|| 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

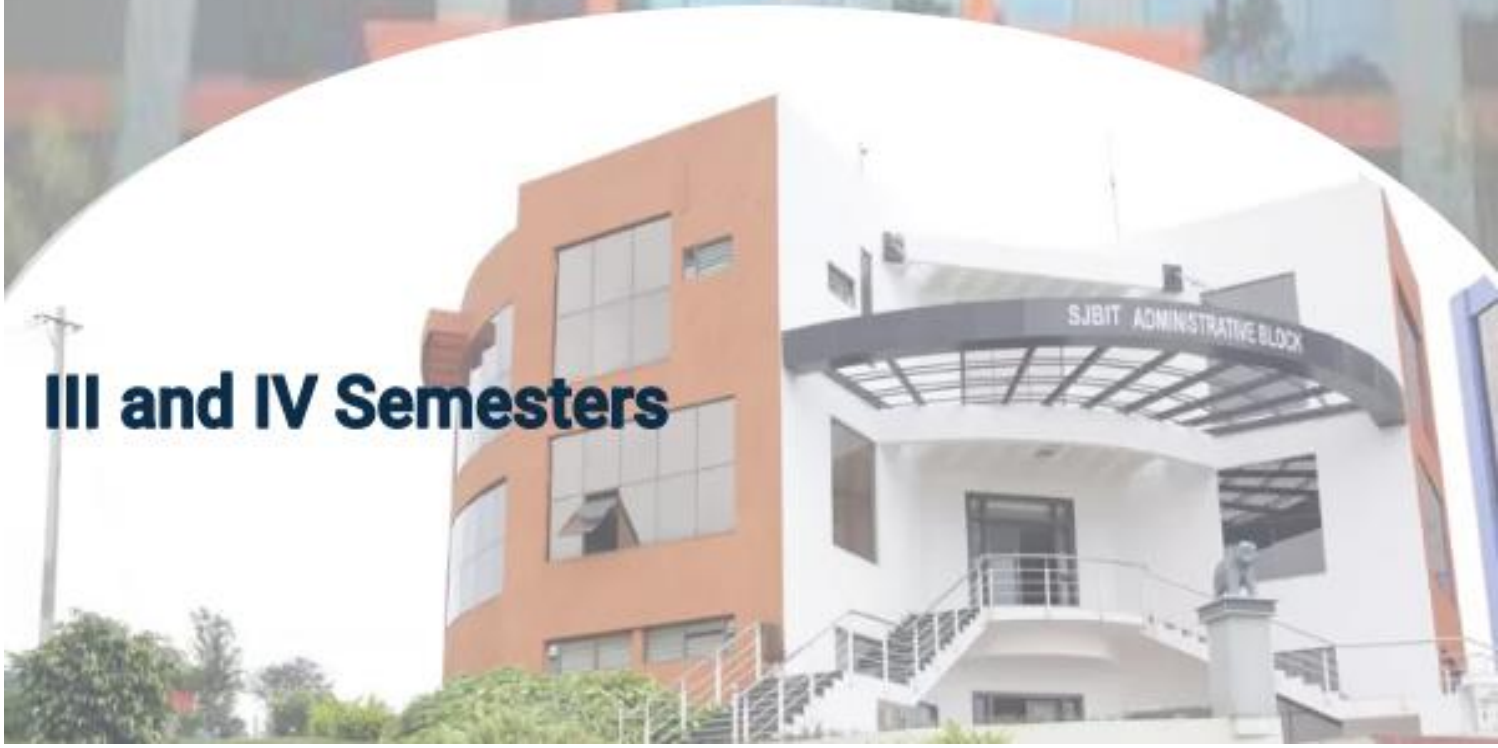
Accredited by NAAC, Accredited by NBA, Certified by ISO 9001 - 2015

B.E.

Autonomous Scheme & Syllabus

Department of Electronics and Communication Engg.

Second Year



III and IV Semesters

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.

VISION of the Institute

To become a recognized technical education center with a global perspective.

MISSION of the Institute

To provide learning opportunities that foster students' ethical values, intelligent development in science technology and social responsibility so that they become sensible and contributing members of society.

Department Vision

Empowering Electronics and Communication engineers to meet the advancements in technological and societal needs.

Department Mission

M1: To facilitate students in acquiring proficiency & providing eminence in Technical education.

M2: To imbibe value based education that contributes to the human values, ethics and societal relevance.

M3: To foster culture of innovation, industry and research in developing intellectual professionals and entrepreneurs.

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
Version 2	10/02/2025	Changed CIE and SEE Guidelines

Table of Contents

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

SCHEME: 2023 SEM: III Release Date: 30.08.2024

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	23ECI301	Transforms and Statistics	Maths	Maths	4	2	2	2	@	50	03	50	-	100
2	PCC	1	23ECT302	Network Analysis	ECE	ECE	3	2	2	0	-	50	03	50	-	100
3	IPCC	1	23ECI303	Analog Electronics Circuits	ECE	ECE	4	3	0	2	-	50	03	50	-	100
4	IPCC	2	23ECI304	Digital systems Design using verilog	ECE	ECE	4	2	2	2	@	50	03	50	-	100
5	PCCL	1	23ECL305	Analog & Digital Electronics Lab	ECE	ECE	1	0	0	2	-	50	03	-	50	100
6	ETC	1	23ECE31y	Emerging Technology Course -1*	ECE	ECE	3	3	0	0	@	50	03	50	-	100
7	AEC	3	23ECAE31	Network Security	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**
23ECE311	Sensors & Instrumentation (3:0:0:0)
23ECE312	Industrial IOT & Automation (3:0:0:0)
23ECE313	Introduction to Cyber Security (3:0:0:0)
23ECE314	Programming in C++ (2:0:2:0)

AUTONOMOUS SCHEME (Tentative) UG - BE 2nd Year 2024-25

SCHEME: 2023 **Date of release: 30/08/2024**

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

Note:

1) For the fulfilment 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 - 2024-25

SCHEME: 2023 Release date: 30/08/2024

Self-Learning course - 1 (NPTEL) (23ECS1yy)			Self-Learning course - 2 (NPTEL) (23ECS2yy)		
Course Code	**Course Title**	**NPTEL Code**	**Course Code**	**Course Title**	**NPTEL Code**
23ECS101	Advanced Computer Architecture	noc24-cs06	23ECS201	Business Intelligence & Analytics	noc24-cs65
23ECS102	RF Transceiver Design	noc24-ee75	23ECS202	Introduction To Environmental Engineering And Science - Fundamental And Sustainability Concepts	noc24-ge19
23ECS103	Blockchain and its Applications	noc24-cs15	23ECS203	Non-conventional energy Resources	noc24-ge24
23ECS104	Introduction To Industry 4.0 And Industrial Internet Of Things	noc24-cs34	23ECS204	Scientific Computing using Matlab	noc24-ma41
23ECS105	Embedded Sensing, Actuation and Interfacing Systems	noc24-ee68	23ECS205	Design and Analysis of VLSI Subsystems	noc24-ee44
23ECS106	Industrial Automation And Control	noc24-ee56	23ECS206	Applied Linear Algebra	noc24-ee48
23ECS107	Modern Computer Vision	noc24-ee21	23ECS207	Biomedical Signal Processing	noc24-ee49
23ECS108	Optical Fiber Sensors	noc24-ee23	23ECS208	Optical Wireless Communications for Beyond 5G Networks and IoT	noc24-ee59
23ECS109	Semiconductor device modeling and Simulation	noc24-ee27	23ECS209	VLSI Physical Design with Timing Analysis	noc24-ee77

2023-SCHEME

SELF LEARNING COURSE

GUIDELINES

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

Department of Mechanical Engineering

Self Learning course list for UG BE - ME

SCHEME: 2023 **Release date: 22-05-2024**

Self-Learning course - 1 (NPTEL) (23xxS1yy)			Self-Learning course - 2 (NPTEL) (23xxS2yy)		
Course Code	**Course Title**	**NPTEL Code**	**Course Code**	**Course Title**	**NPTEL Code**
23MES101	Programming in Java	noc24-cs105	23MES201	The Joy of Computing using Python	noc24-cs113
23MES102	Biomechanics of Joints and Orthopaedic Implants	noc24-me150	23MES202	Programming, Data Structures and Algorithms using Python	noc24-cs78
23MES103	Industrial Robotics : Theories for Implementation	noc24-me117	23MES203	Mechanism and Robot Kinematics	noc24-me155
23MES104	Robotics	noc24-me88	23MES204	Mechanics and Control of Robotic Manipulators	noc24-me92
23MES105	Fabrication Techniques for MEMs-Based Sensors : Clinical Perspective	noc24-ee108	23MES205	Foundations of Cognitive Robotics	noc24-me82
23MES106	Ergonomics Workplace Analysis	noc24-de10	23MES206	Ergonomics Research Techniques	noc24-de17
23MES107	Theory of Production Processes	noc24-me122	23MES207	Environmental & Resource Economics	noc24-ec12
23MES108	Laser Based Manufacturing	noc24-me153	23MES208	Power Plant Engineering	noc24-me89
23MES109	Steam Power Engineering	noc24-me87	23MES209	Fundamentals of Additive Manufacturing Technologies	noc24-me138

Academic Dean **Principal**

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

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

SCHEME: 2023 **SEM: IV** **Release date: 30.08.2024**

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	BSC	4	23ECT401	Probability Distributions and Linear Algebra	Maths	Maths	**3**	2	2	0	@	50	03	50	-	100
2	PCC	2	23ECT402	Embedded Systems and ARM	ECE	ECE	**3**	2	2	0	-	50	03	50	-	100
3	IPCC	3	23ECI403	Signals & Systems	ECE	ECE	**4**	3	0	2	-	50	03	50	-	100
4	IPCC	4	23ECI404	Control systems	ECE	ECE	**4**	3	0	2	-	50	03	50	-	100
5	PCCL	2	23ECL405	Embedded Systems Lab	ECE	ECE	**1**	0	0	2	-	50	03	-	50	100
6	ETC	2	23ECE42y	Emerging Technology Course - 2 *	ECE	ECE	**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	23ECAE41	Data Science Using Python	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**	**14**	**6**	**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**
23ECE421	Computer Organization & Architecture (3:0:0:0)
23ECE422	Programming Using LABVIEW (2:0:2:0)
23ECE423	Industrial Electronics (3:0:0:0)
23ECE424	Programming in Java (2:0:2:0)

Semester:	III	**Course Type:**	IBSC		
Course Title: Transforms and Statistics					
Course Code:	**23ECI301**			**Credits:**	4
Teaching Hours/Week (L:T:P:O)			2:2:2:@	**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:

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. (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. (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 circuits 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.

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	S1	S2	S3
CO1	3	2	1		2							1	2	1	1
CO2	3	3	1		2							1	2	1	1
CO3	3	3	1		2							1	2	1	1
CO4	3	3	1		2							1	2	1	1
CO5	3	3	1		2							1	2	1	1

VI. Assessment Details (CIE & SEE)

General Rules: Refer to – Academic regulations

Continuous Internal Evaluation (CIE): Refer to Annexure SL #2

Semester End Examination (SEE): Refer to – Annexure SL #2
Rubrics: Refer to - Annexure SL #2

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:

1	Advanced Engineering Mathematics	E. Kreyszig	4th Edition, 2002	Pearson Education Asia/ PHI
2	Introductory Methods of Numerical Analysis	S.S.Sastry	8th Edition, 2008	John Wiley India Pt. Ltd
3	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: Network Analysis					
Course Code:	**23ECT302**			**Credits:**	3
Teaching Hours/Week (L:T:P:O)			2:2:0:0	**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:

1. Describe basic network concepts emphasizing source transformation, source shifting, Star to delta/ Delta to Star Transformation, mesh and nodal techniques to solve for resistance/impedance, voltage, current and power.
2. Explain Network Thevenin's, Millman's, Superposition, Maximum Power transfer and Norton's Theorems and apply them in solving the problems related to Electrical Circuits.
3. Explain the behavior of networks subjected to transient conditions.
4. Study two port network parameters like Z, Y, T and h and their inter-relationships and applications.
5. Study of RLC Series and parallel tuned circuit.

II. Teaching-Learning Process (General Instructions):

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

1. Lecture method (L) does not mean only traditional lecture method, but different type of teaching methods may be adopted to develop the outcomes.
2. Show Video/animation films to explain evolution of communication technologies.
3. Encourage collaborative (Group) Learning in the class
4. Ask at least three HOTS (Higher order Thinking) questions in the class, which promotes critical thinking
5. Adopt Problem Based Learning (PBL), which fosters students' Analytical skills, develop thinking skills such as the ability to evaluate, generalize, and analyse information rather than simply recall it.
6. Show the different ways to solve the same problem and encourage the students to come up with their own creative ways to solve them. 7.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: Basic Concepts	8 Hrs

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

Pre-requisites: Cramer's Rule, Conversion of Polar to rectangular, Rectangular to Polar, KCL, KVL Concepts

RBT Levels: L1, L2, L3

Module-2: Network Theorems	8 Hrs
Superposition, Millman's theorems, Thevinin's and Norton's theorems, Maximum Power transfer theorem	
RBT Levels: L1, L2, L3	
Module3: Two Port Network Parameters	8 Hrs
Definition of Z, Y, h and Transmission parameters, modelling with these parameters, relationship between parameters sets.	
Pre-requisites: Matrix Algebra	
RBT Levels: L1 , L2 , L3	
Module-4: Network Topology	8 Hrs
Graph of a network, Concept of tree and Co-tree, incident matrix, tie-set, tie-set and cut-set schedules, Formulation of equilibrium equations in matrix form, Solution of resistive networks, Principle of Duality.	
RBT Levels: L1, L2, L3	
Module-5: Transient analysis & Applications of Laplace Transformation	8 Hrs
Transient behavior and initial conditions: Behavior of circuit elements under switching condition and their Representation, evaluation of initial and final conditions in RL, RC and RLC circuits for AC and DC excitations. **Laplace Transformation &Applications:** Solution of networks, step, ramp and impulse responses, waveform Synthesis.	
Pre-requisites: Basics of Integration and Differentiation	
RBT Levels: L1, L2, L3	

IV. COURSE OUTCOMES

CO1	Distinguish the networks and discuss various circuit analysis techniques.
CO2	Apply network theorems to solve a given network.
CO3	Evaluate the network parameters for two port networks
CO4	Solve the electrical networks using Graphical method
CO5	Analyze the circuit parameters during switching transients and apply Laplace transform to solve the given network

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**			
CO2	**3**	**3**	1										**1**			
CO3	**3**	**3**	1										**1**			
CO4	**3**	**3**	1										**1**			
CO5	**3**	**3**	2										**1**			

VI. Assessment Details (CIE & SEE)

General Rules: Refer to – Academic regulations

Continuous Internal Evaluation (CIE): Refer to Annexure, SL #1

Semester End Examination (SEE):Refer to - Annexure, SL #1
Rubrics: Annexure, SL #1

VII. Learning Resources

VII(a): Textbooks: (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	Engineering Circuit Analysis	Hayt, Kemmerly and Durbin	8th Edition, 2013	TMH
2	Network analysis	M.E. Van Valkenberg	3rdedition, 2000	Prentice Hall of India
3	Networks and systems	Roy Choudhury	2nd edition,2006	New Age International Publications

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

1	Basic Engineering Circuit Analysis	J. David Irwin /R. Mark Nelms	8thEdition, 2006	John Wiley
2	Fundamentals of Electric Circuits	Charles K Alexander and Mathew N O Sadiku	3rd Edition, 2009	Tata McGraw-Hill,

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

https://archive.nptel.ac.in/courses/108/105/108105159/

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

Network theorems, Node, Loop analysis and transient response can be simulate using Multisim

Semester:	III	**Course Type:**	IPCC		
Course Title: Analog Electronics Circuits					
Course Code:	**23ECI303**			**Credits:**	4
Teaching Hours/Week (L:T:P:O)			3:0:2:0	**Total Hours:**	40 hours Theory + 8-10 Lab slot
CIE Marks:	50	**SEE Marks:**	50	**Total Marks:**	100
SEE Type:	Theory			**Exam Hours:**	3

I. Course Objectives:

This course will enable students to

- Design and analyse the BJT circuits as an amplifier and voltage regulation.
- Design of MOSFET Amplifiers and analyse the basic amplifier configurations using small signal equivalent circuit models
- Design of operational amplifiers circuits as Comparators, DAC and filters.
- Understand the concept of positive and negative feedback.
- Analyze Power amplifier circuits in different modes of operation.
- Construct Feedback and Oscillator circuits using FET.
- Understand the thyristor operation and the different types of thyristors.

II. Teaching-Learning Process (General Instructions):

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

1. Lecture method (L) does not mean only traditional lecture method, but different type of teaching methods may be adopted to develop the outcomes.
2. Show Video/animation films to explain evolution of communication technologies.
3. Encourage collaborative (Group) Learning in the class
4. Ask at least three HOTS (Higher order Thinking) questions in the' class, which promotes critical thinking
5. Adopt Problem Based Learning (PBL), which fosters students Analytical skills, develop thinking skills such as the ability to evaluate, generalize, and analyze information rather than simply recall it.
6. Show the different ways to solve the same problem and encourage the students to come up with their own creative ways to solve them.
7. 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: Bipolar Junction Transistor – Biasing, Models and Amplifiers — 8 Hrs

Transistor Biasing: Voltage Divider Bias (VDB), VDB Analysis, VDB Load line and Q point,. BJT AC models: Base Biased Amplifier, Emitter Biased Amplifier, Small Signal Operation, AC Beta, AC Resistance of the emitter diode, Two transistor models, Analyzing an amplifier, H parameters

Voltage Amplifiers: Voltage gain, Loading effect of Input Impedance, CC Amplifiers**,** Output Impedance.

[Text1]

8.1,8.2,8.3,,9.1,9.2,9.3,9.4,9.5,9.6,9.7,10.1,10.2,11.1,11.2

Pre-requisites

Basic of diodes and transistors. Transistor operation & Current components.

