PROGRAM EDUCATIONAL OBJECTIVES (PEOs):

1. To enable graduates to pursue higher education and research, or have a successful career in industries associated with Computer Science and Engineering, or as entrepreneurs. To ensure that graduates will have the ability and attitude to adapt to emerging technological changes.

PROGRAM OUTCOMES POs:

Engineering Graduates will be able to:

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

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

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

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

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

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

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

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

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

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

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

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

PROGRAM SPECIFIC OBJECTIVES (PSOs)

To analyze, design and develop computing solutions by applying foundational concepts of Computer Science and Engineering.

To apply software engineering principles and practices for developing quality software for scientificand business applications.

To adapt to emerging Information and Communication Technologies (ICT) to innovate ideas andsolutions to existing/novel problems.

Mapping of POs/PSOs to PEOs

| Contribution | 1: Reasonable | 2:Significant | 3:Strong |

	PEOs	
POs	1. Graduates will pursue higher education and research, or have a successful career in industries associated with Computer Science and Engineering, or as entrepreneurs.	2. Graduates will have the ability and attitude to adapt to emerging technological changes.
1. **Engineering knowledge**: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.	3	1
2. **Problem analysis**: Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.	3	1

3. **Design/development of solutions**: Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.	3	2
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.	3	2
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.	2	3
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.	2	2
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.	2	1
8. **Ethics**: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.	3	1
9. **Individual and team work**: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.	3	2
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.	3	2

11. Project management and finance: Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.	2		2
12. Life-long learning: Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.	1		3

PSOs		
1. Analyze, design and develop computing solutions by applying foundational concepts of computer science and engineering.	3	1
2. Apply software engineering principles and practices for developing quality software for scientific and business applications.	3	1
3. Adapt to emerging information and communication technologies (ICT) to innovate ideas and solutions to existing/novel problems.	1	3

(EEC)

SI. NO	COURSE CODE	COURSE TITLE	CATEGORY	CONTACT PERIODS	L	T	P	C
1.	HS8381	Interpersonal Skills/Listening & Speaking	EEC	2	0	0	2	1
2.	HS8461	Advanced Reading and Writing	EEC	2	0	0	2	1
3.	CS8611	Mini Project	EEC	2	0	0	2	1
4.	HS8581	Professional Communication	EEC	2	0	0	2	1
5.	CS8811	Project Work	EEC	20	0	0	20	10

L	T	P	C
0	0	2	1

HS8381   INTERPERSONAL

SKILLS/LISTENING&SPEAKINGOBJECTIVES:
The Course will enable learners to:
- Equip students with the English language skills required for the successful undertaking ofacademic studies with primary emphasis on academic speaking and listening skills.
- Provide guidance and practice in basic general and classroom conversation and to engage inspecific academic speaking activities.
- improve general and academic listening skills
- Make effective presentations.

- Make effective presentations
- Participate confidently in Group Discussions.
- Attend job interviews and be successful in them.
- Develop adequate Soft Skills required for the workplace

Recommended Software
1. Open Source Software
2. Win English

REFERENCES:
1. Butterfield, Jeff Soft Skills for Everyone. Cengage Learning: New Delhi, 2015
2. E. Suresh Kumar et al. Communication for Professional Success. Orient Blackswan:Hyderabad, 2015
3. Interact English Lab Manual for Undergraduate Students,. OrientBalckSwan: Hyderabad, 2016.
4. Raman, Meenakshi and Sangeeta Sharma. Professional Communication. Oxford UniversityPress: Oxford, 2014
5. S. Hariharanetal. Soft Skills. MJP Publishers: Chennai, 2010.

CS8811   **PROJECT WORK**

L T P C

0 0 20 10

OBJECTIVES:
- To develop the ability to solve a specific problem right from its identification and literature review till the successful solution of the same. To train the students in preparing project reports and to face reviews and viva voce examination.

The students in a group of 3 to 4 works on a topic approved by the head of the department under the guidance of a faculty member and prepares a comprehensive project report after completing the work to the satisfaction of the supervisor. The progress of the project is evaluated based on a minimum of three reviews. The review committee may be constituted by the Head of the Department. A project report is   required at the end of the semester.   The project work is evaluated based on oral presentation and the project report jointly by external and internal examiners constituted by the Head of the Department.

TOTAL: 300 PERIODS

OUTCOME:
- On Completion of the project work students will be in a position to take up any challenging practical problems and find solution by formulating proper methodology.

B.E. COMPUTER SCIENCE AND ENGINEERING

Regulation - 2020
AUTONOMOUS SYLLABUS CHOICE BASED CREDIT SYSTEM (CBCS)
CURRICULUM AND SYLLABI
(SEM V & VI)

VISION:

To make the Department of Computer Science and Engineering the unique of its kind in the field of Research and Development activities in this part of world.

MISSION:

To impart highly innovative and technical knowledge to the urban and unreachable rural student folks in Computer Science and Engineering through "Total Quality Education".

PROGRAM EDUCATIONAL OBJECTIVES:

PEO 1:

Apply the necessary mathematical tools and fundamental knowledge of computer science & engineering to solve variety of engineering problems.

PEO 2:

Develop software based solutions for real life problems and be leaders in their profession with social and ethical responsibilities.

PEO 3:

Pursue life-long learning and research in selected fields of computer science & engineering and contribute to the growth of those fields and society at large.

PROGRAM OUTCOMES:

After going through the four years of study, the Computer Science and Engineering graduates will have the ability to

S.No	Graduate Attribute	Programme Outcome
1	Engineering knowledge	Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
2	Problem analysis	Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.
3	Design/development of solutions	Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.
4	Conduct investigations of complex problems	Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions
5	Modern tool usage	Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with anunderstanding of the limitations

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
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.
8	Ethics	Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.
9	Individual and team work	Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.
10	Communication	Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.
11	Project management and finance	Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.
12	Life-long learning	Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

PROGRAMME SPECIFIC OUTCOMES (PSOs):

PSO1 :

Professional Skills: The ability to understand, analyze and develop computer programs in the areas related to algorithms, system software, multimedia, web design, big data analytics, and networking for efficient design of computer-based systems of varying complexity.

PSO2:

Problem - Solving Skills: The ability to apply standard practices and strategies in software project development using open-ended programming environments to deliver a quality product for business success.

B.E. COMPUTER SCIENCE AND ENGINEERING
Regulation - 2020 Syllabus
CHOICE BASED CREDIT SYSTEM (CBCS)
SEMESTER V

SI. No	COURSE CODE	COURSE TITLE	CATEGORY	L	T	P	Contact Periods	C
THEORY								
1	IT1571	Computer Networks	PC	3	0	0	3	3
2	CS1501	Internet Programming	PC	3	0	0	3	3
3	CS1502	Theory of Computation and Compiler Design	PC	3	0	2	5	4
4	PE1	Professional Elective I	PE	3	0	0	3	3
5	PE2	Professional Elective II	PE	3	0	0	3	3
6	OE1	Open Elective – I	OE	3	0	0	3	3
		Online Course*						
PRATICALS								
7	CS1511	Internet Programming Lab	PC	0	0	4	4	2
8	IT1581	Computer Networks Laboratory	PC	0	0	4	4	2
			TOTAL	18	0	10	28	23

SEMESTER VI

SI. No	COURSE CODE	COURSE TITLE	CATEGORY	L	T	P	Contact Periods	C
THEORY								
1	CS1601	Distributed Systems	PC	3	0	0	3	3
2	CS1602	Internet of Things	PC	3	0	0	3	3
3	CS1603	Introduction to Machine learning	PC	3	0	0	3	3
4	PE3	Professional Elective III	PE	3	0	0	3	3
5	PE4	Professional Elective IV	PE	3	0	0	3	3
6	OL1	Online Course – I*	OL	0	0	0	0	3
PRATICALS								
7	HS1521	Professional Communication	EEC	0	0	2	2	1
8	CS1611	Internet of Things laboratory	PC	0	0	4	4	2
9	CS1612	Introduction to Machine Learning laboratory	PC	0	0	2	2	1
10	CS1681	Mobile Application Development laboratory	PC	0	0	4	4	2
			TOTAL	15	0	12	27	24

* Students shall complete online course in this semester. Credits earned will be added in consolidated mark statement.

HS1521   **PROFESSIONAL COMMUNICATION**

L	T	P	C
0	0	2	1

OBJECTIVES:

This course aims to:

- Enhance the Employability and Career Skills of students
- Orient the students towards grooming as a professional
- Make them Employable Graduates.
- Develop their confidence and help them attend interviews successfully

UNIT I

Introduction to Soft Skills – Hard skills & soft skills – employability and career Skills - Grooming as a professional with values - Time Management - General awareness of Current Affairs.

UNIT II

Self-Introduction-organizing the material – Introducing oneself to the audience – introducing the topic – answering questions with clarity and appropriate phrases – individual presentation practice - presenting the visuals effectively – 5 minute presentations

UNIT III

Introduction to Group Discussion - Participating in group discussions – understanding group dynamics – brainstorming the topic - questioning and clarifying – GD strategies- activities to improve GD skills

UNIT IV

Interview etiquette – dress code – body language – attending job interviews– telephone/skype interview - one to one interview &panel interview – FAQs related to job interviews

UNIT V

Recognizing differences between groups and teams - managing time-managing stress - networking professionally - respecting social protocols-understanding career management - developing a long-term career plan-making career changes - Error spotting.

TOTAL: 30 PERIODS

OUTCOMES:

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

CO1: Make effective presentations

CO2: Participate confidently in Group Discussions.

CO3: Attend job interviews and be successful in them.

CO4: Develop adequate Soft Skills required for the workplace.

REFERENCES:

1. Jeff Butterfield, 2015, *Soft Skills for Everyone*, Cengage Learning: New Delhi.

2. Suresh Kumar, E, et al., 2015, *Communication for Professional Success,* Orient Blackswan: Hyderabad.

3. *Interact English Lab Manual for Undergraduate Students*, Orient BlackSwan: Hyderabad, 2016.

4. Raman, Meenakshi & Sangeeta Sharma, 2014, *Professional Communication,* Oxford University Press: Oxford.

5. Hariharan, S, et al., 2010, *Soft Skills*, MJP Publishers: Chennai.

LIST OF EQUIPMENT FOR A BATCH OF 30 STUDENTS

S. No.	DESCRIPTION OF EQUIPMENT	QUANTITY REQUIRED
1.	Personal Computers (Intel Core i3, 250 GB, 4 GB RAM)	30
2.	Printer	1
3.	Software: Orell Techno Systems Digital Language Lab Software	30 (Licenses)

B.E. COMPUTER SCIENCE AND ENGINEERING

REGULATION – 2021

AUTONOMOUS SYLLABUS

CHOICE BASED CREDIT SYSTEM

III TO IV SEMESTER CURRICULUM AND SYLLABI

VISION:

> To make the Department of Computer Science and Engineering the unique of its kind in the field of Research and Development activities in this part of world.

