraday's Laws of Electromagnetic Induction, Lenz's Law.

RBT Levels: L1, L2, L3

Module-2: Three Phase Induction Motor — 8 Hrs

Three Phase Induction Motor: Types, Construction, Working Principle, Applications, Slip, significance of slip, Torque equation, Maximum torque, Torque-slip and torque-speed curves, torque-slip characteristic covering motoring, generating and braking regions of operation, Losses, efficiency and Numerical.

Textbook: Chapter: sections: Theory & performance of Electrical Machines, J B Gupta: Part I: Section Part III: Section 7.1 to 7.11, 7.18 to 7.23.

Pre-requisites (Self Learning):
Electromagnetic Fields, Electric Circuits Analysis, Basics of Electrical and Electronics Engineering

RBT Levels: L1, L2, L3

Module-3: Performance Analysis of Three Phase Induction Motor — 8 Hrs

Performance Analysis of Three Phase Induction Motor: No-load and blocked rotor tests, Performance Analysis of induction motor-Equivalent Circuit & Circle Diagram, Induction motor working as induction generator, Cogging and crawling. High torque rotors-double cage and deep rotor bars.

Textbook: Chapter: sections: Theory & performance of Electrical Machines, J B Gupta: Part III: Section7.26 to 7.29,7.31 to 7.32, 7.35, 7.40, 9.1

Pre-requisites (Self Learning):
Electromagnetic Fields, Electric Circuits Analysis.

RBT Levels: L1, L2, L3

Module-4: Starting and Speed Control of 3ϕ & 1ϕ Induction Motor	8 Hrs

Starting Methods and Speed Control of 3 phase Induction motor:
Need for starter. Direct online, Star-Delta, and autotransformer starting. Rotor resistance starting. Speed control by voltage, frequency, and rotor resistance methods.
Single Phase Induction Motor: Double revolving field theory, Types, Construction, Working principle, Applications, AC Series Motor.

Textbook: Chapter: sections: Theory & performance of Electrical Machines, J B Gupta: Part III: Section: 8.1 to 8.3.
Electric Machines, Ashfaq Husain: Chapter 8: Section 8.1 to 8.4, 8.7,8.10 to 8.18

Pre-requisites (Self Learning):
Faraday's Laws of Electromagnetic Induction, Induction Motor working

RBT Levels: L1, L2, L3

Module-5: Special Machines and applications.	8 Hrs

Synchronous Motor: Working Principles, Starting Methods, Applications, Voltage and Power Factor control, V and inverted V curves, PMSM
Special Machines: Linear Induction Motor, AC and DC Servo Motor, Brushless DC motor, Stepper motors, SRM.

Textbook: Chapter: sections: Theory & performance of Electrical Machines, J B Gupta: Part III: Section 5.1, 5.2,5.5,5.13,5.19,5.20,5.25, 9.3, 10.23.3 Part I: Section 11.12
Electrical Machines, Ashfaq Husain: chapter 9: section 9.1-9.2, 9.4-9.9

Pre-requisites (Self Learning):
Faraday's Laws of Electromagnetic Induction

RBT Levels: L1, L2, L3

IV. COURSE OUTCOMES

On the successful completion of the course, students will be able to

CO1	Explain the construction, principle of operation of various types of AC motors, DC motors and special purpose motors.
CO2	Analyze the characteristics and performance of DC machines at loaded conditions.
CO3	Explain the starting methods, speed control, and testing of AC &DC Motors
CO4	Determine the performance of AC Motors using different tests

V. CO-PO-PSO MAPPING (mark H=3; M=2; L=1)

PO/PSO	1	2	3	4	5	6	7	8	9	10	11	12	S1	S2	S3	S4
CO1	3	3				1	1	1				1	1	3	-	-
CO2	3	3				1	1	1				1	1	3	-	-
CO3	3	3				1	1	1				1	1	3	-	-
CO4	3	3				1	1	1				1	1	3	-	-

VI. Assessment Details (CIE & SEE)

General Rules: Refer Annexure Section 1

Continuous Internal Evaluation (CIE): Refer Annexure Section 1

Semester End Examination (SEE): Refer Annexure Section 1

VII. Learning Resources

VII(a): Textbooks:

Sl. No.	Title of the Book	Name of the author	Edition and Year	Name of the publisher
1	Theory of Performances of Electrical Machines'	Gupta.J.B	14th Edition, 2013	Kataria & Sons
2	Electric Machines	Ashfaq Husain	2nd Edition 2008	Dhanpat Rai & Co.

VII(b): Reference Books:

1	A Textbook of Electrical Technology	B.L.Theraja	Reprint Edition 2014	S Chand and Company
2	Basic Electrical Engineering	D.P. Kothari	4th Edition,2019	McGraw-Hill Education

VII(c): Web links and Video Lectures (e-Resources):

Mention the links of the online resources, video materials, etc.

https://youtu.be/qZaB6par1zI
https://youtu.be/VczIcTD9mTo
https://youtu.be/E7jG-m9Kpd8
https://youtu.be/7Wzw04-vmv8
https://youtu.be/ijbZS1kBnSk

VIII: Activity Based Learning / Practical Based Learning/Experiential learning:

Activities like seminar, assignments, quiz, case studies, mini projects, industry visit, self-study activities, group discussions, etc

Semester:	IV	Course Type:	IPCC		
Course Title: Microcontrollers					
Course Code:	**23EEI403**			**Credits:**	**4**
Teaching Hours/Week (L:T:P:O)			**3:0:2:0**	**Total Hours:**	**40(Theory)+ 14(Lab Slots)**
CIE Marks:	**50**	**SEE Marks:**	**50**	**Total Marks:**	**100**
SEE Type:	**Theory**			**Exam Hours:**	**3 Hours**

I. Course Objectives:

- To explain the internal organization and working of Computers, microcontrollers, and embedded processors
- To understand the architecture and working of 8051 microcontrollers
- To explain different addressing modes of 8051, data types & instruction sets
- To program the microcontroller in assembly and C language to satisfy the requirements.
- To be able to interface and operate external peripheral using microcontroller

II. Teaching-Learning Process (General Instructions):

- Chalk and talk method
- Power point presentation / keynotes
- Videos
- Animations
- Experiential & self-learning

III. COURSE CONTENT

III(a). Theory PART

Module-1: Introduction to Microcontrollers — 8: Hrs

Introduction: Introduction to Microprocessor and Microcontroller, Architecture of Microprocessor -Von Neumann and Harvard architecture – CISC and RISC —Comparison of Microprocessor and Microcontroller. Introduction to 8051 microcontrollers, 8051 Architecture- programming model, 8051 Pin diagram details, Clock circuit, Port circuits.
Self study: Evolution of Microprocessor and Micro controllers.

Textbook: The 8051 Microcontroller and Embedded Systems- Muhammad Ali Mazidi: Chapter: 1: Section 0.1, 0.2, 0.3, 1.1
The 8051 Microcontroller, Architecture- Kenneth .J. Ayala: Chapter 1: Section: 1.0 to 1.6

Pre-requisites (Self Learning)
Knowledge on digital circuits, personal computers, Home appliances

RBT Levels: L1, L2, L3

Module-2: 8051 Microcontroller — 8 Hrs

Internal Memory Organization of 8051 Internal RAM structure- 8051 Register Banks and Stack, Timing Diagram, Counters/Timers , Interrupts , Serial port, Special Function Registers, PSW, DPTR & PC, , IO Port Usage in 8051, Port declaration , External memory access.

Textbook: The 8051 Microcontroller and Embedded Systems- Muhammad Ali Mazidi: Chapter 2 : section 2.1 to 2.7

Pre-requisites (Self Learning):
Types of memory, ALU & CU, Knowledge on Bits, Bytes, KB, MB

RBT Levels: L1, L2, L3	
Module-3: 8051 Assembly Language Programming	8 Hrs
8051 Assembly Language Programming: Introduction to assembly language programming, Assembler**,** Assembling and running an 8051 program, addressing modes, Assembler directives, Instruction set of 8051, Basic Assembly language Programming – Arithmetic operations, logical operations, Looping, Jump, subroutines – IO port programming. **Textbook: Chapter: sections: The 8051 Microcontroller and Embedded Systems- Muhammad Ali Mazidi: Chapter 5 & 6: section: 5.1 to 5.4 and section 6.1 to 6.5**	
Pre-requisites (Self Learning): Basic mathematical operations, Logic and analytical thinking	
RBT Levels: L1, L2, L3	
Module-4:8051 C Programming & Interfacing	8 Hrs
8051 Embedded 'C' Programming: Complier, compiling and running an 8051 program, Embedded C Data types, Programming structure- reading and writing data from/ to parallel ports, serial ports, Timer/Counter 8051 Interfacing with peripherals using Embedded 'C', DAC, ADC. **Matrix Keyboard, LCD, LED will be discussing in Lab session** **Textbook: The 8051 Microcontroller and Embedded Systems- Muhammad Ali Mazidi: Chapter 7, 9, 10, 12, 13: section: 7.1 to 7.6, 9.1 to 9.3, 10.1 to 10.5, 12.1 to 12.2 and 13.1 to 13.3.**	
Pre-requisites (Self Learning): Basics of C language, flow charts and algorithms	
RBT Levels:L1, L2, L3	
Module-5: Advanced Microcontrollers	Hrs
Introduction to advanced microcontrollers: Introduction to programming languages- Assembly language, Embedded C, HDL, Overview of 8/16/32/64-bit Microprocessors and Microcontrollers – Applications of Microprocessors and Microcontrollers. PIC microcontroller framework, PIC development tools PIC 16F877 microcontroller,- Architecture, Pi diagram, Timers. **Textbook: Chapter: sections: Design with PIC Microcontrollers-John B.Peatman: Chapter 1, 6, 9, 10**	
Pre-requisites (Self Learning): Interfaces, Timers and counters, memory organisation	
RBT Levels: L1, L2, L3	

III(b). PRACTICAL PART

Sl. No.	**Experiments / Programs / Problems** (insert rows as many required)
1	Write and Verify ALP - Data transfer Program for block data movement without overlap, exchange, sorting, finding largest element in an array.
2	Write and verify arithmetic programs to illustrate Arithmetic instructions: Addition, subtraction, multiplication and division, Find square and cube of numbers
3	Write a program to implement Counters- Hexa & Decimal- Up and Down counter
4	Write a program to convert data - BCD to ASCII, ASCII to BCD, ASCII to decimal
5	Write a program to add and subtract multibyte numbers
6	Write 8051 C Program to interface Stepper motor interface and rotate it clockwise and counter clockwise
7	Write 8051 C Program to interface DC motor interface for speed control

8	Write 8051 C Program to interface DAC and generate different waveforms: Sine, Square, Triangular, Ramp using DAC interface

