



RAJALAKSHMI ENGINEERING COLLEGE
(An Autonomous Institution Affiliated to Anna University, Chennai)
Choice Based Credit System (CBCS)
REGULATIONS – 2023
B.Tech. ARTIFICIAL INTELLIGENCE AND MACHINE LEARNING
CURRICULUM AND SYLLABUS

Vision

To be a Department of Excellence in Information Technology Education, Research and Development.

Mission

- To train the students to become highly knowledgeable in the field of Information Technology.
- To promote continuous learning and research in core and emerging areas.
- To develop globally competent students with strong foundations, who will be able to adapt to changing technologies.

PROGRAMME EDUCATIONAL OBJECTIVES (PEOs)

PEO 1: To equip students with essential background in computer science with emphasis on Artificial Intelligence, Machine Learning, basic electronics and applied mathematics.

PEO 2: To prepare students with fundamental knowledge in programming languages, and tools and enable them to develop applications using emerging technologies.

PEO 3: To encourage research and innovative project development in the field of Artificial Intelligence, Machine Learning, Deep Learning, Networking, Security, Web development, Data Science and also emerging technologies for social benefit.

PEO 4: To develop professionally ethical individuals enhanced with analytical skills, communication skills and organizing ability to meet industry requirements.

PROGRAMME OUTCOMES (POs)

PO1: Engineering knowledge: Apply the knowledge of Mathematics, Science, Engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.

PO2: Problem analysis: Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.

PO3: Design/development of solutions: Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.

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

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

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

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

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

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

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

PO11: Project management and finance: Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.

PO12: Life-long learning: Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

PROGRAM SPECIFIC OUTCOMES (PSOs)

A graduate of the Artificial Intelligence and Machine Learning Program will demonstrate

PSO 1: Foundation Skills: Ability to understand, analyze and develop Intelligent systems based on Algorithms, Web design, Artificial Intelligence, Machine Learning, Deep Learning, and Data Science for efficient design of computer-based systems of varying complexity; familiarity and practical competence with a broad range of programming languages, tools and open source platforms.

PSO 2: Problem-Solving Skills: Ability to apply mathematical methods, model real world problem using appropriate Artificial Intelligence and Machine Learning algorithms and solve computational problems. To understand and apply standard practices and strategies in project development, using open-ended programming environments to deliver a quality product.

PSO 3: Successful Progression: Ability to apply knowledge in various domains to identify gaps and to provide solutions in the form of new ideas, inculcate passion towards higher studies, creating innovative career paths to be an entrepreneur and evolve as an ethically responsible Artificial Intelligence and Machine Learning professional with committed to society.

CURRICULUM

B.Tech. ARTIFICIAL INTELLIGENCE AND MACHINE LEARNING Regulation 2023 | Total Credits: 161

SEMESTER I								
Sl. No.	Course Code	Course Title	Category	Contact Periods	L	T	P	C
THEORY COURSES								
1.	HS23111	Technical Communication I	HS	2	2	0	0	2
2.	MA23116	Mathematical Foundations for AI	BS	4	3	1	0	4
3.	GE23117	தமிழர் மரபு/Heritage of Tamil	HS	1	1	0	0	1
LAB ORIENTED THEORY COURSES								
4.	PH23132	Physics for Information Science	BS	5	3	0	2	4
5.	GE23131	Programming using C	ES	7	1	0	6	4
6.	EE23133	Basic Electrical and Electronics Engineering	ES	5	3	0	2	4
LABORATORY COURSE								
7.	GE23122	Engineering Practices- Electrical and Electronics	ES	2	0	0	2	1
NON CREDIT COURSES								
8.	MC23111	Indian Constitution and Freedom Movement	MC	3	3	0	0	0
TOTAL				29	16	1	12	20

SEMESTER II								
Sl. No.	Course Code	Course Title	Category	Contact Periods	L	T	P	C
THEORY COURSES								
1.	MA23214	Probability and Inferential Statistics	BS	4	3	1	0	4
2.	GE23111	Engineering Graphics	ES	4	2	2	0	4
3.	GE23217	தமிழரும் தொழில்நுட்பமும்/Tamil & Technology	HS	1	1	0	0	1
LAB ORIENTED THEORY COURSES								
4.	IT23231	Digital Principles and Computer Architecture	PC	5	3	0	2	4
5.	AI23231	Principles of Artificial Intelligence	PC	5	3	0	2	4
6.	CS23231	Data Structures	PC	7	3	0	4	5
LABORATORY COURSES								
7.	HS23222/HS23223	Technical Communication II / English for Professional Competence	HS	2	0	0	2	1
8.	GE23121	Engineering Practices-Civil and Mechanical	ES	2	0	0	2	1
9.	CS23221	Python Programming Lab	PC	4	0	0	4	2
TOTAL				34	15	3	16	26

SEMESTER III								
SI. NO.	COURSE CODE	COURSE TITLE	Category	Contact Periods	L	T	P	C
THEORY COURSES								
1.	MA23313	Discrete Mathematics for AI	BS	4	3	1	0	4
2.	BA23512	Fundamentals of Accounting	HS	3	3	0	0	3
LAB ORIENTED THEORY COURSES								
3.	AI23331	Fundamentals of Machine Learning	PC	5	3	0	2	4
4.	CS23331	Design and Analysis of Algorithms	PC	5	3	0	2	4
5.	CS23332	Database Management Systems	PC	7	3	0	4	5
6.	CS23333	Object Oriented Programming Using Java	PC	7	1	0	6	4
NON CREDIT COURSES								
7.	MC23112	Environmental Science and Engineering	MC	3	3	0	0	0
TOTAL				34	19	1	14	24

SEMESTER IV								
SI. NO.	COURSE CODE	COURSE TITLE	Category	Contact Periods	L	T	P	C
THEORY COURSES								
1.		Open Elective-I	OE	3	3	0	0	3
LAB ORIENTED THEORY COURSES								
2.	MA23434	Optimization Techniques for AI	BS	5	3	0	2	4
3.	AI23431	Web Technology and Mobile Application	PC	5	1	0	4	3
4.	CS23431	Operating Systems	PC	7	3	0	4	5
5.	CS23432	Software Construction	PC	5	3	0	2	4
EMPLOYABILITY ENHANCEMENT COURSES								
6.	GE23421	Soft Skills - I	EEC	2	0	0	2	1
7.	AI23421	Industry Internship (2/4 Weeks)	EEC					1
TOTAL				27	13	0	14	21

SEMESTER V								
SI. NO.	COURSE CODE	COURSE TITLE	Category	Contact Periods	L	T	P	C
THEORY COURSES								
1.		Professional Elective-I	PE	3	3	0	0	3
2.		Professional Elective – II	PE	3	3	0	0	3
LAB ORIENTED THEORY COURSES								
3.	AI23531	Deep Learning	PC	5	3	0	2	4
4.	AD23532	Framework for Data and Visual Analytics	PC	5	3	0	2	4
5.	CS23532	Computer Networks	PC	7	3	0	4	5
LABORATORY COURSES								
6.	AI23521	Build and Deploy Machine Learning Applications	PC	2	0	0	2	1
7.	AD23521	Data Science Laboratory	PC	4	0	0	4	2
EMPLOYABILITY ENHANCEMENT COURSES								
8.	GE23521	Soft Skills - II	EEC	2	0	0	2	1
TOTAL				31	15	0	16	23

SEMESTER VI								
SI. NO.	COURSE CODE	COURSE TITLE	Category	Contact Periods	L	T	P	C
THEORY COURSES								
1.		Professional Elective-III	PE	3	3	0	0	3
2.		Open Elective-II	OE	3	3	0	0	3
3.	AI23611	Secure Systems Engineering	PC	3	3	0	0	3
LAB ORIENTED THEORY COURSES								
4.	AI23631	Predictive and Prescriptive Analytics	PC	5	3	0	2	4
5.	AI23632	Foundations of Natural Language Processing	PC	5	3	0	2	4
6.	AI23633	Design Thinking for Innovation in Machine Learning	EEC	3	1	0	2	2
EMPLOYABILITY ENHANCEMENT COURSES								
5.	GE23622	Problem Solving Techniques	EEC	2	0	0	2	1
TOTAL				24	16	0	8	20

SEMESTER VII								
Sl. NO.	COURSE CODE	COURSE TITLE	Category	Contact Periods	L	T	P	C
THEORY COURSES								
1.		Professional Elective -IV	PE	3	3	0	0	3
2.	AI23711	Social and Ethical Issues in AI	PC	1	1	0	0	1
3.	AI23712	Reinforcement Learning	PC	3	3	0	0	3
LAB ORIENTED THEORY COURSES								
4.	IT23731	Cloud and Big data Architecture	PC	5	3	0	2	4
LABORATORY COURSES								
5.	AI23721	Project Phase I	EEC	8	0	0	8	4
TOTAL				20	10	0	10	15

SEMESTER VIII								
Sl. NO.	COURSE CODE	COURSE TITLE	Category	Contact Periods	L	T	P	C
THEORY COURSES								
1.		Professional Elective-V	PE	3	3	0	0	3
2.		Professional Elective- VI	PE	3	3	0	0	3
LABORATORY COURSES								
3.	AI23821	Project Phase II	EEC	12	0	0	12	6
TOTAL				18	6	0	12	12

TOTAL NO. OF CREDITS: 161

PROFESSIONAL ELECTIVES (PE)

Programme Specific Elective 1 (3 Credits)								
SL. NO.	COURSE CODE	COURSE TITLE	Category	Contact Periods	L	T	P	C
1.	AI23A31	Social Network Analysis	PE	4	2	0	2	3
2.	AI23A32	Biomedical Data Analysis	PE	4	2	0	2	3
3.	AD23A21	Image Processing and Computer Vision	PE	4	2	0	2	3
4.	AI23A33	AI for Game Programming	PE	4	2	0	2	3
5.	AI23A34	Text Mining	PE	4	2	0	2	3
6.	AI23A35	Recommendation system	PE	4	2	0	2	3
7.	AI23A36	Big Data Analytics	PE	4	2	0	2	3

Programme Specific Elective 2 (3 Credits)								
SL. NO.	COURSE CODE	COURSE TITLE	Category	Contact Periods	L	T	P	C
1.	AI23B31	Knowledge Representation and Reasoning	PE	4	2	0	2	3
2.	AI23B32	Soft Computing	PE	4	2	0	2	3
3.	AI23B33	Introduction to AI Robotics	PE	4	2	0	2	3
4.	AI23B34	Human Computer Interaction	PE	4	2	0	2	3
5.	AI23B35	Information Visualization	PE	4	2	0	2	3
6.	AI23B36	Cognitive Science	PE	4	2	0	2	3

Full Stack Development								
SL. NO.	COURSE CODE	COURSE TITLE	Category	Contact Periods	L	T	P	C
1.	IT23P31	C# and .Net Programming	PE	4	2	0	2	3
2.	CS23A34	User Interface Design	PE	4	2	0	2	3
3.	IT23431	Software Testing	PE	4	2	0	2	3
4.	CS23A35	Web Application Security	PE	4	2	0	2	3
5.	IT23B33	DevOps	PE	4	2	0	2	3
6.	IT23B32	Advanced Web Programming	PE	4	2	0	2	3
7.	IT23C12	Software Project Management	PE	3	3	0	0	3

Emerging Technologies								
SI. NO.	COURSE CODE	COURSE TITLE	Category	Contact Periods	L	T	P	C
1.	IT23P31	Internet of Things	PE	4	2	0	2	3
2.	CS23A31	Business Analytics	PE	4	2	0	2	3
3.	CS23A32	Robotic Process Automation	PE	5	1	0	4	3
4.	CB23G11	Quantum Computation and Quantum Information	PE	3	3	0	0	3
5.	CR23A33	Cryptocurrency and Blockchain Technologies	PE	4	2	0	2	3
6.	CS23A36	3D Printing and Design	PE	4	2	0	2	3
7.	CS23A33	Cyber security and Forensics	PE	4	2	0	2	3
8.	IT23C18	Agile Methodologies	PE	3	3	0	0	3

Cyber Security								
SI. NO.	COURSE CODE	COURSE TITLE	Category	Contact Periods	L	T	P	C
1.	CR23A11	Security Assessment and Risk Analysis	PE	3	3	0	0	3
2.	CS23A11	Malware Detection and Analysis	PE	3	3	0	0	3
3.	CR23A31	Ethical Hacking and Security	PE	4	2	0	2	3
4.	CR23A32	Digital and Mobile Forensics	PE	4	2	0	2	3
5.	CR23A33	Cryptocurrency and Blockchain Technologies	PE	4	2	0	2	3
6.	CR23A34	Security and Privacy in Cloud	PE	4	2	0	2	3
7.	CR23A35	Social Network Security	PE	4	2	0	2	3
8.	CS23A35	Web Application Security	PE	4	2	0	2	3
9.	CR23A36	Information Security and Management	PE	4	2	0	2	3

Virtual and Augmented Reality								
SI. NO.	COURSE CODE	COURSE TITLE	Category	Contact Periods	L	T	P	C
1.	CS23A37	Augmented Reality and Virtual Reality	PE	4	2	0	2	3
2.	CD23B21	Data Visualization	PE	6	0	0	6	3
3.	CS23A39	Game Development	PE	4	2	0	2	3
4.	CS23B31	Introduction to Metaverse	PE	4	2	0	2	3
5.	IT23B35	Graphics and Multimedia	PE	4	2	0	2	3
6.	CS23A38	Digital Marketing	PE	4	2	0	2	3
7.	CD23721	Visual Effects	PE	6	0	0	6	3
8.	CD23731	Film Making and Radio podcasting	PE	4	2	0	2	3
9.	CS23A34	User Interface Design	PE	4	2	0	2	3