MISSION:

> To impart highly innovative and technical knowledge to the urban and unreachable rural student folks in Computer Science and Engineering through "Total Quality Education".

PROGRAMME EDUCATIONAL OBJECTIVES (PEOs):

PEO 1: Apply the necessary mathematical tools and fundamental knowledge of computer science & engineering to solve variety of engineering problems.

PEO 2: Develop software based solutions for real life problems and be leaders in their profession with social and ethical responsibilities.

PEO 3: Pursue life-long learning and research in selected fields of computer science & engineering and contribute to the growth of those fields and society at large.

PROGRAM OUTCOMES:

After going through the four years of study, the Computer Science and Engineering graduates will have the ability to

POs	Graduate Attribute	Programme Outcome
1	Engineering knowledge	Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
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12	Life-long learning	Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

PROGRAMME SPECIFIC OUTCOMES (PSOs):

PSO1 : Professional Skills: The ability to understand, analyze and develop computer programs in the areas related to algorithms, system software, multimedia, web design, big data analytics, and networking for efficient design of computer-based systems of varying complexity.

PSO2 : Problem - Solving Skills: The ability to apply standard practices and strategies in software project development using open-ended programming environments to deliver a quality product for business success.

S.NO.	COURSE CODE	COURSE TITLE	CATE GORY	CONTACT PERIODS	L	T	P	C
THEORY								
1	MA2251	Discrete Mathematics and Probability	BS	4	3	1	0	4
2	CS2251	Database Management Systems	PC	3	3	0	0	3
3	CS2252	Design and Analysis of Algorithms	PC	3	3	0	0	3
4	CS2253	Software Engineering with UML Design	PC	3	3	0	0	3
5	AI2201	Artificial Intelligence	PC	3	3	0	0	3
6	GE2201	Design Thinking	ES	3	3	0	0	3
7	GE2251	Quantitative Aptitude	EM	1	1	0	0	1
8	AUD110	Tamils and Technology	AU	1	1	0	0	0
PRACTICALS								
9	CS2254	Database Management Systems Laboratory	PC	4	0	0	4	2
10	CS2255	Mobile Application Development Laboratory	PC	4	0	0	4	2
11	EM2252	An Introduction to Advanced Reading and Writing	EM	2	0	0	2	1
			TOTAL	31	20	1	10	25

Course Code	Course Name	L	T	P	C
GE2251	**QUANTITATIVE APTITUDE**	1	0	0	1

Category: Employability Enhancement Course

a. Preamble

To develop the thinking ability and problem solving skills of students to compete themselves in placement and competitive examinations.

b. Course Outcome

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

CO. No.	Course Outcome	Knowledge Level
CO1	Apply the concept of profit in real life problems	K3
CO2	Solve the problems by using proportion	K3
CO3	Compute accurate speed, time and distance	K3
CO4	Apply the concept of Time & Speed	K3
CO5	Calculate the work done based on various methods	K3

c. Course Syllabus **Total : 15 Periods**

PROFIT AND LOSS **3**

Profit and Loss - Cost Price, Selling Price, Profit and Loss %, Marked Price, Discount.

RATIO AND PROPORTION **3**

Ratio and Proportion - Ratio, Proportion, Comparison of Ratios, Duplicate, Triplcate Ratio.

TIME, SPEED AND DISTANCE **3**

Time, Speed and Distance - Concept of time, speed and distance, Conversion of units and proportionality, Avearge speed concept.

APPLICATIONS ON TIME, SPEED AND DISTANCE **3**

Problems on trains - Relative speed concept and application. Boats and Streams - Upstream speed, Downstream speed, Speed of stream, Speed of boat.

TIME AND WORK **3**

Time & work - Problems based on time and work, Formulae, Computation of work together, Wages based work problems. Pipes & Cisterns - Inlet-outlet, Part of tank filled, Time based problems.

d. Learning Resources

Text Book

1. Dinesh Khattar, *Quantitative Aptitude for Competitive Examinations*, Pearson India Education services Pvt Ltd, 4th Edition, Uttar Pradesh, 2019.

Reference Books

1. TCY online, *Reasoning ability and Quantitative Aptitude*, Wiley India Pvt. Ltd, 1st Edition, New Delhi, 2016.

2. Agarwal R S, *Quantitative Aptitude for Competitive Examinations*, S.Chand Limited, 2011.

3. Abhijit Guha, *Quantitative Aptitude for Competitive Examinations*, Tata McGraw Hill, 3rd Edition, 2011.

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Course Code	Course Name	L	T	P	C
EM2252	**AN INTRODUCTION TO ADVANCED READING AND WRITING**	0	0	2	1

Category: Employability Enhancement Course

a. Preamble

The course will enable learners to

- Strengthen the reading skills of students of engineering.
- Enhance their writing skills with specific reference to technical writing
- Develop their critical thinking skills.
- Provide more opportunities to develop their project and proposal writing skills

b. Course Outcome

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

CO. No.	Course Outcome	Knowledge Level
CO1	Understand how the text positions the reader	K3
CO2	Develop critical thinking while reading a text	K3
CO3	Develop a descriptive paragraph	K3
CO4	Make use of sentence structures effectively when creating an essay.	K3
CO5	Demonstrate proper usage of grammar in writing E-Mails, Job application and project	K3

c. Course Syllabus   **Total : 30 Periods**

EFFECTIVE READING   **6**

Reading – Strategies for effective reading-Use glosses and footnotes to aid reading comprehension- Read and recognize different text types-Predicting content using photos and title. Reading-Read for details-Use of graphic organizers to review and aid comprehension.

CRITICAL READING   **6**

Reading– Understanding pronoun reference and use of connectors in a passage- speed reading techniques. Reading– Genre and Organization of Ideas- Reading– Critical reading and thinking- understanding how the text positions the reader

PARAGRAPH WRITING 6

Writing-Plan before writing- Develop a paragraph: topic sentence, supporting sentences, concluding sentence.-Write a descriptive paragraph Writing-State reasons and examples to support ideas in writing– Write a paragraph with reasons and examples- Write an opinion paragraph

ESSAY WRITING 6

Writing– Elements of a good essay - Types of essays- descriptive-narrative- issue-based-argumentative-analytical

EFFECTIVE WRITING 6

Writing– Email writing- visumes – Job application- Report Writing - Project writing-Writing convincing proposals

d. Activities

Students shall be exposed to various passages for reading and trained to write in different forms.

e. Learning Resources

Text Books

1. Gramer, F Margot and Colin, S Ward, *Reading and Writing (Level 3)* Oxford University Press, Oxford, 2011.

2. Debra Daise, CharlNorloff and Paul Carne, *Reading and Writing (Level 4)* Oxford University Press: Oxford, 2011.

Reference Books

1. Davis, Jason and Rhonda Liss, *Effective Academic Writing (Level 3)* Oxford University Press: Oxford, 2006.

2. Suresh Kumar E, *Enriching Speaking and Writing Skills*, 2nd Edition, Orient Black swan: Hyderabad, 2012.

3. Withrow and Jeans, *Inspired to Write. Readings and Tasks to develop writing skills*, Cambridge University Press: Cambridge, 2004.

4. Goatly, Andrew, *Critical Reading and Writing*, Routledge: United States of America, 2000.

5. Petelin, Roslyn and Marsh Durham, *The Professional Writing Guide: Knowing Well and Knowing Why*, Business & Professional Publishing: Australia, 2004.

ANNA UNIVERSITY, CHENNAI
AFFILIATED INSTITUTIONS
B.TECH INFORMATION TECHNOLOGY
REGULATIONS – 2017
CHOICE BASED CREDIT SYSTEM

PROGRAM EDUCATIONAL OBJECTIVES (PEOs)

1. To ensure graduates will be proficient in utilizing the fundamental knowledge of basic sciences, mathematics and Information Technology for the applications relevant to various streams of Engineering and Technology.

2. To enrich graduates with the core competencies necessary for applying knowledge of computers and telecommunications equipment to store, retrieve, transmit, manipulate and analyze data in the context of business enterprise.

3. To enable graduates to think logically, pursue lifelong learning and will have the capacity to understand technical issues related to computing systems and to design optimal solutions.

4. To enable graduates to develop hardware and software systems by understanding the importance of social, business and environmental needs in the human context.

5. To enable graduates to gain employment in organizations and establish themselves as professionals by applying their technical skills to solve real world problems and meet the diversified needs of industry, academia and research.

PROGRAM OUTCOMES (POs)

ENGINEERING GRADUATES WILL BE ABLE TO:

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

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

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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.

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

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

PROGRAM SPECIFIC OBJECTIVES (PSOs)

1. To create, select, and apply appropriate techniques, resources, modern engineering and IT tools including prediction and modelling to complex engineering activities with an understanding of the limitations.

2. To manage complex IT projects with consideration of the human, financial, ethical and environmental factors and an understanding of risk management processes, and operational and policy implications.

SI. No	COURSE CODE	COURSE TITLE	CATEGORY	CONTACT PERIODS	L	T	P	C
1.	CS8085	Social Network Analysis	PE	3	3	0	0	3
2.	CS8086	Soft Computing	PE	3	3	0	0	3
3.	CS8074	Cyber Forensics	PE	3	3	0	0	3
4.	IT8073	Information Security	PE	3	3	0	0	3
5.	EC8093	Digital Image Processing	PE	3	3	0	0	3
6.	IT8004	Network Management	PE	3	3	0	0	3
7.	GE8076	Professional Ethics in Engineering	PE	3	3	0	0	3

SEMESTER VIII
ELECTIVE - V

SI.No	COURSE CODE	COURSE TITLE	CATEGORY	CONTACT PERIODS	L	T	P	C
1.	CS8080	Information Retrieval Techniques	PE	3	3	0	0	3
2.	CS8078	Green Computing	PE	3	3	0	0	3
3.	CS8084	Natural Language Processing	PE	3	3	0	0	3
4.	IT8077	Speech Processing	PE	3	3	0	0	3
5.	IT8078	Web Design and Management	PE	3	3	0	0	3
6.	IT8005	Electronic Commerce	PE	3	3	0	0	3
7.	GE8073	Fundamentals of Nano Science	PE	3	3	0	0	3

*Professional Electives are grouped according to elective number as was done previously.

EMPLOYABILITY ENHANCEMENT COURSES (EEC)

SI.NO	COURSE CODE	COURSE TITLE	CATEGORY	CONTACT PERIODS	L	T	P	C
1.	HS8381	Interpersonal Skills/ Listening & Speaking	EEC	2	0	0	2	1
2.	HS8461	Advanced Reading and Writing	EEC	2	0	0	2	1
3.	IT8611	Mini Project	EEC	2	0	0	2	1
4.	HS8581	Professional Communication	EEC	2	0	0	2	1
5.	IT8811	Project Work	EEC	20	0	0	20	10

12.4 PROJECT WORK

Project work may be allotted to a single student or to a group of students not exceeding 4 per group.