Additional Experiments

1	Auto Intensity Control of Street Lights.
2	Application of Delay using 8051 Timers

Instructions for conduction of practical part: Refer Annexure Section 1

IV. COURSE OUTCOMES

CO1	Understand the architectural details of microcontrollers and understand instruction set.
CO2	Develop assembly and C language programs to demonstrate the functions of microcontrollers.
CO3	Design and apply the knowledge of on-chip peripherals and also to interface external hardware to microcontroller.
CO4	Understand the advanced microcontrollers available and utilize them for applications

V. CO-PO-PSO MAPPING (mark H=3; M=2; L=1)

PO/PSO	1	2	3	4	5	6	7	8	9	10	11	12	S1	S2	S3	S4
CO1	3	2	2												3	
CO2	3	2	3	2	2				2			2			3	
CO3	3	2	3	2	2				2			2			3	
CO4	3	2	3	2	2				2			2			3	

VI. Assessment Details (CIE & SEE)

General Rules: Refer Annexure Section 2

Continuous Internal Evaluation (CIE): Refer Annexure Section 2

Semester End Examination (SEE): Refer Annexure Section 2

VII. Learning Resources

VII(a): Textbooks:

Sl. No.	Title of the Book	Name of the author	Edition and Year	Name of the publisher
1	The 8051 Microcontroller and Embedded Systems	Muhammad Ali Mazidi, Janice Gillispie Mazidi, and Rolin D. McKinlay	Second edition, 2005	Pearson Education, Inc
2	The 8051 Microcontroller, Architecture,	Kenneth .J. Ayala	third edition, 2004	Penram International, India
3	Design with PIC Microcontrollers	John B.Peatman	2002	Pearson Education

VII(b): Reference Books:

1	Microprocessors and Microcontrollers"	N.Senthil kumar, M.Saravanan, S.Jeevanandhan	**2010**	Oxford university press
2	Microcontrollers-Theory and applications	Ajay V.Deshmukh	2005.	Tata McGraw-Hill, publisher

VII(c): Web links and Video Lectures (e-Resources):

1. https://www.youtube.com/@eeedepartment4878
2. https://www.youtube.com/@VTUeShikshanaProgramme
3. NPTEL :: Electrical Engineering - NOC:Microprocessors And Microcontrollers

VIII: Activity Based Learning / Practical Based Learning/Experiential learning:

Mention suggested Activities like seminar, assignments, quiz, case studies, mini projects, industry visit, self-study activities, group discussions, etc

Semester:	IV	Course Type:	IPCC		
Course Title: Transmission & Distribution					
Course Code:	**23EEI404**			**Credits:**	**04**
Teaching Hours/Week (L:T:P:O)			**3:0:2:0**	**Total Hours:**	**40 +12 Lab Slots**
CIE Marks:	**50**	**SEE Marks:**	**50**	**Total Marks:**	**100**
SEE Type:	**Theory**			**Exam Hours:**	**3Hrs**

I. Course Objectives:

- This course discusses on
- The insulators used for the overhead lines along with the string efficiency and methods to improve it.
- Mechanical design of transmission lines including the sag and tension calculations, wind and ice loadings, insulated cables including the grading and calculation of capacitances in single core and three core cables.
- The fundamental concepts and detailed calculations of line parameters such as inductances and capacitances, performance analysis of the overhead lines with different equivalent models used for the calculation of regulation and efficiency.
- Analysis of Ac distribution with concentrated load and AC interconnected systems
- Transmission and distribution age of electrical equipment and life extension techniques.

II. Teaching-Learning Process (General Instructions):

- Chalk and talk method
- Power point presentation / keynotes
- Videos
- Animations
- Experiential & self learning

III. COURSE CONTENT

III(a). Theory PART

Module-1: Transmission & Distribution Systems **10 Hrs**

Standard voltages for generation, transmission and distribution. Advantages of high voltage transmission. Feeders, distributors &service mains. Mechanical design of Transmission Lines- Types of conductors, conductor materials, Calculation of sag in conductors i) At equal supports ii) At different level supports. Effect of ice covering and wind pressure, factors affecting sag, Numerical. Overhead Line Insulators-Types of insulators, potential distribution over a string of suspension insulators. String efficiency & methods of improving string efficiency. Numerical.

Textbook: A Course in Power Systems, J B Gupta, Chapter: Part II -2,3, Sections: 2.1 to 2.9 & 3.1 to 3.8

Pre-requisites (Self Learning): Knowledge of Basic Electrical Engineering, Field Theory

RBT Levels: L1, L2, L3

Module-2: Underground Cables & Corona **10 Hrs**

Underground Cables: General construction of a cable, classification of cables, material used, expression for insulation resistance of a single core cable, dielectric stress in a single core cable, grading of cables, capacitance grading, intersheath grading, measurement of capacitance of a three core cable, determination of maximum current carrying capacity of underground cables. Numerical.

Corona: -Phenomena, disruptive and visual critical voltages, corona loss. Advantages and disadvantages of corona. Methods of reducing corona. Numerical.

Textbook: Principles of Power System, V.K Mehta, Rohith Mehta, A Course in Power Systems, J B Gupta, Chapter: 11 sections: 11.1 to 11.16& Chapter: Part II -4 sections: 4.1 ,4.2, 4.6 to 4.9

Pre-requisites (Self Learning): Knowledge of Basic Electrical Engineering, Field Theory

RBT Levels: L1, L2, L3

Module-3: Line parameters	**10 Hrs**

Line Parameters-Calculation of inductance of single phase, 3 phase line with equilateral & unsymmetrical spacing (transposed), calculation of capacitance of a single-phase line and 3 phase line with symmetrical and unsymmetrical spacing (transposed) without considering the effect of earth on transmission line capacitance, Numerical.

Textbook: A Course in Power Systems, J B Gupta
Chapter: Part II - 5 sections: 5.5 to 5.13

Pre-requisites (Self Learning): Knowledge of Basic Electrical Engineering, Field Theory

RBT Levels: L1, L2, L3

Module-4: Performance of Transmission Lines	**10 Hrs**

Performance of Transmission Lines: Classification of lines, Short Transmission lines, medium Transmission lines - nominal T method, nominal π method, numerical, long transmission lines – Rigorous solution method (excluding numerical), ABCD constants of Transmission lines, calculation of voltage regulation and transmission efficiency. Numerical.

Textbook: A Course in Power Systems, J B Gupta
Chapter: Part II -6 sections: 6.1 to 6.10

Pre-requisites (Self Learning): Knowledge of Basic Electrical Engineering, Field Theory

RBT Levels: L1, L2, L3

Module-5: AC Distribution, Aging and life extension techniques in Transmission & distribution.	**10 Hrs**

AC Distribution: Introduction, AC distribution with concentrated loads, AC interconnected systems. Numerical.

Aging and life extension techniques in Transmission & Distribution

Estimation of electrical equipment lifetime, overloading and estimated life of electrical equipment-circuit breakers, transformers, conductors, underground transmission. Temperature and estimated life of electrical equipment, Aging factors, Aging of conductors & insulation.

Textbook:

1. **A Course in Power Systems, J B Gupta, Chapter: Part II -9 &10, Sections: 10.1 to 10.4**
2. **Electrical power transmission and distribution ageing and life extension techniques- Bella H Chudnovsky, Chapter: 6, Sections: 6.1 to 6.1.3 , 6.2.1 to 6.4.2.**

Pre-requisites (Self Learning): Knowledge of Basic Electrical Engineering, Field Theory

RBT Levels: L1, L2, L3

III(b). PRACTICAL PART

1. Design and Analysis of sag in conductors at different level supports.
2. Design and Analysis of sag on effect of ice covering and wind pressure.
3. Analysis of string Efficiency based on number of insulator connected.
4. Determine the insulation resistance and capacitance in underground single core cable.
5. To determine the visual critical voltage along the line conductors.

6. Design of short transmission line Model .

7. Determine the ABCD Transmission line parameters.

8. Performance analysis of T/ π method medium transmission line.

Simulation using SCI lab/MATlab

IV. COURSE OUTCOMES

CO1	Select a suitable insulator & design the transmission line for the required sag and methods to improve string efficiency.
CO2	Develop a mathematical model of the transmission line with different configurations and determine the parameters to analyse its performance.
CO3	Explain Construction of cables, types, specifications, classification, grading and limitations.
CO4	Comprehend the phenomenon of corona, its effects and methods of reducing.
CO5	Explain the AC distribution with concentrated loads and interconnected systems
CO6	Understand the aging factors and life extension techniques of electrical materials and equipment.

V. CO-PO-PSO MAPPING

PO/PSO	1	2	3	4	5	6	7	8	9	10	11	12	S1	S2	S3	S4
CO1	3	2	2		2	1						1	3	2		
CO2	3	2	2		2	1						1	3	2		
CO3	3	2	2		2	1						1	3	2		
CO4	3	2				1	1					1	3	2		
CO5	3	2	2			1	1					1	3	2		
CO6	3	2				1	1					1	3	2		

VI. Assessment Details (CIE & SEE)

General Rules: Refer Annexure section 2

Continuous Internal Evaluation (CIE): Refer Annexure section 2

Semester End Examination (SEE): Refer Annexure section 2

VII. Learning Resources

VII(a): Textbooks:

Sl. No.	Title of the Book	Name of the author	Edition and Year	Name of the publisher
1	A Course in Power Systems	J B Gupta	2008	Katson
2	Electrical Power Transmission and Distribution	S. Sivanagaraju and Satyanarayana	2009	Pearson
3	Transmisson and Distribution of Electrical Power	J.B.Gupta, S.K.Kataria	2010	PHI Learning Pvt.Ltd.
4	Principles of Power System	V.K Mehta Rohith Mehta	2020	S. Chand

VII(b): Reference Books:

5	Elements of Power System Analysis	W.D Stevenson	1994	Mc. Graw Hill Comp.Ltd.
6	Electric Power Generation	Dr. S.N Singh	2nd Edition, 2010	PHI Learning Pvt.Ltd.

	Transmission & Distribution.			
7	Electric Power Systems	C L Wadhwa	6th Edition, 2013	New Age International Publishers

VII(c): Web links and Video Lectures (e-Resources):

a. NPTEL courses in Electrical Engineering: Power system generation, Transmission & distribution: Video Lecture Numbers:10,11,12,13, 18,19,20,23 by Prof .D. P. Kothari, Centre for Energy Studies ,IIT New Delhi.

VIII: Activity Based Learning / Practical Based Learning/Experiential learning:

Seminars, assignments, quiz, industry visits.

Semester:	IV	Course Type:	PCCL		
Course Title: Electrical Machines lab-2					
Course Code:	**23EEL405**			**Credits:**	**1**
Teaching Hours/Week (L:T:P:O)			**0:0:2:0**	**Total Hours:**	**12 lab slots**
CIE Marks:	50	**SEE Marks:**	**50**	**Total Marks:**	**100**
SEE Type:	**Laboratory**			**Exam Hours:**	**3 Hours**

I. Course Objectives:

Aims in imparting practical exposure to the students to:

- Understand the fundamental concepts of AC & DC motors.
- Differentiate direct and indirect testing methods
- Analyse the motors performance and characteristics under different loading conditions.
- Control the speed of DC shunt motor.