OPEN ELECTIVE COURSES OFFERED BY AIML

SL. NO.	COURSE CODE	COURSE TITLE	Category	Contact Periods	L	T	P	C
1.	AI23O31	Artificial Intelligence and Neural Network	OE	3	3	0	0	3
2.	AI23O32	Introduction to Machine Learning	OE	4	2	0	2	3

SUMMARY OF ALL COURSES

B.Tech. ARTIFICIAL INTELLIGENCE AND MACHINE LEARNING										
S.NO	Course Category	Credits per Semester								Total Credits
		I	II	III	IV	V	VI	VII	VIII	
1	HS	3	2	4						9
2	BS	8	4	4	4					20
3	ES	9	7							16
4	PC		13	16	12	16	11	8		76
5	PE					6	3	3	6	18
6	OE				3		3			6
7	EEC				2	1	3	4	6	16
8	MC									
	Total	20	26	24	21	23	20	15	12	161

AI APPLICATIONS as Minor degree for other branches

Total Credits: 18

AI Applications as Minor degree for other branches									
SL. NO.	COURSE CODE	COURSE TITLE	Category	Contact Periods	L	T	P	C	
1.		Principles of Artificial Intelligence	PE	5	3	0	2	4	
2.		Fundamentals of Machine Learning	PE	5	3	0	2	4	
3.		Computer vision and applications	PE	5	3	0	2	4	
4.		Supply chain analytics	PE	4	2	0	2	3	
5.		AI in Governance	PE	4	2	0	2	3	
6.		AI in Health care	PE	4	2	0	2	3	

AIML Hons – Choose

- 1 Course from Programme Specific Elective 1- 4 Credits
- 2 Courses from Programme Specific Elective 2- 3 Credits – 6 Credits
- 3 Courses from General Elective – 3 Credit – 9 Credits

Total Credits: 19

Students are permitted to do the following activities in their due course, after successful completion, students can drop any one professional /Open elective course (Max 3 credits)

Guidelines for Special Projects / Activities for AIML, AIDS and CSD

S.no	Description	Credits	To be Completed	Compulsory	Optional	Professional or Open Elective can be dropped in
1	GE23527 Research Paper L T P C : 0 0 2 1	1	on or before VI Semester		AIML, AIDS & CSD	Additional credits or combine with other online courses eligible drop in VII or VIII Semester
2	GE23427 Games/Short Film/ Animation Videos/ Animated Educational Content L T P C : 0 0 6 3	3	on or before VI Semester	CSD	AIML & AIDS	Not applicable for CSD, but for others in VII or VIII Sem (3 - credits Course only)
3	GE23428 Interdisciplinary Societal Project / Real World Web & Mobile Applications/ Innovative Product L T P C : 0 0 6 3	3	on or before VI Semester		AIML , AIDS &CSD	VII or VIII Sem (3 - credits Course only)
4	GE23429 Participation in National /International competitions L T P C : 0 0 6 3	3	on or before VI Semester		AIML , AIDS &CSD	VII or VIII Sem (3 - credits Course only)

GE23527 Research Paper writing	L T P C : 0 0 2 1
(Eligible to drop 1 credit course Professional / Open elective course (if any) or combined with other online courses, eligible to drop one Professional/Open Elective (Max 3 credits) in VII or VIII semester)	

Research Paper –Guideline

Activities:

- Individual work
- Each student has to identify the domain area
- Select any 5 conferences/Journal papers to understand their work (published within 5 years)
- Write a research paper on comparative study on the following topics
 - Aim of the paper
 - Problem statement identified
 - Methodology to solve the problem
 - Tools used to solve the problem
 - Result of the problem
 - Identify the error or defect in the result
 - Identify the future work / enhancement of this result

Assessment:

- The **Research Paper writing** shall be evaluated for a maximum of 100 marks, as a Continuous Assessment
- A guide will be assigned to each student to monitor the progress and conduct the review meetings.
- Finally, student has to submit the research paper on comparative study
- The viva-voce examination will be conducted with external faculty member from other/same department(s)

Continuous Assessment 100 Marks		
Review I	Review II	Viva-Voce
Guide	Guide	External (from other department)
30	30	40

Evaluation - To be given as a Rubric – some components

- Introduction/Topic - introduction grabs interest of reader and states topic. Thesis/topic clear, well-developed, and a definitive statement.
- Topic Focus –The topic is focused narrowly enough for the scope of this assignment. A thesis statement provides direction for the paper, either by statement of a position or hypothesis.
- Content - Balanced presentation of relevant and legitimate information that clearly supports a central purpose or argument and shows a thoughtful, in-depth analysis of a significant topic. Concepts are integrated into the writer’s own insights.
- Depth of Discussion - In-depth discussion & elaboration in all sections of the paper. Sources support the thesis argument in a logical manner. References are correctly cited.
- Evaluation and Results – Appropriate evaluation Measure & Results Comparison with existing work
- Conclusion -Summary of thesis argument with concluding ideas that impact reader. Introduces no new information
- Review Presentations

- Writing - Writing is clear and relevant, with no grammatical and/or spelling errors – polished and professional. Reference, citations and images are properly formatted.
- Length - Paper is the not more than 10 pages specified in the assignment.
- References–(atleast 7) Quality -Sources include both general background sources and specialized sources. All web sites utilized are authoritative.

CATEGORY	Obtained	9-10 points	7-8 points	4-6 points	0-3 points
Introduction/Topic					
Topic Focus					
Content					
Depth of Discussion					
Evaluation and Results					
Conclusion					
Review Presentations					
Writing					
Length					
References					
Total:					

Passing Requirements:

- The student should secure 50% marks in Continuous Assessment to pass in the subject
- If a student fails in this course he/she has to redo this course in subsequent semesters.

GE23427 Games/Short Film/ Animation Videos / Animated Educational Content (Eligible to drop one Professional/Open Elective(Max 3-credits) in VII or VIII semester)	L T P C : 0 0 6 3
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Activities:

- Team Size : Maximum 2 students
- Team has to identify the problem statement of game/ Educational video content / short film/ Animated video
- Committee (consist of Project coordinator, Faculty member and guide) has to approve the team proposal to proceed further
- Team has to develop GAME/Video
- Team has to submit the report

Assessment:

- The **Game/Short Film/ Animation Videos /Animated Educational Content** shall be evaluated for a maximum of 100 marks, as a Continuous Assessment
- A guide will be assigned to each team to monitor the progress and conduct the review meetings.
- Finally, each student in the team has to submit the project report
- The viva-voce examination will be conducted with external faculty members from other/same department
- Based on the quality of the project, committee can approve to publish in YouTube.

Continuous Assessment 100 Marks		
Review I	Review II	Viva-Voce
Guide	Guide	External (from other department)
30	30	40

Passing Requirements:

- The student should secure 50% marks in Continuous Assessment to pass in the subject
- For CSD students, this course is compulsory, in such a case , If a student fails in this course he/she has to redo this course in subsequent semesters
- For branch students, on successful completion of this project work, students are eligible to drop one Professional o/Open Elective (Max. 3 credits) in VII or VIII Semesters

GE23428 Interdisciplinary Societal Project / Real World Web or Mobile Applications / Innovative Product (Eligible to drop one Professional/Open Elective(Max 3-Credits) in VII or VIII semester)	L T P C : 0 0 6 3
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Activities:

- Team Size : Maximum 2 students
- Team has to identify the problem statement to solve
- Committee (consist of a Project coordinator, a Faculty member and a guide) has to approve the team proposal to proceed further
- Team has to develop a project
- Team has to submit the Project report

Assessment:

- The **Project work** shall be evaluated for a maximum of 100 marks, as a Continuous Assessment
- A guide will be assigned to each team to monitor the progress and conduct the review meetings.
- Finally, each student in the team has to submit the project report
- The viva-voce examination will be conducted with external faculty members from other/same department
- Based on the quality of the project, committee can approve to publish in YouTube.

Continuous Assessment 100 Marks		
Review I	Review II	Viva-Voce
Guide	Guide	External (from other department)
30	30	40

Passing Requirements:

- The student should secure 50% marks in Continuous Assessment to pass in the subject
- on successful completion of the project work, students are eligible to drop one Professional or Open Electives (3 credits) in VII or VIII Semesters

GE23429 Participation in National /International competitions (Eligible to drop one Professional/Open Elective (Max 3-credits) in VII or VIII semester)	L T P C 0 0 6 3
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Activities:

- Team Size : Maximum 3 students
- Team has to identify National / International level competition
- Based on the problem statement GUIDE will be assigned
- Committee (consist of Project coordinator, Faculty member and guide) has to approve the proposal of the team to proceed further
- Team has to prepare and participate in the competition
- Team has to submit the final report

Assessment:

- Committee (consist of Project coordinator, Faculty member and guide) has to evaluate the report and should conduct viva-voce examination

Viva-Voce
50 Marks

Passing Requirements:

- The student should secure 50% marks in the Viva-voce examination
- Eligible students can drop one Professional or Open Elective (Max. 3 credits) in VII or VIII Semesters

SEMESTER I

Subject Code	Subject Name (Theory course)	Category	L	T	P	C
HS 23111	Technical Communication I	Theory	2	0	0	2
Common to all branches of B.E/B. Tech programmes – First Semester						

Objectives:
To facilitate students develop their comprehension skills
To enable students to improve their receptive skills
To equip learners with better vocabulary and enhance their writing skills
To aid students speak effectively in all kinds of communicative contexts.
To improve the learners' basic proficiency in workplace communication

UNIT-I	DEVELOPING COMPREHENSION SKILLS	6
Listening: Introduction to Informational listening – Listening to Podcasts, News Reading: Intentional Reading - Short Narratives and Passages. Speaking: Introducing Oneself, Narrating a Story / Incident. Writing: Sequential Writing – connecting ideas using transitional words (Jumbled Sentences), Process Description Grammar: Verbs – Main & Auxiliary: Simple Tenses – Form, Function and Meaning. Vocabulary: Word formation – Prefix, Suffix, Compound Words.		
UNIT-II	LISTENING AND EXTENDED READING	6
Listening: Deep Listening – Listening to Talk Shows and Debates Reading: In-depth Reading - Scanning Passages Speaking: Describing Current Issues, Happenings, etc., Writing: Note Making, Note Taking – Paragraph Writing Grammar: Continuous Tenses, Prepositions, Articles Vocabulary: One Word Substitutes, Phrasal Verbs.		
UNIT-III	FORMAL WRITING AND VERBAL ABILITY	6
Listening: Listening to Lectures and Taking Notes Reading: Interpretation of Tables, Charts and Graphs Speaking: SWOT Analysis on Oneself Writing: Formal Letter Writing and Email Writing Grammar: Perfect Tenses, Phrases and Clauses, Discourse Markers Vocabulary : Verbal Analogy / Cloze Exercise		
UNIT-IV	ENHANCING SPEAKING ABILITY	6
Listening: Listening to eminent voices of one's interest (Martin Luther King, APJ Abdul Kalam, etc..) Reading: Timed Reading, Filling KWL Chart. Speaking: Just a Minute, Impromptu Writing: Check-list, Instructions. Grammar: 'Wh' Questions / 'Yes' or 'No' Questions, Imperatives Vocabulary: Synonyms, Antonyms, Different forms of the same words.		
UNIT-V	LANGUAGE FOR WORKPLACE	6
Listening: Extensive Listening (Audio books, rendering of poems, etc.) Reading: Extensive reading (Jigsaw Reading, Short Stories, Novels) Speaking: Short Presentations on Technical Topics Writing: Recommendations, Essay Writing Grammar: Impersonal Passive, Reported Speech, Concord Vocabulary : Informal Vocabulary and Formal Substitutes		
Total Contact Hours: 30		

Course Outcomes:
On completion of the course students will be able to
apply their comprehension skills and interpret different contents effortlessly
read and comprehend various texts and audio visual contents
infer data from graphs and charts and communicate it efficiently in varied contexts
participate effectively in diverse speaking situations
to present, discuss and coordinate with their peers in workplace using their language skills

SUGGESTED ACTIVITIES
<ul style="list-style-type: none"> ● Ice breaker ● Just A Minute ● Ship wreck ● Hot seat ● Vocabulary building ● Chinese whispers ● Case study

SUGGESTED EVALUATION METHODS
<ul style="list-style-type: none"> ● Assignment topics ● Quizzes ● Class Presentation/Discussion ● Continuous Assessment Tests

Text Book(s):
1. Effective Technical Communication by M. Ashraf Rizvi (Author) 2nd Edition Paperback 2017
2. Sylvan Barnet and Hugo Bedau, 'Critical Thinking Reading and Writing', Bedford/st. Martin's: Fifth Edition (June 28, 2004)
3. Meenakshi Upadhyay, Arun Sharma – Verbal Ability and Reading Comprehension.
4. Teaching Speaking: A Holistic Approach, Book by Anne Burns and Christine ChuenMeng Goh, Cambridge University Press

Reference Books(s) / Web links:
1. Basic Vocabulary in Use: 60 Units of Vocabulary Practice in North American English With Answers 2nd Edition by Michael McCarthy (Author), Felicity O'Dell (Author), John D. Bunting (Contributor)
2. Reading Development and Difficulties By Kate Cain
3. The 7 Habits of Highly Effective People by Stephen Covey, Simon and Schuster, UK
4. Everybody Writes: Your Go-To Guide to Creating Ridiculously Good Content Hardcover by Ann Handley (Author)

CO - PO – PSO matrices of course

PO/PSO CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
HS23111. 1	-	-	-	1	-	-	-	-	-	3	-	-	-	2	-
HS23111. 2	-	-	-	1	-	-	-	-	-	3	-	-	2	-	-
HS23111. 3	-	1	-	1	-	-	-	-	-	3	-	-	2	-	-
HS23111. 4	-	-	-	2	-	-	-	-	1	3	-	-	3	-	1
HS23111. 5	-	-	-	1	-	-	-	-	1	3	-	-	1	-	-
Average	-	1.0	-	1.2	-	-	-	-	1	3	-	-	2.0	2	1.0

Correlation levels 1, 2 or 3 are as defined below:

1: Slight (Low)

2: Moderate (Medium)

3: Substantial (High)

No correlation: “-“

Course Code	Course Title	Category	L	T	P	C
MA23116	MATHEMATICAL FOUNDATIONS FOR AI	BS	3	1	0	4
Common to I Sem. B.Tech - AI&DS and AI&ML						

Objectives:
<ul style="list-style-type: none"> To express various matrix techniques and to illustrate the nature of the matrix.
<ul style="list-style-type: none"> To gather the techniques in matrix algebra and the concepts of basis and dimension in vector spaces.
<ul style="list-style-type: none"> To discuss general inner product spaces with associated norms and matrix decompositions.
<ul style="list-style-type: none"> To provide an insight into the concept of information in the context of communication theory and its significance in the design of communication receivers.
<ul style="list-style-type: none"> To explain the techniques of calculus which are applied in the solutions of engineering problems.