The Head of the Institutions shall constitute a review committee for project work for each branch of study. There shall be three reviews during the semester by the review committee. The student shall make presentation on the progress made by him / her before the committee. The total marks obtained in the three reviews shall be **reduced for 20 marks** and rounded to the nearest integer (as per the scheme given in 12.4.1).

12.4.1 The project report shall carry a maximum 30 marks. The project report shall be submitted as per the approved guidelines as given by Director, Academic Courses. Same mark shall be awarded to every student within the project group for the project report. The viva-voce examination shall carry 50 marks. Marks are awarded to each student of the project group based on the individual performance in the viva-voce examination.

Review I	Review II	Review III	End semester Examinations				
			Thesis Submission (30)		Viva-Voce (50)		
			Internal	External	Internal	External	Supervisor
5	7.5	7.5	15	15	15	20	15

12.4.2 If a candidate fails to submit the project report on or before the specified deadline, he/she is deemed to have failed in the Project Work and shall re-register for the same in a subsequent semester.

B.Tech. INFORMATION TECHNOLOGY
REGULATION – 2020
AUTONOMOUS SYLLABUS
CHOICE BASED CREDIT SYSTEM
V TO VI SEMESTER CURRICULUM AND SYLLABI

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PROGRAMME EDUCATIONAL OBJECTIVES (PEOs):

PEO 1: Technical Knowledge : Graduates will be able to identify, analyze and create solutions for real life, industrial and societal needs by applying the principles and practices of Information Technology.

PEO 2: Teamwork & Ethics : Graduates will be able to collaborate effectively and ethically in a multi-disciplinary team as a member &/ as a leader.

PEO 3: Lifelong Learning : Graduates will be able to adopt the contemporary technologies in the field of Information Technology to provide solutions for challenging environments.

PROGRAM OUTCOMES:

After going through the four years of study, the B.Tech. Information Technology graduates will have the ability to

POs	Graduate Attribute	Programme Outcome
1	Engineering knowledge	Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
2	Problem analysis	Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.
3	Design/Development of solutions	Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.
4	Conduct investigations of complex problems	Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions
5	Modern tool usage	Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations
6	The engineer and society	Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice

7	Environment and sustainability	Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.
8	Ethics	Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.
9	Individual and team work	Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.
10	Communication	Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.
11	Project management and finance	Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.
12	Life-long learning	Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

PROGRAMME SPECIFIC OUTCOMES (PSOs):

PSO1 : Demonstrate technical and interpersonal skills to design and develop IT enabled solutions to meet the real time industrial and societal needs

PSO2 : Exhibit an ability to adapt to the evolutionary changes in computing

SEMESTER V

S.NO.	COURSE CODE	COURSE TITLE	CATE GORY	CONTACT PERIODS	L	T	P	C
THEORY								
1	IT1571	Computer Networks	PC	3	3	0	0	3
2	IT1501	Design and Analysis of Algorithms#	PC	5	3	0	2	4
3	IT1502	Object Oriented Analysis and Design#	PC	5	3	0	2	4
4	IT1503	Web Technology	PC	3	3	0	0	3
5	PE1	Professional Elective – I	PE	3	3	0	0	3
6	OE1	Open Elective I	OE	3	3	0	0	3
ONLINE COURSE								
7	OL1	Online Course I	OL	1	1	0	0	3
PRACTICALS								
8	IT1581	Computer Networks Laboratory	PC	4	0	0	4	2
9	IT1511	Web Technology Laboratory	PC	4	0	0	4	2
10	HS1521	Professional Communication	EEC	2	0	0	2	1
			TOTAL	**33**	**19**	**0**	**14**	**28**

SEMESTER VI

S.NO.	COURSE CODE	COURSE TITLE	CATE GORY	CONTACT PERIODS	L	T	P	C
THEORY								
1	IT1601	Data Mining and Warehousing#	PC	5	3	0	2	4
2	IT1602	Mobile Computing	PC	3	3	0	0	3
3	IT1671	Cryptography and Network Security	PC	3	3	0	0	3
4	PE2	Professional Elective – II	PE	3	3	0	0	3
5	PE3	Professional Elective – III#	PE	4	2	0	2	3
ONLINE COURSE								
6	OL2	Online Course II	OL	1	1	0	0	3
AUDIT COURSE								
7	AUD2	Audit Course	AU	3	3	0	0	0
PRACTICALS								
8	IT1681	Cryptography and Network Security Laboratory	PC	4	0	0	4	2
9	CS1681	Mobile Application Development Laboratory	PC	4	0	0	4	2
			TOTAL	**30**	**18**	**0**	**12**	**23**

* Course from the Curriculum of other UG programmes.
# Theory cum Laboratory Course

<table>
<tr><td>L</td><td>T</td><td>P</td><td>C</td></tr>
<tr><td>0</td><td>0</td><td>2</td><td>1</td></tr>
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HS1521   **PROFESSIONAL COMMUNICATION**

OBJECTIVES:

The course aims to

- Enhance the Employability and Career Skills of students
- Orient the students towards grooming as a professional
- Make them Employable Graduates
- Develop their confidence and help them attend interviews successfully

UNIT I

Introduction to Soft Skills– Hard skills & soft skills – employability and career Skills—Grooming as a professional with values—Time Management—General awareness of Current Affairs

UNIT II

Self-Introduction-organizing the material – Introducing oneself to the audience – introducing the topic – answering questions with clarity and appropriate pharases – individual presentation practice— presenting the visuals effectively – 5 minute presentations

UNIT III

Introduction to Group Discussion— Participating in group discussions – understanding group dynamics – brainstorming the topic -– questioning and clarifying –GD strategies- activities to improve GD skills

UNIT IV

Interview etiquette – dress code – body language – attending job interviews– telephone/skype interview -one to one interview &panel interview – FAQs related to job interviews

UNIT V

Recognizing differences between groups and teams- managing time-managing stress- networking professionally- respecting social protocols-understanding career management- developing a long-term career plan-making career changes

TOTAL: 30 PERIODS

Available Software:

1. Odyll

OUTCOMES

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

- Make effective presentations
- Participate confidently in Group Discussions.
- Attend job interviews and be successful in them.
- Develop adequate Soft Skills required for the workplace

REFERENCE BOOKS

1. Butterfield, *Jeff Soft Skills for Everyone*. Cengage Learning: New Delhi, 2015

2. E. Suresh Kumar et al. *Communication for Professional Success*. Orient Blackswan:Hyderabad, 2015

3. *Interact English Lab Manual for Undergraduate Students*,. OrientBalckSwan: Hyderabad,2016.

4. Raman, Meenakshi and Sangeeta Sharma. *Professional Communication*. OxfordUniversity Press: Oxford, 2014

5. S. Hariharanet al. Soft Skills. MJP Publishers: Chennai, 2010.

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PROGRAM OUTCOMES:

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POs	Graduate Attribute	Programme Outcome
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12	Life-long learning	Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

PROGRAMME SPECIFIC OUTCOMES (PSOs):

PSO1 :   Demonstrate technical and interpersonal skills to design and develop IT enabled solutions to meet the real time industrial and societal needs

PSO2 :   Exhibit an ability to adapt to the evolutionary changes in computing

SEMESTER IV

S.NO.	COURSE CODE	COURSE TITLE	CATE GORY	CONTACT PERIODS	L	T	P	C
THEORY								
1	MA2251	Discrete Mathematics and Probability	BS	4	3	1	0	4
2	CS2251	Database Management Systems	PC	3	3	0	0	3
3	IT2251	Data Structures	PC	3	3	0	0	3
4	IT2252	Operating Systems#	PC	5	3	0	2	4
5	IT2253	Web Essentials	PC	3	3	0	0	3
6	GE2251	Quantitative Aptitude	EM	1	1	0	0	1
7	AUD110	Tamils and Technology	HS	0	3	0	0	0
PRACTICALS								
8	CS2254	Database Management Systems Laboratory	PC	4	0	0	4	2
9	IT2254	Data Structures Laboratory	PC	4	0	0	4	2
10	IT2255	Web Essentials Laboratory	PC	4	0	0	4	2
			TOTAL	**31**	**19**	**1**	**14**	**24**

Theory cum Laboratory Course

Course Code	Course Name	L	T	P	C
GE2251	**QUANTITATIVE APTITUDE**	**1**	**0**	**0**	**1**

Category: Employability Enhancement Course

a. Preamble

To develop the thinking ability and problem solving skills of students to compete themselves in placement and competitive examinations.

b. Course Outcome

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

CO. No.	Course Outcome	Knowledge Level
CO1	Apply the concept of profit in real life problems	K3
CO2	Solve the problems by using proportion	K3
CO3	Compute accurate speed, time and distance	K3
CO4	Apply the concept of Time & Speed	K3
CO5	Calculate the work done based on various methods	K3

c. Course Syllabus   **Total : 15 Periods**

PROFIT AND LOSS   **3**

Profit and Loss - Cost Price, Selling Price, Profit and Loss %, Marked Price, Discount.

RATIO AND PROPORTION   **3**

Ratio and Proportion - Ratio, Proportion, Comparison of Ratios, Duplicate, Triplcate Ratio.

TIME, SPEED AND DISTANCE   **3**

Time, Speed and Distance - Concept of time, speed and distance, Conversion of units and proportionality, Avearge speed concept.

APPLICATIONS ON TIME, SPEED AND DISTANCE   **3**

Problems on trains - Relative speed concept and application. Boats and Streams - Upstream speed, Downstream speed, Speed of stream, Speed of boat.

TIME AND WORK   **3**

Time & work - Problems based on time and work, Formulae, Computation of work together, Wages based work problems. Pipes & Cisterns - Inlet-outlet, Part of tank filled, Time based problems.

d. Learning Resources

Text Book

1. Dinesh Khattar, *Quantitative Aptitude for Competitive Examinations*, Pearson India Education services Pvt Ltd, Fourth Edition, Uttar Pradesh, 2019.

Reference Books

1. TCY online, *Reasoning ability and Quantitative Aptitude*, Wiley India Pvt. Ltd, First Edition, New Delhi, 2016.
2. Agarwal.R.S, *Quantitative Aptitude for Competitive Examinations*, S.Chand Limited, 2011.
3. Abhijit Guha, *Quantitative Aptitude for Competitive Examinations*, Tata McGraw Hill, 3rd Edition, 2011

EC8611   **TECHNICAL SEMINAR**   **L T P C**   **0 0 2 1**

OBJECTIVES:

• To encourage the students to study advanced engineering developments

• To prepare and present technical reports.

 • To encourage the students to use various teaching aids such as overhead projectors, power point presentation and demonstrative models.

METHOD OF EVALUATION:

During the seminar session each student is expected to prepare and present a topic on engineering/ technology, for duration of about 8 to 10 minutes. In a session of three periods per week, 15 students are expected to present the seminar. Each student is expected to present atleast twice during the semester and the student is evaluated based on that. At the end of the semester, he / she can submit a report on his / her topic of seminar and marks are given based on the report. A Faculty guide is to be allotted and he / she will guide and monitor the progress of the student and maintain attendance also. Evaluation is 100% internal.