II. Teaching-Learning Process (General Instructions):

- Chalk and talk method
- Hands-on sessions
- Experiential learning

III. COURSE CONTENT

Sl. No.	Experiments
1.	Determine the Armature and Field winding resistance of Shunt and Series motors.
2.	Perform Load test on DC shunt motor to draw speed–torque and horse power–efficiency characteristics.
3.	Conduct Field Test on DC series machines.
4.	Conduct Swinburne's Test on DC motor.
5.	Perform Regenerative test on DC shunt machines.
6.	Perform Load test on three phase induction motor
7.	Conduct No-load and Blocked rotor test on three phase induction motor to draw circle diagram. Determination of performance parameters at different load conditions.
8.	Conduct Load test on single phase induction motor to draw output versus torque, current, power and efficiency characteristics.
9.	Conduct No-load and Blocked rotor test on three phase induction motor to draw equivalent circuit. Determination of performance parameters at different load conditions.
10.	Conduct suitable tests to draw the equivalent circuit of single-phase induction motor and determine performance parameters.
11.	Control the Speed of DC shunt motor by armature and field control using simulation package
12.	Conduct an experiment to draw V and Inverted V curves of synchronous motor at no load and load conditions using simulation package.

IV. COURSE OUTCOMES

On the successful completion of the course, students will be able to

CO1	Test DC machines to determine their characteristic, to monitor efficiency and also to control the speed of DC motor.
CO2	Pre-determine the performance characteristics of DC machines by conducting suitable tests.

CO3	Perform load test on single phase and three phase induction motor to assess its performance.
CO4	Obtain the characteristics of Synchronous motor experimentally

V. CO-PO-PSO MAPPING (mark H=3; M=2; L=1)

PO/PSO	1	2	3	4	5	6	7	8	9	10	11	12	S1	S2	S3	
CO1	3	2	1		2				2	2		1	1	3	-	
CO2	3	2	1						2	2		1	1	3	-	
CO3	3	2	1						2	2		1	1	3	-	
CO4	3	2	1		2				2	2		1	1	3	-	

VI. Assessment Details (CIE & SEE)

General Rules: Refer Annexure Section 4

Continuous Internal Evaluation (CIE): Refer Annexure Section 4

Semester End Examination (SEE): Refer Annexure Section 4

VII. Learning Resources

VII(a): Textbooks:

Sl. No.	Title of the Book	Name of the author	Edition and Year	Name of the publisher
1	Theory of Performances of Electrical Machines'	Gupta.J.B	14th Edition, 2013	Kataria & Sons

VII(b): Web links and Video Lectures (e-Resources):

Mention the links of the online resources, video materials, etc.
https://youtu.be/SMhG5iv5rnI
https://youtu.be/GF9fEXq5HCA
https://youtu.be/mR1OcrUNHYE
https://youtu.be/dW5BdkUV7gU
https://youtu.be/7dOB5s3gRco
https://youtu.be/PAnSiKT4cBM

VIII: Activity Based Learning / Practical Based Learning/Experiential learning:

Industry visit, self-study activities, group discussions.

Semester:	IV	Course Type:	ETC		
Course Title: Power Generation Techniques and Economics					
Course Code:	**23EEE421**			**Credits:**	**3**
Teaching Hours/Week (L:T:P:O)			**3:0:0:@**	**Total Hours:**	**40**
CIE Marks:	**50**	**SEE Marks:**	**50**	**Total Marks:**	**100**
SEE Type:	**Theory**			**Exam Hours:**	**3 Hours**

I. Course Objectives:

- Study the different types of power generation from Conventional Energy Sources.
- Acquire the knowledge of basic design principles of hydro, nuclear, gas and steam plants.
- Learn the importance of Hydrogen energy generation, Piezo electricity generation and its applications.
- Understand the importance of economic aspects of power generation and also the importance of power factor.

II. Teaching-Learning Process (General Instructions):

- Chalk and talk method
- Power point presentation
- Videos
- Animations

III. COURSE CONTENT

Module-1 : Hydro electric Power Plants — 8 Hrs

Energy Scenario: Introduction to conventional and non-conventional sources of energy, Energy scenario, green-house effect.
Hydroelectric Power Plants: Merits and demerits of hydroelectric power plants, Selection of site. General arrangement of hydel plant, elements of the plant, Classification of the plants based on water flow regulation, small hydro and pumped storage plants.
Water turbines – Pelton wheel, Francis and Kaplan turbines. Characteristic of water turbines, selection of water turbines.

Textbook: Chapter: sections: A course in power systems, J B Gupta: Chapter 1 & 2: Section 1.1 to 2.20.

Pre-requisites (Self Learning): Knowledge on Conventional & non conventional energy sources.

RBT Levels: L1, L2

Module-2: Thermal Power Plants — 8 Hrs

Steam (Thermal)Power Plants: Introduction, Schematic arrangement and working of steam power plant, Basic Rankine cycle, advantages and disadvantages, choice of site, efficiency of steam power station, fuel and ash handling, draught system, feed water treatment, steam power plant auxiliaries. Scenario of Thermal Energy generation.

Gas turbine Plants: Introduction, Merits and demerits, site selection, Fuels for gas turbines, Elements of simple gas turbine power plant.

Textbook: Chapter:sections: A course in power systems, J B Gupta: Chapter 3 and 6: Section 3.1 to 3.20. and Section 6.1 to 6.6.

Pre-requisites (Self Learning):
Knowledge on thermal power stations in India.

RBT Levels: L1, L2	
Module-3: Nuclear Power Plants	8 Hrs
Nuclear Power Plants: Introduction, Scenario of Nuclear power generation. Basics of nuclear energy conversion, Merits and demerits, selection of site, Layout and subsystems of nuclear power plants, Boiling Water Reactor (BWR), Pressurized Water Reactor (PWR), CANDU type Reactor, Fast Breeder Reactors (FBR), gas cooled and liquid metal cooled reactors, safety measures for nuclear power plants, Disposal of nuclear waste. **Textbook: Chapter: sections: A course in power systems, J B Gupta: Chapter 4: Section 4.1 to 4.17.**	
Pre-requisites (Self Learning): Nuclear Fusion and Fission Reaction theory	
RBT Levels: L1, L2	
Module-4: Hydrogen Energy & Piezoelectric Energy Generation.	8 Hrs
Hydrogen Energy Generation: Introduction, benefits, hydrogen production technologies, uses, applications. **Piezoelectric Energy**: Introduction, Total power production in India, the piezoelectric effect, Characteristics of piezo electricity, Factors leading to requirement of piezo electricity, Important components of piezoelectric tile, Block diagram of piezoelectric tile, applications of piezoelectricity. **Textbook: Chapter: sections: 1. Non-Conventional Energy Resources, Shobhnath singh Chapter 5: Section 5.1,5.2,5.4, 5.5.** **2.open access peer-reviewed chapter Piezoelectricity and Its Applications: written by B. Chandra Sekhar, B. Dhanalakshmi, B. Srinivasa Rao, S. Ramesh, K. Venkata Prasad, P.S.V. Subba Rao and B. Parvatheeswara Rao.DOI: 10.5772/intechopen.96154** **3.Anand, Hari and Singh, Binod Kumar. "Piezoelectric energy generation in India: an empirical investigation"** ***Energy Harvesting and Systems*****, vol. 6, no. 3-4, 2019, pp. 69-76. https://doi.org/10.1515/ehs-2020-0002**	
Pre-requisites (Self Learning): Piezo electric and its uses	
RBT Levels: L1, L2, L3	
Module-5: Power Plant Economics	8 Hrs
Power Plant Economics: Introduction, Classification of costs, Fixed and Operating costs of Hydro, Thermal and Nuclear Plants, Economics of Power generation and associated definitions, Load factor, diversity factor, Numerical. Tariffs, types, types of consumers and their tariff. Power factor, disadvantages and causes of low power factor, methods and advantages of improving power factor improvement, Simple Numerical. **Textbook: Chapter: sections**: **A course in power systems, J B Gupta: Chapter 14 and 15: Section 14.1 to 14.10 and Section 15.1 to 15.12**.	
Pre-requisites (Self Learning): Knowledge on Tariff and costs of power generation.	
RBT Levels: L1, L2,L3	

IV. COURSE OUTCOMES

At the end of the course students will be able to

CO1	Describe the working of hydroelectric power plant, types and the role of turbines in hydro power generation.
CO2	Explain the working of thermal power plant, components, layout and environmental issues associated.
CO3	Discuss the working of nuclear power plants, types of reactors and environmental societal issues.
CO4	Learn the importance of hydrogen energy & Piezo electricity generation and its applications.
CO5	Discuss the importance of economics in power generation and need of power factor improvement.

V. CO-PO-PSO MAPPING (mark H=3; M=2; L=1)

PO/PSO	1	2	3	4	5	6	7	8	9	10	11	12	S1	S2	S3
CO1	3					2	2					1	3		
CO2	3					2	2					1	3		
CO3	3					2	2					1	3		
CO4	3					2	2					1	3		
CO5	3	2				2	2					1	3		

VI. Assessment Details (CIE & SEE)

General Rules: Refer Annexure Section 1

Continuous Internal Evaluation (CIE): Refer Annexure Section 1

Semester End Examination (SEE): Refer Annexure Section 1

VII. Learning Resources

VII(a): Textbooks:

Sl. No.	Title of the Book	Name of the author	Edition and Year	Name of the publisher
1	A course in power systems	J B Gupta	11thEdition, 2019	S.K.kataria& Sons.
2	Power system Engineering	A Chakrabarti, M.L.Soni, P.V.Guptha & U.S. Bhatnagar	First Edition, Reprint 2017.	Dhanpat rai & co. (pvt.) Ltd.
3	Non-Conventional Energy Resources	Shobh Nath Singh	First Edition, 2015	Pearson India Education Services Pvt Ltd.

VII(b): Reference Books:

1	Power Plant Engineering	P.K.Nag	Third Edition 2012.	McGraw-Hill Education
2	Electrical power Generation, Transmission and Distribution	S.N.Singh	2nd Edition, 2009	PHI Publications.
3	Generation of Electrical Energy S. Chand 2015	B.R.Gupta	7th Edition,2017	S.Chand Publishers.

VII(c): Web links and Video Lectures (e-Resources):

Mention the links of the online resources, video materials, etc.

(1) Power Plant Engineering - YouTube

(2) (1) Electrical - Power System Generation, Transmission and Distribution (Encapsulated from earlier Video) - YouTube

(3) POWER PLANT ENGINEERING (mheducation.com)

VIII: Activity Based Learning / Practical Based Learning/Experiential learning:

Assignments, quiz, case studies, mini projects, industrial visit.