UNIT-I	MATRICES AND QUADRATIC FORMS	12
Matrices : Types - Symmetric and Skew – symmetric matrices, Hermitian matrix, Unitary matrix and Orthogonal matrices – Rank, Inverse and Trace of a matrix - Eigen values and eigenvectors- Diagonalization of matrices using orthogonal transformation - Quadratic forms - Reduction to canonical form using orthogonal transformation.		
UNIT-II	VECTOR SPACES	12
Vector spaces – Subspaces – Linear combinations and system of Linear equations – Linear independence and Linear dependence – Bases and Dimensions – Linear Transformation – Matrix representation of Linear Transformation - Null space, Range space and dimension theorem (without proof).		
UNIT-III	INNER PRODUCT SPACES	12
Inner product and norms - Gram Schmidt orthonormalization process - QR Factorization-Singular value decomposition -Principal component analysis.		
UNIT-IV	INFORMATION THEORY	12
Measure of Information, Entropy, Source coding theorem - Shannon-Fano codes & Huffman codes, Discrete Memoryless channel, Mutual information, Channel Capacity, Shannon-Hartley theorem.		
UNIT-V	FUNCTIONS OF SEVERAL VARIABLES	12
Partial differentiation–Total derivative–Change of variables–Jacobians–Partial differentiation of implicit functions– Taylor’s series for functions of two variables–Maxima and minima of functions of two variables–Lagrange’s method of undetermined multipliers.		
Total Contact Hours: 60		

Course Outcomes:
On completion of the course students will be able to
<ul style="list-style-type: none"> Demonstrate the matrix techniques in solving the related problems in engineering and technology.
<ul style="list-style-type: none"> Apply the concepts of basis and dimension in vector spaces to the solution of related complex engineering problems.
<ul style="list-style-type: none"> Interpret matrix decompositions in the solution of complex engineering problems.
<ul style="list-style-type: none"> Perform mathematical analysis of problems in Information Theory and Coding, Implementation and verification.
<ul style="list-style-type: none"> Interpret the problems in Engineering and Technology using the principles of mathematical calculus.

SUGGESTED ACTIVITIES
<ul style="list-style-type: none"> Problem solving sessions Activity Based Learning(Vector products using Scilab, Linear algebra using online calculator) Implementation of small module

SUGGESTED EVALUATION METHODS

- Problem solving in Tutorial sessions
- Assignment problems
- Quizzes and class test
- Discussion in classroom

Text Book(s):

1.	Grewal B.S., “ Higher Engineering Mathematics ”, Khanna Publishers, New Delhi, 43rd Edition, 2014.
2.	T Veerarajan , Linear Algebra and Partial Differential Equations, Mc Graw Hill Education,2019.
3.	T Veerarajan, Engineering Mathematics –I , Mc Graw Hill Education, 2018.
4.	Simon Haykin, “Communication Systems”, 3rd Edition John Wiley & sons, 2013.
5.	J.G.Proakis, M.Salehi, “Fundamentals of Communication Systems”, 2nd Edition, Pearson Education, 2006.

Reference Books(s) / Web links:

1.	Ramana. B.V., " Higher Engineering Mathematics ", McGraw Hill Education Pvt.Ltd, New Delhi, 2016.
2.	Friedberg, A.H., Insel, A.J. and Spence, L., —Linear Algebra, Prentice - Hall of India, New Delhi, 2004.
3.	Erwin Kreyszig , " Advanced Engineering Mathematics ", John Wiley and Sons, 10th Edition, New Delhi, 2016.

Course Code	Course Title	Category	L	T	P	C
GE23117	தமிழர் மரபு/HERITAGE OF TAMILS	HS	1	0	0	1
Common to all branches of B.E/B. Tech programmes						

அலகு I	மொழி மற்றும் இலக்கியம்:	3
இந்திய மொழிக் குடும்பங்கள் - திராவிட மொழிகள் - தமிழ் ஒரு செம்மொழி - தமிழ் செவ்விலக்கியங்கள் - சங்க இலக்கியத்தின் சமய சார்பற்ற தன்மை - சங்க இலக்கியத்தில் பகிர்தல் அறம் - திருக்குறளில் மேலாண்மைக் கருத்துக்கள் - தமிழிக் காப்பியங்கள், தமிழகத்தில் சமண பௌத்த சமயங்களின் தாக்கம் - பக்தி இலக்கியம், ஆழ்வார்கள் மற்றும் நாயன்மார்கள் - சிற்றிலக்கியங்கள் - தமிழில் நவீன இலக்கியத்தின் வளர்ச்சி - தமிழ் இலக்கிய வளர்ச்சியில் பாரதியார் மற்றும் பாரதிதாசன் ஆகியோரின் பங்களிப்பு.		
அலகு II	மரபு - பாறை ஓவியங்கள் முதல் நவீன ஓவியங்கள் வரை - சிற்பக் கலை:	3
நடுகல் முதல் நவீன சிற்பங்கள் வரை - ஐம்பொன் சிலைகள் - பழங்குடியினர் மற்றும் அவர்கள் தயாரிக்கும் கைவினைப் பொருட்கள், பொம்மைகள் - தேர் செய்யும் கலை - சுடுமண் சிற்பங்கள் - நாட்டுப்புறத் தெய்வங்கள் - குமரிமுனையில் திருவள்ளூர் சிலை - இசைக் கருவிகள் - மிருதங்கம், பறை, வீணை, யாழ், நாதஸ்வரம் - தமிழர்களின் சமூக பொருளாதார வாழ்வில் கோவில்களின் பங்கு.		
அலகு III	நாட்டுப்புறக் கலைகள் மற்றும் வீர விளையாட்டுகள்:	3
தெருக்கூத்து, கரகாட்டம், வில்லுப்பாட்டு, கணியான் கூத்து, ஓயிலாட்டம், தோல்பாவைக் கூத்து, சிலம்பாட்டம், வளரி, புலியாட்டம், தமிழர்களின் விளையாட்டுகள்.		
அலகு IV	தமிழர்களின் திணைக் கோட்பாடுகள்:	3
தமிழகத்தின் தாவரங்களும், விலங்குகளும் - தொல்காப்பியம் மற்றும் சங்க இலக்கியத்தில் அகம் மற்றும் புறக் கோட்பாடுகள் - தமிழர்கள் போற்றிய அறக்கோட்பாடு - சங்ககாலத்தில் தமிழத்தில் எழுத்தறிவும், கல்வியும் - சங்ககால நகரங்களும் துறை முகங்களும் - சங்ககாலத்தில் ஏற்றுமதி மற்றும் இறக்குமதி - கடல்கடந்த நாடுகளில் சோழர்களின் வெற்றி.		
அலகு V	இந்திய தேசிய இயக்கம் மற்றும் இந்திய பண்பாட்டிற்குத் தமிழர்களின் பங்களிப்பு:	3
இந்திய விடுதலைப்போரில் தமிழர்களின் பங்கு - இந்தியாவின் பிறப்பகுதிகளில் தமிழ்ப் பண்பாட்டின் தாக்கம் - சுயமரியாதை இயக்கம் - இந்திய மருத்துவத்தில், சித்த மருத்துவத்தின் பங்கு - கல்வெட்டுகள், கையெழுத்துப்படிக்கள் - தமிழ்ப் புத்தகங்களின் அச்சு வரலாறு.		
Total Contact Hours: 15		

Text Book(s):	
1.	தமிழக வரலாறு - மக்களும் பண்பாடும் - கே.கே. பிள்ளை (வெளியீடு: தமிழ்நாடு பாடநூல் மற்றும் கல்வியியல் பணிகள் கழகம்).
2.	கணினித் தமிழ் - முனைவர் இல. சுந்தரம். (விகடன் பிரசுரம்).
3.	கீழடி - வைகை நதிக்கரையில் சங்ககால நகர நாகரிகம்

(தொல்லியல் துறை வெளியீடு)	
4.	பொருநை - ஆற்றங்கரை நாகரிகம். (தொல்லியல் துறை வெளியீடு)
5.	Social Life of Tamils (Dr. K. K. Pillay) A joint publication of TNTB & ESC and RMRL – (in print)
6.	Social Life of the Tamils – The Classical Period (Dr. S. Singaravelu)(Published by: International Institute of Tamil Studies).
7.	Historical Heritage of the Tamils (Dr. S. V. Subatamanian, Dr.K.D. Thirunavukkarasu) (Published by: International Institute of Tamil Studies).
8.	The Contributions of the Tamils to Indian Culture (Dr.M.Valarmathi) (Published by: International Institute of Tamil Studies).
9.	Keeladi – ‘Sangam City Civilization on the banks of river Vaigai’ (Jointly Published by: Department of archaeology & Tamil Nadu Text Book and Educational Services Corporation, Tamil Nadu)
10.	Studies in the History of India with Special Reference to Tamil Nadu (Dr.K.K.Pillay) (Published by: The Author)
11.	Porunai Civilization (Jointly Published by: Department of Archaeology & Tamil Nadu Text Book and Educational Services Corporation, Tamil Nadu)
12.	Journey of Civilization Indus to Vaigai (R.Balakrishnan) (Published by: RMRL) – Reference Book.

Subject Code	Subject Name	Category	L	T	P	C	
PH23132	PHYSICS FOR INFORMATION SCIENCE	BS	3	0	2	4	
	For Common to -B.E.-CSE, CSD, Cyber Security & B. Tech.- IT, AIML, AI&DS.						
Objectives:							
•	To understand the principles of laser and fiber optics in engineering and technology.						
•	To analyze the properties of magnetic and superconducting materials.						
•	To understand the advanced concept of quantum theory and applications.						
•	To become proficient in semiconductor applications						
•	To become proficient in optoelectronic devices						
UNIT-I	LASERS AND FIBER OPTICS					9	
Lasers: Characteristics, Einstein's A and B coefficients derivation – resonant cavity, optical amplification (qualitative) –Nd-YAG Laser, Semiconductor lasers: Homojunction and Heterojunction- Applications of Lasers. Fiber optics: principle, numerical aperture and acceptance angle - types of optical fibers (material, mode and refractive index) – losses associated with optical fibers -Fiber optic communication system - fiber optic sensors: pressure and displacement.							
UNIT-II	MAGNETIC AND SUPERCONDUCTING MATERIALS					9	
Magnetic dipole moment – atomic magnetic moments- magnetic permeability and susceptibility -Magnetic material classification: diamagnetism – paramagnetism – ferromagnetism – antiferromagnetism – ferrimagnetism – Domain Theory- M versus H behaviour – Hard and soft magnetic materials – examples and uses– Magnetic principle in computer data storage. Superconductors: Properties - BCS theory (Qualitative)- Type-I and Type II superconductors - Magnetic levitation-SQUID-Cryotron.							
UNIT-III	QUANTUM PHYSICS					9	
Introduction- Quantum free electron theory-De Broglie's concept-Schrodinger wave equation-Time independent and time dependent equations-Physical significance of wave function - Particle in a one dimensional box – electrons in metals -degenerate states – Fermi- Dirac statistics – Density of energy states -Size dependence of Fermi energy – Quantum confinement – Quantum wells, Quantum wires, Quantum dots and Quantum clusters - Band gap of nanomaterials.							
UNIT-IV	SEMICONDUCTOR PHYSICS					9	
Intrinsic Semiconductors – Energy band diagram – direct and indirect band gap semiconductors – Carrier concentration in intrinsic semiconductors – Band gap determination- extrinsic semiconductors (Qualitative)- Hall effect - determination of Hall co-efficient -Formation of P-N junction-Forward bias- Reverse bias -Ohmic contact-Schottky diode- Tunnel diode.							
UNIT-V	OPTOELECTRONICS					9	
Classification of optical materials – carrier generation and recombination processes – Absorption, emission and scattering of light in metals, insulators and semiconductors (concepts only) – Photo electric effect-Photo current in a P-N diode – Photo transistor-solar cell - LED – Organic LED- Non Linear Optical materials-properties and applications.							
		Contact Hours	:				45

List of Experiments			
1	Determine the wavelength of the laser using grating and size of the particle using diode laser.		
2	Determine the numerical aperture and acceptance angle of optical fiber.		
3	Study the permeability of the free space using Helmholtz coil.		
4	Determine the hysteresis loss in the transformer core using B-H curve unit.		
5	Determine the band gap of given semiconductor.		
6	Determine the Hall coefficient of semiconducting material.		
7	Determine specific resistance of the material of given wires using metre bridge.		
8	Study the resonance frequency in series connected LCR circuits.		
9	Determine the V-I characteristics of the solar cell.		
10	Determine the thickness of the given specimen by using air wedge method.		
			Contact Hours
			: 30
			Total Contact Hours
			: 75
Course Outcomes:			
On completion of the course, the students will be able to			
<ul style="list-style-type: none"> • Use the concepts of Laser and Fiber optics in communication. • Use the properties of magnetic and superconducting materials in data storage devices. • Apply the concepts of electron transport in nanodevices. • Analyse the physics of semiconductor devices • Analyze the properties of optical materials for optoelectronic applications. 			
Suggested Activities			
<ul style="list-style-type: none"> • Problem solving sessions 			
Suggested Evaluation Methods			
<ul style="list-style-type: none"> • Quizzes • Class Presentation / Discussion 			
Text Book(s):			
1	Bhattacharya, D.K. & Poonam, T. "Engineering Physics". Oxford University Press, 2015.		
2	Jaspri Singh, "Semiconductor Devices: Basic Principles", Wiley 2012.		
3	Kasap, S.O. "Principles of Electronic Materials and Devices", McGraw-Hill Education, 2007.		
Reference Books(s) / Web links:			
1	S. O. Pillai , Solid state physics, New Age International, 2015.		
2	Serway, R.A. & Jewett, J.W. "Physics for Scientists and Engineers". Cengage Learning, 2010.		
3	Hanson, G.W. "Fundamentals of Nanoelectronics". Pearson Education, 2009.		