                                                    TOTAL: 30 PERIODS

OUTCOMES:

• Ability to review, prepare and present technological developments

• Ability to face the placement interviews

LIST OF EQUIPMENT FOR A BATCH OF 30 STUDENTS 3 STUDENTS PER EXPERIMENT:

S.NO	NAME OF THE EQUIPMENT	REQUIRED
1	Trainer kit for carrying out LED and PIN diode characteristics, Digital multi meter, optical power meter	2 Nos
2	Trainer kit for determining the mode characteristics, losses in optical fiber	2 Nos
3	Trainer kit for analyzing Analog and Digital link performance, 2 Mbps PRBS Data source, 10 MHz signal generator, 20 MHz Digital storage Oscilloscope	2 Nos
4	Kit for measuring Numerical aperture and Attenuation of fiber	2 Nos
5	Advanced Optical fiber trainer kit for PC to PC communication, BER Measurement, Pulse broadening.	2 Nos
6	MM/SM Glass and plastic fiber patch chords with ST/SC/E2000 connectors	2 sets
7	LEDs with ST / SC / E2000 receptacles – 650 / 850 nm	2 sets
8	PIN PDs with ST / SC / E2000 receptacles – 650 / 850 nm	2 sets
9	Digital Communications Teaching Bundle (LabVIEW/MATLAB/Equivalent software tools)	10 Users
10	Software Define Radio Transceiver Platform with antennas and accessories	2 Nos

EC8811	**PROJECT WORK**	**L T P C**
		0 0 20 10

OBJECTIVES:

- To develop the ability to solve a specific problem right from its identification and literature review till the successful solution of the same. To train the students in preparing project reports and to face reviews and viva voce examination.

The students in a group of 3 to 4 works on a topic approved by the head of the department under the guidance of a faculty member and prepares a comprehensive project report after completing the work to the satisfaction of the supervisor. The progress of the project is evaluated based on a minimum of three reviews. The review committee may be constituted by the Head of the Department. A project report is   required at the end of the semester. The project work is evaluated   based   on   oral presentation and the project report jointly by external and internal examiners constituted by the Head of the Department.

TOTAL: 300 PERIODS

OUTCOME:

- On Completion of the project work students will be in a position to take up any challenging practical problems and find solution by formulating proper methodology.

CS8392	OBJECT ORIENTED PROGRAMMING	L T P C
		3 0 0 3

OBJECTIVES:

- To understand Object Oriented Programming concepts and basic characteristics of Java
- To know the principles of packages, inheritance and interfaces
- To define exceptions and use I/O streams
- To develop a java application with threads and generics classes
- To design and build simple Graphical User Interfaces

UNIT I   INTRODUCTION TO OOP AND JAVA FUNDAMENTALS   10

Object Oriented Programming - Abstraction – objects and classes - Encapsulation- Inheritance - Polymorphism- OOP in Java – Characteristics of Java – The Java Environment **-** Java Source File -Structure – Compilation. Fundamental Programming Structures in Java – Defining classes in Java – constructors, methods -access specifiers - static members -Comments, Data Types, Variables, Operators, Control Flow, Arrays , Packages - JavaDoc comments.

UNIT II   INHERITANCE AND INTERFACES   9

Inheritance – Super classes- sub classes –Protected members – constructors in sub classes- the Object class – abstract classes and methods- final methods and classes – Interfaces – defining an interface, implementing interface, differences between classes and interfaces and extending interfaces - Object cloning -inner classes, Array Lists - Strings

UNIT III   EXCEPTION HANDLING AND I/O   9

Exceptions - exception hierarchy - throwing and catching exceptions - built in exceptions, creating own exception, Stack Trace Elements.
Input / Output Basics – Streams – Byte streams and Character streams – Reading and Writing Console – Reading and Writing Files

UNIT IV   MULTITHREADING AND GENERIC PROGRAMMING   8

Differences between multi-threading and multitasking, thread life cycle, creating threads, synchronizing threads, Inter thread communication, daemon threads, thread groups.
Generic Programming – Generic classes – generic methods – Bounded Types – Restrictions and Limitations.

UNIT V   EVENT DRIVEN PROGRAMMING   9

Graphics programming - Frame – Components - working with 2D shapes - Using color, fonts, and images - Basics of event handling - event handlers - adapter classes - actions - mouse events - AWT event hierarchy - Introduction to Swing – layout management - Swing Components – Text Fields , Text Areas – Buttons- Check Boxes – Radio Buttons – Lists- choices- Scrollbars – Windows –Menus – Dialog Boxes.

TOTAL: 45 PERIODS

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

- Develop Java programs using OOP principles
- Develop Java programs with the concepts inheritance and interfaces
- Build Java applications using exceptions and I/O streams
- Develop Java applications with threads and generics classes
- Develop interactive Java programs using swings

KAMARAJ
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S.P.G.Chidambara Nadar - C.Nagammal Campus

S.P.G.C. Nagar, K.Vellakulam – 625 701 (Near **VIRUDHUNAGAR**).

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REGULATION – 2020
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PEO 1: To establish a strong foundation in Electronics and Communication Engineering necessary to formulate, model, analyze and solve real time problems.

PEO 2: To inculcate professional skills and life skills for placement or to pursue higher studies in the relevant fields.

PEO 3: To promote research and development activities and solve industrial problems with creative ideas.

PROGRAM OUTCOMES:

After going through the four years of study, the Electronics and Communication Engineering graduates will have the ability to

POs	Graduate Attribute	Programme Outcome
1	Engineering knowledge	Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
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11	Project management and finance	Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.
12	Life-long learning	Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

PROGRAMME SPECIFIC OUTCOMES (PSOs):

PSO1 :   Ability to make use of attained technical knowledge in the field of Electronics and Communication Engineering for successful career and qualifying in competitive examinations at the national level.

PSO2 :   Ability to develop workable solutions for real time challenges in Electronics and Communication Engineering

SEMESTER VI

S.NO.	COURSE CODE	COURSE TITLE	CATE GORY	CONTACT PERIODS	L	T	P	C
THEORY								
1	EC1601	Antennas and Microwave Engineering	PC	3	3	0	0	3
2	EC1602	Microprocessors and Microcontrollers Interfacing	PC	3	3	0	0	3
3	EC1603	VLSI Design#	PC	5	3	0	2	4
4	EC1604	Wireless Communication	PC	3	3	0	0	3
5		Professional Elective - II	PE	3	3	0	0	3
6		Online Course - I	OL	3	3	0	0	3
PRACTICALS								
7	EC1611	Microprocessors and Microcontrollers Interfacing Laboratory	PC	4	0	0	4	2
8	EC1621	Mini Project	EEC	4	0	0	4	2
9	HS1521	Professional Communication	EEC	2	0	0	2	1
			TOTAL	**28**	**18**	**0**	**12**	**24**

* Course from the Curriculum of other UG programmes.

Theory cum Laboratory Course

EC1621　　　　　　　　　　**MINI PROJECT**

L	T	P	C
0	0	4	2

OBJECTIVES:

- To impart required knowledge related to the project.
- To analyze the realtime problem with an indepth study from available literature in the selected domain.
- To understand the methodology used to solve the problem.
- To apply the engineering knowledge in the project domain.
- To discuss results with experimental outputs of hardware/ software implementation.

The Students in a group of 3 or 4 works on a topic approved by the Head of the Department under the guidance of a faculty member and prepares a comprehensive project report after completing the work to the satisfaction of the supervisor. The review progress of the project is evaluated based on a minimum of three reviews. The review committee may be constituted by the Head of the Department. A project report is required at the end of the semester. The project work is evaluated based on oral presentation and the project report by the examiners constituted by the Head of the Department.

TOTAL: 60 PERIODS

OUTCOMES

CO1: Identify a potential problem based on literature survey and real time needs.

CO2: Categorize various solution methodologies to solve problem taken for study.

CO3: Design and develop solution for the proposed problem.

CO4: Infer the experimental results based on hardware & software implementation.

CO5: Analyse the results with the existing solutions.

L	T	P	C
0	0	2	1

HS1521   **PROFESSIONAL COMMUNICATION**

OBJECTIVES:

- To Enhance the Employability and Career Skills of students.
- To Orient the students towards grooming as a professional.
- To Make them Employable Graduates.
- To Develop their confidence and help them attend interviews successfully.

UNIT I   SOFT SKILLS   6

Introduction to Soft Skills– Hard skills & soft skills – employability and career Skills—Grooming as a professional with values—Time Management—General awareness of Current Affairs- Error Spotting.

UNIT II   EFFECTIVE PRESENTATIONS   6

Self-Introduction-organizing the material – Introducing oneself to the audience – introducing the topic – answering questions with clarity and appropriate pharases – individual presentation practice— presenting the visuals effectively – 5 minute presentations.

UNIT III   GROUP DISCUSSION   6

Introduction to Group Discussion— Participating in group discussions – understanding group dynamics – brainstorming the topic -– questioning and clarifying –GD strategies- activities to improve GD skills.

UNIT IV   INTERVIEW ETIQUETTE   6

Interview etiquette – dress code – body language – attending job interviews– telephone/skype interview -one to one interview &panel interview – FAQs related to job interviews.

UNIT V   CAREER PLAN   6

Recognizing differences between groups and teams - managing stress- networking professionally- respecting social protocols-understanding career management- developing a long-term career plan-making career changes.

TOTAL: 30 PERIODS

OUTCOMES

CO1: Apply hard and soft skills to enhance their employability.

CO2: Utilize adequate presentation skills to present a PPT.

CO3: Demonstrate the proper usage of grammar in GD.

CO4: Make use of the acquired skills while attending interviews.

CO5: Develop adequate Soft Skills required for the workplace.

TEXT BOOKS

1. Butterfield, Jeff, 2015. *Soft Skills for Everyone* Cengage Learning: New Delhi.
2. E. Suresh Kumar, 2015. *Communication for Professional Success.* Orient Blackswan: Hyderabad.

REFERENCE BOOKS

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2	Problem analysis	Identify,formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.
3	Design/Development of solutions	Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.
4	Conduct investigations of complex problems	Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions
5	Modern tool usage	Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations
6	The engineer and society	Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice
7	Environment and sustainability	Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.

8	Ethics	Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.
9	Individual and team work	Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.
10	Communication	Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.
11	Project management and finance	Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.
12	Life-long learning	Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

PROGRAMME SPECIFIC OUTCOMES (PSOs):

PSO1 : Ability to make use of attained technical knowledge in the field of Electronics and Communication Engineering for successful career and qualifying in competitive examinations at the national level.

PSO2 : Ability to develop workable solutions for real time challenges in Electronics and Communication Engineering.