RBT Levels:L1, L2, L3,L4

Module-2: MOSFET-Biasing, Models & Amplifiers	8 Hrs
Biasing in MOS amplifier circuits – Fixed Bias, Source Bias, Drain to Gate Feedback Bias Small signal operation and modelling: The DC bias point, signal current in drain, voltage gain, small signal equivalent circuit models, transconductance, The T equivalent circuit model. **MOSFET Amplifier configuration:** Basic configurations, characterizing amplifiers, CS amplifier with and without source resistance, The Common Gate Amplifier, Source follower. [Text 2] **4.5(4.5.1,4.5.2,4.5.3), 4.6 (4.6.1,4.6.2,4.6.3,4.6.5,4.6.6,4.6.7), 4.7 (4.7.1,4.7.2,4.7.3,4.7.4,4.7.5,4.7.6)**	
Pre-requisites **JFET operations**	
RBT Levels: L1,L2,L3,L4	
Module-3: Linear IC & Oscillators	8 Hrs
Linear Opamp Circuits: Summing Amplifier, Nonlinear Op-amp Circuits: Comparator with zero reference, Comparator with non-zero references. Comparator with Hysteresis. **Oscillator:** Theory of Sinusoidal Oscillation, The Wein-Bridge Oscillator, RC Phase Shift Oscillator, The Colpitts Oscillator, Hartley Oscillator, Crystal Oscillator. **The 555 timer**: Monostable Operation, Astable Operation. [Text1] **20.6,22.1,22.2,22.3, 23.1,23.2,23.3,23.4,23.5,23.6,23.7,23.8**	
Pre-requisites **Basic building blocks of Opamp, Differential Operational Amplifiers**	
RBT Levels: L1,L2,L3,L4	
Module-4: Feedback amplifiers & Filters	8 Hrs
Negative Feedback: Four Types of Negative Feedback, VCVS Voltage gain, Other VCVS Equations, ICVS Amplifier, VCIS Amplifier, ICIS Amplifier (Mathematical Derivation of any one amplifier). **Active Filters:** Ideal Responses, First Order Stages, VCVS Unity Gain Second Order Low pass Filters, VCVS Equal Component Low Pass Filters, VCVS High Pass Filters, MFB Bandpass Filters, Bandstop Filters. [Text1] **19.1,19.2,19.3,19.4,19.5,19.6,21.121.4.21.5,21.6,21.7,21.8,21.9,21.10**	
Pre-requisites **Basics of amplifiers, Basic types of filters & their transfer functions**	
RBT Levels: L1,L2,L3,L4	
Module-5: Power Amplifiers	8 Hrs
Power Amplifiers: Amplifier terms, Two load lines, Class A Operation, Class B operation, Class B push pull emitter follower, Class C Operation. **Thyristors:** The four layer Diode, SCR, SCR Phase control, Bidirectional Thyristors, IGBTs, Other Thyristors. [Text1] **12.1, 12.2, 12.3, 12.4, 12.5, 12.7, 15.1, 15.2, 15.4, 15.5, 15.6, 15.7**	
Pre-requisites (Self Learning) **Operating point**	
RBT Levels: L1,L2,L3,L4	

III(b). PRACTICAL PART

Sl. No.	**Experiments / Programs / Problems** (insert rows as many required)
1	Design and Test Bridge Rectifier with Capacitor Input Filter Zener voltage regulator
2	Plot the transfer and drain characteristics of a JFET and calculate its drain resistance, mutual conductance and amplification factor.
3	Plot the transfer and drain characteristics of n-channel MOSFET and calculate its parameters, namely; drain resistance, mutual conductance and amplification factor.
4	Design and test Emitter Follower
5	Design and plot the frequency response of Common Source JFET/MOSFET amplifier
6	Test the Opamp Comparator with zero and non zero reference and obtain the Hysteresis curve.
7	Design and test Full wave Controlled rectifier using RC triggering circuit.
8	Design and test Precision Half wave and full wave rectifiers using Opamp
9	Design and test RC phase shift oscillator

Instructions for conduction of practical part:
Experiments can be conducted either using any circuit simulation software or discrete components

IV. COURSE OUTCOMES

CO1	Design and analyze amplifiers with different circuit configurations and biasing conditions.
CO2	Develop an understanding of small signal amplifier design using linear transistor models.
CO3	Design circuits using linear ICs for wide range applications
CO4	Realize the feedback topologies and approximations in the design of amplifiers and oscillators
CO5	Understand the power electronic device components and its functions for basic power electronic circuits.

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	3	1	3	-	-	2	2	2	1	1	2	2	1
CO2	3	3	-	-	3	-	-	2	2	2	1	1	2	2	1
CO3	3	3	2	1	3	-	-	2	2	2	1	1	2	2	1
CO4	3	3	-	-	3	-	-	2	2	2	1	1	2	2	1
CO5	3	3	-	-	3	-	-	2	2	2	1	1	2	2	1

VI. Assessment Details (CIE & SEE)

General Rules: Refer to – Academic regulations

Continuous Internal Evaluation (CIE): Refer to Annexure, SL #2

Semester End Examination (SEE): Refer to - Annexure, SL #2
Rubrics: Refer to - Annexure, SL #2

VII. Learning Resources

VII(a): Textbooks: (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	Electronic Principles	Albert Malvino, David J Bates	7th Edition, 2017	Mc Graw Hill Education
2	Microelectronic Circuits	Adel S Sedra, Kenneth C Smith	5th Edition, 2004.	Oxford

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

1	Integrated Electronics: Analog and Digital Circuits and Systems	Jacob Millman, Christos C. Halkias,	2015.	McGraw-Hill,
2	Electronic Devices and Circuit	Boylestad & Nashelsky	2015	Pearson

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

1. Integrated Electronics: Analog and Digital Circuits and Systems, Jacob Millman, Christos C. Halkias, McGraw-Hill, 2015.
2. Electronic Devices and Circuit, Boylestad & Nashelsky, Eleventh Edition, Pearson, January 2015.

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

1. Show Video/animation films to explain evolution of communication technologies.
2. Encourage collaborative (Group) Learning in the class
3. Ask at least three HOTS (Higher order Thinking) questions in the class, which promotes critical thinking
4. Adopt Problem Based Learning (PBL), which fosters students' Analytical skills, develop thinking skills such as the ability to evaluate, generalize, and analyze information rather than simply recall it.
5. Show the different ways to solve the same problem and encourage the students to come up with their own creative ways to solve them.
6. Discuss how every concept can be applied to the real world - and when that's possible, it helps improve the students' understanding.

Semester:	III	**Course Type:**	IPCC		
Course Title: Digital Systems Design Using Verilog					
Course Code:	**23ECI304**			**Credits:**	4
Teaching Hours/Week (L:T:P:O) {O – Other pedagogies, mention @}			2:2:2:@	**Total Hours:**	40 hours Theory + 10 Lab slots
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:

1. To impart the concepts of simplifying Boolean expression using K-map techniques and Quine-McCluskey minimization techniques.
2. To impart the concepts of designing and analyzing combinational logic circuits.
3. To impart design methods and analysis of sequential logic circuits.
4. To impart the concepts of Verilog HDL-data flow and behavioral models for the design of digital systems.

II. Teaching-Learning Process (General Instructions):

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

1. Lecture method (L) does not mean only traditional lecture method, but different type of teaching methods may be adopted to develop the outcomes.
2. Show Video/animation films to explain the different concepts of Linear Algebra & Signal Processing.
3. Encourage collaborative (Group) Learning in the class.
4. Ask at least three HOTS (Higher order Thinking) questions in the class, which promotes critical thinking.
5. Adopt Problem Based Learning (PBL), which fosters students' Analytical skills, develop thinking skills such as the ability to evaluate, generalize, and analyze information rather than simply recall it.
6. Topics will be introduced in a multiple representation.
7. Show the different ways to solve the same problem and encourage the students to come up with their own creative ways to solve them.
8. Discuss how every concept can be applied to the real world - and when that's possible, it helps improve the students' understanding.
9. Adopt Flipped class technique by sharing the materials / Sample Videos prior to the class and have discussions on the that topic in the succeeding classes. Give Programming Assignments.

III. COURSE CONTENT	
III(a). Theory PART	
Module-1: Principles of Combinational Logic	8 Hrs
Principles of Combinational Logic: Definition of combinational logic, Canonical forms, Generation of switching equations from truth tables, Karnaugh maps- up to 4 variables, Quine-McCluskey Minimization Technique. Quine-McCluskey using Don't Care Terms. (Section 3.1 to 3.5 of Text 1).	
Pre-requisites: Knowledge on logic design. **Self-Learning : 5 variable KMAP**	
RBT Levels: L1, L2, L3	
Module-2: Logic Design with MSI Components and Programmable Logic Devices	8 Hrs
Logic Design with MSI Components and Programmable Logic Devices: Binary Adders and Subtractors, Comparators, Decoders, Encoders, Multiplexers, Programmable Logic Devices (PLDs) (Section 5.1 to 5.7 of Text 2)	
Pre-requisites: Knowledge on logic design and combinational circuits **Self Learning : FPGA**	
RBT Levels: L1, L2, L3	
Module-3: Flip-Flops and its Applications	8 Hrs
Flip-Flops and its Applications: The Master-Slave Flip-flop (Pulse-Triggered & Edge Triggered flip-flop): SR flip-flop, JK flip flop, Characteristic equations, Registers, Binary Ripple Counters, Synchronous Binary Counters, Counters based on Shift Registers, Design of Synchronous mod-n Counter using clocked T, JK, D and SR flip-flops. (Section 6.4, 6.6 to 6.9 (Excluding 6.9.3) of Text 2)	
Pre-requisites: Knowledge on logic design and sequential circuits **Self Learning : Asynchronous counter, Johnson and ring counter.**	
RBT Levels: L1, L2, L3	
Module-4: Introduction to Verilog and Verilog Data flow description.	8 Hrs
Introduction to Verilog: Structure of Verilog module, Operators, Data Types, Styles of Description. (Section 1.1 to 1.6.2, 1.6.4 (only Verilog), 2 of Text 3) **Verilog Data flow description:** Highlights of Data flow description, Structure of Data flow description.(Section 2.1 to 2.2 (only Verilog) of Text 3)	
Pre-requisites: Basics of C programming **Self Learning : Design flow of FPGA implementation.**	
RBT Levels: L1, L2, L3	
Module-5: Verilog Behavioral and Structural description	8 Hrs
Verilog Behavioral description: Structure, Variable Assignment Statement, Sequential Statements, Loop Statements, Verilog Behavioral Description of Multiplexers (2:1, 4:1, 8:1). (Section 3.1 to 3.4 (only Verilog) of Text 3) **Verilog Structural description**: Highlights of Structural description, Organization of structural description, Structural description of ripple carry adder. (Section 4.1 to 4.2 of Text 3)	

Pre-requisites: Basics of C programming
Self-Learning : Basics of VHDL and comparison between VHDL and Verilog.

RBT Levels: L1, L2, L3

III(b). PRACTICAL PART

Sl. No.	Experiments / Programs / Problem
1	To simplify the given Boolean expressions and realize using Verilog program.
2	To realize Adder/Subtractor (Full/half) circuits using Verilog data flow description.
3	To realize 4-bit ALU using Verilog program
4	To realize the following Code converters using Verilog Behavioral description a) Gray to binary and vice versa b) Binary to excess3 and vice versa
5	To realize using Verilog Behavioral description: 8:1 mux, 8:3 encoder, Priority encoder
6	To realize using Verilog Behavioral description: 1:8 Demux, 3:8 decoder, 2-bit Comparator
7	To realize using Verilog Behavioral description: Flip-flops: a) JK type b) SR type c) T type and d) D type
8	To realize Counters - up/down (BCD and binary) using Verilog Behavioral description.

Instructions for conduction of practical part:

1. On completion of every experiment/program in the laboratory, the students shall be evaluated, and marks shall be awarded on the same day. The **50 marks** are for conducting the experiment and preparation of the laboratory record, the other **50 marks shall be for the test** conducted at the end of the semester.
2. The CIE marks awarded in the case of the Practical component shall be based on the continuous evaluation of the laboratory report.
3. The laboratory test (duration 03 hours) at the end of the 15^{th} week of the semester /after completion of all the experiments (whichever is early) shall be conducted for 50 marks
4. Scaled-down marks of record evaluations and tests added will be CIE marks for the laboratory component of IPCC for **50 marks**

IV. COURSE OUTCOMES

CO1	Explain the concept of combinational and sequential logic circuits and PLD.
CO2	Design the combinational logic circuits
CO3	Design the sequential circuits using SR, JK, D, and T flip-flops.
CO4	Understand the various Verilog HDL descriptions and verify the functionality in the digital circuit systems
CO5	Synthesize Verilog programs for Combinational, sequential circuits and interface the peripherals on FPGA

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			
CO2	3	3	3										2			
CO3	3	3	3										2			
CO4	3	2	1										2			
CO5	3	3	3	2	2			1	1	1			2	1	1	

VI. Assessment Details (CIE & SEE)

General Rules: Refer to – Academic regulations

Continuous Internal Evaluation (CIE): Refer to Annexure, SL #2

Semester End Examination (SEE): Refer to - Annexure, SL #2
Rubrics: Refer to - Annexure, SL #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	Digital Logic Applications and Design	John M Yarbrough	2001	Thomson Learning
2	Digital Principles and Design	Donald D Givone	2002	McGraw Hill
3	HDL Programming VHDL and Verilog	Nazeih M Botros	2009	Dreamtech press

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

1	Logic Design	Sudhakar Samuel	2007	Pearson/ Sanguine
2	Fundamentals of HDL	Cyril P R	2010	Pearson/Sanguine

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

https://nptel.ac.in/courses/108105113
https://nptel.ac.in/courses/106105185

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

Programming assignments / mini projects can be given to improve programming skills.

Semester:	III	**Course Type:**	PCCL		
Course Title: Analog and Digital Electronics Lab					
Course Code:	**23ECL305**			**Credits:**	1
Teaching Hours/Week (L:T:P:O) {O – Other pedagogies, mention @}			0:0:2:0	**Total Hours:**	**2 Hrs / Week**
CIE Marks:	50	**SEE Marks:**	50	**Total Marks:**	100
SEE Type:	Practical			**Exam Hours:**	3

I. Course Objectives:

Course Learning Objectives: This laboratory course enables students to

1. Understand the electronic circuit schematic and its working
2. Realize and test amplifier and oscillator circuits for the given specifications
3. Realize the opamp circuits for the applications such as DAC, implement mathematical functions, timers, filters and precision rectifiers.
4. Design and test the combinational and sequential logic circuits for their functionalities.
5. Use the suitable ICs based on the specifications and functions.

II. PRACTICAL PART

Sl. No.	**Experiments / Programs / Problems** (insert rows as many required)
1	Realize BJT common emitter voltage amplifier without feedback to determine the gain-bandwidth product, input and output impedances
2	Design and set up the circuits using opamp: i) Adder, ii) Integrator and Differentiator
3	Design and set-up BJT i) Colpitts Oscillator and Crystal Oscillator
4	Design and test Astable Multivibrator using 555 Timer
5	Design and test Mona stable Multivibrator using 555 Timer
6	Design of active second order Butterworth low pass
7	Design 4-bit R – 2R Op-Amp Digital to Analog Converter for a 4-bit binary input using toggle switches
8	Design and implement (a) Half Adder NAND& Full Adder using basic gates (b) Half subtractor& Full subtractor using Basic gates,
9	Realize (a) Binary to Gray code conversion & vice-versa (IC74139), b) 3-variable function using IC74151(8:1MUX).
10	(a) Realize using NAND Gates: i) Master-Slave JK Flip-Flop, (b) Realize the shift registers using IC7474/7495: (i) SISO (ii) SIPO (iii) PISO (iv) PIPO
11	Realize (a) Design Mod – N Synchronous Up Counter & Down Counter using 7476 JK Flip-flop . (v) Ring counter and (vi) Johnson counter
12	Realize (a) Design Mod-N Counter using IC7490 / 7476

Instructions for conduction of practical part:
The laboratory conditions using power sources like DC Power supply, AC sources like function generators. Their input and output parameters like input waveforms, output waveforms, input and output current and voltage readings, the impedance or resistance offered by the circuit, etc are analyzed by using measuring instruments like multi-meter and CRO's. The captured values from the instruments are noted and used for further calculations.

III. COURSE OUTCOMES

CO1	Analyse and Design BJT/FET amplifiers, oscillator circuits.
CO2	Design and test analog circuits using OPAMPs and 555 timers for different applications.
CO3	Design and test the combinational logic circuits for the given specifications
CO4	Test the sequential logic circuits for the given functionality.

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	3	3					1				2	1		
CO2	3	2	3	3					1				2	1		
CO3	3	2	3	3					1				2	1		
CO4	3	2	3	3					1				2	1		

V. Assessment Details (CIE & SEE)

General Rules: Refer to – Academic regulations

Continuous Internal Evaluation (CIE): Refer to Annexure, SL #4

Semester End Examination (SEE): Refer to - Annexure, SL #4
Rubrics: Refer to - Annexure, SL #4

Semester:	III	**Course Type:**	ETC		
Course Title: Sensors and Instrumentation					
Course Code:	**23ECE311**			**Credits:**	3
Teaching Hours/Week (L:T:P:O)			3:0:0:0	**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:

1. To impart knowledge of sensors and its classification
2. Understand different aspects involved in dealing instruments and its measurements.
3. Understanding its construction, operation and application of various sensors and instruments.
4. Learn the methods used to interface sensors with electronic instrumentation
5. Review of Instrumentation techniques incorporating computer control, sampling, and data collection and analysis.

II. Teaching-Learning Process (General Instructions):

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

1. Lecture method (L) does not mean only traditional lecture method, but different type of teaching methods may be adopted to develop the outcomes.
2. Show Video/animation films to explain the different concepts of sensors , its construction, working principle and analysis.
3. Ask at least three HOTS (Higher order Thinking) questions in the class, which promotes critical thinking.
4. Adopt Problem Based Learning (PBL), which fosters students' Analytical skills, develop thinking skills such as the ability to evaluate, generalize, and analyse information rather than simply recall it.
5. Topics will be introduced in a multiple representation.
6. Show the different ways to solve the same problem and encourage the students to come up with their own creative ways to solve them.
7. Discuss how every concept can be applied to the real world - and when that's possible, it helps improve the students' understanding.
8. Adopt Flipped class technique by sharing the materials / Sample Videos prior to the class and have discussions on the that topic in the succeeding classes.
9. Encourage students to work in groups to promote collaborative learning.

III. COURSE CONTENT

III(a). Theory PART

Module-1: Introduction	8 Hrs

Definition of a sensor, Generalized measurement system, Static and dynamic characteristics of Instruments, Classification of sensors, Characteristics of sensors.
Resistive sensors: Potentiometers: Characteristics, Loading effect, and problems. Strain gauge: Theory, Types, applications, and problems. Thermistor, RTD: Theory, applications, and problems

(Textbook 1: Chapter 1.1, 1.3, 2.2, 2.3, 3.9.2, 9,1)
Teaching-Learning Process Chalk and Talk, YouTube videos, Power point presentation.