List of Equipment Available

(Common to B.E. CSD and CSE & B.Tech. AI&DS, AI & ML, IT)

S. No	Name of the equipment	Quantity Required	Quantity Available	Deficiency
1	Wavelength of Laser and Characteristics -Laser source and grating plate	7	15	-
2	Laser - angle of divergence and NA acceptance angle	6	8	-
3	Determination of permeability of free space - Helmholtz coil setup	5	5	-
4	B-H curve Setup and CRO	6	7	-
5	Band gap of a semiconductor Setup	6	19	-
6	Hall coefficient of Semiconductor Setup	4	4	-
7	Determine specific resistance of the material of given wires-metre bridge	6	6	-
8	LCR circuit kit	6	7	-
9	Solar cell parameters setup	6	8	-
10	Thickness of thin wire-Air wedge method-Travelling Microscope, Glass Plate	8	13	-

CO - PO – PSO matrices of course

PO/PSO CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO 10	PO 11	PO 12	PSO1	PSO2	PS O3
PH23132.1	3	3	2	2	2	1	-	-	-	-	-	2	1	1	1
PH23132.2	3	3	2	2	3	1	1	-	-	-	-	2	1	1	1
PH23132.3	3	3	2	2	3	1	1	-	-	-	-	2	2	1	1
PH23132.4	3	3	2	2	3	1	1	-	-	-	-	2	2	1	1
PH23132.5	3	3	2	2	3	1	1	-	-	-	-	2	2	1	1
Average	3.00	3.00	2.00	2.00	2.80	1.00	0.00	0.00	0.00	0.00	0.00	2.00	1.80	1.00	1.00

Correlation levels 1, 2 or 3 are as defined below:

- 1: Slight (Low)
- 2: Moderate (Medium)
- 3: Substantial (High)
- No correlation: “-“

Subject Code	Subject Name	Category	L	T	P	C
GE23131	PROGRAMMING USING C	PC	1	0	6	4

Objectives:
• To develop simple algorithms for arithmetic and logical problems.
• To develop C Programs using basic programming constructs
• To develop C programs using arrays and strings
• To develop applications in C using functions , pointers and structures
• To develop applications using structures and union

List of Experiments
1. Overview of C, Constants, Variables and Data Types
2. Operators and Expressions, Managing Input and Output Operations
3. Decision Making and Branching
4. Decision Making and Looping
5. Nested Loops - while and for, Jumps in Loops
6. One-Dimensional Arrays
7. Searching Algorithms - Linear and Binary
8. Sorting Algorithms - Bubble and Selection
9. Two-Dimensional and Multi-dimensional Arrays
10. Character Arrays and Strings Handling Functions
11. User-Defined Functions - Recursive Functions
12. Passing Arrays and Strings to Functions
13. Scope, Visibility and Lifetime of Variables
14. Structures and Unions
15. Pointers
16. The Preprocessor
Platform Needed: GCC Compiler for Windows/Linux
Total Contact Hours: 75

Text Book(s):
1. Brian W. Kernighan and Dennis M. Ritchie, "The C Programming Language", Second Edition, PHI
2. Byron Gottfried, "Programming in C", Second Edition, Schaum Outline Series

Reference Books(s) / Web links:
• Herbert Schildt, "C: The Complete Reference", Fourth Edition, McGraw Hill.
• Yashavant Kanetkar, "Let Us C", BPB Publications
• E. Balaguruswamy, Programming in ANSI C, Tata McGraw-Hill
• NPTEL course , "Problem Solving Through Programming In C", By Prof. Anupam Basu, IIT Kharagpur

Course Outcomes:

- To formulate simple algorithms for arithmetic and logical problems.
- To implement conditional branching, iteration.
- To decompose a problem into functions and synthesize a complete program.
- To use arrays, pointers and structures to formulate algorithms and programs.
- To apply programming to solve simple numerical method problems.

Suggested Activities

- Practice small and tricky codes
- Practice problems in portals like Digital Café
- Debugging the codes
- Completing the function definitions etc

CO - PO – PSO matrices of course

PO/PSO CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
GE23131.1	1	2	2	2	1	-	-	-	1	2	1	1	2	3	-
GE23131.2	1	1	1	1	1	-	-	-	-	-	1	1	2	2	-
GE23131.3	1	1	2	1	1	-	-	-	-	-	1	1	2	2	-
GE23131.4	2	2	3	2	1	-	-	-	1	-	2	1	2	2	2
GE23131.5	2	2	3	2	1	-	-	-	-	-	2	1	2	2	2
Average	1.4	1.6	2.2	1.6	1.0	-	-	-	1.0	2.0	1.4	1.0	2.0	2.2	2.0

Correlation levels 1, 2 or 3 are as defined below:

1: Slight (Low)

2: Moderate (Medium)

3: Substantial (High) No correlation: “-“

Subject Code	Subject Name (Lab oriented Theory Courses)	Category	L	T	P	C	
EE23133	BASIC ELECTRICAL AND ELECTRONICS ENGINEERING	ES	3	0	2	4	
Objectives:							
• To provide knowledge on the analysis of DC circuits.							
• To provide knowledge on the analysis of AC circuits							
• To expose the principles of electrical machines and electronic devices.							
• To teach the concepts of different types of electrical measuring instruments and transducers.							
• To experimentally analyze the electrical circuits and machines, electronic devices and transducers.							
UNIT-I	DC CIRCUITS					9	
Electrical circuit elements (R, L and C), Voltage and current sources, Kirchhoff 's laws, Analysis of simple circuits with DC excitation, Superposition, Thevenin and Norton Theorems.							
UNIT-II	AC CIRCUITS					9	
Representation of sinusoidal waveforms, Power and Power factor, Analysis of single-phase AC circuits consisting of R, L, C, RL, RC, RLC combinations, Series resonance, Three phase balanced circuits							
UNIT-III	ELECTRICAL MACHINES					9	
Construction, Principles of operation of DC machines, Single phase Transformers, Synchronous machines, Single phase induction motors. (Qualitative Treatment Only).							
UNIT-IV	ELECTRONIC DEVICES & CIRCUITS					9	
Review of PN Junction diode – Forward and Reverse Bias – Bipolar Junction Transistor – Common Emitter characteristics – MOSFET - Introduction to operational Amplifier –Inverting and Non-Inverting Amplifier.							
UNIT-V	MEASUREMENTS & INSTRUMENTATION					9	
Introduction to transducers - Classification of Transducers: Resistive, Inductive, Capacitive, Piezoelectric, - Classification of instruments - PMMC and MI Ammeters and Voltmeters – Digital Storage Oscilloscope.							
					Contact Hours	:	45
List of Experiments							
1	Verification of Kirchhoff's Laws.						
2	Load test on DC Shunt Motor (Virtual Lab)						
3	Load test on Single phase Transformer (Virtual Lab)						
4	Load test on Single phase Induction motor (Virtual Lab)						
5	Characteristics of P-N junction Diode.						
6	Characteristics of CE based NPN Transistor.						
7	Characteristics of MOSFET						
8	Characteristics of LVDT, RTD and Thermistor.						
					Contact Hours	:	30
					Total Contact Hours	:	75
Course Outcomes:							
On completion of the course, the students will be able to							
• analyse DC circuits and apply circuit theorems.							
• calculate the power and power factor in AC circuits							
• understand the principles of electrical machines.							
• comprehend the principles of different types of electronic devices, electrical measuring instruments and transducers.							
• experimentally analyze the electric circuits and machines, electronic devices, and transducers.							
Suggested Activities							
• Problem solving sessions							
Suggested Evaluation Methods							
• Quizzes							
• Class Presentation / Discussion							
Text Book(s):							
1	J.B.Gupta, "Fundamentals of Electrical Engineering and Electronics" S.K.Kataria & Sons Publications, 2010.						
2	Joseph A. Edminister, Mahmood, Nahri, "Electric Circuits" – Schaum Series and Systems", Schaum's Outlines, Tata McGrawHill, Indian. 5th Edition, 2017						
3	Thereja .B.L., "Fundamentals of Electrical Engineering and Electronics", S. Chand & Co. Ltd., 2008						
Reference Books(s) / Web links:							
1	Del Toro, "Electrical Engineering Fundamentals", Pearson Education, New Delhi, 2015						
2	John Bird, "Electrical Circuit Theory and Technology", Elsevier, First Indian Edition, 2007						
3	Allan S Moris, "Measurement and Instrumentation Principles", Elsevier, Third Edition, 2006						

4	Rajendra Prasad, “Fundamentals of Electrical Engineering”, Prentice Hall of India, Third Edition, 2014
5	A.E.Fitzgerald, David E Higginbotham and Arvin Gabel, “Basic Electrical Engineering”, McGraw Hill Education(India) Private Limited, 2009
6	D P Kothari and I.J Nagarath, “Basic Electrical and Electronics Engineering”, McGraw Hill Education(India) Private Limited, Third Reprint ,2016
7	https://nptel.ac.in/courses/108108076

Lab Equipment Required:

Sl. No.	Name of the Equipment	Quantity Required (For a batch of 30 students)
1.	Verification of ohms and Kirchhoff's Laws 1. DC Regulated Power supply (0 - 30 V variable) 2. Bread Board 3. Resistors 4. Multimeter 5. Connecting wires	1 1 As per Circuit diagram As Required
2.	Load test on DC Shunt Motor. 1. Ammeter MC (0-20A) 2. Voltmeter MC (0-300)V 3. Tachometer 4. Field Rheostat 500 Ω , 1.5 A 5. Connecting wires	1 1 1 1 As Required
3.	Load Test on Induction Motor 1. Ammeter MI (0-20A) 2. Voltmeter MI (0-300)V 3. Wattmeter – 300V, 30 A 4. Tachometer – Digital 5. Connecting Wires 6. Single phase Induction motor	1 1 1 1 As Required
4.	Load test on Single phase Transformer 1. Ammeter (0-30) A, (0-5) A 2. Voltmeter (0-150)V, (0-300)V 3. Wattmeter – 300V, 5A, UPF 4. Autotransformer 5. Single phase Transformer 6. Connecting Wires	1 1 1 1 1 As Required
5.	Characteristics of PN and Zener Diodes 1. PN Diode (IN4007), Zener diode (6.8V, 1A) 2. Resistor 1 K Ω , 100 Ω 3. Bread Board 4. DC Regulated Power supply (0 - 30 V variable) 5. Multimeter 6. Connecting wires	1 1 1 1 1 As Required
6.	Characteristics of BJT 1. Transistor (BC107) 2. Resistors- 1k Ω , 470K Ω , 1M Ω 3. Bread Board 4. DC Regulated Power supply (0 - 30 V variable) 5. Multimeter 6. Connecting wires	1 1 1 1 1 As Required

7	Characteristics of MOSFET 1. MOSFET (IRF510) 2. Resistors- 100kΩ, 1kΩ 3. Bread Board 4. DC Regulated Power supply (0 - 30 V variable) 5. Multimeter 6. Connecting wires	1 1 1 1 1 As Required
7.	Measurement of displacement of LVDT, RTD and Thermistor 1. LVDT Kit 2. RTD 3. Thermistor 4. Multimeter	1 1 1 1 1

CO - PO – PSO matrices of course

COs/POs&PSOs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
EE23133.1	3	3	3	3	-	3	1	1	2	1	1	1	2	2	2
EE23133.2	3	3	3	3	-	3	1	1	2	1	1	1	1	-	1
EE23133.3	3	3	3	3	-	3	1	1	2	1	1	1	2	2	2
EE23133.4	3	3	3	3	-	3	1	1	2	1	1	1	2	1	2
EE23133.5	3	3	3	3	-	3	1	1	2	1	1	1	2	3	2
Average	3	3	3	3	-	3	1	1	2	1	1	1	1.8	2.0	1.8

Correlation levels 1, 2 or 3 are as defined below:

1: Slight (Low)

2: Moderate (Medium)