Semester:	IV	Course Type:	ETC		
Course Title: Introduction to Electric Vehicle Technology					
Course Code:	**23EEE422**			**Credits:**	**3**
Teaching Hours/Week (L:T:P:O)			**3:0:0:@**	**Total Hours:**	**40**
CIE Marks:	**50**	**SEE Marks:**	**50**	**Total Marks:**	**100**
SEE Type:	**Theory**			**Exam Hours:**	**3**

I. Course Objectives:

This course will enable students to:

- To understand the Electric vehicles and Hybrid vehicles components & function.
- Understand types of Batteries used as an energy source recently.
- Understand the electric propulsion and its control for application of EV.
- Ability to understand Electric Vehicle Charging Infrastructure, Standards.

II. Teaching-Learning Process (General Instructions):

- Chalk and talk method
- Power point presentation
- Videos
- Animations

III. COURSE CONTENT

Module-1:Introduction to Electric Vehicles — 8 Hrs

Introduction to Electric vehicles, Introduction to Hybrid vehicles, Electric & Hybrid Vehicles Components, Limitations of IC engine vehicles, Electric vehicles overview, Types of EV & challenges, History of Electric vehicles ,Advantages of Electric vehicles, Electric vehicles & ICEV Comparison, General block diagram of Electric Vehicles, Performance of Electric vehicles, Introduction to Electric vehicles motors drive technology.

TextBook:Chapter:Sections-'Electric and Hybrid Vehicles : Design Fundamentals, IqbalHussein, :Chapter-1:Section 1.1to 1.8,10.1.

Prerequisites(Self Learning): Basics of Electrical Engg ,Physics fundamentals.

RBT Levels: L1, L2.

Module-2: Vehicle Architecture and Design

Electric Vehicles, HEV, Hybrids based on Architecture, Hybrids based on Transmission assembly, Hybrids based on degree of Hybridization, Plug-in Hybrid Electric vehicles, EVs: skateboard Chassis, Power train component sizing, HEV Power train Sizing.

TextBook:Chapter:Sections-'Electric and Hybrid Vehicles : Design Fundamentals, Iqbal Hussein, :Chapter-3:Section 3.1 to 3.5.2

Prerequisites(Self Learning): Fundamentals knowledge on EV configuration.

RBT Levels:L1, L2, L3

Module-3: Battery Energy storage — 8 Hrs

Batteries in Electric and Hybrid Vehicles, Battery Basics, Battery Parameters. Traction Batteries-types: Lead Acid batteries, Nickel-cadmium (NiMH)battery, Li-ion Battery. Battery Pack management.

TextBook:Chapter:Sections-'Electric and Hybrid Vehicles : Design Fundamentals, Iqbal Hussein : Chapter-5:Section 5.1 to 5.3, 5.6.1 to 5.6.5, 5.7

Prerequisites (Self Learning): Basic knowledge on Electrolysis.

RBT Levels: L1, L2.

Module-4: Electric Propulsion	8 Hrs

Introduction, Types of motors used in Electric Vehicles: DC Series motor, Brush-less-DC-Motor(BLDC), Three phase-Induction machines, Permanent Magnet machines, Switched Reluctance machines(SRM); Each motors working principles, Characteristics, Applications & its limitations.

TextBook:Chapter:Sections-'Electric and Hybrid Vehicles : Design Fundamentals, Iqbal Hussein : Chapter-7: Sections-7.1 to 7.7

Prerequisites(Self Learning): Working principles of different Machines.

RBT Levels: L1, L2, L3

Module-5: Electric Vehicle Charging Infrastructure.	8 Hrs

Introduction, Electric Vehicle Charging Station Infrastructure, Standards for EV Charging, Types of EV Charging Systems, Nature of Electric Vehicles Load, Impact of Electric Vehicles on the Electric Power Grid.

TextBook:Chapter:Sections : "Electric Vehicle Charging Infrastructure, Standards, Types, and Its Impact on Grid":A Review by-P. Bhosale,Sujil A,Rajesh Kumar &R. C. Bansal, LLCISSN: 1532-5008 print / 1532-5016, onlineDOI:10.1080/15325008.2024.2315206 Published online: 10 Apr 2024.

Prerequisites(Self Learning): Knowledge on charging methods.

RBT Levels: L1, L2.

IV. COURSE OUTCOMES

CO1	Explain the working of electric vehicles, Hybrid EVs & recent trends.
CO2	Discuss the various configuration of electric vehicle architecture & design.
CO3	Discuss different methods available for energy storage for EV applications.
CO4	Explain the electric propulsion units and its control for application of electric vehicles.
CO5	Understand the electrical vehicle charging station infrastructure standards and types, along with the impact on grid.

V. CO-PO-PSO MAPPING(mark H=3; M=2; L=1)

PO/PSO	1	2	3	4	5	6	7	8	9	10	11	12	S1	S2	S3	
CO1	2					2	2					1		2	2	
CO2	3					3	3					1		3	3	
CO3	2					2	2					1		2	2	
CO4	2											1		3	3	
CO5	3					3	3					1		3	3	

VI. Assessment Details (CIE & SEE)

General Rules: Refer Annexure Section 1

Continuous Internal Evaluation (CIE): Refer Annexure Section 1

Semester End Examination (SEE): Refer Annexure Section 1

VII. Learning Resources

VII(a): Textbooks:

Sl. No.	Title of the Book	Name of the author	Edition and Year	Name of the publisher
1	'Electric and Hybrid Vehicles: Design Fundamentals',	Iqbal Hussein,	2003.	CRC Press Taylor & Francis Group,
2	Modern Electric, 'Hybrid Electric and Fuel Cell Vehicles: Fundamentals, Theory and Design',	Mehrdad Ehsani, Yimi Gao, Sebastian E. Gay, Ali Emadi,	2004.	CRC Press Taylor & Francis Group,
VII(b): Reference Books:				
1	Hybrid Electric Vehicles: Energy Management Strategies	S. Onori, L. Serrao and G. Rizzoni,	2015	Springer,
2	Hybrid Electric Vehicles: Principles and Applications with PracticalPerspectives,	C. Mi, M.A.Masrur and D. W.Gao	2011.	John Wiley & Sons,

VII(c): Web links and Video Lectures (e-Resources):

VTU EDUSAT programme

VIII: Activity Based Learning / Practical Based Learning/Experiential learning:

Assignments / Presentation/ Quiz.

Semester:	IV	Course Type:	ETC		
Course Title: PLC and Electrical System Automation					
Course Code:	**23EEE423**			**Credits:**	**3**
Teaching Hours/Week (L:T:P:O)			**3:0:0:@**	**Total Hours:**	**40**
CIE Marks:	**50**	**SEE Marks:**	**50**	**Total Marks:**	**100**
SEE Type:	**Theory**			**Exam Hours:**	**3 Hours**

I. Course Objectives:

This course will enable students:

- To explain identification of common operating modes found in PLCs, writing and entering the ladder logic programs.
- To define the functions of Relays, Contactors, Motor Starters, Switches, Sensors, Output Control Devices, Seal-in circuits and Latching Relays, Timers, Counters.
- To discuss the operation of various processes, structures of control systems and the method of communication between different industrial processes

II. Teaching-Learning Process (General Instructions):

- Chalk and talk method
- Power point presentation / keynotes
- Videos
- Field Visit

III. COURSE CONTENT

Module-1: Basics of PLC Programming — 8 Hours

Basics of PLC Programming: Processor Memory Organization, Program Scan, PLC Programming Languages, Relay-Type Instructions, Instruction Addressing, Branch Instructions, Internal Relay Instructions, Programming Examine If Closed and Examine If Open Instructions, Entering the Ladder Diagram, Modes of Operation.

Textbook: Chapter: sections: Programmable Logic Controllers, Frank D Petruzella: Chapter 1, 5: Section 5.1 to 5.10

Pre-requisites (Self Learning)
Relay Operations.

RBT Levels: L1, L2

Module-2 Developing PLC Wiring Diagrams and Timers — 8 Hours

Developing Fundamental PLC Wiring Diagrams and Ladder Logic Programs: Electromagnetic Control Relays, Contactors, Motor Starters, Manually Operated Switches, Mechanically Operated Switches, Sensors, Output Control Devices, Seal-In Circuits, Latching Relays, Converting Relay Schematics into PLC Ladder Programs, Writing a Ladder Logic Program Directly from a Narrative Description.
Programming Timers: Mechanical Timing Relays, Timer Instructions, On-Delay Timer Instruction, Off-Delay Timer Instruction, Retentive Timer, Cascading Timers.

Textbook: Chapter: sections: Programmable Logic Controllers, Frank D Petruzella: Chapter 6, 7 : Section 6.1 to 6.11 and 7.1 to 7.6

Pre-requisites (Self Learning):
Sensors, Relay Operation, Timer Concepts

RBT Levels: L1, L2

Module-3: Programming Counters and Control Instructions	8 Hours

Programming Counters: Counter Instructions, Up-Counter, Down-Counter, Cascading Counters, Incremental Encoder-Counter Applications, Combining Counter and Timer Functions.
Program Control Instructions: Master Control Reset Instruction, Jump Instruction, Subroutine Functions, Immediate Input and Immediate Output Instructions, Forcing External I/O Addresses, Safety Circuitry, Selectable Timed Interrupt, Fault Routine, Temporary End Instruction, Suspend Instruction.

Textbook: Chapter: sections: Programmable Logic Controllers, Frank D Petruzella: Chapter 8, 9 : Section 8.1 to 8.6 and 9.1 to 9.10

Pre-requisites (Self Learning):
Counter Operation, Control Instructions

RBT Levels: L1, L2

Module-4: Development of Control Circuit	8 Hours

Development Of Control Circuit: Develop ladder diagram for control from one place, remote control, interlocking, DOL starter, Forward and reverse motoring, Automatic star delta starter, 3 speed motor Control, Automatic Plugging, Jogging and sequence speed control, Motor control centre, Thyristor controlled DC Motor Drive and Induction motor drive.

Textbook: Chapter: sections: Fundamentals of control, Mclntyre and losee: Chapter 10: Section 10.1 to 10.10

Pre-requisites (Self Learning):
Motor Control Techniques.

RBT Levels: L1, L2

Module-5: Process Control, Network Systems, and SCADA	8 Hours

Process Control, Network Systems, and SCADA: Types of Processes, Structure of Control Systems, On/Off Control, PID Control, Motion Control, Data Communications, Supervisory Control and Data Acquisition (SCADA).