Pre-requisites (Self Learning) Fundamental physics concepts such as force, motion, energy, electricity, magnetism, and waves is essential, mathematics to understand sensor data, sensor behaviour, and designing of sensor systems.	
RBT Levels: L1, L2, L3	
Module-2: Electromechanical sensors	8 Hrs
Inductive sensors: Basic principle, Types of Inductive transducers: LVDT Principle of working and construction, Characteristics, Practical applications of LVDT. Capacitive sensors: Capacitive sensors using change in area of plates (Cylindrical), distance between plates (Parallel plate) and change of dielectric constants, Frequency response, Applications of Capacitive sensors, and problems. (Textbook 1: Chapter 2.4, 2.5) Teaching-Learning Process Chalk and Talk, Power point presentation.	
Pre-requisites (Self Learning): Knowledge of materials science, their properties and behaviour of materials used in sensors	
RBT Levels: L1, L2	
Module-3: Thermal sensors	8 Hrs
Material expansion type: solid, liquid, gas & vapor, Resistance change type: RTD materials, tip sensitive & stem sensitive type, Thermister material, shape, ranges, and accuracy specification. Thermoemf sensor: types, thermoelectric power, general consideration, Junction semiconductor type IC and PTAT type. Radiation sensors: types, characteristics, and comparison. Pyroelectric type Measurement of thermocouple output, compensating circuits, lead compensation, advantages, and disadvantages of thermocouple. (Textbook 1: 3.3, 3.9, 3.10, 3.11, 3.12) Teaching-Learning Process Chalk and Talk, Power point presentation , videos	
Pre-requisites (Self Learning): Knowledge of statistical analysis, signal processing, and data visualization to interpret sensor data and to extract meaningful information.	
RBT Levels: L1, L2, L3	
Module-4: Fundamentals of Instrumentation	8 Hrs
Need of Instrumentation, General Measurement System, Classification of Instruments, Static and Dynamic characteristics of instruments, Error: limiting error, Types of Errors. Loading effect: Input impedance and admittance of load & output impedance and admittance of source, loading effects of series and shunt connected instruments, Calibration: Definition, calibration report & certification, traceability and traceability chart. (Textbook 2:Chapter 1 &2 : 1.2 to 1.6 and 2.2 to 2.6) Teaching-Learning Process Chalk and Talk, Power point presentation , videos if required.	
Pre-requisites (Self Learning): Concepts in instrumentation involve mathematical modelling, analysis, and statistical methods for error quantification and correction, understand the physical phenomena measured by instruments. circuits components for instrument functioning and interaction with electronic systems.	
RBT Levels: L1, L2	

Module-5: Performance Characteristics of Instruments	8 Hrs

Static characteristics – Range, Span, Accuracy, Precision, Significant of figure, Range of doubt, Dead time, Dead zone, Hysteresis, Threshold, Resolution, Sensitivity, Linearity, Reproducibility, Stability, Loading effect, Input impedance and Output impedance. Dynamic characteristics – Speed of response, Measuring lag, Fidelity and Dynamic error. Standard Test input signals - Dynamic response – Steady state and Transient response. (Textbook 2: Chapter 2 &3: 2.6, 3.3, 3.8)
Teaching-Learning Process Chalk and Talk, Power point presentation.

Pre-requisites (Self Learning): Knowledge of sensors, signal conditioning, amplification, and signal processing. Familiarity with software tools for data acquisition, analysis, and visualization.

RBT Levels: L1, L2

IV. COURSE OUTCOMES

CO1	Comprehend and apply knowledge of basic principles of different sensors.
CO2	Apply methods for the measurement of resistance, capacitance and inductance and evaluate the performance characteristics of different sensors for various applications
CO3	Apply fundamental knowledge of Instrument for measurements in terms of error, calibration etc.
CO4	Understand the concepts of Performance Characteristics of Instruments

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				3	2	2				2	2	1	2
CO2	3	3				3	2	2				3	2	2	3
CO3	3	3				2	2	2				2	3	1	3
CO4	3	3				2	2	2				3	2	2	3

VI. Assessment Details (CIE & SEE)

General Rules: Refer to – Academic regulations

Continuous Internal Evaluation (CIE): Refer to Annexure, SL #1

Semester End Examination (SEE): Refer to - Annexure, SL #1
Rubrics: Refer to - Annexure, SL #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	Sensor & transducers,	D. Patranabis,	2nd edition	PHI
2	Sawhney A. K.,	Electrical and Electronics Measurements and Instruments	2nd edition.	Dhanpat Rai & Co.

VII(b): Reference Books:

1.	Handbook of Modern Sensors: Physics, Designs, and Applications	Jacob Fraden	2016, ISBN: 3319307673	Springer, 2016
2.	Electronic Instrumentation	Kalsi H.S	3rd Edition, 2010	Tata McGraw-Hill Education

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

NA

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

PPT presentation , Youtube Videos

Semester:	III	**Course Type:**	ETC		
Course Title: Industrial IoT & Automation					
Course Code:	**23ECE312**			**Credits:**	3
Teaching Hours/Week (L:T:P:O) {O – Other pedagogies, mention @}			3:0:0:0	**Total Hours:**	40 hours
CIE Marks:		**SEE Marks:**	50	**Total Marks:**	100
SEE Type:	Theory			**Exam Hours:**	3

I. Course Objectives:

1. Students will learn the new evolution in hardware, software, and data.
2. While the promise of the Industrial Internet of Things (IIoT) brings many new business prospects, it also presents significant challenges ranging from technology architectural choices to security concerns.
3. Students acquire upcoming Industrial Internet of Things: Roadmap to the Connected World Course offers important insights on how to overcome these challenges and thrive in this exciting space.

II. Teaching-Learning Process (General Instructions):

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

1. Chalk and Board
2. Demonstration
3. Interactive learning
4. Videos and online material

III. COURSE CONTENT

III(a). Theory PART

Module-1: Introduction & Architecture — 8 Hrs

What is IIoT and connected world? The difference between IoT and IIoT,. The Various Industrial Revolutions, Role of Internet of Things (IoT) & Industrial Internet of Things (IIoT) in Industry, the web of things, architecture of IIoT Industry 4.0 revolutions, Support System for Industry 4.0, Smart Factories.

Pre-requisites

RBT Levels:

Module-2: Communication Technologies, Visualization & Data Types in IIoT — 8 Hrs

Industry standards communication technology (LoRAWAN, OPC UA, MQTT), connecting into existing Modbus and Profibus technology, wireless network communication, security issues in IIoT. HMI in an Industrial IoT world, front end EDGE devices, enterprise data for IIoT, emerging descriptive data standards for IIoT, cloud data base

Pre-requisites

RBT Levels:

Module-3: IIoT Data Monitoring & Control	8 Hrs
IoT Gate way, IoT Edge Systems and It's Programming, Cloud computing, Real Time Dashboard for Data Monitoring, Data Analytics and Predictive Maintenance with IIoT technology.	
Pre-requisites	
RBT Levels:	
Module-4: Automation	8 Hrs
Automation definition, automation pyramid, field level sensors, Embedded sensors, HMI in an automation process.	
Pre-requisites	
RBT Levels:	
Module-5: Control & Supervisory Level of Automation	8 Hrs
Programmable logic controller (PLC), real-time control system, Supervisory Control & Data Acquisition (SCADA).	
Pre-requisites (Self Learning)	
RBT Levels:	

IV. COURSE OUTCOMES

CO1	Familiar with various automation technologies in manufacturing and process industries.
CO2	Understand various automation tools and methods in manufacturing industry
CO3	Implement various control and automation method in process industries.
CO4	Familiar with various communication technologies in manufacturing and process industries.

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		
CO2	3	3											1	1		
CO3	3	3	2		5							2	1	1		
CO4	3	3	1		5								1	1		

VI. Assessment Details (CIE & SEE)

General Rules: Refer to – Academic regulations

Continuous Internal Evaluation (CIE): Refer to Annexure, SL #1

Semester End Examination (SEE): Refer to - Annexure, SL #1
Rubrics: Refer to - Annexure, SL #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	The Internet of Things in the Industrial Sector	Mahmood, Zaigham (Ed.)	First Edition, 2019	Springer Publication
2	Industrial Internet of Things: Cyber manufacturing System	Sabina Jeschke, Christian Brecher, Tobias Meisen, Denis Özdemir	First Edition, 2016	Springer Publication

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

1	Industry 4.0: The Industrial Internet of Things	Alasdair Gilchrist	1st Edition,2019	APress Publications:

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

https://www.classcentral.com/course/youtube-noc-jan-2019-introduction-to-industry-4-0-and-industrial-internet-of-things-47354

https://www.youtube.com/watch?v=pj8ApxsymB4

https://www.coursera.org/learn/introduction-to-internet-of-things?utm_medium=sem&utm_source=gg&utm_campaign=b2c_india_introduction-to-internet-of-things_iitb_ftcof_learn_arte_june-24_dr_sem_rsa_gads_lg-all&campaignid=21344364957&adgroupid=163454955815&device=c&keyword=iot%20full%20course&matchtype=p&network=g&devicemodel=&adposition=&creativeid=701242136280&hide_mobile_promo&gad_source=1&gclid=EAIaIQobChMIivKjl_nkhgMV2RqDAx1JXgzDEAMYASAAEgKkGvD_BwE

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

Projects:
1.A smart meter is an internet-capable device that measures energy.
2.Building connection into existing Modbus & Profibus networks.
3.Monitoring environmental conditions in an apparel factory space.
4. Predictive monitoring of CNC machine operation.

Semester:	III	**Course Type:**	ETC		
Course Title: Introduction to Cyber Security					
Course Code:	**23ECE313**			**Credits:**	3
Teaching Hours/Week (L:T:P:0)			3:0:0:0	**Total Hours:**	40 hours
CIE Marks:	50	**SEE Marks:**	50	**Total Marks:**	100
SEE Type:	Theory			**Exam Hours:**	3

I. Course Objectives:

This course provides the student

1. To familiarize cybercrime terminologies and perspectives
2. To understand Cyber Offenses and Botnets
3. To gain knowledge on tools and methods used in cybercrimes
4. To understand phishing and computer forensics

II. Teaching-Learning Process (General Instructions):

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

1. Chalk and Board
2. Demonstration
3. Interactive learning
4. Videos and online material

III. COURSE CONTENT

Module-1 : Introduction to Cybercrime	8 Hrs

Introduction to Cybercrime: Cybercrime: Definition and Origins of the Word, Cybercrime and Information Security, Who are Cybercriminals? Classifications of Cybercrimes, An Indian Perspective, Hacking and Indian Laws., Global Perspectives
Textbook:1 Chapter 1 (1.1 to 1.5, 1.7-1.9)

Pre-requisites : Basic understanding of computer systems
Self Learning : Do's and Don'ts for posting content on Social media platforms.

RBT Levels: L1,L2

Module-2 : Cyber Offenses	8 Hrs

Cyber Offenses: How Criminals Plan Them: Introduction, How criminals plan the attacks, Social Engineering, Cyber Stalking, Cyber cafe & cybercrimes. Botnets: The fuel for cybercrime, Attack Vector. Textbook:1 Chapter 2 (2.1 to 2.7)

Pre-requisites : Advantages and disadvantages of internet.
Self Learning : Criminal activities that are carried out using digital devices.

RBT Levels: L1,L2	
Module-3 : Tools and Methods used in Cybercrime	8 Hrs
Tools and Methods used in Cybercrime: Introduction, Proxy Servers, Anonymizers, Phishing, Password Cracking, Key Loggers and Spyways, Virus and Worms, Trozen Horses and Backdoors, Steganography, DoS and DDOS Attackes, Attacks on Wireless networks. Textbook:1 Chapter 4 (4.1 to 4.9, 4.12)	
Pre-requisites : E-Commerce & Digital payments. **Self Learning :** Overview of Social media and its security	
RBT Levels: L1,L2	
Module-4 : Phishing and Identity Theft	8 Hrs
Phishing and Identity Theft: Introduction, methods of phishing, phishing,phising techniques, spear phishing, types of phishing scams, phishing toolkits and spy phishing, counter measures, Identity Theft Textbook:1 Chapter 5 (5.1. to 5.3)	
Pre-requisites : Cyber scams **Self Learning :** Malware (such as ransomware) which can sabotage systems and organisations	
RBT Levels: L1,L2	
Module-5 : Computer Forensics	8 Hrs
Understanding Computer Forensics: Introduction, Historical Background of Cyber forensics, Digital Forensics Science, Need for Computer Forensics, Cyber Forensics and Digital Evidence, Digital Forensic Life cycle, Chain of Custody Concepts, network forensics. Textbook:1 Chapter 7 (7.1. to 7.5, 7.7 to 7.9)	
Pre-requisites : Various computer evidences **Self Learning :** Cyber security best practices and do's and don'ts	
RBT Levels: L1,L2	

IV. COURSE OUTCOMES

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

CO1	Explain the cybercrime terminologies
CO2	Describe Cyber offenses and Botnets
CO3	Illustrate Tools and Methods used on Cybercrime
CO4	Explain Phishing and Identity Theft
CO5	Justify the need of computer forensics

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	1					1	1	2				2			1	
CO2	1					2	2	2				2			1	
CO3	1					2	2	2				2			1	
CO4	1					2	2	2				2			1	
CO5	1					2	2	2				2			1	

VI. Assessment Details (CIE & SEE)

General Rules: Refer to – Academic regulations

Continuous Internal Evaluation (CIE): Refer to Annexure, SL #1

Semester End Examination (SEE): Refer to - Annexure, SL #1
Rubrics: Refer to - Annexure, SL #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.	"Cyber Security: Understanding Cyber Crimes, Computer Forensics And Legal Perspectives"	Sunit Belapure and Nina Godbole	2011, First Edition (Reprinted 2018)	Wiley India Pvt Ltd, ISBN: 978-81- 265-21791

VII(b): Reference Books:

1.	Information Warfare and Security.	Dorothy F. Denning	1998, First Edition	Addison Wesley
2.	Introduction to Cyber Security Guide to the World of Cyber Security	Anand Shinde	4th Edition	HARPERCOLLINS

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

- https://www.youtube.com/watch?v=yC_hFm0BX28&list=PLxApjaSnQGi6Jm7LLSxvmNQjS_rt9swsu
- https://www.youtube.com/watch?v=nzZkKoREEGo&list=PL9ooVrP1hQOGPQVeapGsJCktzIO4DtI4_
- https://www.youtube.com/watch?v=6wi5DI6du-4&list=PL_uaeekrhGzJlB8XQBxU3z__hDwT95xlk
- https://www.youtube.com/watch?v=KqSqyKwVuA8

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

- Illustration of standard case study of cybercrime
- Setup a cyber court at Institute level

Semester:	III	**Course Type:**	ETC		
Course Title: Programming in C++					
Course Code:	**23ECE314**			**Credits:**	3
Teaching Hours/Week (L:T:P:O)			2:0:2:0	**Total Hours:**	25 hours of theory + 2 Hrs Lab / Week
CIE Marks:	50	**SEE Marks:**	50	**Total Marks:**	100
SEE Type:	Theory			**Exam Hours:**	3

I. Course Objectives:

1. Understanding object-oriented programming and Gaining knowledge about the capability to store information together in an object.
2. Understand the capability of a class to rely upon another class and functions.
3. Understand constructors which special types of functions and features of C++ are including Exception handling.
4. Create and process data in files using file I/O functions
5. Use the generic programming on Data structure and its applications.

II. Teaching-Learning Process (General Instructions):

These are sample Strategies; that teachers can use to accelerate the attainment of the various course outcomes and make Teaching –Learning more effective

1. Chalk and talk
2. Online demonstration
3. Hands-on problem solving

III. COURSE CONTENT

III(a). Theory PART

Module-1: Introduction to object-oriented programming — 8-Hrs

Difference between function-oriented programming and object-oriented programming, Features of OOP, Applications of OOP, structure of C++ program with simple C++ program, basics of console Input and Output, C++ data types, Control Structures,

Textbook: 1 Chapter: 1-2

Pre-requisites

Basic C Programming

RBT Levels: L1, L2

Module-2: Functions in C++: — 8-Hrs

Tokens – Keywords – Identifiers and constants – Operators in C++ – Scope resolution operator – Expressions and their types – Special assignment expressions – Function prototyping – Call by reference – Return by reference – Inline functions -Default arguments – Function overloading.

Introduction to Exception - Benefits of Exception handling- Try and catch Block Throw statement- Pre-defined exceptions in C++

Text Bbook 1: Chapter: 3-4, Chapter 13 (13.2 to13.6)

Self-Learning: Recursive functions

RBT Levels: L1, L2

Module-3: Inheritance & Polymorphism:	8-Hrs
Derived class Constructors, destructors-Types of Inheritance-Defining Derived classes, Single Inheritance, Multiple, Hierarchical Inheritance, Hybrid Inheritance **Textbook:1 Chapter: 6 (6.2,6.11) Chapter 8 (8.1 to,8.8)**	
Pre-requisites Object-Oriented Programming (OOP) Concepts	
RBT Levels: L1,L2,L3	
Module-4: I/O Streams:	8-Hrs
C++ Class Hierarchy- File Stream-Text File Handling- Binary File Handling during file operations. **Textbook: 2 Chapter 12(12.5), Chapter 13 (13.6,13.7)**	
Pre-requisites Input and Output Concepts and Streams and Stream Buffers.	
RBT Levels: L1, L2, L3	
Module-5: Data structures	8-Hrs
Data Structures Important and definition, Classification of Data Structures, Types of Data Structures- Linear Data Structures and Non-Linear Data Structures, Linear Data Structures -insertion and deletion operations. Examples include arrays, stack, linked lists, and queues. Applications of Data Structures **Textbook: 3**	
Pre-requisites Pointers, Memory Management, Arrays and Strings Self-Learning – implementation **Linear Data Structures and Non-Linear Data Structures using pointers**	
RBT Levels:L1, L2, L3	

III(b). PRACTICAL PART

Sl. No.	Programs
1.	Write a C++ program to sort the elements in ascending and descending order.
2.	Write a C++ program to find the sum of all the natural numbers from 1 to n.
3.	Write a C++ program to swap 2 values by writing a function that uses call by reference technique.
4.	Write a C++ program to demonstrate function overloading for the following prototypes. *add(int a, int b)* *add(double a, double b)*
5.	Create a class named Shape with a function that prints "This is a shape". Create another class named Polygon inheriting the Shape class with the same function that prints Polygon is a shape". Create two other classes named Rectangle and Triangle having the same function which prints "Rectangle is a polygon" and "Triangle is a polygon" respectively. Again, make another class named Square having the same function which prints "Square is a rectangle". Now, try calling the function by the object of each of these classes.
6.	Write a Program for the Implementation linked list Using an Array.
7.	Write a Program for the Implementation of Stacks Using an Array.

8.	Write a Program for the Implementation of a Queue Using an Array
9.	Write a C++ program to create a text file, check file is created or not, if created it will write some text into the file and then read the text from the file.
10.	Write a C++ program to write and read time in/from binary file using fstream
11.	Write a function that throws a division by zero exception and catch it in catch block. Write a C++ program to demonstrate usage of try, catch and throw to handle exception.
12.	Write a C++ program function which handles array of bounds exception using C++.

Instructions for conducting of practical part:

1. Ensure all students have a C++ compiler and an Integrated Development Environment (IDE)
2. Gradually introduce fundamental concepts such as variables, data types, control structures (if-else, loops), and functions.
3. Create exercises that require students to design and implement their own classes, use constructors/destructors, and practice inheritance and polymorphism
4. Provide exercises that involve real-world scenarios where students need to apply STL containers and algorithms to solve problems efficiently.
5. Design exercises that challenge students to write generic functions and classes, handle errors gracefully, and perform file operations (reading from and writing to files).

IV. COURSE OUTCOMES

CO1	Students will be able to understand and apply the fundamental syntax and concepts of the C++ programming language, including variables, data types, operators, control structures, and Functions to create modular and reusable code with exception handling.
CO2	Students will understand and implement inheritance hierarchies and polymorphic behavior in C++,
CO3	Students will be able to analyze, design, and implement file input/output operations in C++, including reading from and writing to text files, binary files, and file stream manipulation.
CO4	Students will understand the concept of Linear Data Structures -insertion and deletion operations of arrays, linked lists, and queues.