3: Substantial (High) No correlation: “-“

Subject Code	Subject Name	Category	L	T	P	C	
GE23122	ENGINEERING PRACTICES - ELECTRICAL AND ELECTRONICS	ES	0	0	2	1	
Objectives:							
•	To provide hands-on experience on various basic engineering practices in Electrical Engineering.						
•	To provide hands-on experience on various basic engineering practices in Electronics Engineering.						
List of Experiments							
A. ELECTRICAL ENGINEERING PRACTICE							
1	Residential house wiring using switches, fuses, indicators, lamp and energy meter.						
2	Fluorescent lamp wiring.						
3	Stair case wiring.						
4	Measurement of electrical quantities – voltage, current, power & power factor in RL circuit.						
5	Measurement of earth resistance using Megger.						
6	Study of Ceiling Fan and Iron Box						
B. ELECTRONICS ENGINEERING PRACTICE							
1	Study of electronic components and equipment – Resistor, colour coding, measurement of AC signal parameters (peak-peak, rms period, frequency) using CRO/DSO.						
2	(a) Measurement of electrical quantities using Multimeter (b) Testing of electronic components.						
3	Study of logic gates : AND, OR, EXOR and NOT.						
4	Generation of Clock Signals.						
5	Soldering practice – Components Devices and Circuits – Using general purpose PCB.						
6	Measurement of ripple factor of Half-wave and Full-wave Rectifiers.						
					Total Contact Hours	:	30
Course Outcomes:							
On completion of the course, the students will be able to							
•	fabricate the basic electrical circuits						
•	implement the house wiring circuits						
•	fabricate the electronic circuits						
•	verify the truth table of logic gates						
•	design the Half-wave and Full-wave Rectifiers using diodes and passive components						
SUGGESTED EVALUATION METHODS							
•	Experiment based Viva						

REFERENCE	
1	Bawa H.S., “Workshop Practice”, Tata McGraw – Hill Publishing Company Limited, 2007.
2	Jeyachandran K., Natarajan S. & Balasubramanian S., “A Primer on Engineering Practices Laboratory”, Anuradha Publications, 2007.
3	Jeyapooan T., Saravanapandian M. &Pranitha S., “Engineering Practices Lab Manual”,Vikas Publishing House Pvt.Ltd, 2006.
4	Rajendra Prasad A. &Sarma P.M.M.S., “Workshop Practice”, SreeSai Publication, 2002.

Lab Equipment Required:

S.	Name of the Equipment	Quantity Required
1	Residential house wiring using switches, fuse, indicator, lamp and energy	3 Nos
2	Fluorescent lamp wiring.	3 Nos
3	Stair case wiring	3 Nos
4	Measurement of electrical quantities – voltage, current, power & power	2 Nos
5	Study purpose items: Iron box, Ceiling fan.	2 each
6	Megger (250V/500V)	2 Nos.
7	Soldering guns	10 Nos.
8	Assorted electronic components for making circuits	50 Nos.
9	Small PCBs	10 Nos.
10	Multimeters	10 Nos.
11	Digital trainer kit	5 Nos.
12	CRO	8 Nos.
13	Transformer	8 Nos.
14	Function Generator	8 Nos.

CO - PO – PSO matrices of course

COs/POs&PSOs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
GE23122.1	3	3	3	2	-	-	2	-	3	2	-	3			
GE23122.2	3	3	2	2	-	-	2	-	3	2	-	3			
GE23122.3	3	3	3	2	-	-	2	-	3	2	-	3			
GE23122.4	3	3	3	2	-	-		-	3	2	-	3			
GE23122.5	3	3	3	2	-	-		-	3	2	-	3			
Average	3	3	2.67	2	-	-	2	-	3	2	-	3			

Correlation levels 1, 2 or 3 are as defined below:

1: Slight (Low)

2: Moderate (Medium)

3: Substantial (High) No correlation: “-“

Subject Code	Subject Name (Theory course)	Category	L	T	P	C
MC23111	INDIAN CONSTITUTION AND FREEDOM MOVEMENT	MC	3	0	0	0
Common to all branches of B.E/B. Tech Programmes – First / Second/third Semester						

Objectives:
• To apprehend the sacrifices made by the freedom fighters.
• To inculcate the values enshrined in the Indian constitution.
• To instill a sense of responsibility as the citizens of India.
• To familiarize about the functions of the various levels of Government.
• To be informed about Constitutional and Non- Constitutional bodies.

UNIT-I	INDIAN FREEDOM MOVEMENT	9
British Colonialism in India-Colonial administration till 1857- Revolt of 1857- Early Resistance to British Rule-Rise of Nationalism in India-Indian Freedom Struggle under Mahatma Gandhi-Non- Cooperation Movement-Civil Disobedience Movement- Quit India Movement-British Official response to National movement- Independence of India Act 1947-Freedom and Partition.		
UNIT-II	CONSTITUTION OF INDIA	9
Historical Background – Indian Constitution: Constitution’ meaning of the term, Sources and constitutional history, Constituent Assembly of India – Philosophical foundations of the Indian Constitution – Preamble – Fundamental Rights – Directive Principles of State Policy – Fundamental Duties – Citizenship – Constitutional Remedies for citizens.		
UNIT-III	STRUCTURE AND FUNCTIONS OF CENTRAL GOVERNMENT	9
Union Government – Structure of the Union Government and Functions – President – Vice President – Prime Minister – Cabinet – Parliament – Supreme Court of India – Judicial Review.		
UNIT-IV	STRUCTURE AND FUNCTION OF STATE GOVERNMENT AND LOCAL BODY	9
State Government – Structure and Functions – Governor – Chief Minister – Cabinet – State Legislature – Judicial System in States – High Courts and other Subordinate Courts- Role and Importance, Municipalities: Introduction, Mayor and role of Elected Representative, CEO of Municipal Corporation, Pachayati Raj: Introduction, Elected officials and their roles, Village level: Role of Elected and Appointed officials.		
UNIT-V	CONSTITUTIONAL FUNCTIONS AND BODIES	9
Indian Federal System – Centre – State Relations – President’s Rule – Constitutional Functionaries – Assessment of working of the Parliamentary System in India- CAG, Election Commission, UPSC, GST Council and other Constitutional bodies-. NITI Aayog, Lokpal, National Development Council and other Non –Constitutional bodies.		
Total Contact Hours: 45		

Course Outcomes: Upon completion of the course, students will be able to:
• appreciate the sacrifices made by freedom fighters during freedom movement.
• be responsible citizens and abide by the rules of the Indian constitution.
• be aware of the functions of the Indian government.
• be knowledgeable about the functions of the state Government and the Local bodies.
• apply the knowledge on constitutional functions and role of constitutional bodies and non-constitutional bodies.

SUGGESTED EVALUATION METHODS
• Assignment topics
• Quizzes
• Class Presentation/Discussion
• Continuous assessments (CAT)

Text Book(s):
1. M. Laxmikanth , “Indian Polity”, McGraw-Hill, New Delhi.
2. Durga Das Basu, “Introduction to the Constitution of India “, Lexis Nexis, New Delhi. 21 st ed 2013.
3. P K Agarwal and K N Chaturvedi ,PrabhatPrakashan, New Delhi, 1 st ed , 2017.

Reference Books(s) / Web links:
1. Sharma, Brij Kishore, "Introduction to the Constitution of India:", Prentice Hall of India, New Delhi.
2. U.R.Gahai, "Indian Political System ", New Academic Publishing House, Jalaendhar
3. Bipan Chandra, India's Struggle for Independence, Penguin Books, 2016.
4. Maciver and Page, "Society: An Introduction Analysis ", Mac Milan India Ltd., New Delhi.2 nd ed, 2014.
5. Bipan Chandra, History of Modern India, Orient Black Swan, 2009.

CO - PO – PSO matrices of course

PO/PSO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
CO															
MC23111.1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
MC23111.2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
MC23111.3	-	-	-	-	-	1	-	1	-	-	-	-	-	-	-
MC23111.4	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-
MC23111.5	-	-	-	-	-	1	-	1	1	-	-	-	-	-	-
Average	-	-	-	-	-	1	-	1	1	-	-	-	-	-	-

Correlation levels 1, 2 or 3 are as defined below:

1: Slight (Low)

2: Moderate (Medium)

3: Substantial (High) No correlation: "--"

SEMESTER II

Course Code	Course Title	Category	L	T	P	C
MA23214	PROBABILITY AND INFERENTIAL STATISTICS	BS	3	1	0	4
Common to II Sem. B.E. – CSD and B.Tech. - AI&DS and AI&ML						

Objectives:
<ul style="list-style-type: none"> ● To analyse data pertaining to discrete and continuous variables and to interpret the results in the given situation.
<ul style="list-style-type: none"> ● To explain the data that we are interested by using hypothesis testing and to draw conclusions about the population using sample data.
<ul style="list-style-type: none"> ● To identify the strength and direction of a linear relationship between two variables and using regression and correlation to predict dependency for data-driven decisions regarding our processes.
<ul style="list-style-type: none"> ● To Characterize, compare, and contrast different nonparametric hypothesis tests.
<ul style="list-style-type: none"> ● To Model time series to analyses the underlying structure(s) in both the time and frequency domains.

UNIT-I	PROBABILITY - BAYES THEOREM	12
Probability models and axioms- Conditioning and Bayes' rule – Discrete random variables: Binomial and Poisson distributions - Multiple discrete random variables: joint PMFs, expectations, conditioning - Continuous random variables: Uniform and Gaussian distributions - Multiple continuous random variables- Continuous Bayes rule.		
UNIT-II	STATISTICAL TESTING	12
Bayesian statistical inference- Maximal Likelihood estimation: Parameters of Binomial and Poisson distribution- Test of significance – Z test: Single mean, difference of means - Chi square - F test.		
UNIT-III	LINEAR STATISTICAL MODELS	12
Scatter diagram- Linear Regression and Correlation- Least squares method- Rank correlation- Multiple regression and multiple correlation- Analysis of variance (one way, two way).		
UNIT-IV	NON PARAMETRIC TESTS	12
Sign test -Wilcoxon signed rank test - Mann Whitney test - Run test - Kolmogorov Smirnov test - Spearmann and Kendall's test - Tolerance region.		
UNIT-V	BASICS OF TIME SERIES	12
Stationary Time Series - ARIMA models: Identification, Estimation and Forecasting.		
Total Contact Hours: 60		

Course Outcomes:
On completion of the course students will be able to
<ul style="list-style-type: none"> ● Apply the basic concepts of probability and random variables in complex engineering problems.
<ul style="list-style-type: none"> ● Obtain statistical data from experiments and to analyze the same using statistical test to conduct investigations of complex problems in engineering.
<ul style="list-style-type: none"> ● Use the concepts of regression and correlation in real life problems such as predict trends and adjust product and services or advertising and marketing campaigns. That is, analyze complex engineering problems reaching substantiated conclusions.
<ul style="list-style-type: none"> ● Formulate, test and interpret various nonparametric tests for problems in engineering and technology. That is, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.
<ul style="list-style-type: none"> ● Run and interpret time series models and regression models and reaching substantiated conclusions in relevant engineering problems using time series.

SUGGESTED ACTIVITIES
<ul style="list-style-type: none"> ● Problem solving sessions ● MATLAB and GeoGebra ● Time series forecasting using R program

SUGGESTED EVALUATION METHODS

- Problem solving in Tutorial sessions
- Assignment problems
- Quizzes and class test
- Discussion in classroom

Text Book(s):

1.	T. Veerarajan, 'Probability, Statistics and Random Processes with Queueing Theory and Queueing Networks', McGraw Hill, 2016.
2.	Goon, M. Gupta and B. Dasgupta, "Fundamentals of Statistics", Vol. I & II, A., World Press.
3.	Grewal B.S., "Higher Engineering Mathematics", Khanna Publishers, New Delhi, 43rd Edition, 2014.
4.	John F. Shortle, James M. Thompson, Donald Gross, Carl M. Harris, "Fundamentals of Queueing Theory", Wiley series in Probability and Statistics, 5 th edition, 2018.

Reference Books(s) / Web links:

1.	S.M. Ross, "A first course in Probability", Prentice Hall, 8 th edition, 2010.
2.	R. Johnson, "Miller & Freund's Probability and Statistics for Engineers", (9 th Edition), PHI.
3.	Trivedi.K.S., "Probability and Statistics with Reliability, Queueing and Computer Science Applications", John Wiley and Sons, 2016.
4.	Chris Chatfield, "The analysis of Time series: An Introduction".