Textbook: Chapter: sections: Programmable Logic Controllers, Frank D Petruzella: Chapter 14 Section 14.1 to 14.7

Pre-requisites (Self Learning):
Control Circuit, SCADA basics

RBT Levels: L1, L2

IV. COURSE OUTCOMES

CO1	Discuss the hardware components of PLC, operating modes and programming, execution of data transfer and PLC closed-loop control system.
CO2	Describe field devices Operations on Relays, Contactors, Motor Starters, Switches, Sensors, Output Control Devices, Seal-In Circuits, and Latching Relays, processes and structure of control systems and communication between the processes.
CO3	Analyse PLC timer and counter ladder logic programs and describe the operation of different program control instructions

V. CO-PO-PSO MAPPING (mark H=3; M=2; L=1)

PO/PSO	1	2	3	4	5	6	7	8	9	10	11	12	S1	S2	S3
CO1	3	2	-	-	-	1	1	1	-	-	-	2	2	2	-
CO2	3	2	-	-	-	1	1	1	-	-	-	2	2	2	-
CO3	3	2	-	-	-	1	1	1	-	-	-	2	2	2	-

VI. Assessment Details (CIE & SEE)

General Rules: Refer Annexure Section 1

Internal Assessment Test: Refer Annexure Section 1

Semester-End Examination: Refer Annexure Section 1

VII. Learning Resources

VII(a): Textbooks:

Sl. No.	Title of the Book	Name of the author	Edition and Year	Name of the publisher
1	Programmable Logic Controllers	Frank D Petruzella	4th Edition, 2011	McGraw Hill

VII(b): Reference Books: (Insert or delete rows as per requirement)

1	Fundamentals of control	Mclntyre and losee	3rd Edition	McGraw Hill
2	Introduction Programmable Logic Controllers	Gary Dunning	3rd Edition, 2006	Cengage

VII(c): Web links and Video Lectures (e-Resources):

Mention the links of the online resources, video materials, etc.
https://www.youtube.com/watch?v=PbAGl_mv5XI
https://www.youtube.com/watch?v=zsajTNtxfAE
https://www.youtube.com/watch?v=LIQ9imlgH-U

VIII: Activity Based Learning / Practical Based Learning/Experiential learning:

Activities like seminar, assignments, quiz, case studies, mini projects, industry visit, self-study activities, group discussions, etc

Semester:	IV	**Course Type:**	**ETC**		
Course Title:	**Object Oriented Programming with JAVA**				
Course Code:	**23EEE424**			**Credits:**	**3**
Teaching Hours/Week (L:T:P:O)			**3:0:0:@**	**Total Hours:**	**40**
CIE Marks:	**50**	**SEE Marks:**	**50**	**Total Marks:**	**100**
SEE Type:	**Theory**			**Exam Hours:**	**3 Hours**

I. Course Objectives:

This course will enable students to:

- Understand about object-oriented programming to Acquire knowledge about the capability to store data together in an object.
- Develop technique to represent entity as a real time object using Class, object, strings, Inheritance, Packages, and Interface
- Study about type of functions called constructors and hence to implement exception/ Event handling mechanism.
- Create and process data in files using file I/O operations.

II. Teaching-Learning Process (General Instructions):

- Chalk and talk method.
- Power point presentation / keynotes
- Videos

III. COURSE CONTENT

Module-1: Introduction to Java and Java Evolution — 8 Hrs

Fundamentals of OOP: Introduction, Object-oriented paradigm, Basic concepts of Object-Oriented programming, Benefits of OOP, Applications of OOP

Java Evolution: Java History, Java features, how Java differs from C & C++, Java and Internet, Java and World wide web, Web browsers, Hardware and Software requirements, Java support systems, Java environment.

Textbook: Programming with Java - E Balagurusamy Chapter 1: Section: 1.1,1.2,1.3,1.4 and 1.5 Chapter 2 : Section: 2.1,2.2,2.3,2.4,2.5,2.6,2.7,2.8 and 2.9

Pre-requisites (Self Learning): Structure of any Programming language

RBT Levels: L1, L2, L3

Module-2: Overview of Java Language, Variables and Data types — 8 Hrs

Overview of Java language: Introduction, Simple java program, more of Java, Java programming structure, Java tokens, Java statements, Implementing a Java program, Java virtual Machine, Example Programs

Constants, Variables and Data types: Introduction, Constants, Variables, Datatypes, Declaration of a variable, giving values to variables, Scope and Lifetime of variables, Example Programs

Textbook: Programming with Java-E Balagurusamy Chapter 3: Section: 3.1,3.2,3.4,3.5,3.6,3.7,3.9 and 3.10 Chapter 4 : Section: 4.1,4.2,4.3,4.4,4.5,4.6 and 4.7

Pre-requisites (Self Learning): Knowledge in C++ Programming

RBT Levels: L1, L2, L3

Module-3: Operators, Decision making & Branching	8 Hrs

Operators and Expressions: Introduction, Arithmetic operators, Relational operators, Logical Operators, Assignment operators, Increment and decrement operators, conditional operators, Arithmetic Expressions, Evaluation of expressions, Example Programs
Decision making and branching: Introduction, Decision making with If statement, If-else statement, Nesting of If_else Statements, The ELSE If ladder, Switch statements, The ?: Operator, Example Programs

Textbook: **Programming with Java-E Balagurusamy Chapter 5: Section: 5.1,5.2,5.3,5.4,5.5,5.6,5.7,5.8,5.9,5.10 and 5.11 Chapter 6 : Section: 6.1,6.2,6.3,6.4,6.5,6.6,6.7 and 6.8**

Pre-requisites (Self Learning): Knowledge in C++ Programming

RBT Levels: L1, L2, L3

Module-4: Control flow, Classes, and Methods	8 Hrs

Decision making and lopping: Introduction, while statement, do statement, for statement, Jumps in Loops, return statement, Labelled loops, Example Programs
Classes and Methods: Introduction, defining a class, fields declaration, Methods declaration, creating objects, Accessing class members, Constructors, Destructors, Method overloading, Static members, Nesting of methods, Example Programs.

Textbook: Programming with Java-E Balagurusamy Chapter 7: Section: 7.1,7.2,7.3,7.4,7.5,7.6 and 7.7 Chapter 8 : Section: 8.1,8.2,8.3,8.4,8.5,8.6,8.7,8.9 and 8.10

Pre-requisites (Self Learning): Knowledge in any of the Programming language

RBT Levels: L1, L2, L3

Module-5: Inheritance and Polymorphism	8 Hrs

Inheritance: Basics of Inheritance: Member access and Inheritance, A more practical Example, super keyword, Example programs
Polymorphism: Method overriding, Dynamic method dispatch: Why overridden methods? Applying method overriding, Introduction to Abstract classes, using final to prevent inheritance, Example programs.

Textbook: Java the Complete Reference- Herbert Schildt Chapter 8: Section: Pg. No. 171 to 195

Pre-requisites (Self Learning): Knowledge in any of the Programming language

RBT Levels: L1, L2, L3

IV. COURSE OUTCOMES

At the end of the course, students will be able to

CO1	Develop JAVA programs using OOP principles and proper program structuring with extensible Class types, User-defined operators, and functions
CO2	Achieve code reusability and extensibility by means of Inheritance.
CO3	Analyse the concepts of Polymorphism for effective programming in JAVA

V. CO-PO-PSO MAPPING (Mark H=3; M=2; L=1)

PO/PSO	1	2	3	4	5	6	7	8	9	10	11	12	S1	S2	S3	S4
CO1	3	3	2			2						2	3			
CO2	3	3	2			2						2	3			
CO3	3	3	2			2						2	3			

VI. Assessment Details (CIE & SEE)

General Rules: Refer Annexure Section 1

Continuous Internal Evaluation (CIE): Refer Annexure Section 1

Semester End Examination (SEE): Refer Annexure Section 1

VII. Learning Resources

VII(a): Textbooks:

Sl. No.	Title of the Book	Name of the author	Edition and Year	Name of the publisher
1	Java the Complete Reference	Herbert Schildt	12th Edition, 2023	McGraw Hill, Chennai
2	Programming with Java	E Balagurusamy	6th Edition, 2019	McGraw Hill

VII(b): Reference Books:

2	JAVA One step Ahead	Anita Seth and B L Juneja	2017	Oxford University Press
3	Programming with Java	Mahesh Bhave and Sunil Patekar	First Edition, 2008	Pearson Education

VII(c): Web links and Video Lectures (e-Resources):

Object Oriented Programming (OOPs) Concept in Java - GeeksforGeeks
The Best Java Examples (freecodecamp.org)
Learn Java Programming (programiz.com)

VIII: Activity Based Learning / Practical Based Learning/Experiential learning:

Activities like seminar, assignments, quiz, mini projects, self-study activities, group discussions, Activity Based Learning, Practical Based learning, Project Based learning, Demonstration of simple projects, etc

Semester:	4	Course Type:	AEC		
Course Title: Network Security					
Course Code:	**23EEAE41**			**Credits:**	1
Teaching Hours/Week (L:T:P:O)			1:0:0:3	**Total Hours:**	40
CIE Marks:	50	**SEE Marks:**	50	**Total Marks:**	100
SEE Type:	Theory			**Exam Hours:**	2

I. Course Objectives:

- Understand core security principles: confidentiality, integrity, availability, and non-repudiation.
- Define and enforce physical security measures at various levels.
- Identify different types of security policies and controls.
- Recognize various attack types and vulnerabilities.
- Understand backup and restore types: full, incremental, and differential.
- Identify methods for protecting client and server systems.
- Configure user authentication mechanisms and manage permissions effectively.
- Implement wireless security measures and network protection devices.
- Understand network isolation methods and protocol security concepts.
- Implement email protection measures, manage browser security, and maintain anti-malware software.

II. Teaching-Learning Process (General Instructions):

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

outcomes.

1. Lecturer method (L) need not to be only a traditional lecture method, but alternative effective teaching methods could be adopted to attain the outcomes.
2. Use of Video/Animation to explain functioning of various concepts.
3. Encourage collaborative (Group Learning) Learning in the class.
4. Ask at least three HOT (Higher order Thinking) questions in the class, which promotes critical thinking.
5. Adopt Problem Based Learning (PBL), which fosters students' Analytical skills, develop design thinking skills such as the ability to design, evaluate, generalize, and analysed information rather than simply recall it.
6. Introduce Topics in manifold representations.

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

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

III. COURSE CONTENT

III(a). Theory PART

Module-1: Defence in Depth	Hrs 8

Heading:

1.1 Identify core security principles

• Confidentiality, integrity, availability, non-repudiation, threat, risk, vulnerability, principle of least privilege, attack surfaces including IoT

1.2 Define and enforce physical security

• Site security, computer security, removable devices and drives, mantraps

1.3 Identify security policy types

• Administrative controls, technical controls

1.4 Identify attack types

• Buffer overflow, viruses, polymorphic viruses, worms, Trojan horses, spyware, ransomware, adware, rootkits, backdoors, zero day attacks/ vulnerabilities, denial-of-service (DoS) attacks, common attack methods,

types of vulnerability, cross-site scripting (XSS), SQL injection, brute force attack, man-in-the-middle (MITM) and man-in-the-browser (MITB), social engineering, keyloggers (software and hardware), logic bombs

1.5 Identify backup and restore types

• Full, incremental, differential

Textbook: Chapter: sections

"Principles of Computer Security" by William Stallings and Lawrie Brown: This textbook covers core security principles such as confidentiality, integrity, availability, and non-repudiation. It also delves into topics like threats, risks, vulnerabilities, and the principle of least privilege.