REGULATIONS- 2021

CHOICE BASED CREDIT SYSTEM

B.E. ELECTRONICS AND COMMUNICATION ENGINEERING

CURRICULUM AND SYLLABI FOR SEMESTER III TO IV

SEMESTER III

S.NO.	COURSE CODE	COURSE TITLE	CATEGORY	CONTACT PERIODS	L	T	P	C
THEORY								
1	MA2202	Transforms and Numerical Solution of Equations	BS	4	3	1	0	4
2	AI2202	Data Structures and Algorithms	ES	3	3	0	0	3
3	EC2205	Circuit Analysis	PC	3	3	0	0	3
4	EC2206	Electronic Devices	PC	3	3	0	0	3
5	EC2207	Signals and Systems	PC	4	3	1	0	4
6	GE2201	Design Thinking	EM	3	3	0	0	3
PRACTICALS								
7	AI2203	Data Structures and Algorithms Laboratory	ES	4	0	0	4	2
8	EC2208	Circuits and Devices Laboratory	PC	4	0	0	4	2
9	EM2202	Interpersonal Skills - Listening and Speaking	EM	2	0	0	2	1
			TOTAL	**30**	**18**	**2**	**10**	**25**

S.NO.	COURSE CODE	COURSE TITLE	CATE GORY	CONTACT PERIODS	L	T	P	C
THEORY								
1	MA2252	Probability and Random Processes	BS	4	3	1	0	4
2	EC2251	Communication Systems#	PC	4	2	0	2	3
3	EC2252	Digital Electronics	PC	3	3	0	0	3
4	EC2253	Discrete Time Signal Processing#	PC	5	3	0	2	4
5	EC2254	Electronic Circuits	PC	3	3	0	0	3
6	EC2255	Linear Integrated Circuits	PC	3	3	0	0	3
7	GE2251	Quantitative Aptitude	EM	1	1	0	0	1
8	AUD110	Tamils and Technology	AU	1	1	0	0	0
PRACTICALS								
9	EC2256	Analog and Digital Laboratory	PC	3	0	0	3	1
10	EC2257	Linear Integrated Circuits Laboratory	PC	3	0	0	3	1
			TOTAL	**30**	**19**	**1**	**10**	**23**

Theory cum Laboratory Course

Course Code	Course Name	L	T	P	C
EM2202	**INTERPERSONAL SKILLS - LISTENING AND SPEAKING**	**0**	**0**	**2**	**1**

Category: Employability Enhancement Courses

a. Preamble

The Course will enable learners to:

- Equip students with the English language skills required for the successful undertaking of academic studies with primary emphasis on academic speaking and listening skills.
- Provide guidance and practice in basic general and classroom conversation and to engage in specific academic speaking activities.
- Improve general and academic listening skills
- Make effective presentations.

b. Course Outcome

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

CO. No.	Course Outcome	Knowledge Level
CO1	Develop their communicative competence in English with specific reference to listening.	K3
CO2	Prepare conversation with reasonable accuracy.	K3
CO3	Apply lexical Chunking for accuracy in speaking.	K3
CO4	Demonstrate their ability to communicate effectively in GDs.	K3
CO5	Explain directions and instructions in academic and business contexts.	K2

c. Course Syllabus   Total : 30 Periods

LISTENING AS A KEY SKILL   6

Listening as a key skill- its importance- speaking - give personal information - ask for personal information - express ability - enquire about ability - ask for clarification - Improving pronunciation- pronunciation basics - stressing syllables and speaking clearly - intonation patterns - conversation starters: small talk.

LISTEN TO A PROCESS INFORMATION 6

Listen to a process information- give information, as part of a simple explanation -- taking lecture notes - preparing to listen to a lecture - articulate a complete idea as opposed to producing fragmented utterances - compare and contrast information and ideas from multiple sources- converse with reasonable accuracy over a wide range of everyday topics.

LEXICAL CHUNKING 6

Lexical chunking for accuracy and fluency- factors influence fluency, deliver a five-minute informal talk - greet - respond to greetings - describe health and symptoms - invite and offer -accept - decline - take leave - listen for and follow the gist- listen for detail

GROUP DISCUSSION 6

Being an active listener: giving verbal and non-verbal feedback - participating in a group discussion - summarizing academic readings and lectures conversational speech listening to and participating in conversations - persuade- negotiate disagreement in group work.

GROUP & PAIR PRESENTATIONS 6

Formal and informal talk - listen to follow and respond to explanations, directions and instructions in academic and business contexts - strategies for presentations and interactive communication - group/pair presentations.

d. Activities

Students shall be taken to the Language lab for enhancing their listening and speaking skills.

e. Learning Resources

Text Books

1. Brooks, Margret, 2011. *Skills for Success. Listening and Speaking*. Level 4, Oxford University Press, Oxford.
2. Richards, C, Jack and David Bholke, 2010. *Speak Now Level 3*,Oxford University Press, Oxford.

References

1. Bhatnagar, Nitin and Mamta Bhatnagar, 2010. *Communicative English for Engineers and Professionals*, Pearson, New Delhi.
2. Hughes, Glyn and Josephine Moate, 2014. *Practical English Classroom*, Oxford University Press, Oxford.
3. Vargo, Mari, 2013. *Speak Now Level 4*, Oxford University Press, Oxford.
4. Richards, C, Jack, 2006. *Person to Person (Starter),* Oxford University Press, Oxford.

5. Ladousse, Gillian Porter, 2014. *Role Play*. Oxford University Press, Oxford.

WEB RESOURCES:

1. https://www.cambridge.org/elt/blog/wp-content/uploads/2019/10/Learning-Language-inChunks.pdf
2. https://english.eagetutor.com/english/628-how-to-greet-your-boss-people-in-office.html
3. https://www.groupdiscussionideas.com/group-discussion-topics-with-answers/
4. https://www.bbc.co.uk/worldservice/learningenglish/business/talkingbusiness/unit3presentations/1opening.shtml

Course Code	Course Name	L	T	P	C
GE2251	**QUANTITATIVE APTITUDE**	**1**	**0**	**0**	**1**

Category: Employability Enhancement Course

a. Preamble

To develop the thinking ability and problem solving skills of students to compete themselves in placement and competitive examinations.

b. Course Outcome

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

CO. No.	Course Outcome	Knowledge Level
CO1	Apply the concept of profit in real life problems	K3
CO2	Solve the problems by using proportion	K3
CO3	Compute accurate speed, time and distance	K3
CO4	Apply the concept of Time & Speed	K3
CO5	Calculate the work done based on various methods	K3

c. Course Syllabus   **Total : 15 Periods**

PROFIT AND LOSS   **3**

Profit and Loss - Cost Price, Selling Price, Profit and Loss %, Marked Price, Discount.

RATIO AND PROPORTION   **3**

Ratio and Proportion - Ratio, Proportion, Comparison of Ratios, Duplicate, Triplcate Ratio.

TIME, SPEED AND DISTANCE   **3**

Time, Speed and Distance - Concept of time, speed and distance, Conversion of units and proportionality, Avearge speed concept.

APPLICATIONS ON TIME, SPEED AND DISTANCE   **3**

Problems on trains - Relative speed concept and application. Boats and Streams - Upstream speed, Downstream speed, Speed of stream, Speed of boat.

TIME AND WORK   **3**

Time & work - Problems based on time and work, Formulae, Computation of work together, Wages based work problems. Pipes & Cisterns - Inlet-outlet, Part of tank filled, Time based problems.

d. Learning Resources

Text Book

1. Dinesh Khattar, 2019. *Quantitative Aptitude for Competitive Examinations*, Pearson India Education services Pvt Ltd, Fourth Edition, Uttar Pradesh.

References

1. TCY online, 2016. *Reasoning ability and Quantitative Aptitude*, Wiley India Pvt. Ltd, First Edition, New Delhi.
2. Agarwal.R.S, 2011. *Quantitative Aptitude for Competitive Examinations*, S.Chand Limited.
3. Abhijit Guha, 2011. *Quantitative Aptitude for Competitive Examinations*, Tata McGraw Hill, 3rd Edition.

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Educational Objectives
Bachelor of Electrical and Electronics Engineering curriculum is designed to prepare the graduates having attitude and knowledge to
1. Have successful technical and professional careers in their chosen fields such as circuit theory, Field theory, control theory and computational platforms.
2. Engross in life long process of learning to keep themselves abreast of new developments in the field of Electronics and their applications in power engineering.

Programme Outcomes
The graduates will have the ability to
a. Apply the Mathematical knowledge and the basics of Science and Engineering to solve the problems pertaining to Electronics and Instrumentation Engineering.
b. Identify and formulate Electrical and Electronics Engineering problems from research literature and be ability to analyze the problem using first principles of Mathematics and Engineering Sciences.
c. Come out with solutions for the complex problems and to design system components or process that fulfill the particular needs taking into account public health and safety and the social, cultural and environmental issues.
d. Draw well-founded conclusions applying the knowledge acquired from research and research methods including design of experiments, analysis and interpretation of data and synthesis of information and to arrive at significant conclusion.
e. Form, select and apply relevant techniques, resources and Engineering and IT tools for Engineering activities like electronic prototyping, modeling and control of systems and also being conscious of the limitations.
f. Understand the role and responsibility of the Professional Electrical and Electronics Engineer and to assess societal, health, safety issues based on the reasoning received from the contextual knowledge.
g. Be aware of the impact of professional Engineering solutions in societal and environmental contexts and exhibit the knowledge and the need for Sustainable Development.
h. Apply the principles of Professional Ethics to adhere to the norms of the engineering practice and to discharge ethical responsibilities.
i. Function actively and efficiently as an individual or a member/leader of different teams and multidisciplinary projects.
j. Communicate efficiently the engineering facts with a wide range of engineering community and others, to understand and prepare reports and design documents; to make effective presentations and to frame and follow instructions.
k. Demonstrate the acquisition of the body of engineering knowledge and insight and Management Principles and to apply them as member / leader in teams and multidisciplinary environments.
l. Recognize the need for self and life-long learning, keeping pace with technological challenges in the broadest sense.