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		2				2	1			1			
CO2	3	2	2		2				2	1			1			
CO3	3	2	2	1	2		1		2	1			1			
CO4	3	2	2	1	2	1			2	1			1			

VI. Assessment Details (CIE & SEE)

General Rules: Refer to – Academic regulations

Continuous Internal Evaluation (CIE): Refer to Annexure, SL #1

Semester End Examination (SEE): Refer to - Annexure, SL #1
Rubrics: Refer to - Annexure, SL #1

VII. Learning Resources

VII(a): Textbooks: (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	Object-oriented Programming with C++	E.Balaguruswamy	Fourth Edition 2010.	McGrawHill Education.
2	"Programming with ANSI C++"	Bhushan Trivedi,	Second Edition, 2012.	Oxford Press
3	Data Structures Through C++	Yashavant P. Kanetkar	2003	PBP

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

01	The C++ Programming Language	Bjarne Stroustrup	2013	Addison-Wesley, 2013
02	C++ Primer	Stanley B. Lippman, Josée Lajoie, Barbara E. Moo	2012	Addison-Wesley, 2012

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

1. Basics of C++ - https://www.youtube.com/watch?v=BClS40yzssA
2. Functions of 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:

- Quizzes
- Assignments
- Seminar

Semester:	III	**Course Type:**	AEC		
Course Title: Network Security					
Course Code:	**23ECAE31**			**Credits:**	1
Teaching Hours/Week (L:T:P:O)		1:0:0:3		**Total Hours:**	40
CIE Marks:	50	**SEE Marks:**	-	**Total Marks:**	50
SEE Type:	Theory			**Exam Hours:**	0

I. Course Objectives:

1. Understand core security principles: confidentiality, integrity, availability, and non-repudiation.
2. Define and enforce physical security measures at various levels.
3. Identify different types of security policies and controls.
4. Recognize various attack types and vulnerabilities.
5. Understand backup and restore types: full, incremental, and differential.
6. Identify methods for protecting client and server systems.
7. Configure user authentication mechanisms and manage permissions effectively.
8. Implement wireless security measures and network protection devices.
9. Understand network isolation methods and protocol security concepts.
10. 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: Defense in Depth	10 Hrs

Identify core security principles : Confidentiality, integrity, availability, non-repudiation, threat, risk, vulnerability, principle of least privilege, attack surfaces including IoT

Define and enforce physical security : Site security, computer security, removable devices and drives, mantraps

Identify security policy types : Administrative controls, technical controls

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

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.

RBT Levels: L2 & L3

Module-2: Operating System Security	10 Hrs

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

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

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	10 Hrs

Managing Permissions : 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

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

Implement wireless security : Wireless security types (strength of encryption), service set identifiers (SSIDs), MAC filtering, default configuration (OOBE)
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	5 Hrs

Identify network isolation methods : Routing, honeynet, perimeter networks (DMZ), NAT/PAT, VPN, IPsec, air gap network, DirectAccess, virtual LAN (VLAN)
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	10 Hrs

Implement email protection : Antispam, spoofing, phishing, and pharming, client protection, user training
Manage browser security : Browser settings, cache management, private browsing
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

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: NA

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 to – Academic regulations

Continuous Internal Evaluation (CIE): Refer to Annexure, SL #5

Semester End Examination (SEE): Refer to - Annexure, SL #5
Rubrics: Refer to - Annexure, SL #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 (5 December 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 (24 July 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:

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

Semester:	III	Course Type:	NCMC
Course Title: Skillful Futures: Empowering Aptitude and Softskills			
Course Code:	**23PDSN03**	**Credits:**	PP/NP
Teaching Hours/Week (L: T: P: O)	0:0:0:2	**Total Hours:**	24
CIE Marks:	50	**SEE Marks:**	NA	**Total Marks:**	50
SEE Type:	NA	**Exam Hours:**	00

I. Course Objectives:

- To strengthen logical and analytical thinking skills required to solve quantitative problems.
- To discuss the importance of ethical considerations in leadership and negotiation, emphasizing integrity, fairness, and accountability in decision-making and interactions.
- To apply problem-solving strategies to real-world situations.
- To crafting Effective Openings and Closings.
- To develop a systematic approach to creative problem solving

II. Teaching-Learning Process (General Instructions):

The following are some of the strategies that teachers can employ to facilitate the achievement of various course outcomes:

1. **Diverse Teaching Methods**: Instead of relying solely on traditional lecture methods, can explore alternative and effective teaching approaches. These might include interactive discussions, hands-on activities, or multimedia presentations.
2. **Visual Aids**: Utilize videos and animations to elucidate complex concepts. Visual representations enhance understanding and engagement among students.
3. **Collaborative Learning**: Encourage group learning within the classroom. Collaborative activities foster teamwork, communication, and a deeper grasp of subject matter.
4. **Higher Order Thinking (HOT) Questions**: Pose at least three thought-provoking questions during class. These questions stimulate critical thinking and encourage students to analyze and evaluate information.
5. **Problem-Based Learning (PBL):** Implement PBL, which nurtures analytical skills. PBL goes beyond rote memorization by challenging students to design solutions, evaluate evidence, and think critically.
6. **Multiple Representations**: Introduce topics using various representations. Visuals, diagrams, and real-world examples cater to diverse learning styles.
7. **Creative Problem Solving**: Present different approaches to solving the same problem. Encourage students to think outside the box and devise their own innovative solutions.
8. **Real-World Application**: Discuss how each concept relates to practical scenarios. Connecting theoretical knowledge to real-world contexts enhances students' comprehension and retention.
   - Chalk & Talk □ Stud. Assignment □ Web Resources □ LCD/Smart Boards □ Stud. Seminars

III. COURSE CONTENT

Module-1: Quantitative Aptitude-1	6 Hrs

Problems on Permutation and Combination. Problems on Surds and Indices

Textbook : Textbook (b) -1: Section –I Page no: 308-373; page no 375-408

Prerequisites: Basic knowledge of Mathematics

Module-2: Visualize Leadership and Negotiation skills	4 Hrs

Leadership skills, Persuasion Skills, Negotiation Skills and Conflict Resolving Skills

Textbook: Textbook 5: Chapter-1

Module-3: Quantitative Aptitude – 02	6 Hrs
Problems on Percentage, Problems on Profit and Loss , Problems on cubes and Dices. **Textbook : Textbook (b) -1 Section –I Page no: 308-373; page no 375-408**	
Prerequisites: Basic Calculation Knowledge.	
Module-4: Letter and Writing Skills	4 Hrs
Writing Skills, Formal, Informal Letters, Sample Letters, Business Professional writings and Adaptability in writing style **Textbook : Textbook 4: Chapter-1**	
Module-5: Logical Reasoning	4 Hrs
Syllogism Concepts and Logical Deduction **Text book : Textbook 3; Chapter1 to 3**	
Prerequisites: Basic concepts of Set theory/ Venn diagrams	

IV. COURSE OUTCOMES

CO1	Solve complex problems related to Arithmetic, algebra, geometry, Statistics Permutation and Combination, demonstrating a strong understanding of the concepts.
CO2	Apply Surds and Indices concepts proficiently to solve mathematical problems with precision.
CO3	Develop leadership skills, including effective communication, persuasion, negotiation, and conflict resolution techniques.
CO4	Demonstrate proficiency in solving Percentage, Profit and Loss, and cubes and Dices problems, showcasing quantitative aptitude.
CO5	Enhance writing skills by effectively composing formal and informal letters, business professional writings, and adapting writing styles to different contexts.

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	1		2	1
CO2								2	2			2		2		
CO3	2	2						2				2			1	
CO4										2		2				2
CO5	2	2										1	1	1		1

VI. Assessment Details (CIE & SEE)

General Rules: Refer to – Academic regulations

Continuous Internal Evaluation (CIE): Refer to Annexure, SL #8

Semester End Examination (SEE): Refer to - Annexure, SL #8
Rubrics: Refer to - Annexure, SL #8

VII. Learning Resources

VII(a): Textbooks:

Sl. No.	Title of the Book	Name of the author	Edition and Year	Name of the publisher
1	Fastrack Objective Arithmetic	Rajesh verma	2022	Arihant Publications
2	Algebra Booster	Rejaul Markshud	2017	Mcgraw Hill Education
3	Sense and Syllogism	Aparna Tulpule	2019	Whitefalcon
4	A Handbook on letter writing	S.C Gupta	2018	Arihant publications

5	"Leadership Theory and practice"	Peter.G Northouse	2021	SAGE
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://youtu.be/6B-dvOMTeV8?si=Mx0GqAVqjh6VtDRP • https://youtu.be/MFj7QIXn-mM?si=AQlxLi086k1GrJuk				
VIII: Activity Based Learning / Practical Based Learning/Experiential learning:				
Assignments, Quizzes and Seminar, group discussions etc.				

Semester:	IV	**Course Type:**	BSC		
Course Title: Probability Distributions and Linear Algebra					
Course Code:	**23ECT401**			**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

VII. 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.

VIII. 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.

IX. 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: Chapter4-[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	

X. 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.

XI. 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	2	1	1
CO2	3	2	1									1	2	1	1
CO3	3	2	1									1	2	1	1
CO4	3	2	1									1	2	1	1

XII. Assessment Details (CIE & SEE)

General Rules: Refer to – Academic regulations

Continuous Internal Evaluation (CIE): Refer to Annexure, SL #1

Semester End Examination (SEE): Refer to - Annexure, SL #1
Rubrics: Refer to - Annexure, SL #1

XIII. 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 Done Right	Sheldon Axler	4th Ed., 2024	Springer
5	Linear Algebra and its Applications	Gilbert Strang	4th Ed., 2022.	Cengage Publications

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: Embedded Systems and ARM					
Course Code:	**23ECT402**			**Credits:**	3
Teaching Hours/Week (L:T:P:O)			2:2:0:0	**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:

1. Understand the importance and applications of ARM Design
2. Know the architecture of ARM processor
3. Use instruction sets of ARM processor
4. Analyze the adaptation of C code, firmware, OS, Interrupts, caches, etc. in ARM embedded systems

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.

1. Lecturer method (L) needs 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 analyze 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.
9. Use any of these methods: Chalk and board, Active Learning, Case Studies.

III. COURSE CONTENT

Module-1: Embedded System Components	8 Hrs

Embedded System Components: Embedded Vs General computing system, Classification of Embedded systems, Major applications and purpose of ES. Elements of an Embedded System (Block diagram and explanation), Differences between RISC and CISC, Harvard and Princeton, Big and Little Endian formats, Memory (ROM and RAM types), Sensors, Actuators, Optocoupler, Communication Interfaces (I2C, SPI, IrDA, Bluetooth, Wi-Fi, Zigbee only)

Textbook 2 : Chapter 1 and 2: Sections : 1.1 – 1.6, 2.1 – 2.3 , 2.4 – 2.4.1, 2.4.2

Pre-requisites

Digital circuits, Knowledge of microcontrollers and microprocessors

RBT Levels: L1, L2

Module-2: Embedded System Design Concepts	8 Hrs
Embedded System Design Concepts: Characteristics and Quality Attributes of Embedded Systems, Operational and non-operational quality attributes, Embedded Systems-Application and Domain-specific, Hardware Software Co-Design and Program Modeling (excluding UML), Embedded firmware design and development (excluding C language). **Textbook 2 :Chapters 7 and 9: Sections: 7.1, 7.2, 7.4, 9.1, 9.2**	
Pre-requisites Digital circuits, Knowledge of microcontrollers and microprocessors	
RBT Levels:L1,L2	
Module-3: Fundamentals of ARM Processor	8 Hrs
ARM Embedded Systems: Introduction, RISC design philosophy, ARM design philosophy, Embedded system hardware – AMBA bus protocol, ARM bus technology, Memory, Peripherals, Embedded system software – Initialization (BOOT) code, Operating System, Applications. ARM Processor Fundamentals :ARM core dataflow model, registers, current program status register, Pipeline, Exceptions, Interrupts and Vector Table, Core extensions. **Textbook 1: Chapters 1 and 2: Sections: 1.1 to 1.4, 2.1 to 2.5**	
Pre-requisites Digital circuits, Knowledge of programming in C, Knowledge of microcontrollers and microprocessors	
RBT Levels:L1,L2	
Module-4: ARM Instruction Set	8 Hrs
Introduction, Data processing instructions, Load - Store instruction, Software interrupt instructions, Program status register instructions, Loading constants, Conditional Execution. ALP programming. Introduction, THUMB register usage, ARM – THUMB interworking, Other branch instructions, Data processing instructions, Stack instructions, Software interrupt instructions. ALP programming **Textbook 1: Chapters 3 and 4: Sections: 3.1 to 3.6, 3.8, 4.1 to 4.8**	
Pre-requisites (Self Learning) Digital circuits, Knowledge of programming in C, Knowledge of microcontrollers and microprocessors	
RBT Levels:L1,L2, L3	
Module-5: C Compilers, Optimization and Interrupt Handling	8 Hrs
Efficient C Programming: Overview of C Compilers and optimization, Basic C data types, Local Variable Types, Portability issues Exception and Interrupt Handling: Exception Handling-ARM Processor Exceptions and Modes, Vector Table, Exception Priorities, Link Register Offset, Interrupts- Interrupt Latency, Basic Interrupt Stack design and implementation, Interrupt Handling Schemes (general description only of the schemes) **Textbook 1: Chapter 5 and 9: Sections: 5.1, 5.2, 5.13, 9.1, 9.2 – 9.2.1, 9.2.2, 9.2.4, 9.3**	

Pre-requisites (Self Learning):- Digital circuits, Knowledge of programming in C, Knowledge of microcontrollers and microprocessors

RBT Levels:L1,L2, L3

IV. COURSE OUTCOMES

CO1	Understand the basic hardware components and their selection method based on the characteristics and attributes of an embedded system.
CO2	Develop the hardware-software co-design and firmware design approaches.
CO3	Depict the organization, architecture, bus technology, memory and operation of the ARM processors
CO4	Employ the knowledge of the Instruction set of ARM processors to develop basic Assembly Language Programs and Recognize the importance of the Thumb mode of operation of ARM processors
CO5	Describe the techniques involved in writing C code for ARM processors and Exception & Interrupt handling in ARM Processors

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			
CO2	3	3			2								2			
CO3	3	3	2	1	2							1	2	1		
CO4	3	3	2	1								1	2	1		
CO5	3	3	2	2								1	2	1		

VI. Assessment Details (CIE & SEE)

General Rules: Refer to – Academic regulations

Continuous Internal Evaluation (CIE): Refer to Annexure, SL #1

Semester End Examination (SEE): Refer to - Annexure, SL #1
Rubrics: Refer to - Annexure, SL #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	ARM System Developers Guide	Andrew N Sloss, Dominic System and Chris Wright	1st Edition, 2008, ISBN:1758608745	Elsevier, Morgan Kaufmann publisher
2	Introduction to Embedded Systems	Shibu K V	2nd Edition.	Tata McGraw Hill Education Private Limited

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

1	"The Definitive Guide to the ARM Cortex-M3"	Joseph Yiu	2nd,Edition 2010.	Newnes, (Elsevier),
2	"ARM System on chip Architecture	Furber S, Addison Wiley	2 nd Edition,2008, ISBN:9780201675191	Tata McGraw-Hill Publishers
3	"Embedded System	Rajkamal	2nd Edition, 2008, ISBN: 0070494703.	Tata McGraw-Hill Publishers

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

https://youtu.be/uFhDGagZzjs?si=9V4SCoxoiD_TCm0E
https://youtu.be/SUusup7FfJo?si=imZOF3CO2epKrIUO
https://youtu.be/CuuIBvHrvtA?si=cGSx_Hoqnug_Xd1t
https://youtu.be/l7w5HCCtQ30?si=tyV0YBbNFvXpMg_u
https://youtu.be/UdY5RkkT7bg?si=3As57SZPflQhokHX
https://youtu.be/xYQ60EqTNuo?si=n2nwvIymdDao_B6i

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

Assignments
Quiz
Mini Projects
NPTEL/ Swayam Courses

Semester:	IV	**Course Type:**	IPCC		
Course Title: Signals & Systems					
Course Code:	23ECI403			**Credits:**	04
Teaching Hours/Week (L:T:P:O)			3:0:2:0	**Total Hours:**	40 + 10 Lab sessions
CIE Marks:	50	**SEE Marks:**	50	**Total Marks:**	100
SEE Type:	Theory			**Exam Hours:**	03

I. Course Objectives:

1. To describe various types of signals and systems mathematically and understand how to perform mathematical operations on them.
2. Also familiar with commonly used signals such as the unit step, ramp, and impulse function, sinusoidal signals, complex exponentials and their operations.
3. Analysis using Fourier series and Fourier transform for a given signal.
4. Applying Z-transforms on signals and analysing properties of systems.

II. Teaching-Learning Process (General Instructions):

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

1. Lecture method (L) does not mean only traditional lecture method, but different type of teaching methods may be adopted to develop the outcomes.
2. Show Video/animation films to explain the different concepts of Linear Algebra & Signal Processing.
3. Encourage collaborative (Group) Learning in the class.
4. Ask at least three HOTS (Higher order Thinking) questions in the class, which promotes critical thinking.
5. Adopt Problem Based Learning (PBL), which fosters students' Analytical skills, develop thinking skills such as the ability to evaluate, generalize, and analyze information rather than simply recall it.
6. Topics will be introduced in a multiple representation.
7. Show the different ways to solve the same problem and encourage the students to come up with their own creative ways to solve them.
8. Discuss how every concept can be applied to the real world - and when that's possible, it helps improve the students' understanding.
9. Adopt Flipped class technique by sharing the materials / Sample Videos prior to the class and have discussions on the that topic in the succeeding classes.
10. Give Programming Assignments.

III. COURSE CONTENT

III(a). Theory PART

Module-1: Introduction and Classification of signals	**08 Hrs**

Definition of signal and systems, communication and control system as examples Classification of signals. Basic Operations on signals: Amplitude scaling, addition, multiplication, differentiation, integration, time scaling, time shift and time reversal. Elementary signals/Functions: Exponential, sinusoidal, step, impulse and ramp functions. Expression of triangular, rectangular and other waveforms in terms of elementary signals.
(Textbook 1- Chapter 1:1.1 to 1.6)

Pre-requisites: Knowledge of integration, differentiation and basic trigonometric functions.