Pre-requisites (Self Learning): Device divers, script language

RBT Levels: L2 & L3

Module-2: Operating System Security	Hrs 8

Heading:

2.1 Identify client and server protection

• Separation of services, hardening, patch management, reducing the attack surface, group policy (gpupdate and gpresult), secure dynamic Domain Name System (DNS) updates, User Account Control (UAC), keeping

client operating system and software updated, encrypting offline folders, software restriction policies

2.2 Configure user authentication

• Multifactor authentication, enforcing password policies, remote access, using secondary sign-on to perform administrative tasks (Run As, sudo), domain and local user and group creation, Kerberos

2.3 Manage permissions in Windows and Linux

• File and folder permissions, share permissions, inheritance, moving or copying files within the same disk or on another disk, multiple groups with different permissions, take ownership, delegation.

Textbook:Chapter:sections "CompTIA Security+ Study Guide: Exam SY0-601" by Emmett Dulaney and Chuck Easttom	
Pre-requisites: Security Policy and Types of security policies (Chapter 1)	
RBT Levels: L2 & L4	
Module-3: Network Device Security	Hrs 8
Heading: **3: Managing Permissions** 3.1 Facilitate non-repudiation using audit policies and log files • Types of auditing, what can be audited, enabling auditing, what to audit for specific purposes, where to save audit information, reviewing log files 3.2 Demonstrate knowledge of encryption • File and folder encryption, how encryption impacts moving/copying files and folders, drive encryption, TPM, secure communication processes (email, texting, chat, social media), virtual private network (VPN) encryption methods, public key/private key, certificate properties and services, Bitlocker **3.3. Implement wireless security** • Wireless security types (strength of encryption), service set identifiers (SSIDs), MAC filtering, default configuration (OOBE) **3.2 Identify the role of network protection devices** • Purpose of firewalls, hardware vs. software firewalls, network vs. host firewalls, stateful vs. stateless firewall inspection, security baselines, intrusion detection system (IDS), intrusion prevention system (IPS), security information and event manager (SIEM), content filtering, blacklisting/ whitelisting **Textbook:Chapter:sections** "Network Security Essentials: Applications and Standards" by William Stallings”	
Pre-requisites : Components used in network, Client and Server protection(Chapter 2).	
RBT Levels: L2 & L4	
Module-4: Network Device Security	Hrs 8
Heading: **4.1 Identify network isolation methods** • Routing, honeynet, perimeter networks (DMZ), NAT/PAT, VPN, IPsec, air gap network, DirectAccess, virtual LAN (VLAN) 4.2 Identify protocol security concepts • Tunneling, DNSSEC, network sniffing, well-known ports (FTP, HTTP, HTTPS, DNS, RDP, Telnet, SSH, LDAP, LDAPS, SNMP, SMTP, IMAP, SFTP)	
Pre-requisites: Learning Wireless Technology (Chapter 2)	
RBT Levels: L2 & L3	
Module-5: Secure Computing	Hrs 8

Heading:

5.1 Implement email protection

• Antispam, spoofing, phishing, and pharming, client protection, user training

5.2 Manage browser security

• Browser settings, cache management, private browsing

5.3 Install and configure anti-malware and antivirus software

• Installing, uninstalling, reinstalling, and updating; remediation, scheduling scans, investigating alerts.

Textbook:Chapter:sections

"The Art of Deception: Controlling the Human Element of Security" by Kevin D. Mitnick and William L. Simon

Pre-requisites: Knowledge on Browser usage, email usage & Antivirus.

RBT Levels: L2 & L3

III(b). PRACTICAL PART

(Fill this portion III(b) if course type is integrated or else delete this portion, if course type is only practical, delete the theory part III(a) and retain this section)

Sl. No.	**Experiments / Programs / Problems** (insert rows as many required)
1.	Experiment 1: Set up a simple network with multiple layers of security (e.g., firewall, antivirus software, access control lists) and simulate various attack scenarios (e.g., DoS attack, malware infection). Observe how each layer of defense reacts to the attacks and mitigates the threats. Experiment 2: Implement backup and restore procedures using different methods (full, incremental, differential) on a test system. Practice restoring data from backups to understand the recovery process.
2.	Experiment 3: Harden a Windows or Linux operating system by implementing security measures such as disabling unnecessary services, configuring firewall rules, enabling UAC (User Account Control), and applying security patches. Test the system's resilience against common attack vectors. Experiment 4: Configure user authentication mechanisms such as multifactor authentication and enforce password policies on a test environment. Explore the implications of different authentication methods on system security.
3.	Experiment 5: Set up a wireless network with various security types (e.g., WPA2-PSK, WPA2-Enterprise) and experiment with SSID hiding, MAC filtering, and encryption strength. Assess the effectiveness of each security measure in preventing unauthorized access. Experiment 6: Configure and deploy network protection devices such as firewalls and intrusion detection/prevention systems (IDS/IPS) in a simulated network environment. Test the devices' functionality by generating and analyzing network traffic.
4.	Experiment 7: Implement email protection measures such as configuring spam filters, setting up SPF/DKIM/DMARC records, and conducting phishing simulation exercises. Evaluate the effectiveness of these measures in detecting and preventing email-based threats. Experiment 8: Explore browser security settings and conduct experiments to understand how to manage cache, cookies, and security certificates. Test the security features of different web browsers and assess their effectiveness in preventing malicious activities.

	Experiment 9: Install and configure anti-malware and antivirus software on a test system. Perform malware scanning, schedule regular scans, and analyze scan results. Practice responding to alerts and remediating malware infections.

Instructions for conduction of practical part:

IV. COURSE OUTCOMES

CO1	Students will understand the concept of defense in depth and its importance in network security.
CO2	Students will be proficient in configuring security settings to minimize vulnerabilities within operating systems.
CO3	Students will gain skills in performing vulnerability assessments and applying patches to network devices.
CO4	Students will understand secure communication protocols and their role in ensuring data confidentiality and integrity.
CO5	Students will be able to configure and manage secure computing environments compliant with relevant standards and regulations.

V. CO-PO-PSO MAPPING (mark H=3; M=2; L=1)

PO/PSO	1	2	3	4	5	6	7	8	9	10	11	12	S1	S2	S3	S4
CO1	2		2		2											
CO2	2		2		2											
CO3	2		2		2											
CO4	2		2		2											
CO5	2		2		2											

VI. Assessment Details (CIE & SEE)

General Rules: Refer Annexure section 5

Continuous Internal Evaluation (CIE): Refer Annexure section 5

Semester End Examination (SEE): Refer Annexure section 5

VII. Learning Resources

VII(b): Reference Books: (Insert or delete rows as per requirement)

Sl. No.	Title of the Book	Name of the author	Edition and Year	Name of the publisher
1	"Network Security Essentials: Applications and Standards"	William Stallings	6th edition 2016	Pearson
2	"Computer Networking: A Top-Down Approach" by	James Kurose and Keith Ross	6th edition in 2012	Addison-Wesley
3	"CISSP (ISC)2 Certified Information Systems Security Professional Official Study Guide"	Mike Chapple, James Michael Stewart, and Darril Gibson	8th edition 2018	Sybex

VII(c): Web links and Video Lectures (e-Resources):

https://learn.microsoft.com/en-us/security/

VIII: Activity Based Learning / Practical Based Learning/Experiential learning:

Seminar, assignments, quiz, case studies, mini projects, industry visit, self-study activities, group discussions, etc

Semester:	IV	Course Type:	NCMC

Course Title: Mindful Mastery: Aptitude and Soft skills Integration

Course Code:	23PDSN04		Credits:	PP/NP
Teaching Hours/Week (L:T:P:O)		0:0:0:2	Total Hours:	24
CIE Marks:	50	SEE Marks: ----	Total Marks:	50
SEE Type:	---		Exam Hours:	00

I. Course Objectives:

- To comprehend numerical relationships, place value, fractions, decimals, percentages, ratios, and proportions.
- Learn how to prioritize tasks and activities based on importance and urgency..
- Understanding of different types of data representations, such as tables, charts, graphs, and diagrams.
- Learn how to interpret different body language signal and their meanings.
- Learn Strategies for breaking down complex problems into manageable steps

II. Teaching-Learning Process (General Instructions):

Chalk and Talk

Video Demonstration

Pictorial representation

PPT presentation and Activity based learning

III. COURSE CONTENT

III(a). Theory PART

Module-1: (Arithmetical Ability)	06 Hrs
Problems on Pipes Cisterns , Time , Work and Averages	
Pre-requisites (Self Learning)	
Module-2: (Time management and Presentation skills)	04 Hrs
Misconceptions of Time, Symptoms of Poor Time Management, the ‘Five Time Zone’ Concept, Elements of Effective Time Management. ABC of presentation / Accent and pronunciation / Practice to Perform / Impact of voice modulation, eye contact and body language during presentation. Evaluation, Feed back	
Pre-requisites (Self Learning)	
Module-3: (Quantitave section and Data Interpretation**)**	06 Hrs
Simple interest and compound interest problems, Bar graphs, Pie charts and Line graphs concepts and problem	
Pre-requisites (Self Learning)	
Module-4: (Body language and Postures)	04 Hrs
Facial expressions, Gestures, Handshakes, tone of voice, Attitude, Universal vs. Culture specific	

Pre-requisites (Self Learning)	
Module-5: (Mental ability)	04 Hrs
Puzzle based question and Psychometric based interview Question	
Pre-requisites (Self Learning)	

IV. COURSE OUTCOMES

CO1	Understand Mathematical Concepts such as Arithmetic, algebra, geometry and Statistics
CO2	Develop decision-making abilities by learning techniques for making informed and timely decisions, considering various factors and perspectives.
CO3	Develop problem-solving skills to tackle various quantitative problems efficiently and accurately.
CO4	Understand data types, data Collection and cleaning
CO5	Understanding Non-Verbal Communication

V. CO-PO-PSO MAPPING (mark H=3; M=2; L=1)

PO/PSO	1	2	3	4	5	6	7	8	9	10	11	12	S1	S2	S3	S4
CO1	2	2						2				1				
CO2								2	2			2				
CO3	2	2						2				2				
CO4										2		2				
CO5	2	2										1				

VI. Assessment Details of CIE

General Rules: Refer Annexure section 8

Continuous Internal Evaluation (CIE): Refer Annexure section 8

Semester End Examination (SEE): Refer Annexure section 8

VII. Learning Resources

VII(b): Reference Books:

1	Quantitative Aptitude for Competitive examination	R S Agarwal	2017	S Chand
2	Gestures and Body Language	Aparna majumdar	2017	V& S Publisher
3	A modern approach to logical reasoning	R S Agarwal	2019	S Chand

VII(c): Web links and Video Lectures (e-Resources):

https://swayam.gov.in/explorer
https://nptel.ac.in/courses

VIII: Activity Based Learning / Practical Based Learning/Experiential learning:

Seminar, assignments, Quiz, mini projects.