PEO \PO	a	b	c	d	e	f	g	h	i	j	k	l
1	✓	✓	✓	✓	✓	✓	✓					✓
2	✓	✓	✓	✓	✓	✓		✓		✓		

13.	EE8461	Linear and Digital Integrated Circuits Laboratory	PC	4	0	0	4	2
14.	EE8501	Power System Analysis	PC	3	3	0	0	3
15.	EE8551	Microprocessors and Microcontrollers	PC	3	3	0	0	3
16.	EE8552	Power Electronics	PC	3	3	0	0	3
17.	EE8591	Digital Signal Processing	PC	4	2	2	0	3
18.	EE8511	Control and Instrumentation Laboratory	PC	4	0	0	4	2
19.	EE8601	Solid State Drives	PC	3	3	0	0	3
20.	EE8602	Protection and Switchgear	PC	3	3	0	0	3
21.	EE8661	Power Electronics and Drives Laboratory	PC	4	0	0	4	2
22.	EE8681	Microprocessors and Microcontrollers Laboratory	PC	4	0	0	4	2
23.	EE8701	High Voltage Engineering	PC	3	3	0	0	3
24.	EE8702	Power System Operation and Control	PC	3	3	0	0	3
25.	EE8703	Renewable Energy Systems	PC	3	3	0	0	3
26.	EE8711	Power System Simulation Laboratory	PC	4	0	0	4	2
27.	EE8712	Renewable Energy Systems Laboratory	PC	4	0	0	4	2

EMPLOYABILITY ENHANCEMENT COURSES (EEC)

S.No	COURSE CODE	COURSE TITLE	CATEGORY	CONTACT PERIODS	L	T	P	C
1.	EE8412	Technical seminar	EEC	2	0	0	2	1
2.	HS8581	Professional Communication	EEC	2	0	0	2	1
3.	EE8611	Mini Project	EEC	4	0	0	4	2
4.	EE8811	Project work	EEC	20	0	0	20	10

7	Computer (PSPICE installed)	1	
Consumabilitys (sufficient quantity)		
1	IC 741/ IC NE555/566/565		
2	Digital IC types		
3	LED		
4	LM317		
5	LM723		
6	ICSG3524 / SG3525		
7	Transistor – 2N3391		
8	Diodes, IN4001,BY126		
9	Zener diodes		
10	Potentiometer		
11	Step-down transformer 230V/12-0-12V		
12	Capacitor		
13	Resistors 1/4 Watt Assorted		
14	Single Strand Wire		

EE8412   TECHNICAL SEMINAR   LT P C
                                                                        0 0 2 1

OBJECTIVES:
- To encourage the students to study advanced engineering developments
- To prepare and present technical reports.
- To encourage the students to use various teaching aids such as overhead projectors, power point presentation and demonstrative models.

METHOD OF EVALUATION:

During the seminar session each student is expected to prepare and present a topic on engineering/ technology, for a duration of about 8 to 10 minutes. In a session of three periods per week, 15 students are expected to present the seminar. Each student is expected to present atleast twice during the semester and the student is evaluated based on that. At the end of the semester, he / she can submit a report on his / her topic of seminar and marks are given based on the report.   A Faculty guide is to be allotted and he / she will guide and monitor the progress of the student and maintain attendance also. Evaluation is 100% internal.

TOTAL: 30 PERIODS

5.	8259 Interface boards	5	
6.	8279 Keyboard / Display Interface boards	5	
7.	8254 timer/ counters	5	
8.	ADC and DAC cards	5	
9.	AC & DC motor with Controller s	5	
10.	Traffic Light Control Systems	5	

EE8611   **MINI PROJECT**   **L T P C**
                                                                                                 0 0 4 2

OBJECTIVES:
•   To develop their own innovative prototype of ideas.
•   To train the students in preparing mini project reports and examination.

The students in a group of 5 to 6 works on a topic approved by the head of the department and prepares a comprehensive mini project report after completing the work to the satisfaction. The progress of the project is evaluated based on a minimum of two reviews. The review committee may be constituted by the Head of the Department. A mini project report is required at the end of the semester. The mini project work is evaluated based on oral presentation and the mini project report jointly by external and internal examiners constituted by the Head of the Department.

TOTAL: 60 PERIODS
OUTCOMES:
•   On Completion of the mini project work students will be in a position to take up their
         final year project work and find solution by formulating proper methodology.

EE8701   **HIGH VOLTAGE ENGINEERING**   **L   T   P   C**
                                                                                         3   0   0   3

OBJECTIVES:
To impart knowledge on the following Topics
•   Various types of over voltages in power system and protection methods.
•   Generation of over voltages in laboratories.
•   Measurement of over voltages.
•   Nature of Breakdown mechanism in solid, liquid and gaseous dielectrics.
•   Testing of power apparatus and insulation coordination

UNIT I   OVER VOLTAGES IN ELECTRICAL POWER SYSTEMS   9
Causes of over voltages and its effects on power system – Lightning, switching surges and temporary over voltages, Corona and its effects – Bewley lattice diagram- Protection against over voltages.

Consumabilitys (Minimum of 5 Nos. each)			
8.	Potentiometer	5	-
9.	Step-down transformer	5	230V/12-0-12V
10	Component data sheets to be provided		

EE8811   **PROJECT WORK**   **L T P C**
                                                                                  0 0 20 10

OBJECTIVES:
•To develop the ability to solve a specific problem right from its identification and literature review till the successful solution of the same. To train the students in preparing project reports and to face reviews and viva voce examination.

The students in a group of 3 to 4 works on a topic approved by the head of the department under the guidance of a faculty member and prepares a comprehensive project report after completing the work to the satisfaction of the supervisor. The progress of the project is evaluated based on a minimum of three reviews. The review committee may be constituted by the Head of the Department. A project report is required at the end of the semester. The project work is evaluated based on oral presentation and the project report jointly by external and internal examiners constituted by the Head of the Department.

TOTAL: 300 PERIODS

OUTCOMES:
•On Completion of the project work students will be in a position to take up any challenging practical problems and find solution by formulating proper methodology.

IC8651   **ADVANCED CONTROL SYSTEM**   **L T P C**
                                                                                     2 2 0 3
OBJECTIVES:
   i.   To provide knowledge on design state feedback control and state observer.
   ii.   To provide knowledge in phase plane analysis.
   iii.   To give basic knowledge in describing function analysis.
   iv.   To study the design of optimal controller.
   v.   To study the design of optimal estimator including Kalman Filter

UNIT I   STATE VARIABLE ANALYSIS   **6+6**
Introduction- concepts of state variables and state model-State model for linear continuous time systems, Diagonalisation- solution of state equations- Concepts of controllability and observability.

UNIT II   STATE VARIABLE DESIGN   **6+6**
Introduction to state model: Effect of state feedback - Pole placement design: Necessary and sufficient condition for arbitrary pole placement, State regulator design Design of state observers- Separation principle- Design of servo systems: State feedback with integral control.

Department of Electrical and Electronics Engineering

B.E. Electrical and Electronics Engineering

(Regulations 2020 – Autonomous)

Vision of the Department:

To make the Department of Electrical and Electronics Engineering of this Institution the unique of its kind in the field of Research and Development activities in this part of the world.

Mission of the Department:

Department of Electrical and Electronics Engineering is committed to

1. Inculcate technical knowledge by providing well-balanced curriculum to the urban and unreachable rural student community through "Total Quality Education"

2. Induce leadership and entrepreneurial skills with high standard of ethics and moral values to the student community.

3. Impart innovative skills to the student community by effectively involving them in research activities.

4. Create a wholesome environment to promote effective interaction of students with the industry experts

Program Educational Objectives (PEOs):

Graduates of the programme will be able to

1. Technical Knowledge:

Apply Technical knowledge acquired in the field of Electrical and Electronics Engineering and allied areas for practical or industrial problems for a successful professional career

2. Problem Solving:

Develop and envisage appropriate solutions for real time technological problems faced by the industries and society.

1

3. Personality Development

Demonstrate interpersonal skills, soft skills and leadership quality blended with ethical and social responsibility for a prospective career

4. Life Long Learning:

Habituate life-long learning so as to adapt to the emerging needs of the profession

Program Specific Outcomes (PSOs):

PSO 1: Ability to design and solve engineering problems by applying the fundamental knowledge of Engineering Mathematics, Basic Sciences, Electrical and Electronics Engineering.

PSO 2: Ability to understand the recent technological developments in Electrical & Electronics Engineering and develop products / software to cater the Societal & Industrial needs.

S. No.	Course Code	Course Name	Category	Contact Periods	Credits			
					L	T	P	C
Theory								
1.	EE1501	Power System Analysis	PC	3	3	0	0	3
2.	EE1571	Control Systems	PC	4	3	1	0	4
3.	EE1572	Microprocessors and Microcontrollers	PC	3	3	0	0	3
4.		Professional Elective I	PE	3	3	0	0	3
5.		Open Elective I	OE	3	3	0	0	3
6.		Audit Course II	AU	3	3	0	0	0
Practical								
7.	EE1511	Control and Instrumentation Laboratory	PC	4	0	0	4	2
8.	EE1581	Microprocessors and Microcontrollers Laboratory	PC	4	0	0	4	2
9.	EE1521	Presentation Skills and Technical Seminar	EEC	2	0	0	2	1
			Total	**29**	**18**	**1**	**10**	**21**

SEMESTER VI

S. No.	Course Code	Course Name	Category	Contact Periods	Credits			
					L	T	P	C
Theory								
1.	EE1601	Power Electronics and Drives	PC	3	3	0	0	3
2.	EE1602	Protection and Switchgear	PC	3	3	0	0	3
3.	EE1603	Renewable Energy Systems	PC	3	3	0	0	3
4.	EE1671	Digital Signal Processing	PC	3	3	0	0	3
5.		Professional Elective II	PE	3	3	0	0	3
6.		Online Course I*	OL	3	3	0	0	3
Practical								
7.	EE1611	Power Electronics and Drives Laboratory	PC	4	0	0	4	2
8.	EE1612	Renewable Energy Systems Laboratory	PC	4	0	0	4	2
9.	HS1621	Verbal Reasoning and Aptitude	EEC	2	0	0	2	1
			Total	**28**	**18**	**0**	**10**	**23**

*Total of 3 credits to be earned before the end of 7th Semester

9	Stepper motor - 28 BY J-48 - 5V	5
10	Servo motor - SG90-Microservo motor	5
11	Ultrasonic sensor - HC SR 04	5
12	IR transmitter module	5
13	L293D Module	5
14	PIR Motion sensor	5
15	LDR	10
16	LM35 Sensor	5

EE1521   **PRESENTATION SKILLS AND TECHNICAL SEMINAR L   T   P   C**

0   0   2   1

OBJECTIVES:

- To encourage the students to study advanced engineering developments.
- To prepare and present technical reports.
- To encourage the students to use various teaching aids such as overhead projectors, power point presentation and demonstrative models.

METHOD OF EVALUATION

During the seminar session each student is expected to prepare and present a topic on engineering/ technology, for duration of about 8 to 10 minutes. In a session of two periods per week, 15 students are expected to present the seminar. Each student is expected to present at least twice during the semester and the student is evaluated based on that. At the end of the semester, he / she can submit a report on his / her topic of seminar and marks are given based on the report. A course instructor is to be allotted and he / she will guide and monitor the progress of the student and maintain attendance also. Evaluation is 100% internal.

TOTAL: 30 PERIODS

OUTCOMES:

Upon Successful Completion of this course, the students will be able to

        CO1 : Comprehend the various technological developments in domain area of
           specialization.

        CO2: Prepare a documentation report on the chosen topic of interest.

        CO3: Give a formal technical presentation on the topic chosen.

7.	Micro Wind Energy Generator module	1	-
Consumables (Minimum of 5 Nos. each)			
8.	Potentiometer	5	-
9.	Step-down transformer	5	230V/12-0-12V
10.	Component data sheets to be provided		

HS1621   **VERBAL REASONING AND APTITUDE**   **L   T   P   C**

                                                                      0   0   2   1

OBJECTIVES:

- To improve their problem-solving skill.
- To give the basic idea about aptitude and reasoning for their GATE exam.
- Make them Employable Graduates
- Develop their confidence and help them attend interviews successfully.