RBT Levels: L1, L2, L3

Module-2: System Classification and properties	**08 Hrs**
Linear-nonlinear, Time variant-invariant, causal-non causal, static-dynamic, stable- unstable, invertible. Time domain representation of LTI System: Impulse response, convolution sum, convolution integral. Computation of convolution sum and convolution integral using graphical method for unit step and unit step, unit step and exponential, exponential and exponential, unit step and rectangular, and rectangular and rectangular. (Textbook 1- Chapter 1: 1.8, Chapter 2: 2.1-2.5)	
Pre-requisites: Knowledge of integration, differentiation and basic trigonometric functions.	
RBT Levels: L1, L2, L3	
Module-3: LTI system Properties in terms of impulse response & Fourier Series	**08 Hrs**
System interconnection, Memoryless, Causal, Stable, Invertible and Deconvolution, and step response. Fourier Representation of Periodic Signals: CTFS properties and basic problems. (Textbook 1-Chapter 2: 2.5 to 2.8, Chapter 3: 3.1 to 3.3, 3.5)	
Pre-requisites: Knowledge of integration, differentiation and basic trigonometric functions.	
RBT Levels: L1, L2, L3	
Module-4: Fourier Representation of aperiodic Signals	**08 Hrs**
Introduction to Fourier Transform & DTFT, Definition and basic problems. Properties of Fourier Transform: Linearity, Time shift, Frequency shift, Scaling, Differentiation and Integration, Convolution and Modulation, Parseval's theorem and problems on properties of Fourier Transform. (Textbook 1-Chapter 3: 3.6, 3.8)	
Pre-requisites: Knowledge of integration, differentiation and basic trigonometric functions. Self-Learning: Relations between Fourier Series and Fourier Transform, Frequency domain sampling and reconstruction.	
RBT Levels: L1, L2, L3	
Module-5: The Z-Transforms	**08 Hrs**
Z transform, properties of the region of convergence, properties of the Z-transform, Inverse Z-transform, Causality and stability, Transform analysis of LTI systems. (Textbook 1-Chapter 7: 7.1 to 7.7)	
Pre-requisites: Knowledge of integration, differentiation and basic trigonometric functions. Self-Learning: Frequency response from poles & zeros, Unilateral Z-transforms.	
RBT Levels: L1, L2, L3	

III(b). PRACTICAL PART

Sl. No.	**Programs**
1	Program to generate discrete waveforms.
2	Program to perform basic operation on signals.
3	Program to perform convolution of two given sequences.
4	Program to perform verification of properties of convolution - commutative, distributive, associative.
5	Program to compute step response from the given impulse response.

6	Program to Implement the Fourier series
7	Program to Implement the Fourier transform
8	Programs to find Z-transform and inverse Z-transform of a sequence.
9	Applications of signal processing in speech signal
10	Applications of signal processing in image signal

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 Signals & Systems.

IV. COURSE OUTCOMES

CO1	Classify the different types of signals and systems.
CO2	Verify the properties of continuous and discrete time systems.
CO3	Comprehend the knowledge of LTI systems and compute the response of a Continuous and Discrete LTI system using convolution.
CO4	Determine the spectral characteristics of continuous and discrete time signal using Fourier analysis.
CO5	Apply the knowledge of Z-transforms to analyse discrete systems in frequency domain.

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	1	1	2	-	-	-	-	-	-	-	3	1		
CO2	2	2	1	1	2	-	-	-	-	-	-	-	3	1		
CO3	2	2	1	1	2	-	-	-	-	-	-	-	3	1		
CO4	2	2	1	1	2	-	-	-	-	-	-	-	3	1		
CO5	2	2	1	1	2	-	-	-	-	-	-	-	3	1		

VI. Assessment Details (CIE & SEE)

General Rules: Refer to – Academic regulations

Continuous Internal Evaluation (CIE): Refer to Annexure, SL #2

Semester End Examination (SEE): Refer to - Annexure, SL #2
Rubrics: Refer to - Annexure, SL #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	Signals and Systems	Simon Haykin and Barry Van Veen	2nd Edition, 2008	Wiley India

VII(b): Reference Books:

1	Fundamentals of Signals & Systems	Michael Roberts	2nd edition, 2010	Tata McGraw-Hill
2	Signals and Systems	Alan V Oppenheim, Alan S, Willsky and A Hamid Nawab	2nd edition, 1997	Pearson Education Asia / PHI

3	Signals and Systems	H.P Hsu, R. Ranjan	2006	Schaum's outlines, TMH
4	Linear Systems and Signals	B. P. Lathi	2005	Oxford University Press
5	Signals and Systems	Ganesh Rao and Satish Tunga	-	Pearson/Sanguine

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

MIT OCW Signals and Systems by Prof. Alan V. Oppenheim- https://ocw.mit.edu/courses/res-6-007-signals-and-systems-spring-2011/
Principles of Signals and Systems by Prof. Aditya K. Jagannatham, IIT Kanpur- https://onlinecourses.nptel.ac.in/noc24_ee36/preview

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: Control Systems					
Course Code:	**23ECI404**			**Credits:**	4
Teaching Hours/Week (L:T:P:O)			3:0:2:0	**Total Hours:**	40 hours of theory + 2 Hrs Lab / Week
CIE Marks:	50	**SEE Marks:**	50	**Total Marks:**	100
SEE Type:	Theory			**Exam Hours:**	3

I. Course Objectives:

This course will enable students to:

6. Understand the basic features, configurations, and application of control systems.
7. Understand various terminologies and definitions for the control systems.
8. Understand basics of control systems and design mathematical models using block diagram reduction, SFG, etc.
9. Understand Time domain and Frequency domain analysis.
10. Familiarize with the State Space Model of the system.

II. Teaching-Learning Process (General Instructions):

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

1. Lecture method (L) does not mean only traditional lecture method, but different type of teaching methods may be adopted to develop the outcomes.
2. Show Video/animation films to explain the different concepts of Linear Algebra & Signal Processing. • Encourage collaborative (Group) Learning in the class.
3. Ask at least three HOTS (Higher order Thinking) questions in the class, which promotes critical thinking.
4. Adopt Problem Based Learning (PBL), which fosters students' Analytical skills, develop thinking skills such as the ability to evaluate, generalize, and analyse information rather than simply recall it.
5. Topics will be introduced in a multiple representation.
6. Show the different ways to solve the same problem and encourage the students to come up with their own creative ways to solve them.
7. Discuss how every concept can be applied to the real world - and when that's possible, it helps improve the students' understanding.
8. Adopt Flipped class technique by sharing the materials / Sample Videos prior to the class and have discussions on the that topic in the succeeding classes.
9. Use software tools like MATLAB/Simulink for system modelling and analysis. Give Programming Assignments.
10. Encourage students to work in groups to promote collaborative learning.

III. COURSE CONTENT

III(a). Theory PART

Module-1: Basic Concepts and representation	8 Hrs

Basic Concepts and representation: Types of control systems, effect of feedback systems, differential equation of physical systems (only electrical systems),
Introduction to block diagrams, transfer functions, Signal Flow Graphs (Textbook 1: Chapter 1.1, 2.1, 2.2, 2.4, 2.5, 2.6)
Teaching-Learning Process Chalk and Talk, YouTube videos.

Pre-requisites (Self Learning): Experiences and knowledge in physics, mathematics, and control theory	
RBT Levels: L1, L2, L3	
Module-2: Time Response analysis	8 Hrs
Time Response analysis: Time response of first order systems. Time response of second order systems, time response specifications of second order systems, steady state errors and error constants. (Textbook 1: Chapter 5.1,5.2, 5.3, 5.4, 5.5) Teaching-Learning Process Chalk and Talk, any software tool to show time response.	
Pre-requisites (Self Learning): Integral – Basic (Special Integrals). Differential – Intermediate (Differential Equations), Z and Laplace Transforms.	
RBT Levels: L1, L2, L3	
Module-3: Stability Analysis	8 Hrs
Stability Analysis: Concepts of stability necessary condition for stability, Routh stability criterion, relative stability Analysis (Textbook 1: Chapter 6.1, 6.2, 6.4, 6.5) Root locus: Introduction the root locus concepts, construction of root loci, Analysis of stability by root locus plot. (Textbook 1: 7.1, 7.2, 7.3) Teaching-Learning Process Chalk and Talk, any software tool to show time response and plot Root locus.	
Pre-requisites (Self Learning): General qualitative analysis of the system & Ordinary Differential Equations.	
RBT Levels: L1, L2, L3	
Module-4: Frequency Domain analysis and stability	8 Hrs
Frequency Domain analysis and stability: Correlation between time and frequency response and Bode plots (Textbook 1: 8.1, 8.2, 8.3, 8.4) Introduction to Polar Plots, (Inverse Polar Plots excluded) Mathematical preliminaries, Nyquist Stability criterion, (Systems with transportation lag excluded) (Textbook 1: 9.1, 9.2) Teaching-Learning Process Chalk and Talk, any software tool to plot Bode, polar and Nyquist plots.	
Pre-requisites (Self Learning): Concepts of spectrum analysis & Linear Graphs	
RBT Levels: L1, L2, L3	
Module-5: State Variable Analysis	8 Hrs
State Variable Analysis: Introduction to state variable analysis: Concepts of state, state variable and state models. State model for Linear continuous –Time systems, solution of state equations. Controllability and observability (Textbook 1: 12.2, 12.3, 12.6, 12.7) Teaching-Learning Process Chalk and Talk, any software tool to obtain state models and analyse the stability of LTI systems.	
Pre-requisites (Self Learning): Concepts of Linear systems, Non-linear system, Time variant systems, Time invariant systems, Multiple input multiple output systems	
RBT Levels: L1, L2, L3	

III(b). PRACTICAL PART

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

Sl. No.	**Experiments / Programs / Problems** (insert rows as many required)
1.	Implement Block diagram reduction technique to obtain transfer function a control system.
2.	Determine the transfer function and pole locations for the unity feedback.

3.	Step, ramp and Impulse response of first order systems. b) Step, ramp and Impulse response of second order systems.
4.	Identification of damping in second order systems.
5.	Time domain analysis for second order systems
6.	Stability analysis of linear systems using Routh-Hurwitz method
7.	Stability analysis of linear systems using Root Locus.
8.	Frequency response analysis using Bode Plot.
9.	The open-loop transfer function of a unity-feedback control system is given (a) draw a Nyquist plot of G(s) (b) determine the stability of the system.
10.	Obtain the state-space representation of the LTI system.
11.	Obtain the time response from state model of a system.
12.	Implement frequency response of a lead lag compensator.

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 control systems.

IV. COURSE OUTCOMES

CO1	Develop transfer functions for control systems using block diagram reduction techniques and signal flow graph methods.
CO2	Analyze time-domain specifications for both first and second-order systems.
CO3	Evaluate system stability using the Routh-Hurwitz criterion and Root-locus techniques.
CO4	Assess system stability in the frequency domain using Nyquist and Bode plots.
CO5	Represent state models of systems and determine the time response.

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	-		3								2			
CO2	3	3	3		3								3			
CO3	3	3	3		3							1	3	2		
CO4	3	3	3		3							1	3	2		
CO5	3	3	3		3							1	3	2		

VI. Assessment Details (CIE & SEE)

General Rules: Refer to – Academic regulations

Continuous Internal Evaluation (CIE): Refer to Annexure, SL #2

Semester End Examination (SEE): Refer to - Annexure, SL #2
Rubrics: Refer to - Annexure, SL #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	Control Systems Engineering.	I J Nagrath, M Gopal	Fifth edition.	New age international Publishers

VII(b): Reference Books:

1.	Modern Control Engineering	K. Ogata	4th Edition, 2002	Pearson Education Asia/ PHI
2.	Automatic Control Systems	Benjamin C. Kuo	8th Edition, 2008	John Wiley India Pt. Ltd
3.	Feedback and Control System	Joseph J Distefano	2nd Edition 2007	Schaum's Outlines, TMH

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

Mention the links of the online resources, video materials, etc.
https://nptel.ac.in/courses/108106098
https://www.youtube.com/watch?v=nw72DcenMEY&list=PL_n6G_zaDmZlF6P3OsPkV28s2T1Lt4J9&pp=iAQB

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

Programming Assignments / Mini Projects can be given to improve programming skills.

Semester:	IV	**Course Type:**	PCCL		
Course Title: Embedded Systems Lab					
Course Code:	**23ECL405**		**Credits:**		1
Teaching Hours/Week (L:T:P:O)			0:0:2:0	**Total Hours:**	2 hrs / week
CIE Marks:	50	**SEE Marks:**	50	**Total Marks:**	100
SEE Type:	Practical			**Exam Hours:**	3

I. Course Objectives:

This course will enable students to:

1. Understand the instruction set of ARM Cortex M3, a 32-bit microcontroller and software tool required for programming in Assembly and C language.
2. Program ARM Cortex M3 using the various instructions in assembly-level language for different applications.
3. Interface external devices and I/O with ARM Cortex M3 .
4. Develop C language programs and library functions for embedded system applications.

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.

1. Lecturer method (L) needs 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 the functioning of various concepts.
3. Encourage collaborative (Group Learning) Learning in the class.

III. COURSE CONTENT

PART - A

1. ALP to multiply two 16-bit binary numbers
2. ALP to find the sum of the first 10 integer numbers
3. ALP to find the number of 0's and 1's in a 32-bit data
4. ALP to find whether the given 16-bit number is Even or Odd.
5. ALP to arrange a series of 32-bit numbers in ascending/descending order.

PART - B

6. Display the "HELLO WORLD" message using the internal UART
7. Interface and control the speed of DC Motor
8. Interface a stepper motor and rotate it in a clockwise and anticlockwise direction
9. Interface a DAC and generate Triangular and square waveforms
10. Interface a 4*4 keyboard and display the key code on an LCD

11. Demonstrate the use of an external interrupt to toggle an LED on / off
12. Display the Hex digits 0 to F on a 7 segment LED interface , with an appropriate delay .
13. Measure ambient temperature using a sensor and SPI ADC IC.

IV. COURSE OUTCOMES

CO1	Understand the instruction set of 32 bit microcontroller ARM Cortex M3, and the software tool required for programming in Assembly and C language.
CO2	Develop assembly language programs using ARM Cortex M3 for different applications.
CO3	Interface external devices and I/O with ARM Cortex M3
CO4	Develop C language programs and library functions for embedded system 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	3			3								2			
CO2	3	3			3								2			
CO3	3	3	2	1	2								2	1		
CO4	3	3	2	1	3								2	1		

VI. Assessment Details (CIE & SEE)

General Rules: Refer to – Academic regulations

Continuous Internal Evaluation (CIE): Refer to Annexure, SL #4

Semester End Examination (SEE): Refer to - Annexure, SL #4
Rubrics: Refer to - Annexure, SL #4

Semester:	IV	**Course Type:**	ETC		
Course Title: Computer Organization and Architecture					
Course Code:	**23ECE421**			**Credits:**	3
Teaching Hours/Week (L:T:P:O)			3:0:0:0	**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 understand the architecture of computer systems and machine instructions.
- To know the input and output devices along with peripheral interfaces.
- To learn the types of memories.
- To list the functions performed by processing unit and the architectures of procesors.

II. Teaching-Learning Process (General Instructions):

- Chalk and talk method
- Power point presentation / keynotes
- Videos
- Virtual Labs

III. COURSE CONTENT

Module-1 Basic Structure of Computers	8 Hours

Basic Structure of Computers:
Basic Operational Concepts, Bus Structures, Performance – Processor Clock, Basic Performance Equation, Clock Rate, Performance Measurement.

Machine Instructions and Programs:
Memory Location and Addresses, Memory Operations, Instructions and Instruction Sequencing, Addressing Modes
Text 1: Chapter 1 & 2

RBT Levels: L1, L2, L3

Module-2 : Input/Output Organization	8 Hours

Peripheral Devices, Input –Output Interface, Asynchronous Data Transfer, Modes of Transfer , Priority Interrupt, Direct Memory Access, Input- Output Processor.
Text 2: Chapter - 11

RBT Levels: L1, L2, L3

Module-3 : Memory System	8 Hours

Basic Concepts, Semiconductor RAM Memories, Read Only Memories, Speed, Size, and Cost, Cache Memories – Mapping Functions, Virtual memories, Secondary Storage
Text 1: Chapter -5

RBT Levels: L1, L2, L3

Module-4 : Basic processing Unit and Pipelining	8 Hours

Basic Processing Unit:
Fundamental Concepts, Execution of a Complete Instruction, Multiple Bus Organization Hardwired control, Micro programmed control
Basic of pipeline, Data Hazards, Instruction Hazards, Influence of Instruction sets.
Text 1 : Chapter 7,8

RBT Levels: L1, L2, L3

Module-5 : Multiprocessors	8 Hours

Characteristics of multiprocessors, Interconnection structures, Inter processor Arbitration, Inter processor Communication and Synchronization
Text 2: Chapter 13

RBT Levels: L1, L2, L3

IV. COURSE OUTCOMES

At the end of the course students will be able to

CO1	Explain the organization and architecture of computer systems with machine instructions and programs
CO2	Differentiate the different input/output devices communicating with computer system
CO3	Explain the features of different types of memories.
CO4	Analyze the functions of basic processing unit, Parallel processing and pipelining
CO5	Compare the different architectures of processors.

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										2	1	
CO2	3	2	2										2		1
CO3	3	2	2			2				2		2	2		
CO4	2														
CO5	2											2			

VI. Assessment Details (CIE & SEE)

General Rules: Refer to – Academic regulations

Continuous Internal Evaluation (CIE): Refer to Annexure, SL #1

Semester End Examination (SEE): Refer to - Annexure, SL #1
Rubrics: Refer to - Annexure, SL #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	Computer Organization	Carl Hamacher, Zvonko Vranesic, Safwat Zaky	5th Edition,	Tata McGraw Hill
2	Computer System Architecture	M. Morris Mano	3rd Edition	PHI
VII(b): Reference Books:				
1	Computer Organization & Architecture	William Stallings	9th Edition	Pearson
VII(c): Web links and Video Lectures (e-Resources):				
Nil				
VIII: Activity Based Learning / Practical Based Learning/Experiential learning:				
Nil				

Semester:	IV	**Course Type:**	ETC		
Course Title: Programming Using LABVIEW					
Course Code:	**23ECE422**			**Credits:**	3
Teaching Hours/Week (L:T:P:O)			2:0:2:0	**Total Hours:**	25 hours of theory + 2 Hrs Lab / Week
CIE Marks:	50	**SEE Marks:**	50	**Total Marks:**	100
SEE Type:	Theory			**Exam Hours:**	3 Hrs

I. Course Objectives:

1. Aware of various front panel controls and indicators.
2. Connect and manipulate nodes and wires in the block diagram.
3. Locate various toolbars and pull-down menus for the purpose of implementing specific functions.
4. Locate and utilize the context help window.
5. Familiar with LabVIEW and different applications using it.
6. Run a Virtual Instrument (VI).

II. Teaching-Learning Process (General Instructions):

1. Information Communication Technology (ICT) tools
2. Modern tool usage – Eclipse IDE
3. Activities like quizzes, debugging tests, and usage of a virtual lab

COURSE CONTENT

III(a). Theory PART

Module-1: Introduction To LABVIEW	4 Hrs

Advantages of LabVIEW, software environment, front panel windows, block diagram windows, icon/connector pane, creating and saving a vi, front panel toolbar, block diagram toolbar, palettes, shortcut menu, property dialog boxes, front panel controls and indicators, block diagram, data types, data flow program

Text book 1: Ch 2

Pre-requisites: Basic Computer Skills, Graphical programming

RBT Levels: L1, L2

Module-2: Repetition And Loops	4 Hrs

Introduction, for loops, while loops, structure tunnels, terminals inside or outside loops, shift registers, feedback nodes, control timing, communicating among multiple loops, local variables, global variables

Text book 1: Ch 4

Self Learning: LabVIEW For Loop Basics: Official NI documentation on loops in LabVIEW.
Community and Forums: **https://forums.ni.com/**

RBT Levels: L1, L2

Module-3: Arrays And Clusters	4 Hrs

ARRAYS : Arrays in LabVIEW, creating one-dimensional array controls, indicators And constants, deleting elements, inserting elements, array functions, using auto-indexing to set the for loop count.