ANNEXURE

|| Jai Sri Gurudev ||
Sri Adichunchanagiri Shikshana Trust (R)

SJB Institute of Technology

BGS Health and Education City, Dr. Vishnuvardhana Road, Kengeri, Bengaluru-560060
Approved by AICTE, New Delhi.
Autonomous Institute affiliated to Visvesvaraya Technological University, Belagavi
Accredited by NAAC with 'A+'grade, Certified by ISO 9001 – 2015
Recognized by UGC, New Delhi with 2(f) & 12 (B)

CIE & SEE Evaluation strategy for Autonomous Scheme 2023 (Tentative)

Revised/updated on 29/06/2024; the update modifies the practical component evaluation of integrated courses & laboratory courses involving the mini projects or course projects.

Sl. No.	Course Type /Credits	Continuous Internal Evaluation (CIE)																		Semester End Examination (SEE)									Total Marks (CIE+SEE)
				I. Theory Component							II. Practical Component											Theory				Practical				
		Total CIE marks	Min. Eligty.	Marks	Min. Eligty.	A. Unit test		B. Formative Assessments		Tot. Theory marks (I)	Marks	Min. Eligty.	C. Weekly Evaluation		D. Internal Test			E. Prj	Tot. marks (II)	Total CIE marks	Dur. In hrs.	Max. cond. marks	Max. considered marks	min. pass %	Max. cond. marks	Max. considered marks	min. pass %	Total SEE marks	
						Nos.	Marks / Each	Nos.	Marks / Each				Each week	Tot. marks	Nos.	Marks / Each	Total marks	Marks												
1	BSC/ESC/PCC/ETC/ PEC/OEC (3 or 4 Credit courses)	50	50%	50	50%	3	50	2	50	50 (avg. of 5)	--	--	--	--	--	--	--	--	--	50 (I)	03	100	50	40%	--	--	--	50	100
2	IBSC/IESC/IPCC (4 Credit courses)	50	50%	50	50%	3	50	--	--	50 (avg. of 3)	50	50%	50	50 (Avg. of all)	1	50	50	50	50 (Avg. of C & [D or E])	50 (Avg. of I & II)	03	100	50	40%	--	--	--	50	100
3	IESC - CAED (4 credit course)	50	50%	--	--	--	--	--	--	--	50	50%	50	50 (Avg. of all)	1	50	50	--	50 (Avg. of C & D)	50	03	--	--	--	100	50	40%	50	100
4	PCCL (1 Credit courses)	50	50%	--	--	--	--	--	--	--	50	50%	50	50 (Avg. of all)	1	50	50	50	50 (Avg. of C & [D or E])	50 (II)	03	--	--	--	100	50	40%	50	100
5	AEC- IDT, Skill Development courses (1 credit course)	50	50%	50	50%	2	50	1	50	50 (Avg. of 3)	--	--	--	--	--	--	--	--	--	50 (I)	02	50	50	40%	--	--	--	50	100
6	HSMC- CIP, Env studies, SFH, UHV (1 credit course)	50	50%	50	50%	2	50	1	50	50 (Avg. of 3)	--	--	--	--	--	--	--	--	--	50 (I)	02	50	50	40%	--	--	--	50	100
7	HSMC - English, Kannada (No credits)	50	50%	50	50%	2	50	1	50	50 (Avg. of 3)	--	--	--	--	--	--	--	--	--	50 (I)	--	--	--	--	--	--	--	--	50
8	NCMC - Personality Development courses, PE, Yoga, NCC, NSS, IKS (No credits)	50	50%	50	50%	--	--	1	50	50	--	--	--	--	--	--	--	--	--	50 (I)	--	--	--	--	--	--	--	--	50

 # Formative (Successive) Assessments: Assignments/quiz/ seminars/field survey and report presentation/course project/etc. based on the faculty & dept. planning. **# Practical Conduction:** The conduction of each experiment/program per week should evaluate for 50 Marks and average of all shall be taken. **# In case of Integrated course,** minimum eligibility shall be attained as prescribed in both the theory and practical components. **# Self Learning Courses (SLC) Courses, Internship, Mini project & Major Project: Rubrics & Methodology shall be defined seperately**

Academic Dean 22/6/24

Dr. BABU. N.V
Prof. & Academic Dean
SJB Institute of Technology
BGS Health & Education City
Kengeri, Bengaluru-560060

25.6.2024
Principal

Principal
SJB Institute of Technology
67, BGS Health & Education City,
Dr. Vishnuvardhan Road,
Kengeri, Bengaluru - 560 060.

ANNEXURE

|| Jai Sri Gurudev ||
Sri Adichunchanagiri Shikshana Trust (R)

SJB Institute of Technology

BGS Health and Education City, Dr. Vishnuvardhana Road, Kengeri, Bengaluru-560060
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Accredited by NAAC with 'A+'grade, Certified by ISO 9001 - 2015
Recognized by UGC, New Delhi with 2(f) & 12 (B)

CIE and SEE guidelines based on course Type for Autonomous Scheme 2023

Revised/updated on 29/06/2024; the update modifies the practical component evaluation of integrated courses & laboratory courses involving the mini projects or course projects.

Note:

- **The CIE conduction coordination will be done by the office of Controller of Examination (COE).**
- **The SEE will be conducted by the office of Controller of Examination (COE).**

Continuous Internal Evaluation (CIE)	Semester End Examination (SEE)	Final Passing requirement
1. BSC/ESC/PCC/ ETC/PEC/OEC – Theory Course (03 & 04 Credit courses)		
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 50% of the maximum marks (25 marks out of 50). **Continuous Internal Evaluation:** CIE will be conducted by the department and it will have only 01 component: **I. Theory component.** Theory Component will consist of A. Internal Assessment Test B. Formative assessments	The minimum passing mark for SEE is 40% of the maximum marks (20 out of 50 marks). **Semester-End Examination:** Duration of 03 hours and total marks of 100. • The question paper will have ten questions. Each question is set for 20 marks. • There will be 2 questions from each module. Each of the two questions under a	The student is declared as a pass in the course if he/she secures a minimum of 45% (45 marks out of 100) in the sum total of the CIE and SEE taken together.

week & 15th week, respectively. • The question paper will have four questions (max of 3 sub questions) from the notified syllabus. Each question is set for 25 marks. • The student must answer 2 full questions (one from 1st& 2nd questions and another from 3rd& 4th question). • Internal Assessment Test question paper shall be designed to attain the different levels of Bloom's taxonomy as per the outcome defined for the course. **B. Formative assessments:** • 02 formative assessments each of 50 marks shall be conducted by the course coordinator based on the dept. planning during random times. • One formative assessment shall be completed before 5th week and second shall be completed before 12th week. • The syllabus content for the formative assessment shall be defined by the course coordinator. • The formative assessments include Assignments/ Quiz/ seminars/case study/field survey/ report presentation/ course project/etc. • The assignment QP or Quiz QP shall indicate marks of each question and the relevant COs & RBT levels. • The rubrics required for the other formal assessments shall be defined by the departments along with mapping of relevant COs & POs and get it approved from academic dean. **The final CIE marks will be 50:** Average of all 05 events of Internal Assessment test and formative assessments. **The documents of all the assessments shall be maintained meticulously.**	module (with a maximum of 3 sub-questions), should have a mix of topics under that module. • The students have to answer 5 full questions, selecting one full question from each module. • Marks scored shall be proportionally reduced to 50 marks.	

2. IBSC/IESC/IPCC – Integrated with Theory & Practical (04 credit courses)

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 50% of the maximum marks (25 marks out of 50). Minimum eligibility of 50% marks shall be attained separately in both the theory component and practical component. **Continuous Internal Evaluation:** CIE will be conducted by the department and it will have 02 component: I. Theory Component. II. Practical Component. I. Theory Component will consist of A. Internal Assessment Test B. Formative assessments (Not required for Integrated courses) **A. Internal Assessment Test:** • There are 03 tests each of 50 marks conducted during 6th week, 10th week & 15th week, respectively. • The question paper will have four questions (max of 3 sub questions) from the notified syllabus. Each question is set for 25 marks. • It is suggested to include questions on laboratory content in the Internal Assessment test Question papers. • The student must answer 2 full questions (one from 1st& 2nd questions andanother from 3rd& 4th question). • Internal Assessment Test question paper shall be designed to attain the different levels of Bloom's taxonomy as per the outcome defined for the course. **B. Formative assessments:** • Not required for Integrated courses.	The minimum passing mark for SEE is 40% of the maximum marks (20 out of 50 marks). **Semester-End Examination:** Only theory SEE for duration of 03 hours and total marks of 100. • The question paper will have ten questions. Each question is set for 20 marks. • There will be 2 questions from each module. Each of the two questions under a module (with a maximum of 3 sub-questions), should have a mix of topics under that module. • The laboratory content must be included in framing the theory question papers. • The students have to answer 5 full questions, selecting one full question from each module. • Marks scored shall be proportionally reduced to 50 marks. **No Practical SEE for Integrated Course.** Note: CAED Course shall not be considered here, it shall be considered as in sl. No. 3 in the next row	The student is declared as a pass in the course if he/she secures a minimum of 45% (45 marks out of 100) in the sum total of the CIE and SEE taken together.

II. Practical Component: **C.** Conduction of each experiment/program should be evaluated for 50 marks and average of all the experiments/programs shall be taken.(rubrics will be published by the lab conduction committee) **D.** One laboratoryInternal Assessment test will be conducted during the 14th week for 50 marks.(rubrics will be published by the lab conduction committee) **E.** If the course project / mini project is involved in the laboratory component.**The evaluation shall be completed by 14th week of the semester.** The rubrics required for the evaluation of the project shall be defined by the departments along with mapping of relevant COs & POsand get it approved from academic dean. **Note:** • If component 'E' is involved in the course either component 'D' or 'E' along with component 'C' shall be considered for average of item II. • Otherwise, components 'C' & 'D' shall be considered for average of item II. **The final CIE marks will be 50 =** Avg. {**I** [Avg. of 03 Internal assessment tests] + **II** [Avg. of (C&(Dor E))]} **The documents of all the assessments shall be maintained meticulously.** Note: CAED Course shall not be considered here, it shall be considered as in sl. No. 3 in the next row		
3. IESC: CAED Course (4 credits)		
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 50% of the maximum marks (25 marks out of 50). • CIE shall be conducted for max. marks of 100 and shall be scaled down to 50 marks • CIE component should comprise of both Manual and computer drafting i.e. 50% manual and 50% computer drafting out of total 100 marks	The minimum passing mark for SEE is 40% of the maximum marks (20 out of 50 marks). **Semester-End Examination:** SEE for duration of 03 hours and total marks of 100.	The student is declared as a pass in the course if he/she secures a minimum of 45% (45 marks out of 100) in the sum total of the CIE and SEE taken together.