UNIT I   NUMERICAL COMPUTATION   6

Percentages - Ratios – powers – exponents and logarithms – Permutation and combination

UNIT II   ANALYTICAL APTITUDE   6

Logical Induction and Deduction – Analogy – Word analogy, Numerical Analogy, Mixed analogy, Image analogy.

UNIT III   DATA INTERPRETATION   6

Table charts- Pie Charts- Bar Charts- Line Charts – Maps

UNIT IV   VERBAL   6

Reading Comprehension- Sentence Rearrangement- Error Detection- Antonyms and Synonyms - Subject verb agreement - One word substitution

UNIT V   INTERVIEW SKILLS   6

Self-Introduction- Individual presentation practice - Participating in group discussions - GD strategies - Interview etiquette - FAQs related to job interviews

TOTAL: 30 PERIODS

OUTCOMES:

Upon Successful Completion of this course, the students will be able to

CO1: Apply speed math tricks.

CO2: Develop their thinking ability.

CO3: Interpret data from various types of chart.

CO4: Apply their verbal skills to participate effectively in competitive exams.

CO5: Participate confidently in Group Discussions and Job interviews.

TEXT BOOKS:

1. Raman, Meenakshi and Sangeeta Sharma. Professional Communication. Oxford University

Press: Oxford, 2014.

REFERENCES:

1. Agarwal.R.S, "Quantitative Aptitude for Competitive Examinations", S.Chand Limited 2011.
2. Abhijit Guha, "Quantitative Aptitude for Competitive Examinations", Tata McGraw Hill, 3rd Edition, 2011.
3. Dr. R.S. Agarwal, "A modern approach to Verbal & Non-Verbal Reasoning", S. Chand Limited, 2nd Edition, 2018.
4. Edgar Thorpe, "Course in Mental ability and Quantitative Aptitude for Competitive Examinations", Tata McGraw Hill, 2nd Edition, 2001.
5. E. Suresh Kumar et al. Communication for Professional Success. Orient Blackswan: Hyderabad, 2015.

B.E. ELECTRCIAL AND ELECTRONICS ENGINEERING
REGULATIONS – 2021
AUTONOMOUS SYLLABUS
CHOICE BASED CREDIT SYSTEM
III TO IV SEMESTER CURRICULUM AND SYLLABI

VISION:

> To make the Department of Electrical and Electronics Engineering of this Institution the unique of its kind in the field of Research and Development activities in this part of the world.

MISSION:

> Department of Electrical and Electronics Engineering is committed to impart highly innovative and technical knowledge in the field of Electrical and Electronics Engineering to the urban and unreachable rural student folks through Total Quality Education

PROGRAMME EDUCATIONAL OBJECTIVES (PEOs):

PEO 1: **Technical Knowledge:** To provide basic knowledge in Physics, Chemistry, Mathematics and necessary foundation in various concepts of Electrical and Electronics Engineering

PEO 2: **Problem Solving:** To impart training to enable the students to envisage the real time problems related to the field of Electrical and Electronics Engineering and allied areas faced by the Industries so as to model, analyze and provide appropriate solutions.

PEO 3: **Personality Development:** To provide an academic environment for the students to develop team spirit, leadership qualities, communication skills and soft skills.

PEO 4:   **Life Long Learning:** To motivate students to prepare for competitive examinations enabling them to pursue higher studies, thereby, promoting Research and Development activities.

PROGRAM OUTCOMES:

After going through the four years of study, the Electrical and Electronics Engineering graduates will have the ability to

POs	Graduate Attribute	Programme Outcome
1	Engineering knowledge	Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
2	Problem analysis	Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.
3	Design/development of solutions	Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.
4	Conduct investigations of complex problems	Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions
5	Modern tool usage	Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations
6	The engineer and society	Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice

POs	Graduate Attribute	Programme Outcome
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.
8	Ethics	Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.
9	Individual and team work	Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.
10	Communication	Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.
11	Project management and finance	Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.
12	Life-long learning	Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

PROGRAMME SPECIFIC OUTCOMES (PSOs):

PSO1 : Ability to design and solve engineering problems by applying the fundamental knowledge of Engineering Mathematics, Basic Sciences, Electrical and Electronics Engineering.

PSO2 : Ability to understand the recent technological developments in Electrical & Electronics Engineering and develop products / software to cater the Societal & Industrial needs.

KAMARAJ
COLLEGE OF ENGINEERING & TECHNOLOGY

(**An Autonomous Institution** - AFFILIATED TO ANNA UNIVERSITY, CHENNAI)
S.P.G.Chidambara Nadar - C.Nagammal Campus
S.P.G.C. Nagar, K.Vellakulam – 625 701 (Near **VIRUDHUNAGAR**).

REGULATIONS - 2021

CHOICE BASED CREDIT SYSTEM

B.E. ELECTRICAL AND ELECTRONICS ENGINEERING

CURRICULUM AND SYLLABI FOR SEMESTER III TO IV

SEMESTER III

S.NO.	COURSE CODE	COURSE TITLE	CATE GORY	CONTACT PERIODS	L	T	P	C
THEORY								
1	MA2202	Transforms and Numerical solution of equations	BS	4	3	1	0	4
2	EE2202	Circuit Theory	PC	4	3	1	0	4
3	EE2203	Electronic Devices and Circuits	ES	3	3	0	0	3
4	EE2204	Measurements and Instrumentation	PC	3	3	0	0	3
5	EE2205	Transmission and Distribution	PC	3	3	0	0	3
6	GE2201	Design Thinking	ES	3	3	0	0	3
7		Audit Course	AU	3	3	0	0	0
PRACTICALS								
8	EE2206	Electric Circuits Laboratory	PC	4	0	0	4	2
9	EE2207	Electronic Devices and Circuits Laboratory	ES	4	0	0	4	2
10	EM2201	Practical Course on Electronic Product Development	EM	2	0	0	2	1
			TOTAL	**33**	**21**	**2**	**10**	**25**

SEMESTER IV

S.NO.	COURSE CODE	COURSE TITLE	CATE GORY	CONTACT PERIODS	L	T	P	C
THEORY								
1	EE2251	Control Systems	PC	3	3	0	0	3
2	EE2252	DC Machines and Transformers	PC	3	3	0	0	3
3	EE2253	Digital Logic Circuits	PC	3	3	0	0	3
4	EE2254	Linear Integrated Circuits and Applications	PC	3	3	0	0	3
5	EE2255	Power System Analysis	PC	3	3	0	0	3
6	GE2251	Quantitative Aptitude	EM	1	1	0	0	1
7	AUD110	Tamils and Technology	AU	1	1	0	0	0
PRACTICALS								
8	EE2256	Control and Instrumentation Laboratory	PC	4	0	0	4	2
9	EE2257	DC Machines and Transformers Laboratory	PC	4	0	0	4	2
10	EE2258	Linear and Digital Integrated Circuits Laboratory	PC	4	0	0	4	2
			TOTAL	**29**	**17**	**0**	**12**	**22**

Course Code	Course Name	L	T	P	C
EM2201	**PRACTICAL COURSE ON ELECTRONIC PRODUCT DEVELOPMENT**	0	0	2	1

Category: Emplayability Enhancement Course

a. Preamble

All the electrical and electronics engineers should have knowledge in PCB Design, Layout and printing. This course will give practical exposer to the students in the operation of PCB Machine, Arduino Controller & Various Sensors.

b. Course Outcome

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

CO. No.	Course Outcome	Knowledge Level
CO1	Understand and develop the basic PCB design	K3
CO2	Develop basic PCB design in the PCB Board by using manual and using PCB machine.	K3
CO3	Model and analyze Arduino Controller and their application to Real time	K3
CO4	Implement the simple applications using Sensors.	K3
CO5	Implement simple applications for controlling PWM pulses	K3

c. Course Syllabus   **Total: 30 Periods**

Design and Development of:

1. PCB Board for 5V DC Power Supply - using Manual method
2. PCB Board for 5V DC Power Supply - using PCB Machine
3. Product for water level indication
4. Product for protect the motor/electrical equipment
5. 12V DC – 12V AC Square Wave Inverter
6. 12V DC Step Down DC Chopper

d. Activities

Students will develop electronic products.

e. Learning Resources

   i. REFERENCE BOOKS

1. Archambeault, B.R. and Drewniak, J., 2013. *PCB design for real-world EMI control* (Vol. 696). Springer Science & Business Media.

2. Norris, D., 2015. *The Internet of things: do-it-yourself projects with Arduino, Raspberry Pi, and BeagleBone Black*. McGraw-Hill Education TAB.

3. Fraden, J. and Fraden, J., 2004. *Handbook of modern sensors: physics, designs, and applications* (Vol. 3). New York, NY, USA: springer.

Course Code	Course Name	L	T	P	C
GE2251	QUANTITATIVE APTITUDE	1	0	0	1

Category: Employability Enhancement Course

a. Preamble

To develop the thinking ability and problem solving skills of students to compete themselves in placement and competitive examinations.

b. Course Outcome

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

CO. No.	Course Outcome	Knowledge Level
CO1	Apply the concept of profit in real life problems	K3
CO2	Solve the problems by using proportion	K3
CO3	Compute accurate speed, time and distance	K3
CO4	Apply the concept of Time & Speed	K3
CO5	Calculate the work done based on various methods	K3

c. Course Syllabus   **Total : 15 Periods**

PROFIT AND LOSS   **3**

Profit and Loss - Cost Price, Selling Price, Profit and Loss %, Marked Price, Discount.

RATIO AND PROPORTION   **3**

Ratio and Proportion - Ratio, Proportion, Comparison of Ratios, Duplicate, Triplcate Ratio.

TIME, SPEED AND DISTANCE   **3**

Time, Speed and Distance - Concept of time, speed and distance, Conversion of units and proportionality, Avearge speed concept.

APPLICATIONS ON TIME, SPEED AND DISTANCE   **3**

Problems on trains - Relative speed concept and application. Boats and Streams - Upstream speed, Downstream speed, Speed of stream, Speed of boat.