CLUSTERS : Creating cluster controls and indicators, order of cluster elements, cluster operations, conversion between arrays and clusters

Text book 1: Ch 5, Ch 6

Community and Forums: **https://forums.ni.com/**

RBT Levels: L1, L2, L3

Module-4: Plotting Data and Structures	4 Hrs
PLOTTING DATA : Types of waveforms, waveform graphs, *xy* graphs, intensity graphs and charts, digital waveform graphs, **STRUCTURES:** case structures, sequence structures, timed structures, formula nodes, event structure, LabVIEW math-script. **Text book 1: Ch 7 Ch 8.**	
Community and Forums: https://forums.ni.com/	
RBT Levels: L1, L2, L3	
Module-5: Strings and File Input/Output	4 Hrs
STRINGS: Creating string controls and indicators, string functions, formatting strings, and configuring string controls and indicators. **FILE I/O:** Choosing a file i/o format, LabVIEW data directory, creating a relative path **Text book 1: Ch 9**	
Community and Forums: https://forums.ni.com/	
RBT Levels: L1, L2, L3, L4	

III(b). PRACTICAL PART

II . PROGRAMS

Sl. No.	VI Programs (using LabVIEW software) to realize the following:
1	**Datatype and its properties:** a) Using Different LabVIEW Data Types b) Performing Conversion from one Data Type to another
2	**Basic arithmetic and Boolean operations:** a) Using Formula node b) Find the roots of the quadratic equations c) Implement adder and subtractor
3	**Creating Sub-VI and its applications:** Implement full adder by using two half adders using sub VI
4	**Programs on FOR and WHILE loop, use of feedback node and shift register**: a) Find the sum of N Natural numbers b) Find the Factorial of a number
5	**Programs on Arrays:** a) Find the sum and average of the N array element b) Sort the N array element-Even array/ODD array
6	**Program on Case structure, Flat sequence:** a) Implement the mini calculator b) Implement the traffic light control
7	**Program on Event Structure:** Password control door opening and closing system.
8	**Programs on string functions with cluster:** Implement the student database with name, ID,5 subject marks, and modified marks to his record.
9	**Programs on graphs with Signal Express:** Generate signals using signal express and display using graphs

10	**Programs on File Handling:** Use the File I/O VI's and functions to a) Open and close file b) Read from and write to files. c) Create directories and files specified in the path control. d) Retrieve Directory information. e) Write strings, numbers, arrays and clusters to files.

III. COURSE OUTCOMES

CO1	to understand the principles of graphical programming and demonstrate proficiency in creating, modifying, and debugging LabVIEW programs.
CO2	To Use the programming structures and data types that exist in Lab VIEW
CO3	To Create user interfaces with charts, graph and buttons
CO4	To simulate and generate the different kind of signals by using Signal Express
CO5	To able to analyze, design, and implement file input/output operations in LabVIEW, including reading from and writing to text files

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	2		2				2	1			1			
CO2	3	2	2		2				2	1			1			
CO3	3	2	2	1	2		1		2	1			1			
CO4	2	2	2	1	2	1			2	1			1			
CO5	2	2	2	1	2	1			2	1			1			

V. Assessment Details (CIE & SEE)

General Rules: Refer to – Academic regulations

Continuous Internal Evaluation (CIE): Refer to Annexure, SL #1

Semester End Examination (SEE): Refer to - Annexure, SL #1
Rubrics: Refer to - Annexure, SL #1

VI. Learning Resources

Sl. No.	Title of the Book	Name of the author	Edition and Year	Name of the publisher
1	Virtual Instrumentation using LABVIEW	Jovitha Jerome	2011	PHI
2	Virtual Instrumentation using LABVIEW	Sanjay Gupta, Joseph John	Second Edition, 2011.	TMH, McGraw Hill

Semester:	IV	Course Type:	ETC		
Course Title: Industrial Electronics					
Course Code:	23ECE423			Credits:	3
Teaching Hours/Week (L:T:P:O) {O – Other pedagogies, mention @}			3:0:0:0	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 student to

1. Explain broad types of industrial power devices, there structure, and its characteristics.
2. Design and analyse the broad categories of power electronic circuits.
3. Explain various types of MEMs devices, principle of operation and construction.
4. Familiarize with soft core processors and computer architecture.
5. Apply protective methods for devices and circuits.

II. Teaching-Learning Process (General Instructions):

Five key points for effective teaching and learning in this subject area:

1. **Fundamental Concepts:** Start with foundational knowledge in electronics, including circuit analysis, semiconductor devices, digital electronics, and analog circuits. Ensure students understand the principles behind electronic components and their applications in industrial settings.
2. **Hands-on Training:** Provide practical experience through laboratory sessions and workshops where students can assemble circuits, troubleshoot electronic systems, and interface with industrial equipment. Hands-on training enhances understanding and prepares students for real-world challenges.
3. **Industrial Applications:** Introduce students to industrial automation technologies such as PLCs (Programmable Logic Controllers), sensors, actuators, and motor control systems. Emphasize how electronics are used in automated manufacturing processes and industrial control systems.
4. **Safety Protocols:** Emphasize the importance of safety practices in industrial electronics, including proper handling of equipment, understanding electrical hazards, and compliance with industry standards. Instill a culture of safety consciousness to prevent accidents and ensure workplace safety.
5. **Problem-Solving Skills:** Foster critical thinking and problem-solving abilities by presenting students with industrial scenarios and challenges. Encourage them to analyze circuit diagrams, diagnose faults, and propose solutions using their knowledge of electronics principles and troubleshooting techniques.

III. COURSE CONTENT	
III(a). Theory PART	
Module-1: Industrial Power Devices	8 Hrs
Power diode types: General purpose diodes, fast recovery diodes, schottky diodes, silicon carbide power diodes. Power MOSFETs, Steady state characteristics, switching characteristics, silicon carbide MOSFETs, COOLMOS, Junction field effect transistors, operation, and characteristics of JFETs, Silicon Carbide JFET structures, Bipolar Junction Transistors, Steady state characteristics, switching characteristics, silicon carbide BJTs, IGBTs, silicon carbide IGBTs. **Textbook 1: Chapter 2: 2.5, 2.6, Chapter 4: 4.3, 4.4, 4.5, 4.6, 4.7**	
Pre-requisites Network theory and basics of semiconductor physics.	
RBT Levels: L1 and L2	
Module-2: Power Electronics Circuits	8 Hrs
Thyristor, Thyristor characteristics, two transistor model. Controlled Rectifiers – Single phase full converter with R and RL load, Single phase dual converters. Switching mode regulators – Buck Regulator, Boost regulator, Buck – Boost regulator, comparison of regulators. **Textbook 1: Chapter 9: 9.2, 9.3, 9.4, Chapter 10: 10.2, 10.3, Chapter 5: 5.9, 5.9.1, 5.9.2, 5.9.3, 5.10**	
Pre-requisites Electrical and electronic circuits, network theory and basics of semiconductor physics.	
RBT Levels: L1 and L2	
Module-3: Inverters and AC voltage controllers	8 Hrs
Principle of operation, Single phase bridge inverter, Voltage Control of Single-Phase Inverters, Current source inverter. Single phase full wave controller with resistive load, single phase full wave controller with inductive load. **Textbook 1: Chapter 6: 6.3, 6.4, 6.6, 6.9, Chapter 11: 11.3, 11.4**.	
Pre-requisites Electrical and electronic circuits, network theory and basics of semiconductor physics.	
RBT Levels: L1 and L2	
Module-4: MEMS Devices and Applications	8 Hrs
Sensing and Measuring Principles, Capacitive Sensing, Resistive Sensing, Piezoelectric Sensing, Thermal Transducers, Optical Sensors, Magnetic Sensors, MEMS Actuation Principles, Electrostatic Actuation, Thermal Actuation, Piezoelectric Actuation, Magnetic Actuation, MEMS Devices: Inertial Sensors, Pressure Sensors, Radio Frequency MEMS: Capacitive Switches and Phase Shifters. MEMS Applications: Introduction, Industrial, Automotive, Biomedical **Textbook 2: Chapter 13: 13.1, 13.2, 13.3, 13.4,13.4.1,13.4.2, Chapter 15: 15.1, 15.2, 15.3, 15.4**	
Pre-requisites Electrical and electronic circuits, network theory and basics of semiconductor physics.	
RBT Levels: L1 and L2	

Module-5: Protections of Devices and Circuits	8 Hrs

Cooling and Heat sinks, Thermal Modeling of Power Switching Devices, Electrical Equivalent Thermal model, Mathematical Thermal Equivalent Circuit, Coupling of Electrical and Thermal Components, Snubber circuits, Voltage protection by Selenium Diodes and Metaloxide Varistors, Current protection, Fusing, Fault current with AC source, Fault current with DC source, Electromagnetic Interference, sources of EMI, Minimizing EMI Generation, EMI shielding, EMI standards.

Textbook 1: 17.2, 17.3, 17.4, 17.7, 17.8, 17.9

Pre-requisites

Electrical and electronic circuits, network theory and basics of semiconductor physics.

RBT Levels: L1 and L2

IV. COURSE OUTCOMES

CO1	Explain the structure and operating characteristics of different types of industrial power devices.
CO2	Analyse the power electronic circuits such as switch mode regulators, inverters, controlled rectifiers, and ac voltage controllers.
CO3	Explain various types of MEMs devices used for sensing different physical parameters.
CO4	Apply protective methods for the circuits against various electrical parameters.

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			
CO2	3	3	2										3			
CO3	3	3											2			
CO4	3	2	2										3			

VI. Assessment Details (CIE & SEE)

General Rules: Refer to – Academic regulations

Continuous Internal Evaluation (CIE): Refer to Annexure, SL #1

Semester End Examination (SEE): Refer to - Annexure, SL #1
Rubrics: Refer to - Annexure, SL #1

VII. Learning Resources

VII(a): Textbooks: (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	Power Electronics: Devices, Circuits, and Applications	Muhammad H. Rashid	4th International edition, 2014	Pearson
2	Fundamentals of Industrial Electronics	Bogdan M. Wilamowski, J. David Irwin	2011	CRC Press

VII(b): Reference Books: (Insert or delete rows as per requirement)				
1	Industrial Electronics: Applications for Programmable Controllers, Instrumentation and Process Control	Thomas E. Kissell	3rd edition, 2003	Prentice Hall
2	Power Electronics: Converters, Applications and Design	Ned Mohan, T.M. Undeland and W.P. Robbins	2008	Wiley India Ltd
VII(c): Web links and Video Lectures (e-Resources):				
1. https://archive.nptel.ac.in/courses/108/102/108102145/ 2. https://nptel.ac.in/courses/117105082 3. https://www.youtube.com/channel/UCKg8GNii0Q-ieXE56AXosGg/featured 4. https://www.ieee-ies.org/				
VIII: Activity Based Learning / Practical Based Learning/Experiential learning:				
Demonstrate the working of power electronic switching devices.				

Semester:	IV	**Course Type:**	ETC		
Course Title: Programming in Java					
Course Code:	**23ECE424**			**Credits:**	3
Teaching Hours/Week (L:T:P:O)			2:0:2:0	**Total Hours:**	25 hours of theory + 2 Hrs Lab / Week
CIE Marks:	50	**SEE Marks:**	50	**Total Marks:**	100
SEE Type:	Theory			**Exam Hours:**	3

I. Course Objectives:

1. Learn fundamental features of object-oriented language and JAVA
2. Set up Java JDK environment to create, debug and run simple Java programs.
3. Learn object-oriented concepts using programming examples.
4. Study the concepts of importing of packages and exception handling mechanism.
5. Discuss the String Handling examples with Object Oriented concepts.

II. Teaching-Learning Process (General Instructions):

4. Information Communication Technology (ICT) tools
5. Modern tool usage – Eclipse IDE
6. Activities like quizzes, debugging tests, and usage of a virtual lab

III. COURSE CONTENT

III(a). Theory PART

Module-1: Introduction to Java	4 Hrs

An Overview of Java: Object-Oriented Programming, A First Simple Program, A Second Short Program, Two Control Statements, Using Blocks of Code, Lexical Issues, The Java Class Libraries, Data Types, Variables, and Arrays: Java Is a Strongly Typed Language, The Primitive Types, Integers, Floating-Point Types, Characters, Booleans, A Closer Look at Literals, Variables, Type Conversion and Casting, Automatic Type Promotion in Expressions, Arrays, A Few Words About Strings

Text book 1: Ch 2, Ch 3

Pre-requisites: Basic Computer Skills, object-oriented principles

RBT Levels: L1, L2

Module-2: Operators in Java	4 Hrs

Operators: Arithmetic Operators, The Bitwise Operators, Relational Operators, Boolean Logical Operators, The Assignment Operator, The ? Operator, Operator Precedence, Using Parentheses, Control Statements: Java's Selection Statements, Iteration Statements, Jump Statements.

Text book 1: Ch 4, Ch 5

Self Learning: Ternary, Shift and Instance operators

RBT Levels: L1, L2

Module-3: Classes & Methods	4 Hrs
Introducing Classes: Class Fundamentals, Declaring Objects, Assigning Object Reference Variables, Introducing Methods, Constructors, The this Keyword, Garbage Collection, The finalize( ) Method, A Stack Class, A Closer Look at Methods and Classes: Overloading Methods, Using Objects as Parameters, A Closer Look at Argument Passing, Returning Objects, Recursion, Introducing Access Control, Understanding static, Introducing final, Arrays Revisited, **Text book 1: Ch 6, Ch 7.1-7.9**	
Self Learning: Encapsulation in Java	
RBT Levels: L1, L2, L3	
Module-4: Inheritance in Java	4 Hrs
Inheritance: Inheritance, Using super, Creating a Multilevel Hierarchy, When Constructors Are Called, Method Overriding, Dynamic Method Dispatch, Using Abstract Classes, Using final with Inheritance, The Object Class. **Text book 1: Ch 8.**	
Self Learning: Hierarchical Inheritance & Hybrid Inheritance.	
RBT Levels: L1, L2, L3	
Module-5: Packages & Interfaces	4 Hrs
Packages and Interfaces: Packages, Access Protection, Importing Packages, Interfaces, Exception Handling: Exception-Handling Fundamentals, Exception Types, Uncaught Exceptions, Using try and catch, Multiple catch Clauses, Nested try Statements, throw, throws, finally, Java's Built-in Exceptions, Creating Your Own Exception Subclasses, Chained Exceptions, Using Exceptions. **Text book 1: Ch 9, Ch 10**	
Self Learning: Inheritance in Interfaces	
RBT Levels: L1, L2, L3, L4	

III(b). PRACTICAL PART

Sl. No.	Programs
1	a. Arithmetic operations: addition, subtraction and multiplication. b. Calculate simple and compound interest. c. Swap Two Numbers with and without temporary variables
2	a. Prints all real solutions to the quadratic equation. b. Display All Prime Numbers from 1 to N c. Write a Program for factorial of a number
3	To search a given element in the array using linear and binary search techniques to find the largest and smallest element in an array.
4	Given two matrices A and B, write a program to: a. Add the matrices b. Multiply the matrices c. Find the determinant of a matrix

5	Write a program to perform the following: a. Reverse a string b. Check for palindrome c. Compare two strings
6	To create n Student objects and print the USN, Name, Branch, and Phone of these objects with suitable headings
7	To create a class known as "Bank Account" with methods called deposit() and withdraw(). Create a subclass called SB Account that overrides the withdraw() method to prevent withdrawals if the account balance falls below one hundred.
8	Demonstrating Method overloading and Constructor overloading
9	Design a super class called Staff with details as Staff_Id, Name, Phone, Salary. Extend this class by writing three subclasses namely Teaching (domain, publications), Technical (skills), and Contract (period). Write a Java program to read and display at least 3 staff objects of all three categories.
10	a. Write a JAVA program to read two integers a and b. Compute a/b and print, when b is not zero. Raise an exception when b is equal to zero. Also demonstrate working of Array Index Out of Bound-Exception b. Write a Java program to create a method that takes an integer as a parameter and throws an exception if the number is odd
11	Write a Java program to create an abstract class Bank Account with abstract methods deposit() and withdraw(). Create subclasses: Savings Account and Current Account that extend the Bank Account class and implement the respective methods to handle deposits and withdrawals for each account type.
12	Create two packages P1 and P2. In package P1, create class A, class B inherited from A, class C. In package P2, create class D inherited from class A in package P1 and class E. Demonstrate working of access modifiers (private, public, protected, default) in all these classes using JAVA

Instructions for conduction of practical part:
Use eclipse or Netbean platform and acquaint with the various menus, create a test project, add a test class and run it see how you can use auto suggestions, auto fill. Try code formatter and code refactoring like renaming variables, methods and classes. Try debug step by step.

IV. COURSE OUTCOMES

CO1	Explain the object-oriented concepts and JAVA.
CO2	Use the syntax and semantics of java programming language
CO3	Develop reusable programs using the concepts of inheritance, polymorphism, interfaces and packages
CO4	Apply the concepts of Multithreading and Exception handling to develop efficient and error free codes.
CO5	Develop computer programs to solve real world problems 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	**2**	**2**	**2**	**3**	**2**	-	-	**2**	**2**	**3**	-	-	**2**	-	-	
CO2	**2**	**2**	**1**	**3**	**2**	-	-	**2**	**3**	**3**	-	-	**2**	-	-	
CO3	**2**	**3**	**3**	**3**	**2**	-	-	**2**	**3**	**3**	-	-	**2**	-	-	
CO4	**3**	**3**	**3**	**3**	**2**	-	-	**2**	**3**	**3**	-	**1**	**2**	**1**	**1**	
CO5	**3**	**3**	**3**	**3**	**2**	-	-	**2**	**3**	**3**	-	**1**	**2**	**1**	**1**	

VI. Assessment Details (CIE & SEE)

General Rules: Refer to – Academic regulations

Continuous Internal Evaluation (CIE): Refer to Annexure, SL #1

Semester End Examination (SEE): Refer to - Annexure, SL #1
Rubrics: Refer to - Annexure, SL #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	7th Edition - 2007	Tata McGraw Hill

VII(b): Reference Books:

1	Programming with Java	Mahesh Bhave and Sunil Patekar	1st Edition - 2008	Pearson Education
2	Object oriented Programming with java	Rajkumar Buyya,S Thamarasi selvi, xingchen chu	-	Tata McGraw Hill
3	Programming with Java A primer	E Balagurusamy	-	Tata McGraw Hill
4	JAVA One step Ahead	Anita Seth and B L Juneja	2017	Oxford University Press

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

- VTU e-Shikshana Program
- VTU EDUSAT Program
- https://www.youtube.com/watch?v=CFD9EFcNZTQ
- https://www.youtube.com/watch?v=grEKMHGYyns

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

Seminar, assignments, quiz, case studies, mini projects, self-study activities

Semester:	IV	**Course Type:**	HSMC		
Course Title: UHV (Universal Human Values)					
Course Code:	**23UHVH07**			**Credits:**	1
Teaching Hours/Week (L:T:P:O)			1:0:0:0	**Total Hours:**	12Hrs (Theory)
CIE Marks:	50	**SEE Marks:**	50	**Total Marks:**	100
SEE Type:	Theory	**Exam Hours:**	02 Hrs		

I. Course Objectives:

This course will enable students to:

- To help the students appreciate the essential complementarity between 'VALUES' and 'SKILLS' to ensure sustained happiness and prosperity which are the core aspirations of all human beings.
- To facilitate the development of a Holistic perspective among students towards life and profession as well as towards happiness and prosperity based on a correct understanding of the Human reality and the rest of existence. Such a holistic perspective forms the basis of Universal Human Values and movement towards value-based living in a natural way.
- To highlight plausible implications of such a Holistic understanding in terms of ethical human conduct, trustful and mutually fulfilling human behaviour and mutually enriching interaction with Nature.
- This course is intended to provide a much-needed orientation input in value education to the young enquiring minds.