- CIE component should comprise of Continuous evaluation of drawing work of students as and when the modules are covered based on below detailed weightage.

Module	Module Max. Marks	Evaluation Weightage in marks	
		Computer display and print out	Manual Sketching
Module 1	20	10	10
Module 2	20	10	10
Module 3	20	10	10
Module 4	20	10	10
Module 5	20	10	10
TOTAL	**100**	**50**	**50**

- At least one Test covering all the modules is to be conducted for 100 marks during 14th week and the same is to be scaled down to **25 Marks.**
- Assignments = **10 Marks from each module. (50 marks scaled down to 25 Marks)**
- The final CIE 50 marks = Test (25 marks) + Assignment (25 marks).

- SEE shall be conducted and evaluated for maximum marks of 100 and shall be scaled down to 50 marks.
- Question paper shall be made available for each batch asper schedule.
- Evaluation shall be carried jointly by both theinternal & external examiners.
- Scheme of Evaluation: To be defined by both the examiners jointly.
- Maximum 3 questions shall be set as per the following pattern.

From Module			Marks Allotted
Module 01 (Choice between Lines or Planes)			30
Module 02 (Compulsory question)			40
Module 03 or Module 04 or Module 05			30
TOTAL			**100**
Q. No.	**Manual Sketching**	**Computer display and print out**	**TOTAL MARKS**
1	15	15	30
2	20	20	40
3	15	15	30
TOT.	**50**	**50**	**100**

4. PCCL: Laboratory course (01 credit course)

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 50% of the maximum marks (25 marks out of 50).

The minimum passing mark for SEE is 40% of the maximum marks (20 out of 50 marks).

The student is declared as a pass in the course if he/she secures a

Continuous Internal Evaluation: CIE will be conducted by the department and it will have only 01 component: I. Theory Component. (Not required for Laboratory course) II. Practical Component. **II. Practical Component:** **C.** Conduction of each experiment/program should be evaluated for 50 marks and average of all the experiments/program shall be taken (rubrics will be published by the lab conduction committee). **D.** One laboratory Internal Assessment test will be conducted for 50 marks (rubrics will be published by the lab conduction committee). **E.** If the course project / mini project is involved in the laboratory component.**The evaluation shall be completed by 14th week of the semester.** The rubrics required for the evaluation of the project shall be defined by the departments along with mapping of relevant COs & POsand get it approved from academic dean. **Note:** • If component 'E' is involved in the course either component 'D' or 'E' along with component 'C'shall be consideredfor average of item II. • Otherwise, components 'C' & 'D' shall be considered for average of item II. **The final CIE marks will be 50** = Avg. of (C &[D or E]) **The documents of all the assessments shall be maintained meticulously.**	**Semester-End Examination:** Only laboratory SEE will be conducted jointly by the internal examiner and external examiner appointed by COE as per the scheduled timetable for duration of 03 hours. • The examination shall be conducted for 100 marks and shall be reduced to 50 marks proportionately. • All laboratory experiments/programs are to be included for practical examination. • Breakup of marks (Rubrics) and the instructions printed on the cover page of the answer script to be strictly adhered to by the examiners (OR) based on the course requirement evaluation rubrics shall be decided jointly by examiners. • Students can pick one question (experiment/program) from the questions lot prepared by the internal /external examiners jointly. • Evaluation of test write-up/ conduction procedure and result/viva will be conducted jointly by examiners. • General rubrics suggested for SEE: writeup-20%, Conduction procedure and results -60%, Viva-voce 20% of maximum marks. • Change of experiment is allowed only once and shall be assessed only for 85% of the maximum marks.	minimum of 45% (45marks out of 100) in the sum total of the CIE and SEE taken together.
5. AEC: Ability Enhancement Courses (01 credit courses)		
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 50% of the maximum marks	The minimum passing mark for SEE is 40%	The student is declared

(25 marks out of 50). **Continuous Internal Evaluation:** CIE will be conducted by the department and will have only 01 component: **I. Theory component.** Theory Component will consist of A. Internal Assessment Test B. Formative assessments **A. Internal Assessment Test:** • There are 02 tests each of 50 marks conducted during 6th week & 15th week, respectively. • The question paper will be of Multiple-Choice Questions (MCQ). • The student must answer all questions. • Internal Assessment Test question paper shall be designed to attain the different levels of Bloom's taxonomy as per the outcome defined for the course **B. Formative assessments:** • 01 formative assessments of 50 marks shall be conducted by the Course coordinator based on the dept. planning before 14th week. • The formative assessments include Assignments/seminars/case study/field survey/ report presentation/course project/etc. • The assignment QP shall indicate marks of each question and the relevant COs & RBT levels. • The rubrics required for the other formal assessments shall be defined by the departments along with mapping of relevant COs &POs. **The final CIE marks will be 50:** Average of all 03 events (02 Internal Assessment test and 01 formative assessment). **The documents of all the assessments shall be maintained meticulously.**	of the maximum marks (20 out of 50 marks). **Semester-End Examination:** Theory SEE will be conducted by COE as per the scheduled timetable for duration of 02 hours and total marks of 50. • Multiple choice Question paper. • The students have to answer all questions.	as a pass in the course if he/she secures a minimum of 45% (45marks out of 100) in the sum total of the CIE and SEE taken together.
6. HSMC: (01 credit course)		
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 50% of the maximum marks (25 marks out of 50). **Continuous Internal Evaluation:** CIE will be conducted by the department and will have only 01 component: **I. Theory component.** Theory Component will consist of A. Internal Assessment Test B. Formative assessments **A. Internal Assessment Test:** • There are 02 tests each of 50 marks conducted during 6th week & 15th week, respectively. • The question paper will be of Multiple-Choice Questions (MCQ). • The student must answer all questions. • Internal Assessment Test question paper shall be designed to attain the different levels of Bloom's taxonomy as per the outcome defined for the course **B. Formative assessments:** • 01 formative assessments of 50 marks shall be conducted by the faculty based on the dept. planning before 14th week. • The formative assessments include Assignments/seminars/case study/field survey/ report presentation/course project/etc. • The assignment QP shall indicate marks of each question and the relevant COs & RBT levels. • The rubrics required for the other formal assessments shall be defined by the departments along with mapping of relevant COs &POs. **The final CIE marks will be 50:** Average of all 03 events (02 IA test and 01 formative assessment). **The documents of all the assessments shall be maintained meticulously.**	The minimum passing mark for SEE is 40% of the maximum marks (20 out of 50 marks). **Semester-End Examination:** Theory SEE will be conducted by COE as per the scheduled timetable for duration of 02 hours and total marks of 50. • Multiple choice Question paper. • The students have to answer all questions. • Marks scored shall be proportionally reduced to 50 marks.	The student is declared as a pass in the course if he/she secures a minimum of 45% (45 marks out of 100) in the sum total of the CIE and SEE taken together.
7. HSMC: (0 credit courses)		

The weightage is only for Continuous Internal Evaluation (CIE).		
The minimum passing mark for the CIE is 50% of the maximum marks (25 marks out of 50). **Continuous Internal Evaluation:** CIE will be conducted by the department and it will have only 01 component: **I. Theory component.** Theory Component will consist of C. Internal Assessment Test D. Formative assessments **A. Internal Assessment Test:** • There are 02 tests each of 50 marks conducted during 6th week & 15th week, respectively. • The question paper will be of Multiple-Choice Questions (MCQ). • The student must answer all questions. • Internal Assessment Test question paper shall be designed to attain the different levels of Bloom's taxonomy as per the outcome defined for the course **B. Formative assessments:** • 01 formative assessments of 50 marks shall be conducted by the faculty based on the dept. planning during random times. • The formative assessments include Assignments/seminars/case study/field survey/ report presentation/course project/etc. • The assignment QP shall indicate marks of each question and the relevant COs & RBT levels. • The rubrics required for the other formal assessments shall be defined by the departments along with mapping of relevant COs &POs. **The final CIE marks will be 50** = Average of all 03 events (02 IA test and 01 formative assessment). **The documents of all the assessments shall be maintained meticulously.**	• No Semester End Examination.	The student is declared as a pass in the course if he/she secures a minimum of 50% (25 marks out of 50) in the CIE.
8. NCMC: (0 credit course)		
The weightage is only for Continuous Internal Evaluation (CIE).		

The minimum passing mark for the CIE is 50% of the maximum marks (25 marks out of 50). **Continuous Internal Evaluation:** CIE will be conducted by the department and it will have only 01 component: **I. Theory component.** Theory Component will consist of only 01 assessment A. Internal Assessment Test (not required for NCMC course). B. Formative assessments. **B. Formative assessments:** • 01 formative assessments of 50 marks shall be conducted by the faculty based on the dept. planning during random times. • The formative assessments include Quiz/Assignments/seminars/case study/field survey/ report presentation/course project/etc. • The assignment QP shall indicate marks of each question and the relevant COs & RBT levels. • The rubrics required for the other formal assessments shall be defined by the departments along with mapping of relevant COs &POs. **The final CIE marks will be 50** **The documents of all the assessments shall be maintained meticulously.**	• No Semester End Examination.	The student is declared as a pass in the course if he/she secures a minimum of 50% (25 marks out of 50) in the CIE.

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Autonomous Institute affiliated to Visvesvaraya Technological University, Belagavi
Accredited by NAAC with 'A+'grade, Certified by ISO 9001 - 2015
Recognized by UGC, New Delhi with 2(f) & 12 (B)

Program Outcomes (POs)- Graduate Attributes

Engineering Graduates will be able to:

1. **Engineering knowledge**: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.

2. **Problem analysis**: Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.

3. **Design/development of solutions**: Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.

4. **Conduct investigations of complex problems**: Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.

5. **Modern tool usage**: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.

6. **The engineer and society**: Apply reasoning informed by contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.

7. **Environment and sustainability**: Understand the impact of professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.

8. **Ethics**: Apply ethical principles and commit to professional ethics and responsibilities and norms of engineering practice.

9. **Individual and teamwork**: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.

10. **Communication**: Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.

11. **Project management and finance**: Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.

12. **Life-long learning**: Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change

|| Jai Shree Gurudev ||
Sri Adichunchanagiri Shikshana Trust ®

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Accredited by NBA

Accredited by NAAC with A+

Recognized by UGC, New Delhi with 2(f) and 12(B)

Certified by ISO 9001 – 2015

ATAL Ranking:
Band Performer

Band of 151 to 300 in
Innovation Category