Course Code	Course Title	Category	L	T	P	C
GE23111	ENGINEERING GRAPHICS	ES	2	0	4	4

Objectives:
<ul style="list-style-type: none"> To understand the importance of the drawing in engineering applications
<ul style="list-style-type: none"> To develop graphic skills for communication of concepts, ideas and design of engineering products
<ul style="list-style-type: none"> To expose them to existing national standards related to technical drawings.
<ul style="list-style-type: none"> To improve their visualization skills so that they can apply this skill in developing new products.
<ul style="list-style-type: none"> To improve their technical communication skill in the form of communicative drawings

CONCEPTS AND CONVENTIONS (Not for Examination)		1
Importance of graphics in engineering applications–Use of drafting instruments– BIS conventions and specifications– Size, layout and folding of drawing sheets– Lettering and dimensioning. Basic Geometrical constructions		
UNIT-I	PLANE CURVES AND PROJECTION OF POINTS	5+12
Curves used in engineering practices: Conics–Construction of ellipse, parabola and hyperbola by eccentricity method – Cycloidal Curves–Construction of cycloid, epicycloid and hypocycloid – Construction of involutes of square and circle–Drawing of tangents and normal to the above curves. Principles of Projection and Projection of points.		
UNIT-II	PROJECTION OF LINES AND PLANE SURFACES	6+12
Projection of straight lines (First angle projection) inclined to both the principal planes – Determination of true lengths and true inclinations by rotating line method Projection of planes (polygonal and circular surfaces) inclined to both the principal planes by rotating object method.		
UNIT-III	PROJECTION OF SOLIDS AND PROJECTION OF SECTIONED SOLIDS	12
Projection of simple solids like prisms, pyramids, cylinder and cone when the axis is inclined to one of the principal planes by rotating object method. Sectioning of solids in simple vertical position when the cutting plane is inclined to HP and perpendicular to VP – obtaining true shape of the section. Practicing three-dimensional modeling of simple objects by CAD software (Not for examination)		
UNIT-IV	DEVELOPMENT OF SURFACE AND ISOMETRIC PROJECTIONS	12
Development of lateral surfaces of simple and sectioned solids – Prisms, pyramids cylinders and cones. Principles of isometric projection–isometric scale–Isometric projections of simple solids and truncated solids - Prisms, pyramids, cylinders and cones Model making of isometric projection of combination of solids as assignment (Not for End semester)		
UNIT-V	FREE HAND SKETCHING AND PERSPECTIVE PROJECTIONS	12
Free Hand sketching: Freehand sketching of multiple views from pictorial views of objects - Freehand sketching of pictorial views of object from multiple views		

Perspective projection of simple solids-Prisms, pyramids, cylinder and cone by visual ray method.

Total Contact Hours: (L=30; P=60) 90 Periods

Course Outcomes:

After learning the course, the students should be able

- To construct different plane curves and to comprehend the theory of projection
- To draw the basic views related to projection of lines and planes
- To draw the projection of simple solids and to draw the projection of development of surfaces of Sectioned solids in simple vertical position
- To draw the orthographic projection from pictorial objects and Isometric projections of simple solids
- To visualize Perspective view of simple solids

Text Book(s):

1. Bhatt N.D. and Panchal V.M., “Engineering Drawing”, Charotar Publishing House, 50th Edition, 2010.
2. Natarajan K.V., “A text book of Engineering Graphics”, Dhanalakshmi Publishers, Chennai, 2017.
3. Graph Theory with Applications, J. A. Bondy and U. S. R. Murty, Macmillan Press, London.

Reference Books(s) / Web links:

1. Varghese P I., “Engineering Graphics”, McGraw Hill Education (I) Pvt.Ltd., 2013.
2. V.B Sikka “Civil Engineering Drawing”, S.K Kataria & Sons, New Delhi.
3. Venugopal K. and PrabhuRaja V., “Engineering Graphics”, New Age International (P)Limited, 2008.
4. Gopalakrishna K.R., “Engineering Drawing” (Vol. I&II combined), Subhas Stores, Bangalore, 2017.
5. Basant Agarwal and Agarwal C.M., “Engineering Drawing”, McGraw Hill Publishing Company Limited, New Delhi, 2018.

CO PO PSO MAPPING

CO/PO	PO												PSO		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
GE23111.1	3	2	2	1	-	1	-	2	2	2	-	2	-	-	-
GE23111.2	3	2	2	1	-	1	-	2	2	2	-	2	-	-	-
GE23111.3	3	2	2	1	-	1	-	2	2	2	-	2	-	-	-
GE23111.4	3	2	2	1	-	1	-	2	2	2	-	2	-	-	-
GE23111.5	3	2	2	1	-	1	-	2	2	2	-	2	-	-	-

Correlation levels 1, 2 or 3 are as defined below:

- 1: Slight (Low)
- 2: Moderate (Medium)
- 3: Substantial (High) No correlation: “-“

Course Code	Course Title	Category	L	T	P	C
GE23217	தமிழரும் தொழில்நுட்பமும்	HS	1	0	0	1
Common to all branches of B.E/B. Tech programmes						

அலகு I	நெசவு மற்றும் பானைத் தொழில்நுட்பம்:	3
சங்க காலத்தில் நெசவுத் தொழில் - பானைத் தொழில்நுட்பம் - கருப்பு சிவப்பு பாண்டங்கள் - பண்டங்களில் கீறல் குறியீடுகள்.		
அலகு II	வடிவமைப்பு மற்றும் கட்டிடத் தொழில்நுட்பம்:	3
சங்க காலத்தில் வடிவமைப்பு மற்றும் கட்டுமானங்கள் & சங்க காலத்தில் வீட்டுப்பொருட்களில் வடிவமைப்பு - சங்க காலத்தில் கட்டுமான பொருட்களும் நடுகல்லும் - சிலப்பதிகாரத்தில் மேடை அமைப்பு பற்றிய விவரங்கள் - மாமல்லபுரம் சிற்பங்களும், கோவில்களும் - சோழர் காலத்துப் பெருங்கோயில்கள் மற்றும் பிற வழிபாட்டுத் தலங்கள் - நாயக்கர் காலக் கோயில்கள் - மாதிரி கட்டமைப்புகள் பற்றி அறிதல், மதுரை மீனாட்சி அம்மன் ஆலயம் மற்றும் திருமலை நாயக்கர் மஹால் - செட்டிநாடு வீடுகள் - பிரிட்டிஷ் காலத்தில் சென்னையில் இந்தோ - சாரோசெனிக் கட்டிடக் கலை.		
அலகு III	உற்பத்தித் தொழில் நுட்பம்:	3
கப்பல் கட்டும் கலை - உலோகவியல் - இரும்புத் தொழிற்சாலை - இரும்பை உருக்குதல், எஃகு - வரலாற்றுச் சான்றுகளாக செம்பு மற்றும் தங்க நாணயங்கள் - நாணயங்கள் அச்சடித்தல் - மணி உருவாக்கும் தொழிற்சாலைகள் - கல்மணிகள், கண்ணாடி மணிகள் - சுடுமண் மணிகள் - சங்கு மணிகள் - எலும்புத்துண்டுகள் - தொல்லியல் சான்றுகள் - சிலப்பதிகாரத்தில் மணிகளின் வகைகள்.		
அலகு IV	வேளாண்மை மற்றும் நீர்ப்பாசனத் தொழில் நுட்பம்:	3
அணை, ஏரி, குளங்கள், மதகு - சோழர்காலக் குழுவித் தூம்பின் முக்கியத்துவம் - கால்நடை பராமரிப்பு - கல்நடைகளுக்காக வடிவமைக்கப்பட்ட கிணறுகள் - வேளாண்மை மற்றும் வேளாண்மைச் சார்ந்த செயல்பாடுகள் - கடல்சார் அறிவு - மீன்வளம் - முத்து மற்றும் முத்துக்குளித்தல் - பெருங்கடல் குறித்த பண்டைய அறிவு - அறிவுசார் சமூகம்.		
அலகு V	அறிவியல் தமிழ் மற்றும் கணித்தமிழ் :	3
அறிவியல் தமிழின் வளர்ச்சி - கணித்தமிழ் வளர்ச்சி - தமிழ் நூல்களை மின்பதிப்பு செய்தல் - தமிழ் மென்பொருட்கள் உருவாக்கம் - தமிழ் இணையக் கல்விக்கழகம் - தமிழ் மின் நூலகம் - இணையத்தில் தமிழ் அகராதிகள் - சொற்குவைத் திட்டம்.		
Total Contact Hours: 15		

Text Book(s):
1. தமிழக வரலாறு - மக்களும் பண்பாடும் - கே.கே. பிள்ளை (வெளியீடு: தமிழ்நாடு பாடநூல் மற்றும் கல்வியியல் பணிகள் கழகம்).
2. கணினித் தமிழ் - முனைவர் இல. சுந்தரம். (விகடன் பிரசுரம்).
3. கீழடி - வைகை நதிக்கரையில் சங்ககால நகர நாகரிகம் (தொல்லியல் துறை வெளியீடு)
4. பொருதை - ஆற்றங்கரை நாகரிகம். (தொல்லியல் துறை வெளியீடு)
5. Social Life of Tamils (Dr. K. K. Pillay) A joint publication of TNTB & ESC and RMRL – (in print)
6. Social Life of the Tamils – The Classical Period (Dr. S. Singaravelu)(Published by: International Institute of Tamil Studies.
7. Historical Heritage of the Tamils (Dr. S. V. Subatamanian, Dr.K.D. Thirunavukkarasu) (Published by: International Institute of Tamil Studies).
8. The Contributions of the Tamils to Indian Culture (Dr.M.Valarmathi) (Published by: International Institute of Tamil Studies).
9. Keeladi – ‘Sangam City Civilization on the banks of river Vaigai’ (Jointly Published by: Department of archaeology & Tamil Nadu Text Book and Educational Services Corporation, Tamil Nadu)
10. Studies in the History of India with Special Reference to Tamil Nadu (Dr.K.K.Pillay) (Published by: The Author)
11. Porunai Civilization (Jointly Published by: Department of Archaeology & Tamil Nadu Text Book and Educational Services Corporation, Tamil Nadu)
12. Journey of Civilization Indus to Vaigai (R.Balakrishnan) (Published by: RMRL) – Reference Book.

Subject Code	Subject Name (Lab Oriented Theory course)	Category	L	T	P	C
IT23231	Digital Principles and Computer Architecture	PC	3	0	2	4
Common to	AIML, AIDS,CSD					

Objectives:
To introduce basic postulates of Boolean algebra and the methods for simplifying Boolean expressions. To introduce Logic Gates and implementation of logic function using logic gates
To outline the formal procedures for the analysis and design of combinational and sequential circuits
To learn the basic structure and operation of digital computer.
To familiarize the students with arithmetic and logic unit and implementation of fixed point and floating-point arithmetic operations
To expose and make the students to learn about the memory system design and different ways of communicating with I/O devices and standard I/O interfaces.

UNIT-I	MINIMIZATION TECHNIQUES	9
Number System and Complements. Fundamentals : Boolean postulates and Laws – De-Morgan’s Theorem – Principle of Duality – Boolean Expression – Minimization of Boolean expressions -Sum of Products (SOP) – Product of Sums (POS). Minimization Techniques: Minimization of Boolean expressions using Boolean laws, Karnaugh map, Quine McCluskey method of minimization, don’t care conditions. Logic Gates : Basic Logic Gates, Universal Gates,		
UNIT-II	COMBINATIONAL AND SEQUENTIAL CIRCUITS	9
Combinational Circuits : Adder - Subtractor –Multiplexer- De multiplexer – Decoder – Encoder. Sequential Circuits: Latches – Flip Flops – Shift Registers.		
UNIT-III	INTRODUCTION TO COMPUTER ARCHITECTURE & INSTRUCTIONS	9
Introduction –RISC – CISC, Eight ideas – Components of a computer system – Technology – Performance – Power wall –Instructions – Operations & Operands, Representing instructions, Logical operations – Instructions for decision making- Addressing Modes. Case Study: Evolution of Intel x86 architecture.		
UNIT-IV	ARITHMETIC AND LOGIC UNIT	9
Design of ALU, Integer Arithmetic: Addition, Subtraction, Multiplication and Division – Floating Point Arithmetic: Representation, Addition, subtraction, Multiplication.		
UNIT-V	MEMORY AND I/O SYSTEMS	9
Memory hierarchy - Memory technologies – Cache basics – Measuring and improving cache performance - Virtual memory – TLBs, Input/output system, programmed I/O, DMA and interrupts, I/O processors. Case Study: RAID		
Total Contact Hours: 45		

Course Outcomes:
On completion of the course, the students will be able to
Simplify the Boolean expressions using basic postulates of Boolean algebra with suitable minimization techniques.
Understand the use of electronic circuits involved in the design of logic gates.
Apply the procedure to design and implement combinational and sequential circuits.
Understand the impact of instruction set architecture on cost-performance of computer design.
Perform computer arithmetic operations.
Evaluate the performance of memory systems.

SUGGESTED ACTIVITIES
<ul style="list-style-type: none"> ● Problem Based Learning ● Flipped classroom ● Circuit Design using Software ● Students Seminar to improve technical presentation ● Quiz to check conceptual understanding

SUGGESTED EVALUATION METHODS

- Continuous Assessment Test
- Online Quiz Assignment
- Offline Assignments
- Circuit Design
- Practical Evaluation

Text Book(s):

M. Morris Mano, "Digital Design", 4th Edition, Prentice Hall of India Pvt. Ltd., 2008 / Pearson Education(Singapore) Pvt. Ltd., New Delhi, 2003.

David A. Patterson and John L. Hennessey, "Computer organization and design", 5th edition, Elsevier, 2014.

Reference Books(s) / Web links:

Charles H.Roth, "Fundamentals of Logic Design", 7th Edition, Thomson Learning, 2014.

Thomas L. Floyd, "Digital Fundamentals", 10th Edition, Pearson Education Inc, 2011.

Charles H.Roth. "Fundamentals of Logic Design", 6th Edition, Thomson Learning, 2013.

Donald D.Givone, "Digital Principles and Design", TMH, 2003.

Vincent P. Heuring, Harry F. Jordan, "Computer System Architecture", 2nd Edition, Pearson Education, 2005.

Govindarajalu, "Computer Architecture and Organization, Design Principles and Applications", 1st edition, Tata McGraw Hill, New Delhi, 2005.

John P Hayes, "Computer Architecture and Organization", 3rd edition, McGraw Hill, 2002.

V.CarlHamacher, Zvonko G. Varanescic and Safat G. Zaky, "Computer Organisation", 6th edition, Mc Graw-Hill Inc, 2012.