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.

- The methodology of this course is explorational and thus universally adaptable. It involves a systematic and rational study of the human being vis-à-vis the rest of existence.
- In addition to the traditional lecture method, different types of innovative teaching methods may be adopted so that the activities will develop students' theoretical and applied skills.
- State the need for UHV activities and its present relevance in the society and Provide real-life examples.
- Support and guide the students for self-study activities.
- You will also be responsible for assigning homework, grading assignments and quizzes, and documenting students' progress in real activities in the field.
- This process of self-exploration takes the form of a dialogue between the teacher and the students to begin with, and then to continue within the student in every activity, leading to continuous self-evolution.
- Encourage the students for group work to improve their creative and analytical skills.

III. COURSE CONTENT

Module-1: Introduction to Value Education	3 Hrs

Introduction to Value Education: Understanding the need, basic guidelines, content and process for Value Education.

Self-Exploration–what is it? - its content and process; 'Natural Acceptance' and Experiential Validation- as the mechanism for self-exploration

The Basic Human Aspirations Continuous Happiness and Prosperity

The Program to Fulfil Basic Human Aspirations : Right understanding, Relationship and Physical Facilities- the basic requirements for fulfilment of aspirations of every human being with their correct priority

Understanding Happiness and Prosperity correctly- A critical appraisal of the current scenario, Method to fulfil the above human aspirations: understanding and living in harmony at various levels.

Textbook: 2 Chapter: 1 , 2, 3, 4
Textbook: 1 Chapter: 4

Pre-requisites (Self Learning)

Student Induction Program, Having an inherent faith and belief in our own abilities, Clearly being able to state and communicate our thoughts

RBT Levels: L1, L2,L3

Module-2: Understanding Harmony in the Human Being	3 Hrs

Understanding Human being as the Co-existence of the Self and the Body, Distinguishing between the Needs of the Self and the Body, The Body as an Instrument of the Self, Understanding Harmony in the Self, Harmony of the Self with the Body, Program to ensure self-regulation and Health , Harmony of the Self with the Body

Textbook: 1 Chapter :- 5 , 6 , 7

Pre-requisites (Self Learning)

Student Induction Program, Having an inherent faith and belief in our own abilities, Clearly being able to state and communicate our thoughts

RBT Levels: L1, L2, L3

Module-3: Harmony in the Family and Society	3 Hrs

Harmony in the Family – Understanding the Values in Human-Human Relationships , 'Trust' – the Foundational Value in Relationship, 'Respect' – as the Right Evaluation, Other Feelings, Justice in Human-to Human Relationship, Understanding Harmony in the Society, Vision for the Universal Human Order

Textbook: 1 Chapter :- 8 , 9

Pre-requisites (Self Learning)

Student Induction Program, Having an inherent faith and belief in our own abilities, Clearly being able to state and communicate our thoughts

RBT Levels: L1, L2, L3

Module-4: Harmony in the Nature/Existence	3 Hrs
Understanding Harmony in the Nature, Interconnectedness, self-regulation and Mutual Fulfilment among the Four Orders of Nature, Realizing Existence as Co-existence at All Levels, The Holistic Perception of Harmony in Existence **Textbook:1 Chapter: 10 , 11**	
Pre-requisites (Self Learning) Student Induction Program, Having an inherent faith and belief in our own abilities, Clearly being able to state and communicate our thoughts	
RBT Levels: L1, L2, L3	
Module-5: Implications of the Holistic Understanding – a Look at Professional Ethics	3 Hrs
Providing the Basis for Universal Human Values and Ethical Human Conduct text - Natural Acceptance of Human Values, Definitiveness of (Ethical) Human Conduct, A Basis for Humanistic Education, Holistic Development towards Universal Human Order : Humanistic Education and Constitution , The Vision for Holistic Development and Universal Human Order Vision for Holistic Technologies, Production Systems and Management Models : Holistic Technologies and Systems Typical Case Studies , Strategies for Transition towards Value-based Life and Profession **Textbook: 1 Chapter: 12, 14** **Textbook: 2 Chapter: 15 , 16**	
Pre-requisites (Self Learning) Student Induction Program, Having an inherent faith and belief in our own abilities, Clearly being able to state and communicate our thoughts	
RBT Levels: L1, L2, L3	

IV. COURSE OUTCOMES

CO1	Understand Value-based education towards the development of human consciousness and Self-exploration for the transformation in society.
CO2	Recognize the relevance of individual personality in harmony with society, nature and co-existence at all levels.
CO3	Apply Professional ethics through implications of Holistic understanding towards value-based life and profession

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	-	-	-	-	-	1	2	3	2	1	2	3	-	-	3
CO2	-	-	-	-	-	1	2	3	2	1	2	3	-	-	3
CO3	-	-	-	-	-	1	2	3	2	1	2	3	-	-	3

VI. Assessment Details (CIE & SEE)

General Rules: Refer to – Academic regulations

Continuous Internal Evaluation (CIE): Refer to Annexure, SL #6

Semester End Examination (SEE): Refer to - Annexure, SL #6
Rubrics: Refer to - Annexure, SL #6

VII. Learning Resources

VII(a): Textbooks: (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	The Textbook A Foundation Course in Human Values and Professional Ethics	R R Gaur, R Asthana, G P Bagaria	2nd Revised Edition, 2019. ISBN 97893-87034- 47-1	Excel Books, New Delhi
2	The Teacher"s Manual for A Foundation Course in Human Values and Professional Ethics	R R Gaur, R Asthana, G P BAGARIA	2009	Excel Books, New Delhi

VII(b): Reference Books:

1.	Jeevan Vidya: Ek Parichaya, A Nagaraj, Jeevan Vidya Prakashan, Amar kantak, 1999.
2.	Human Values, A.N. Tripathi, New Age Intl. Publishers, New Delhi, 2004.
3.	The Story of Stuff (Book).
4.	The Story of My Experiments with Truth - by Mohandas Karamchand Gandhi
5.	Small is Beautiful - E. F Schumacher.
6.	Slow is Beautiful - Cecile Andrews
7.	Economy of Permanence - J C Kumarappa
8.	Bharat Mein Angreji Raj – Pandit Sunderlal
9.	Rediscovering India - by Dharampal
10.	Hind Swaraj or Indian Home Rule - by Mohandas K. Gandhi
11.	India Wins Freedom - Maulana Abdul Kalam Azad
12.	Vivekananda - Romain Rolland (English)
13.	Gandhi - Romain Rolland (English
14.	Sussan George, 1976, How the Other Half Dies, Penguin Press. Reprinted 1986, 1991
15.	Donella H. Meadows, Dennis L. Meadows, Jorgen Randers, William W. Behrens III, 1972, Limits to Growth – Club of Rome's report, Universe Books.
16.	A Nagraj, 1998, Jeevan Vidya Ek Parichay, Divya Path Sansthan, Amarkantak
17.	P L Dhar, RR Gaur, 1990, Science and Humanism, Commonwealth Publishers.
18.	A N Tripathy, 2003, Human Values, New Age International Publishers.
19.	SubhasPalekar, 2000, How to practice Natural Farming, Pracheen (Vaidik) KrishiTantraShodh, Amravati.
20.	E G Seebauer & Robert L. Berry, 2000, Fundamentals of Ethics for Scientists & Engineers , Oxford University Press
21.	M Govindrajran, S Natrajan & V.S. Senthil Kumar, Engineering Ethics (including Human Values), Eastern Economy Edition, Prentice Hall of India Ltd.
22.	B P Banerjee, 2005, Foundations of Ethics and Management, Excel Books
23.	B L Bajpai, 2004, Indian Ethos and Modern Management, New Royal Book Co., Lucknow. Reprinted 2008.

VII(c): Web links and Video Lectures (e-Resources):
• Value Education websites, • https://www.uhv.org.in/uhv-ii, • http://uhv.ac.in, • http://www.uptu.ac.in • Story of Stuff, • http://www.storyofstuff.com • Al Gore, An Inconvenient Truth, Paramount Classics, USA • Charlie Chaplin, Modern Times, United Artists, USA • IIT Delhi, Modern Technology – the Untold Story • Gandhi A., Right Here Right Now, Cyclewala Productions • https://www.youtube.com/channel/UCQxWr5QB_eZUnwxSwxXEkQw • https://fdp-si.aicte-india.org/8dayUHV_download.php • https://www.youtube.com/watch?v=8ovkLRYXIjE • https://www.youtube.com/watch?v=OgdNx0X923I • https://www.youtube.com/watch?v=nGRcbRpvGoU • https://www.youtube.com/watch?v=sDxGXOgYEKM
VIII: Activity Based Learning / Practical Based Learning/Experiential learning:
Seminar, Assignments, Quiz, Case Studies, Self-Study Activities, Group Discussions

Semester:	IV	**Course Type:**	AEC		
Course Title: Data Science Using Python					
Course Code:	**23ECAE41**			**Credits:**	01
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:**	02

I. Course Objectives:

1. Work independently on Data Science (AI and Machine learning) projects
2. Data Analysis and Manipulation using Pandas
2. Handling Python libraries for data insights and Visualization
3. Understanding different machine learning algorithms (Supervise, Unsupervised and Semi Supervised)
4. Understanding the difference between Regression and Classifications
5. Text Analysis

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.

III. COURSE CONTENT

III(a). Theory PART

Module-1: Introduction to Python, data science and to AI-ML and Foundation-Pandas	8Hrs

Python basics, progress to object-oriented programming, and utilize Pandas for CSV handling, data manipulation, statistics, and table operations. They also explore data visualization with libraries like Matplotlib and Seaborn, crucial for presenting insights in Data Science & AI-ML, where they learn statistics, data manipulation, and machine learning implementation using Python libraries.

Textbook : Textbook1: Chapters: 1 to 9,Chapters 4: Sections 4.1 to 4.5

Chapters 5: Sections 5.2, 5.3

Pre-requisites (Self Learning) Basic computer literacy and familiarity with mathematics and statistics are beneficial for data science and AI-ML. Understanding Python basics and CSV file structures, along with relational database comprehension, aids in Pandas usage. Additionally, basic knowledge of data visualization principles enhances effective graph creation.

RBT Levels: L1, L2, L3 &L4

Module-2:Foundation-Numpy and Foundation- Descriptive Analysis	8 Hrs

Understand the distinction between one-dimensional and two-dimensional data structures and how to stack data in a two-dimensional array. Explore techniques for descriptive analysis of single and double numeric variables, along with methods for analyzing both categorical and numeric data types.

Textbook: Textbook1: Chapters: 4, 5, 10, 11, 12, 14, Chapter 4: Sections 4.1 to 4.5

Chapter 5: Sections 5.2, 5.3

Pre-requisites (Self Learning) Understanding of Python programming and familiarity with data structures. Additionally, a grasp of fundamental statistical concepts such as mean, median, and variance
is beneficial for descriptive analysis.

RBT Levels: L1, L2, L3 &L4

Module-3: Regression	8Hrs

Regression basics, data preprocessing, and feature selection techniques. Additionally, explore model regularization, residual analysis, and data import methods. Can delve into specific regression implementations, such as linear regression with preprocessing, tree-based models, and CatBoost algorithm with hyperparameter tuning.

Textbook: Textbook 1: Chapters: 7, 8, 12,· Chapter 7: Sections 7.1 to 7.3

Chapter 8: Sections 8.1 to 8.4

Pre-requisites (Self Learning): Basic understanding of Python programming, familiarity with data structures, and knowledge of fundamental statistical concepts. Additionally, comprehension of regression analysis principles and familiarity with machine learning concepts would be beneficial for grasping the topics effectively.	
RBT Levels: L1, L2, L3 &L4	
Module-4: Classification	8Hrs
Understand classification algorithms' basics and their practical applications. Hands-on experience in coding Random Forest, CatBoost, One-Class SVM, and Logistic Regression algorithms forclassification tasks. Data loading techniques and gain proficiency in implementing classification algorithms using Python**.**	
Textbook: Textbook 1, Chapters: 7, 8, 13, Chapter 7: Sections 7.1 to 7.3 **Chapter 8: Sections 8.1 to 8.4**	
Pre-requisites (Self Learning) Basic understanding of Python programming and familiarity with fundamental machine learning concepts. Additionally, knowledge of data preprocessing techniques and basic statistics would be beneficial. Understanding the principles of classification algorithms and their applications would also help in comprehending the topics effectively.	
RBT Levels: L1, L2, L3 &L4	
Module-5: Advanced Data Clustering and Text Analytics with Python	8 Hrs
Delve into clustering algorithms like KMeans, Agglomerative, and KNN for grouping data points. Explore text analytics through NLTK installation, tokenization, and TextBlob for tasks like sentiment analysis. Additionally, grasp techniques such as named-entity recognition, stemming, lemmatization, and word cloud generation for comprehensive text analysis.	
Textbook: Textbook 1, Chapters: 7, 8, 10, 13,· Chapter 7: Sections 7.1 to 7.3 **Chapter 8: Sections 8.1 to 8.4**	
Pre-requisites (Self Learning) Basic Python proficiency and familiarity with data manipulation are prerequisites. Additionally, understanding fundamental machine learning concepts and basic knowledge of text processing and NLP would be beneficial.	
RBT Levels: L1, L2, L3 &L4	

III(b). PRACTICAL PART

Sl. No.	**Experiments / Programs / Problems** (insert rows as many required)
1	Perform exploratory data analysis on a given data set to summerise its main characteristics
2	Use a data set to create a linear regression model, evaluate its performance using like matrix and Mean Absolute Error (MAE) and R_squared and visualize the regression line.
3	Build a classification model to predict categorical outcomes

IV. COURSE OUTCOMES

CO1	Advance from Python basics to using Pandas, Matplotlib, and Seaborn for data handling and analysis, essential for Data Science & AI-ML
CO2	Understand one vs. two-dimensional data structures and stacking. Explore descriptive analysis techniques for single and double numeric variables and analyze categorical and numeric data types.
CO3	Learn regression basics, pre-processing, and feature selection. Explore regularization, residual analysis, and specific implementations like linear regression, tree-based models, and CatBoost with tuning.
CO4	Understand classification algorithms, code Random Forest, CatBoost, One-Class SVM,Logistic Regression, and implement them using Python.
CO5	Learn clustering algorithms (KMeans, Agglomerative, KNN) for data grouping and text analytics (NLTK, TextBlob) for sentiment analysis, named-entity recognition, andword cloud generation.

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															
CO2	1		2	3												
CO3			3		1											
CO4		3		1												
CO5			2		2											
CO6																

VI. Assessment Details (CIE & SEE)

General Rules: Refer to – Academic regulations

Continuous Internal Evaluation (CIE):
Refer to Annexure, SL #5

Semester End Examination (SEE): Refer to - Annexure, SL #5
Rubrics: Refer to - Annexure, SL #5

RBT Levels: L1, L2, L3 &L4

VII. Learning Resources

VII(a): Textbooks: (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	Python for DataAnalysis	Wes McKinney	2nd edition 2017	O'Reilly Media

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

1	Data Science for Business: What You Need to Know about Data Mining and Data-Analytic Thinking	Foster Provost andTom Fawcett	Second Edition 2013	O'Reilly Media
2	Deep Learning	Ian Goodfellow, Yoshua Bengio, and Aaron Courville	First Edition 2016	The MIT Press
3	Introduction to Machine Learning with Python: A Guide for Data Scientists	Andreas C	First Edition 2016	O'Reilly Media
4	Hands-On Machine Learningwith Scikit-Learn,Keras, and TensorFlow: Concepts, Tools, and Techniques toBuild Intelligent Systems	Aurelien Geron	Second Edition 2019	O'Reilly Media

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

- [Kaggle](https://www.kaggle.com/): Kaggle - Data science competitions, datasets, and tutorials.
- [Python Data Science Handbook](https://jakevdp.github.io/PythonDataScienceHandbook/): Python Data Science Handbook - Online resource covering data science using Python.
- [Data Science Full Course - Learn Data Science in 10 Hours](https://www.youtube.com/watch?v=_8V5o2UHG0E): Learn Data Science in 10 Hours - Comprehensive video course covering various data science topics.
- [Python for Data Science Full Course - 6-Hour Python Data Science Tutorial](https://www.youtube.com/watch?v=rfscVS0vtbw): 6-Hour Python Data Science Tutorial - Tutorial covering Python basics, data manipulation, visualization, and machine learning.

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:**	NCMC		
Course Title: Mindful Mastery : Aptitude And Softskill 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:**	NA	**Total Marks:**	50
SEE Type:	NA			**Exam Hours:**	NA

I. Course Objectives:

- To gain a deep understanding of numerical concepts including place value, fractions, decimals, percentages, ratios, and proportions.
- To acquire skills to prioritize tasks and activities effectively based on their importance and urgency.
- To develop the ability to interpret and utilize various data representations, including tables, charts, graphs, and diagrams.
- To learn to interpret different body language signals and understand their underlying meanings in interpersonal communication.
- To acquire strategies for breaking down complex problems into manageable steps, enhancing problem-solving abilities.

II. Teaching-Learning Process (General Instructions):

The following are some of the strategies that teachers can employ to facilitate the achievement of various course outcomes:

9. **Diverse Teaching Methods**: Instead of relying solely on traditional lecture methods, can explore alternative and effective teaching approaches. These might include interactive discussions, hands-on activities, or multimedia presentations.
10. **Visual Aids**: Utilize videos and animations to elucidate complex concepts. Visual representations enhance understanding and engagement among students.
11. **Collaborative Learning**: Encourage group learning within the classroom. Collaborative activities foster teamwork, communication, and a deeper grasp of subject matter.
12. **Higher Order Thinking (HOT) Questions**: Pose at least three thought-provoking questions during class. These questions stimulate critical thinking and encourage students to analyze and evaluate information.
13. **Problem-Based Learning (PBL):** Implement PBL, which nurtures analytical skills. PBL goes beyond rote memorization by challenging students to design solutions, evaluate evidence, and think critically.
14. **Multiple Representations**: Introduce topics using various representations. Visuals, diagrams, and real-world examples cater to diverse learning styles.
15. **Creative Problem Solving**: Present different approaches to solving the same problem. Encourage students to think outside the box and devise their own innovative solutions.
16. **Real-World Application**: Discuss how each concept relates to practical scenarios. Connecting theoretical knowledge to real-world contexts enhances students' comprehension and retention.

□ Chalk & Talk □ Stud. Assignment □ Web Resources □ LCD/Smart Boards □ Stud. Seminars

III. COURSE CONTENT

Module-1: Arithmetical Ability	5 Hrs

Problems on Pipes Cisterns , Time , Work and Averages

Textbook: Textbook 1; Section-1;Page no-510to525

Prerequisites: Have the basic knowledge of Mathematics and logics

Module-2: Time management and Presentation skills	5Hrs
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 **Textbook : Textbook 2; Chapter-2**	
Prerequisites: (Self learning): Basic Presentation ideas and Time management.	
Module-3: Quantitative section and Data Interpretation	5Hrs
Simple interest and compound interest problems, Bar graphs, Pie charts and Line graphs concepts and problem. **Textbook: Textbook 1;Section-I; Page no 641-687**	
Prerequisites: Basic Calculation knowledge.	
Module-4: Body language and Postures	5Hrs
Facial expressions, Gestures, Handshakes, tone of voice, Attitude, Universal vs. Culture specific. **Textbook: Textbook 3**	
Module-5: Mental ability	4Hrs
Puzzle based question and Psychometric based interview Question **Reference link: https://www.hitbullseye.com/puzzle/logical-puzzle-questions-with-answers.php**	

IV. COURSE OUTCOMES

CO1	Apply problem-solving techniques in Pipes, Cisterns, Time, Work, and Averages, showcasing arithmetical ability.
CO2	Develop efficient time management skills, recognizing misconceptions, symptoms, and implementing effective strategies.
CO3	Apply quantitative analysis and data interpretation, handling problems in simple interest, compound interest, and graphical data interpretation.
CO4	Apply effective body language and postures in communication, distinguishing universal cues from culture-specific ones.
CO5	Apply mental agility through puzzle-solving and psychometric interview preparation, refining problem-solving and cognitive abilities.

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				1	2		1	2
CO2								2	2			2		2		
CO3	3	2						2	2		2	2	2			
CO4						2		2		2		2		2	2	1
CO5	2	2	3									3	1		2	2

VI. Assessment Details (CIE & SEE)

General Rules: Refer to – Academic regulations

Continuous Internal Evaluation (CIE): Refer to Annexure, SL #8

Semester End Examination (SEE): Refer to - Annexure, SL #8
Rubrics: Refer to - Annexure, SL #8

VII. Learning Resources

VII(a): Textbooks:

Sl. No.	Title of the Book	Name of the author	Edition and Year	Name of the publisher
1	Quantitative Aptitude for Competitive examination	R S Agarwal	2017	S Chand
2	Time Management	Marc Mincini	2003	Mcgraw Hill
3	Gestures and Body Language	Aparna majumdar	2017	V& S Publisher

VII(b): Reference Books:

1	Gestures and Body Language	Aparna majumdar	2017	V& S Publisher
2	A modern approach to logical reasoning	R S Agarwal	2019	S Chand

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

- https://youtu.be/-iQEzSd9QUQ?si=qwWVOnDiky3vyuju
- https://youtu.be/MV00SQU_f7E?si=Rq0EAIZKzCU-EVOp
- https://youtu.be/MV00SQU_f7E?list=PLOoogDtEDyvvDNHO_Ba58OrE567nCzzl2

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

Assignments, Quizzes and Seminar, group discussions etc.

|| Jai Sri Gurudev ||
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ANNEXURE

CIE & SEE evaluation for Autonomous Scheme 2023 – UG

Note: Revised as per approvals of 4th Academic Council Meeting held on 05/02/2025

S. #	Course Type /Credits	Continuous Internal Evaluation (CIE)																					Semester End Examination (SEE)									Min. pass % (CIE + SEE)
		Total CIE marks	Min. Eligty.	I. Theory Component									II. Practical Component									Total CIE marks	Dur. In hrs.	Theory			Practical			Total SEE marks	
						A. Unit test			B. Formative Assessments			Tot. Theory marks (I)			C. Weekly Evaluation		D. Internal Test			E. Prj	Tot. marks (II)				Max. conducted marks	Max. considered marks	min. pass %	Max. conducted marks	Max. considered marks	min. pass %		
				Marks	Min. Eligty.	Nos.	Marks / Each	Tot.	Nos.	Marks / Each	Tot.		Marks	Min. Eligty.	Each week	Tot. marks	Nos.	Marks / Each	Total marks	Marks												
1	BSC/ESC/PCC/ETC /PEC/OEC (3 or 4 Credit courses)	50	40%	50	40%	2	50	50 (avg. of 2)	2	50	50 (avg. of 2)	50 (avg. of A & B)	--	--	--	--	--	--	--	--	--	50 (I)	03	100	50	35%	--	--	--	50	40%
2	IBSC/IESC/IPCC/ ETC (4 Credit courses)	50	40%	50	40%	2	50	50 (avg. of 2)	2	50	50 (avg. of 2)	50 (avg. of A & B)	50	40%	50	50 (Avg. of all)	1	50	50	50	50 (Avg. of C & [D or E])	50 (Avg. of I & II)	03	100	50	35%	--	--	--	50	40%
3	IESC - CAED (4 credit course)	50	40%	--	--	--	--		--	--		--	50	40%	50	50 (Avg. of all)	1	50	50	--	50 (Avg. of C & D)	50	03	--	--	--	100	50	35%	50	40%
4	PCCL (1 Credit courses)	50	40%	--	--	--	--		--	--		--	50	40%	50	50 (Avg. of all)	1	50	50	50	50 (Avg. of C & [D or E])	50 (II)	03	--	--	--	100	50	35%	50	40%
5	AEC- IDT, Skill Development courses (1 credit course)	50	40%	50	40%	1	50		1	50		50 (Avg. of 2)	--	--	--	--	--	--	--	--	--	50 (I)	02	50	50	35%	--	--	--	50	40%
6	HSMC- CIP, Env studies, SFH, UHV (1 credit course)	50	40%	50	40%	1	50		1	50		50 (Avg. of 2)	--	--	--	--	--	--	--	--	--	50 (I)	02	50	50	35%	--	--	--	50	40%
7	HSMC - English, Kannada (No credits)	50	40%	50	40%	1	50		1	50		50 (Avg. of 2)	--	--	--	--	--	--	--	--	--	50 (I)	--	--	--	--	--	--	--	--	40%
8	NCMC - Personality Development courses, PE, Yoga, NCC, NSS, IKS (No credits)	50	40%	50	40%	--	--		1	50		50	--	--	--	--	--	--	--	--	--	50 (I)	--	--	--	--	--	--	--	--	40%

 # Formative (Successive) Assessments: Assignments/quiz/ seminars/field survey and report presentation/course project/group discussions/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 10/2/25

Principal 10.2.2025

Academic Director 10/2/25

ANNEXURE

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CIE and SEE guidelines for Autonomous Scheme 2023 –ಆ೬

Note: Revised as per approvals of 4th Academic Council Meeting held on 05/02/2025

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%.		
Continuous Internal Evaluation: The minimum passing mark for the CIE is 40% of the maximum marks (20 marks out of 50). CIE will be conducted by the department and it will have only 01 component (I): **I. Theory component:** Theory Component will consist of A. Internal Assessment Test (IAT). B. Formative Assessments (FA). **A. Internal Assessment Test:** i) There are 02 tests each of 50 marks conducted during 8th week & 15th week, respectively. ii) The question paper will have four questions (max of 3 sub questions) from the notified syllabus. Each question is set for 25 marks. iii) The student must answer 2 full questions (one from 1st & 2nd questions and another from 3rd & 4th question).	**Semester-End Examination:** The minimum passing mark for SEE is 35% of the maximum marks (18 out of 50 marks). Duration of 03 hours and total marks of 100. i) The question paper will have ten questions. Each question is set for 20 marks. ii) 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. iii) The students have to answer 5 full questions, selecting one full question from each module. iv) 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 40% (40 marks out of 100) in the sum total of the CIE and SEE taken together.

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Principal 10.2.2025

Academic Director 10/2/25

iv) IAT QP shall be designed to attain the different levels of Bloom's taxonomy as per the outcomes defined for the course. **B. Formative assessments:** i) 02 formative assessments each of 50 marks shall be conducted by the course coordinator based on the dept. planning during random times. ii) One formative assessment shall be completed before 5th week and second shall be completed before 12th week. iii) The syllabus content for the formative assessment shall be defined by the course coordinator. iv) The formative assessments include Assignments/seminars/case study/field survey/ report presentation/course project/etc. v) The assignment QP or Quiz QP shall indicate marks of each question and the relevant COs & RBT levels. vi) The rubrics required for the other type of 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:** CIE = Avg. {Avg. of two tests + Avg. of two FA} **The documents of all the assessments shall be maintained meticulously.**		
2. IBSC/IESC/IPCC– Integrated with Theory & Practical (04 credit courses), ETC (if offered as integrated course)		
The weightage of Continuous Internal Evaluation (CIE) is 50% and for Semester End Exam (SEE) is 50%.		
Continuous Internal Evaluation: The minimum passing mark for the CIE is 40% of the maximum marks (20 marks out of 50). Minimum eligibility of 40% marks shall be attained separately in both the theory component and practical component. CIE will be conducted by the department and it will have 02 component: I. Theory Component. II. Practical Component. **I. Theory Component:** Theory component will consist of A. Internal Assessment Test (IAT). B. Formative assessments (FA).	The minimum passing mark for SEE is 35% of the maximum marks (18 out of 50 marks). **Semester-End Examination:** Only theory SEE for duration of 03 hours and total marks of 100. i) The question paper will have ten questions. Each question is set for 20 marks. ii) 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 student is declared as a pass in the course if he/she secures a minimum of 40% (40 marks out of 100) in the sum total of the CIE and SEE taken together.

A. Internal Assessment Test: i) There are 02 tests each of 50 marks conducted during 8th week & 15th week, respectively. ii) The question paper will have four questions (max of 3 sub questions) from the notified syllabus. Each question is set for 25 marks. iii) It is suggested to include questions on laboratory content in the Internal Assessment test Question papers. iv) The student must answer 2 full questions (one from 1st & 2nd questions and another from 3rd & 4th question). v) IAT QP shall be designed to attain the different levels of Bloom's taxonomy as per the outcome defined for the course. **B. Formative assessments:** i) 02 formative assessments each of 50 marks shall be conducted by the course coordinator based on the dept. planning during random times. ii) One formative assessment shall be completed before 5th week and second shall be completed before 12th week. iii) The syllabus content for the formative assessment shall be defined by the course coordinator. iv) The formative assessments include Assignments/seminars/case study/field survey/ report presentation/course project/etc. v) The assignment QP or Quiz QP shall indicate marks of each question and the relevant COs & RBT levels. vi) The rubrics required for the other type of formal assessments shall be defined by the departments along with mapping of relevant COs & POs and get it approved from academic dean. **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 concerned committee) **D.** One laboratory Internal Assessment test will be conducted during the 14th week for 50 marks. (rubrics will be published by the concerned 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 & POs and get it approved from academic dean.	iii) The laboratory content must be included in framing the theory question papers. iv) The students have to answer 5 full questions, selecting one full question from each module. v) 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	

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Note:

i) 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.

ii) Otherwise, components 'C' & 'D' shall be considered for average of item II.

The final CIE marks will be 50:

CIE= Avg. {**I** [Avg. of two tests + Avg. of two FA] + **II** [Avg. of (C & (D or 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 40% of the maximum marks (20 marks out of 50).

i) CIE shall be conducted for max. marks of 100 and shall be scaled down to 50 marks

ii) CIE component should comprise of both Manual and computer drafting i.e. 50% manual and 50% computer drafting out of total 100 marks

iii) 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**

The minimum passing mark for SEE is 35% of the maximum marks (18 out of 50 marks).

Semester-End Examination:

SEE for duration of 03 hours and total marks of 100.

i) SEE shall be conducted and evaluated for maximum marks of 100 and shall be scaled down to 50 marks.

ii) Question paper shall be made available for each batch as per schedule.

iii) Evaluation shall be carried jointly by both the internal & external examiners.

iv) Scheme of Evaluation: To be defined by both the examiners jointly.

v) Maximum 3 questions shall be set as per the following pattern.

The student is declared as a pass in the course if he/she secures a minimum of 40% (40 marks out of 100) in the sum total of the CIE and SEE taken together.

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iv) 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.**

v) Assignments = **10 Marks from each module. (50 marks scaled down to 25 Marks)**

vi) The final CIE 50 marks = Test (25 marks) + Assignment (25 marks).

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%.

Continuous Internal Evaluation: The minimum passing mark for the CIE is 40% of the maximum marks (20 marks out of 50).

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 concerned committee).

D. One laboratory Internal Assessment test will be conducted for 50 marks (rubrics will be published by the concerned 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 & POs and get it approved from academic dean.

The minimum passing mark for SEE is 35% of the maximum marks (18 out of 50 marks).

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.

i) The examination shall be conducted for 100 marks and shall be reduced to 50 marks proportionately.

ii) All laboratory experiments/programs are to be included for practical examination.

iii) 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

The student is declared as a pass in the course if he/she secures a minimum of 40% (40 marks out of 100) in the sum total of the CIE and SEE taken together.

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Note: **i)** 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. **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.**	requirement evaluation rubrics shall be decided jointly by examiners. iv) Students can pick one question (experiment/program) from the questions lot prepared by the internal /external examiners jointly. v) Evaluation of test write-up/ conduction procedure and result/viva will be conducted jointly by examiners. vi) General rubrics suggested for SEE: writeup-20%, Conduction procedure and results-60%, Viva-voce 20% of maximum marks. vii) Change of experiment is allowed only once and shall be assessed only for 85% of the maximum marks.	

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 40% of the maximum marks (20 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 (IAT). B. Formative Assessments (FA). **A. Internal Assessment Test:** i) 01 test of 50 marks conducted during 15th week. ii) The question paper will be of Multiple-Choice Questions (MCQ). iii) The student must answer all questions. iv) IAT QP shall be designed to attain the different levels of Bloom's taxonomy as per the outcome defined for the course.	The minimum passing mark for SEE is 35% of the maximum marks (18 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. i) Multiple choice Question paper. ii) The students have to answer all questions.	The student is declared as a pass in the course if he/she secures a minimum of 40% (40 marks out of 100) in the sum total of the CIE and SEE taken together.

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B. Formative assessments: i) 01 formative assessment of 50 marks shall be conducted by the Course coordinator based on the dept. planning during 12th week. ii) The formative assessments include Assignments/seminars/case study/field survey/ report presentation/course project/etc. iii) The assignment QP shall indicate marks of each question and the relevant COs & RBT levels. iv) The rubrics required for the other type of formal assessments shall be defined by the departments along with mapping of relevant COs & POs. **The final CIE marks will be 50:** CIE = Avg. of 02 events (01 IAT and 01 FA). **The documents of all the assessments shall be maintained meticulously.**		

6. HSMC: (01 credit course)

The weightage of Continuous Internal Evaluation (CIE) is 50% and for Semester End Exam (SEE) is 50%.

Continuous Internal Evaluation: The minimum passing mark for the CIE is 40% of the maximum marks (20 marks out of 50). 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 (IAT). B. Formative Assessments (FA). **A. Internal Assessment Test:** i) 01 test of 50 marks conducted during 15th week. ii) The question paper will be of Multiple-Choice Questions (MCQ). iii) The student must answer all questions. iv) IAT QP shall be designed to attain the different levels of Bloom's taxonomy as per the outcome defined for the course **B. Formative assessments:** i) 01 formative assessment of 50 marks shall be conducted by the faculty based on the dept. planning during 12th week. ii) The formative assessments include Assignments/seminars/case study/field survey/ report presentation/course project/etc.	The minimum passing mark for SEE is 35% of the maximum marks (18 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. i) Multiple choice Question paper. ii) The students have to answer all questions	The student is declared as a pass in the course if he/she secures a minimum of 40% (40 marks out of 100) in the sum total of the CIE and SEE taken together.

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iii) The assignment QP shall indicate marks of each question and the relevant COs & RBT levels. iv) The rubrics required for the other type of formal assessments shall be defined by the departments along with mapping of relevant COs & POs. **The final CIE marks will be 50:** CIE = Avg. of 02 events (01 IAT and 01 FA). **The documents of all the assessments shall be maintained meticulously.**		
7. HSMC: (0 credit courses)		
The weightage is only for Continuous Internal Evaluation (CIE).		
Continuous Internal Evaluation: The minimum passing mark for the CIE is 40% of the maximum marks (20 marks out of 50). 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 (IAT). B. Formative assessments (FA). **A. Internal Assessment Test:** i) 01 test of 50 marks conducted during 15th week. ii) The QP will be of Multiple-Choice Questions (MCQ). iii) The student must answer all questions. iv) IAT QP shall be designed to attain the different levels of Bloom's taxonomy as per the outcome defined for the course **B. Formative assessments:** i) 01 formative assessment of 50 marks shall be conducted by the faculty based on the dept. planning during 12th week. ii) The formative assessments include Assignments/seminars/case study/field survey/ report presentation/course project/etc. iii) The assignment QP shall indicate marks of each question and the relevant COs & RBT levels. iv) The rubrics required for the other type of formal assessments shall be defined by the departments along with mapping of relevant COs & POs. **The final CIE marks will be 50:** CIE = Avg. of 02 events (01 IAT and 01 FA). **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 40% (20 marks out of 50) in the CIE.

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8. NCMC: (0 credit course)		
The weightage is only for Continuous Internal Evaluation (CIE).		
Continuous Internal Evaluation: The minimum passing mark for the CIE is 40% of the maximum marks (20 marks out of 50). 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 Assessment (FA). **B. Formative assessments:** i) 01 formative assessment of 50 marks shall be conducted by the faculty based on the dept. planning during random times during 12th week. ii) The formative assessments include Quiz/Assignments/seminars/case study/field survey/ report presentation/course project/etc. iii) The assignment QP shall indicate marks of each question and the relevant COs & RBT levels. iv) The rubrics required for the other type of 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 40% (20 marks out of 50) in the CIE.

Academic Dean
Dr. Babu N V

Principal
Dr. K V Mahendra Prashanth

Academic Director
Dr. Puttaraju

Academic Dean

Principal 10.2.2025

Academic Director

|| Jai Shree Gurudev ||
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Certified by ISO 9001 – 2015

ATAL Ranking:
Band Performer

Band of 151 to 300 in
Innovation Category

Academic Year 2024-2025

2023-2027 Batch

Department Vision

Empowering Electronics and Communication engineers to meet the advancements in technological and societal needs.

Department Mission

M1: To facilitate students in acquiring proficiency & providing eminence in Technical education.

M2: To imbibe value based education that contributes to the human values, ethics and societal relevance.

M3: To foster culture of innovation, industry and research in developing intellectual professionals and entrepreneurs.