William Stallings, "Computer Organization and Architecture Designing for performance", 10th Edition, PHI Pvt. Ltd., Eastern Economy Edition 2016

Description of the Experiments	
1. Design and Implementation basic logic gates	
2. Design and Implementation universal gates	
3. Design and Implementation of adder using logic gate	
4. Design and Implementation of subtractor using logic gate	
5. Design and Implementation of Multiplexer using logic gates.	
6. Design and Implementation of De-multiplexer using logic gates.	
7. Design of Registers	
8. Design of ALU	
9. Design of Central Processing Unit	
10. Design of Memory	
Total Contact Hours: 15	

SUGGESTED EVALUATION METHODS (if Any) (UNIT/ Module Wise) – could suggest topic

- Experiment based viva
- Quizzes
- Mini Project

Web Links for Virtual Lab (If any)

<http://vlabs.iitkgp.ernet.in/coa/>

<https://www.vlab.co.in/broad-area-computer-science-and-engineering>

<https://cse11-iiith.vlabs.ac.in/>

CO - PO – PSO matrices of course

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
IT23231.1	3	3	3	-	-	-	-	-	-	-	-	-	2	2	-
IT23231.2	3	2	3	-	-	-	-	-	-	-	-	-	2	1	2
IT23231.3	2	2	1	1	-	1	-	-	-	-	-	-	2	2	2
IT23231.4	3	3	1	2	-	-	-	-	2	-	1	-	2	2	2
IT23231.5	2	2	3	1	2	2	2	-	-	-	2	-	2	-	-
Average	2.6	2.4	2.2	1.33	2	1.5	2	-	2	-	1.5	-	2	1.75	2

Correlation levels 1, 2 or 3 are as defined below:

1: Slight (Low)

2: Moderate (Medium)

3: Substantial (High) No correlation: “-“

Subject Code	Subject Name (Lab oriented Theory Courses)	Category	L	T	P	C
AI23231	PRINCIPLES OF ARTIFICIAL INTELLIGENCE	PC	3	0	2	4

Objectives:	
•	To Understand the various characteristics of a problem solving agent
•	To Learn about the different strategies involved in problem solving
•	To Learn about solving problems with various constraints.
•	To Learn about various knowledge representation
•	To Understand the different models of reasoning and decision making

UNIT-I	INTRODUCTION TO ARTIFICIAL INTELLIGENCE AND PROBLEM-SOLVING AGENT	9
AI-Introduction. Intelligent Agents, Agents & environment, nature of environment, structure of agents, goal-based agents, utility-based agents, learning agents. Defining the problem as state space search, production system, problem characteristics, issues in the design of search programs.		
UNIT-II	SEARCH TECHNIQUES	9
Problem solving agents, searching for solutions; uniform search strategies: breadth first search, depth first search, depth limited search, bidirectional search. Heuristic search strategies Greedy best-first search, A* search, AO* search, memory bounded heuristic search: local search algorithms & optimization problems: Hill climbing search, simulated annealing search, local beam search.		
UNIT-III	CONSTRAINT SATISFACTION PROBLEMS AND GAME THEORY	9
Local search for constraint satisfaction problems. Adversarial search, Games, optimal decisions & strategies in games, the min max search procedure, alpha-beta pruning.		
UNIT-IV	KNOWLEDGE REPRESENTATION	9
AI for knowledge representation, rule-based knowledge representation, procedural and declarative knowledge, Logic programming, Forward and backward reasoning.		
UNIT-V	REASONING & DECISION MAKING	9
Statistical Reasoning: Probability and Bays' Theorem, Certainty Factors and Rule-Base Systems, Bayesian Networks, Dempster-Shafer Theory, Fuzzy Logic. Decision networks, Markov Decision Process. Expert System		
		Contact Hours : 45

List of Experiments			
1	Programs on Problem Solving		
	a. Write a program to solve 8 Queens problem		
	b. Solve any problem using depth first search		
	c. Implement MINIMAX algorithm		
	d. Implement A* algorithm		
2	Programs on Decision Making and Knowledge Representation		
	a. Introduction to PROLOG i) Find minimum maximum of two numbers ii) Here are some simple clauses. likes(mary,food). likes(mary,wine). likes(john,wine). likes(john,mary). The following queries yield the specified answers. ?- likes(mary,food). yes. ?- likes(john,wine). yes. ?- likes(john,food). no. How do you add the following facts? 1. John likes anything that Mary likes 2. John likes anyone who likes wine 3. John likes anyone who likes themselves		
	b. Implementation of Unification and Resolution Algorithm		
	c. Implementation of Backward Chaining		
	d. Implementation of Forward Chaining		
3	Programs on Planning and Learning		
	a. Implementation of Blocks World program		
	b. Implementing a fuzzy inference system		
Contact Hours		:	60
Total Contact Hours		:	105

Lab Specifications:

- The lab can be implemented using Python or C.
- Knowledge representation experiments can be performed using a PROLOG TOOL.

Course Outcomes:	
On completion of the course, the students will be able to	
•	Basic knowledge representation, problem solving, and learning methods of artificial intelligence.
•	Provide the apt agent strategy to solve a given problem
•	Represent a problem using first order and predicate logic
•	Design applications like expert systems and chat-bot.
•	Suggest the different models of reasoning and decision making for any given problem

Text Books:	
1	S. Russell and P. Norvig, Artificial Intelligence: A Modern Approach, Pearson, Fourth Edition, 2022.
2	Denis Rothman, Artificial Intelligence By Example: Acquire advanced AI, machine learning, and deep learning design skills, Packt Publishing; 2nd edition, 2020
3	Deepak Khemani , A First Course in Artificial Intelligence , McGraw Hill Education, 2017

Reference Books:

1	Elaine Rich, Kevin Knight, & Shivashankar B Nair, Artificial Intelligence, McGraw Hill, 3 rd ed.,2017.
2	Introduction to Artificial Intelligence & Expert Systems, Patterson, Pearson, 1 st ed. 2015

WEB LINKS

- <https://sites.cs.ucsb.edu/~yuxiangw/classes/AICourse-2022Spring/>
- <https://web.stanford.edu/class/archive/cs/cs221/cs221.1196/>
- <https://redirect.cs.umbc.edu/~ypeng/AICourseOld/471-671.html>
- http://ai.berkeley.edu/lecture_slides.html
- <https://www.cs.utexas.edu/~mooney/cs343/>
- <https://courses.cs.washington.edu/courses/csep573/22wi/>
- <https://www.cse.iitd.ac.in/~rohanpaul/teaching/2022-col333.html>
- <https://courses.grainger.illinois.edu/ece448/sp2022/>

SUGGESTED ACTIVITIES

- Case study Discussion
- Flipped classroom – Comparing of Different Algorithms
- Activity Based Learning

SUGGESTED EVALUATION METHODS

- Mini Projects
- Assignment problems
- Quizzes

CO - PO – PSO matrices of course

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
AI23231.1	3	3	1	-	2	1	1	1	1	-	2.2	1	2	1	1
AI23231.2	2	2	1	-	2	1	2	-	-	-	2	2	1	1	1
AI23231.3	3	3	1	-	3	-	1	-	-	-	3	1	2	3	2
AI23231.4	2	2	2	2	3	-	1	2	-	-	2	2	2	2	2
AI23231.5	2	3	-	-	2	1	1	1	-	-	2	2	2	2	2
Average	2.4	2.4	1.0	2.0	2.4	0.6	1.2	0.8	0.2	-	2.0	1.8	1.8	1.8	1.6

Correlation levels 1, 2 or 3 are as defined below:

- 1: Slight (Low)
- 2: Moderate (Medium)
- 3: Substantial (High) No correlation: “-“

Subject Code	Subject Name	Category	L	T	P	C
CS23231	DATA STRUCTURES	PC	3	0	4	5

Objectives:	
•	To apply the concepts of Linked List in the applications of various linear data structures.
•	To demonstrate the understanding of stacks, queues and their applications.
•	To apply the concepts of Linked List in the applications of various nonlinear data structures.
•	To understand the implementation of graphs and their applications.
•	To be able to incorporate various sorting and hashing techniques in real time scenarios

UNIT-I	LINEAR DATA STRUCTURE -LIST	9
Self-Referential Structures, Dynamic Memory Allocation, Linked list implementation - Singly Linked List, Doubly Linked List, Circular Linked List, Applications of List.		
UNIT-II	LINEAR DATA STRUCTURE –STACK AND QUEUE	8
Stack – Operations, Array and Linked list implementation, Applications – Evaluation of Arithmetic Expressions, Queues- Operations, Array and Linked list Implementation.		
UNIT-III	NON LINEAR DATA STRUCTURE -TREES	10
Tree Terminologies, Binary Tree Representation, Tree Traversals, Binary Search Trees, Binary Heap, Height Balance Trees – AVL Trees.		
UNIT-IV	NONLINEAR DATA STRUCTURE -GRAPH	9
Representation of Graphs, Topological Sort, Depth First Search and Breadth-First Search , Minimum Spanning Tree – Prim's Algorithm, Shortest path algorithm – Dijkstra's Algorithm.		
UNIT-V	SORTING AND HASHING	9
Sorting Techniques –Insertion Sort, Quick Sort, Merge Sort, Hashing- Hashing functions – Mid square, Division, Folding, Collision Resolution Techniques – Separate Chaining – Open Addressing – Rehashing.		
Contact Hours		: 45

Course Outcomes:	
On completion of the course, the students will be able to	
•	Understand and apply the various concepts of Linear data Structures
•	Understand and apply the various concepts of Non Linear data Structures.
•	Understand and apply the various sorting and Hashing concepts.
•	Analyse and apply the suitable data structure for their research.
•	Choose efficient data structures and apply them to solve real world problems.

SUGGESTED ACTIVITIES

- **Role play-** Linked List (**Unit 1**).
- **Mind Map, Poster Design -** Stack and Queue (**Unit 2**).
- **Flipped Classroom -** Binary Heap (**Unit 3**).
- **Poster Design -** Graph (**Unit4**).
- **Implementation of small module-** Hashing (**Unit5**).

SUGGESTED EVALUATION METHODS

- **Assignment problems -** Linked List (**Unit 1**).
- **Tutorial problems -** Applications – Evaluation of Arithmetic Expressions (**Unit 2**).
- **Quizzes -** BST and Binary Heap (**Unit 3**).
- **Tutorial problems-** Graph traversal (**Unit 4**).
- **Quizzes - Hashing and Sorting(Units5) .**

Text Books(s):

1	“Data Structures and Algorithm Analysis in C”, Mark Allen Weiss, 2nd Edition, Pearson Education, 2005
2	“Data Structures and Algorithm Analysis in C++ - Anna University, Mark Allen Weiss, Pearson Education, 2017.

Reference Books:

1	“Data Structures Using C and C++”, Langsam, Augenstein and Tanenbaum, 2nd Edition, Pearson Education, 2015.
2	Thomas H. Cormen, Charles E. Leiserson, Ronald L.Rivest, Clifford Stein, Introduction to Algorithms”, Fourth Edition, Mcgraw Hill/ MIT Press, 2022.

Description of Experiments (If applicable)		Total Contact Hours: 60
1	Implementation of Single Linked List (Insertion , Deletion and Display).	
2	Implementation of Doubly Linked List (Insertion , Deletion and Display).	
3	Implementation of Stack using Array and Linked List implementation.	
4	Implementation of Queue using Array and Linked List implementation.	
5	Implementation of Binary Search Tree and perform Tree Traversal Techniques.	
6	Program to perform Quick Sort	
7	Program to perform Merge Sort	
8	Program to perform Linear Probing.	

9	Program to perform Rehashing.
10	<p>Mini Project:</p> <ul style="list-style-type: none"> ● Contact book application using Linked List. ● Dictionary using Binary search trees. ● Snake Game. ● Chess Game. ● Travel Planner (Shortest Path Algorithm). ● Tic-Tac-Toe Game. ● Library Management System. ● Project Management System. ● other projects .

Web links for Theory & Lab	
1	Data Structures - GeeksforGeeks
2	Data Structures DS Tutorial - javatpoint
3	Data Structure and Types (programiz.com)

CO - PO – PSO matrices of course

CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
CS23231.1	1	2	1	2	1	-	-	-	-	-	-	1	1	2	-
CS23231.2	1	1	2	1	1	-	-	-	-	-	-	2	2	2	-
CS23231.3	1	1	2	1	1	-	-	-	-	-	-	2	2	2	-
CS23231.4	1	1	2	1	1	-	-	-	-	-	-	2	2	2	-
CS23231.5	1	1	2	1	1	-	-	-	-	-	-	1	1	2	-
Average	1.0	1.2	1.8	1.2	1.0	-	-	-	-	-	-	1.6	1.6	2.0	-

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High) No correlation: “-”

Subject Code	Subject Name (Laboratory Course)	Category	L	T	P	C
HS23222	Technical Communication II	Theory	0	0	2	1
Common to all branches of B.E/B. Tech programmes –Second Semester						

Objectives:
<ul style="list-style-type: none"> To facilitate students to improve their vocabulary for a better communication To enable learners to understand and reproduce language To aid students to write technical reports in a convincing manner To expose students to different sentence structures To equip learners to present their ideas in an efficient manner

UNIT-I	VOCABULARY FOR BETTER COMMUNICATION	6
<p>Listening: Telephonic Conversations and TV News</p> <p>Reading: Newspapers and Magazines</p> <p>Speaking: Conversational Practice: Speaking in a given situation, Asking permission and requesting etc...</p> <p>Writing: Job Application Letter and Resume</p> <p>Grammar: Reference words: pronouns and determiners</p> <p>Vocabulary: Guessing meanings of words in different contexts.</p>		
UNIT-II	FUNCTIONAL LANGUAGE ASPECTS	6
<p>Listening: Motivational listening – listening to real life challenges</p> <p>Reading: Articles and Technical reports</p> <p>Speaking: Using Polite Expressions, Indirect Questions</p> <p>Writing: Paraphrasing a Text, Poem</p> <p>Grammar: Purpose Statements, Cause and Effect Expressions</p> <p>Vocabulary: Neologisms.</p>		
UNIT-III	TECHNICAL REPORTWRITING	6
<p>Listening: Empathetic Listening – Giving Solutions to Problems</p> <p>Reading: Inferential Reading</p> <p>Speaking: Dialogues – Interviewing Celebrities / Leaders / Sportspersons, etc...</p> <p>Writing: Report Writing</p> <p>Grammar: Functional Usage of Expressions – used to, gone / been, etc...</p> <p>Vocabulary: Words Often Confused</p>		
UNIT-IV	STRUCTURAL GRAMMAR	6

Listening: Comprehension (IELTS practice tests)	
Reading: Intensive Reading for specific information	
Speaking: Pick and Talk	
Writing: Proposals	
Grammar: Sentence Structures – Simple, Compound, Complex Sentences	
Vocabulary: Replacing dull words with vivid ones	
UNIT-V	PRESENTATION SKILLS
Listening: Discriminative listening – sarcasm, irony, pun, etc.,	
Reading: Practice of chunking – breaking up reading materials	
Speaking: Mini presentation on some topic	
Writing: Minutes of the meeting	
Grammar: Correction of Errors	
Vocabulary: Advanced vocabulary – fixing appropriate words in the given context.	
Total Contact Hours: 30	

Course Outcomes:
On completion of the course students will be able to
<ul style="list-style-type: none"> • communicate effectively using appropriate vocabulary • use the acquired language skills to comprehend various types of language contents • evaluate different texts and write effective technical content • use appropriate sentence structures to convey their thoughts in varied contexts • present their concepts and ideas in an effective manner

SUGGESTED ACTIVITIES
<ul style="list-style-type: none"> • Story Lines • One truth and two lies • Hang Man • Pictionary • Word Scramble • Case study

SUGGESTED EVALUATION METHODS
<ul style="list-style-type: none"> • Assignment topics • Quizzes • Class Presentation/Discussion • Continuous Assessment Tests

Text Book(s):
5. Raymond Murphy, "Intermediate English Grammar," Second Edition, Cambridge University Press, 2018
6. Meenakshi Raman & Sangeeta Sharma, "Technical Communication" Third Edition, Oxford University Press, 2015
7. Teaching Speaking: A Holistic Approach, Book by Anne Burns and Christine ChuenMeng Goh, Cambridge University Press

Reference Books(s) / Web links:
1. Michael McCarthy (Author), Felicity O'Dell (Author), John D. Bunting (Contributor), "Basic Vocabulary in Use: 60 Units of Vocabulary Practice in North American English With Answers" 2nd Edition
2. Dale Carnegie, "The Art of Public Speaking," Insight Press
3. Jack C. Richards & Theodore S. Rodgers, "Approaches and Methods in Language Teaching, Second Edition, Cambridge University Press

CO - PO – PSO matrices of course

CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
HS23221.1	-	-	-	1	-	-	-	-	-	2	-	-	-	-	-
HS23221.2	-	-	-	1	-	-	-	-	-	3	-	-	-	-	-
HS23221.3	-	2	-	1	-	-	-	-	-	3	-	-	-	-	-
HS23221.4	-	-	-	1	-	-	-	-	2	3	-	-	-	-	-
HS23221.5	-	-	-	1	-	-	-	-	2	2	-	-	-	-	-
Average	-	2	-	1	0	0	0	0	2	2.6	-	-	-	-	-

Correlation levels 1, 2 or 3 are as defined below:

1: Slight (Low)

2: Moderate (Medium)

3: Substantial (High)

No correlation: "-"

Subject Code	Subject Name	Category	L	T	P	C
HS23223	English for Professional Competence		0	0	2	1
	Common to all branches of B.E/B. Tech programmes –Second Semester					

Objectives:

- To facilitate the learners in acquiring listening and reading competence
- To enable the learners to communicate effectively through written and oral medium
- To assist the learners in preparing for competitive examinations
- To train the students in acquiring corporate skills
- To inculcate professional standards among the students and make them realize their responsibility in addressing the challenges

UNIT-I	RECEPTIVE SKILLS	6	
<p>Listening – Comprehensive Listening – Watching the news – Listening to a peer giving presentation, etc. – Critical Listening – Watching a televised debate, Listening to poems – Reading – Extensive Reading – Short stories and One-act Plays – Intensive Reading – Articles or Editorials in Magazines, Blog posts on topics like science and technology, arts, etc.</p>			
UNIT-II	PRODUCTIVE SKILLS	6	
<p>Speaking – Demonstrative Speaking – Process description through visual aids – Persuasive Speaking – Convincing the listener with the speaker’s view – Writing – Descriptive Writing - Describing a place, person, process – Subjective Writing – Autobiography, Writing based on personal opinions and interpretations</p>			
UNIT-III	ENGLISH FOR COMPETITIVE EXAMS	6	
<p>An introduction to International English Language Testing System (IELTS) – Test of English as a Foreign Language (TOEFL) – Graduate Record Examination (GRE) – Civil Service, Indian Economic Service Examination, Indian Statistical Service Examination, Combined Defence Services Examination, Staff Selection- (Language Related) – Aptitude tests.</p>			
UNIT-IV	CORPORATE SKILLS	6	
<p>Critical Thinking and Problem Solving – Case Study, Brainstorming, Q & A Discussion – Team work and Collaboration – Activities like Office Debates, Perfect Square, Blind Retriever, etc. – Professionalism and Strong Work Ethics – Integrity, Resilience, Accountability, Adaptability, Growth Mind set</p>			
UNIT-V	PROJECT WORK	6	
<p>Case Study based on the challenges faced by the employers and the employees – Devise Plan, Provide Solution</p>			
		Total Contact Hours	30
Course Outcomes:			
On completion of the course, students will be able to			
<ul style="list-style-type: none"> ● interpret and respond appropriately in the listening and reading contexts. ● express themselves effectively in spoken and written communication ● apply their acquired language skills in writing the competitive examinations ● exhibit their professional skills in their work place ● identify the challenges in the work place and suggest strategies solutions 			

SUGGESTED ACTIVITIES

- Online Quizzes on Vocabulary
- Online Quizzes on grammar
- Communication Gap Exercises
- Presentations
- Word Building Games
- Case study

SUGGESTED EVALUATION METHODS

- Assignment topics
- Quizzes
- Class Presentation/Discussion
- Continuous Assessment Tests

Reference Books

1	How to Read Better & Faster, Norman Lewis, Goyal Publishers
2	Teaching Speaking: A Holistic Approach, Book by Anne Burns and Christine Chuen Meng Goh, Cambridge University Press
3	The Official Cambridge Guide To IELTS by Pauline Cullen, Cambridge University Press
4	The 7 Habits of Highly Effective People by Stephen Covey, Simon and Schuster, UK

Reference Books(s) / Web links:

1. Board of Editors. Sure Outcomes. A Communication Skills Course for Undergraduate Engineers and Technologists. Orient Black Swan Limited, Hyderabad, 2013.
2. Hartley, Mary. "The Power of Listening," JaicoPublishing House; First Edition (2015).
3. Chambers, Harry. "Effective Communication Skills for Scientific and Technical Professionals," Persues Publishing, Cambridge, Massachusetts, 2000.

CO - PO – PSO matrices of course

CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
HS23222.1	-	1	-	-	-	-	-	-	-	3	-	-	-	-	-
HS23222.2	-	1	-	-	-	-	-	-	-	3	-	-	-	-	-
HS23222.3	-	-	-	-	-	-	-	-	-	3	-	-	-	-	-
HS23222.4	-	-	-	-	-	-	2	2	-	3	-	-	-	-	-
HS23222.5	-	-	1	-	-	-	2	-	-	3	-	-	-	-	-
Average	0	1	1	0	0	0	2	2	0	3	0	0	-	-	-

Correlation levels 1, 2 or 3 are as defined below:

- 1: Slight (Low)
 - 2: Moderate (Medium)
 - 3: Substantial (High)
- No correlation: “-”

Course Code	Course Name (Laboratory Course)	Category	L	T	P	C
GE23121	ENGINEERING PRACTICES – Civil& Mechanical	ES	0	0	2	1

Objectives:

To provide exposure to the students with hands on experience on various basic engineering practices in Civil and Mechanical Engineering.

List of Experiments							
CIVIL ENGINEERING PRACTICE							
1.	Study of pipeline joints, its location and functions: valves, taps, couplings, unions, reducers, and elbows in household fittings.						
2.	Preparation of basic plumbing line sketches for wash basins, water heaters, etc.						
3.	Hands-on-exercise: Basic pipe connections – Pipe connections with different joining components.						
Carpentry Works:							
4.	Study of joints in roofs, doors, windows and furniture.						
5.	Hands-on-exercise: Woodwork, joints by sawing, planing and chiselling.						
MECHANICAL ENGINEERING PRACTICE							
6.	Preparation of butt joints, lap joints and T- joints by Shielded metal arc welding.						
7.	Gas welding practice.						
Basic Machining:							
8.	Simple Turning and Taper turning						
9.	Drilling Practice						
Sheet Metal Work:							
10.	Forming & Bending:						
11.	Model making – Trays and funnels						
12.	Different type of joints.						
Machine Assembly Practice:							
13.	Study of centrifugal pump						
14.	Study of air conditioner						
					Total Contact Hours	:	30

Course Outcomes:	
•	Able to perform plumbing activities for residential and industrial buildings considering safety aspects while gaining clear understanding on pipeline location and functions of joints like valves, taps, couplings, unions, reducers, elbows, etc.
•	Able to perform wood working carpentry activities like sawing, planning, cutting, etc. while having clear understanding of the joints in roofs, doors, windows and furniture.
•	Able to produce joints like L joint, T joint, Lap joint, Butt joint, etc. through arc welding process while acquiring in depth knowledge in the principle of operation of welding and other accessories
•	Able to perform operations like Turning, Step turning, Taper turning, etc. in lathe and Drilling operation in drilling machine
•	Able to perform sheet metal operations like Forming, Bending, etc. and fabricating models like Trays, funnels, etc.

CO - PO – PSO matrices of course

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
GE23121 .1	1	1	1	-	-	2	1	-	2	-	-	2	-	2	1
GE23121 .2	1	1	1	-	-	2	1	-	2	-	-	2	-	2	1
GE23121 .3	1	1	1	-	-	2	1	-	2	-	-	2	-	2	1
GE23121 .4	1	1	1	-	-	2	1	-	2	-	-	2	-	2	1
GE23121 .5	1	1	1	-	-	2	1	-	2	-	-	2	-	2	1

Correlation levels 1, 2 or 3 are as defined below:

1: Slight (Low)

2: Moderate (Medium)

3: Substantial (High) No correlation: “-”

Subject Code	Subject Name (Laboratory Course)	Category	L	T	P	C
CS23221	PYTHON PROGRAMMING LAB	PC	0	0	4	2
Common to	All the Programs					

Objectives:

- Learn the basics of Python Programming and Control statements
- Demonstrate various Python data structures like Lists, Tuples, Sets and dictionaries
- Understand about Strings, Functions, Modules and Regular Expressions in Python Programming
- Understand the concepts of file handling using Python
- Understand the concepts of Numpy, Pandas, sciPy modules

Description of the Experiments	Total Contact Hours:
1. Experiments based on Variables, Datatypes and Operators in Python.	
2. Implement various control statements in python.	
3. Implement various String & List operations.	
4. Implement Inbuilt functions, User-defined functions and Lambda functions.	
5. Implementation of Tuples, sets, Dictionary and its operations.	
6. Implementation of Exception Handling and I/O files.	
7. Experiments based on Packages : math, datetime, platform, re	
8. Experiments based on Packages : NumPy, pandas, matplotlib	
9. Experiments based on Packages : collections	
10. Experiments based on Packages :sciPy	
11. Mini Project	

Course Outcomes: On completion of the course, students will be able to

- Use the basics of Python Programming in problem solving and conditionals and loops.
- Use of Python Data structures such as List, Sets, Tuples, Dictionary for Compound Data
- Use Strings, Functions, Modules and Regular Expressions in Python Programming
- Implement the concepts of file handling and Exceptional handling.
- Apply Numpy, Pandas and SciPy for numerical and statistical data

SUGGESTED EVALUATION METHODS (if Any) (UNIT/ Module Wise) – could suggest topic

- Experiment based viva
- Quizzes

Web links for virtual lab (if any)

- <https://www.python.org/shell/>
- <https://python-iitk.vlabs.ac.in/>
- https://www.tutorialspoint.com/execute_python_online.php

CO - PO – PSO matrices of course

PO/PSO CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
CS23221.1	3	2	2	1	-	1	-	2	2	2	-	2	-	-	-
CS23221.2	3	2	2	1	-	1	-	2	2	2	-	2	-	-	-
CS23221.3	3	2	2	1	-	1	-	2	2	2	-	2	-	-	-
CS23221.4	3	2	2	1	-	1	-	2	2	2	-	2	-	-	-
CS23221.5	3	2	2	1	-	1	-	2	2	2	-	2	-	-	-
Average	3	2	2	1	-	1	-	2	2	2	-	2	-	-	-

Correlation levels 1, 2 or 3 are as defined below:

- 1: Slight (Low)
 - 2: Moderate (Medium)
 - 3: Substantial (High)
- No correlation: “-”