TIME AND WORK   **3**

Time & work - Problems based on time and work, Formulae, Computation of work together, Wages based work problems. Pipes & Cisterns - Inlet-outlet, Part of tank filled, Time based problems.

d. Learning Resources

i. TEXT BOOK

1. Dinesh Khattar, *Quantitative Aptitude for Competitive Examinations*, Pearson India Education services Pvt Ltd, Fourth Edition, Uttar Pradesh, 2019.

ii. REFERENCE BOOKS

1. TCY online, *Reasoning ability and Quantitative Aptitude*, Wiley India Pvt. Ltd, First Edition, New Delhi, 2016.
2. Agarwal.R.S, *Quantitative Aptitude for Competitive Examinations*, S.Chand Limited, 2011.
3. Abhijit Guha, *Quantitative Aptitude for Competitive Examinations*, Tata McGraw Hill, 3rd Edition, 2011

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Educational Objectives

Bachelor of Electronics and Instrumentation Engineering curriculum is designed to prepare the graduates having attitude and knowledge to

1. Have successful technical and professional careers in their chosen fields such as Process Control, Electronics & Information Technology.
2. Engross in life long process of learning to keep themselves abreast of new developments in the field of Electronics & Instrumentation

Programme Outcomes

The graduates will have the ability to

a. Apply the Mathematical knowledge and the basics of Science and Engineering to solve the problems pertaining to Electronics and Instrumentation Engineering.
b. Identify and formulate Instrumentation Engineering problems from research literature and be able to analyze the problem using first principles of Mathematics and Engineering Sciences.
c. Come out with solutions for the complex problems and to design system components or process that fulfill the particular needs taking into account public health and safety and the social, cultural and environmental issues.
d. Draw well-founded conclusions applying the knowledge acquired from research and research methods including design of experiments, analysis and interpretation of data and synthesis of information and to arrive at significant conclusion.
e. Form, select and apply relevant techniques, resources and Engineering and IT tools for Engineering activities like electronic prototyping, modeling and control of systems/processes and also being conscious of the limitations.
f. Understand the role and responsibility of the Professional Instrumentation Engineer and to assess societal, health, safety issues based on the reasoning received from the contextual knowledge.
g. Be aware of the impact of professional Engineering solutions in societal and environmental contexts and exhibit the knowledge and the need for sustainable Development.
h. Apply the principles of Professional Ethics to adhere to the norms of the engineering practice and to discharge ethical responsibilities.
i. Function actively and efficiently as an individual or a member/leader of different teams and multidisciplinary projects.
j. Communicate efficiently the engineering facts with a wide range of engineering community and others, to understand and prepare reports and design documents; to make effective presentations and to frame and follow instructions.
k. Demonstrate the acquisition of the body of engineering knowledge and insight and Management Principles and to apply them as member / leader in teams and multidisciplinary environments.
l. Recognize the need for self and life-long learning, keeping pace with technological challenges in the broadest sense.

PEO \ PO	a	b	c	d	e	f	g	h	i	j	k	l
1	✓	✓	✓	✓	✓			✓	✓	✓	✓	
2	✓	✓	✓	✓	✓	✓	✓				✓	✓

20.	EI8691	Computer Control of Processes	PC	3	3	0	0	3
21.	EI8692	Electronic Instrumentation	PC	3	3	0	0	3
22.	EI8661	Process Control Laboratory	PC	4	0	0	4	2
23.	EI8751	Industrial Data Networks	PC	3	3	0	0	3
24.	EE8691	Embedded Systems	PC	3	3	0	0	3
25.	EC8093	Digital Image Processing	PC	3	3	0	0	3
26.	EI8761	Industrial Automation Laboratory	PC	4	0	0	4	2
27.	EI8762	Instrumentation System Design Laboratory	PC	4	0	0	4	2

EMPLOYABILITY ENHANCEMENT COURSES (EEC)

S.No	COURSE CODE	COURSE TITLE	CATEGORY	CONTACT PERIODS	L	T	P	C
1.	HS8581	Professional Communication	EEC	2	0	0	2	1
2.	EI8811	Project work	EEC	20	0	0	20	10

6. Temperature process station with all accessories
7. Pressure process station with all accessories
7. Personal computer-15 nos
8. MATLAB software
9. Two tank system with following accessories.

<table>
<tr><td>HS8581</td><td>PROFESSIONAL COMMUNICATION</td><td>L T P C
0 0 2 1</td></tr>
</table>

OBJECTIVES: The course aims to:
- Enhance the Employability and Career Skills of students
- Orient the students towards grooming as a professional
- Make them Employable Graduates
- Develop their confidence and help them attend interviews successfully.

UNIT I
Introduction to Soft Skills-- Hard skills & soft skills - employability and career Skills—Grooming as a professional with values—Time Management—General awareness of Current Affairs

UNIT II
Self-Introduction-organizing the material - Introducing oneself to the audience – introducing the topic – answering questions – individual presentation practice–– presenting the visuals effectively – 5 minute presentations

UNIT III
Introduction to Group Discussion— Participating in group discussions – understanding group dynamics - brainstorming the topic -– questioning and clarifying –GD strategies- activities to improve GD skills

UNIT IV
Interview etiquette – dress code – body language – attending job interviews– telephone/skype interview -one to one interview &panel interview – FAQs related to job interviews

UNIT V
Recognizing differences between groups and teams- managing time-managing stress- networking professionally- respecting social protocols-understanding career management-developing a long-term career plan-making career changes.

TOTAL : 30 PERIODS

OUTCOMES: At the end of the course Learners will be able to:

- Make effective presentations
- Participate confidently in Group Discussions.
- Attend job interviews and be successful in them.
- Develop adequate Soft Skills required for the workplace

Recommended Software

1. **Globearena**

2. Win English

REFERENCES:
1. Butterfield, Jeff   **Soft Skills for Everyone.** Cengage Learning: New Delhi, 2015
2. **Interact** English Lab Manual for Undergraduate Students,. OrientBalckSwan: Hyderabad, 2016.
3. E. Suresh Kumar et al. **Communication for Professional Success.** Orient Blackswan: Hyderabad, 2015
4. Raman, Meenakshi and Sangeeta Sharma. **Professional Communication**. Oxford University Press: Oxford, 2014
5. S. Hariharanetal. **Soft Skills**. MJP Publishers: Chennai, 2010.

EI8751	INDUSTRIAL DATA NETWORKS	LT P C
		3 0 0 3

OBJECTIVES:

- To educate on the basic concepts of data networks
- To introduce the basics of internetworking and serial communications
- To provide details on HART and Field buses
- To educate on MODBUS, PROFIBUS and other communication protocol
- To introduce industrial Ethernet and wireless communication

UNIT I   DATA NETWORK FUNDAMENTALS   9
Networks hierarchy and switching – Open System Interconnection model of ISO - Data link control protocol - Media access protocol - Command / response - Token passing -CSMA/CD, TCP/IP

UNIT II   INTERNET WORKING and RS 232, RS485   9
Bridges - Routers - Gateways - Standard ETHERNET and ARCNET configuration special requirement for networks used for control - RS 232, RS 485 configuration Actuator Sensor (AS) – interface, Devicenet

UNIT III   HART AND FIELD BUS   9
Introduction - Evolution of signal standard - HART communication protocol - HART networks - HART commands - HART applications - Fieldbus - Introduction - General Fieldbus architecture - Basic requirements of Fieldbus standard - Fieldbus topology - Interoperability - Interchangeability - Introduction to OLE for process control (OPC).

UNIT IV   MODBUS AND PROFIBUS PA/DP/FMS AND FF   9

MODBUS protocol structure - function codes – troubleshooting Profibus, Introduction, Profibus protocol stack, Profibus communication model - communication objects - system operation - troubleshooting - review of foundation fieldbus - Data Highway

UNIT V   INDUSTRIAL ETHERNET AND WIRELESS COMMUNICATION   9
Industrial Ethernet, Introduction, 10 Mbps Ethernet, 100 Mbps Ethernet - Radio and wireless

OBJECTIVES:

- To develop the ability to solve a specific problem right from its identification and literature review till the successful solution of the same. To train the students in preparing project reports and to face reviews and viva voce examination.

The students in a group of 3 to 4 works on a topic approved by the head of the department under the guidance of a faculty member and prepares a comprehensive project report after completing the work to the satisfaction of the supervisor. The progress of the project is evaluated based on a minimum of three reviews. The review committee may be constituted by the Head of the Department. A project report is required at the end of the semester. The project work is evaluated based on oral presentation and the project report jointly by external and internal examiners constituted by the Head of the Department.

TOTAL: 300 PERIODS

OUTCOMES:

- On Completion of the project work students will be in a position to take up any challenging practical problems and find solution by formulating proper methodology.

EE8072   **MEMS AND NANO SCIENCE**   **LT P C**
3 0 0 3

COURSE OBJECTIVES

- To provide wide knowledge of semiconductors and solid mechanics to fabricate MEMS devices
- To educate on the rudiments of Micro fabrication techniques
- To educate on applications of MEMS
- To provide wide information dealing with nano material and its necessity
- To analyze methods involving preparation of nano scale devices

UNIT I   OVERVIEW OF MEMS AND MICROSYSTEMS   9

Introduction to MEMS and Microsystems, Need for Miniaturization, MEMS and Microsystem products: Micro gears - Micro turbines – Micromotors - Micro optical devices. Microsystems and Microelectronics, Application of Microsystems in Automotive Industries: Safety - Engine and power trains - Comfort and convenience, Microactuation: Actuation using thermal forces - actuation using shape memory alloys - Actuation using piezoelectric effect - Actuation using Electrostatic forces.

UNIT II   MICROSYSTEM FABRICATION PROCESS   9

Photolithography, Ion Implantation, Diffusion, Oxidation: Thermal oxidation-Oxidation by color, Chemical Vapour Depostion, Physical Vapour Deposition: Sputtering, Etching: Chemical-Plasma, Micromaching: Bulk Micromachining - Surface Micromachining.

UNIT III   POLYMERS AND OPTICAL MEMS   9

Polymers in MEMS : Polimide - SU-8 - Liquid Crystal Polymer (LCP) – PDMS – PMMA –

B.E. Electronics and Instrumentation Engineering

Regulation - 2020

AUTONOMOUS SYLLABUS

CHOICE BASED CREDIT SYSTEM (CBCS)

CURRICULUM AND SYLLABI

(V TO VI)

Vision of the Department:

To develop competent Electronics and Instrumentation Engineers with Societal, Environmental and Human Values through Quality Education, Training and Research

Mission of the Department:

Department of Electronics and Instrumentation Engineering is committed to

1. Impart technical knowledge and skills to meet the industry needs .
2. Build self-learning capability among the students to update the recent technology.
3. Tie up with the industries and research institution.
4. Create passion for serving the society with moral and ethical values.

Program Educational Objectives (PEOs):

Graduates of the programme will be able to

1. Work in the Design, Automation, Testing and Software Industries.
2. Pursue higher studies and research in the field of Process Control, Biomedical, Robotics & Automation and Renewable Energy Resources.
3. Be an Entrepreneur by building leadership quality and teamwork.

PROGRAM OUTCOMES:

After going through the four years of study, the Electronics and Instrumentation Engineering graduates will have theability to

	Graduate Attribute	Programme Outcome
1	Engineering knowledge	Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems
2	Problem analysis	Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences
3	Design/development of solutions	Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.
4	Conduct investigations of complex problems	Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions
5	Modern tool usage	Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations
6	The engineer and society	Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities

		relevant to the professional engineering practice
7	Environment and sustainability	Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.
8	Ethics	Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.
9	Individual and team work	Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings
10	Communication	Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.
11	Project management and finance	Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments
12	Life-long learning	Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change

Program Specific Outcomes (PSOs):

PSO 1: Design and develop mathematical model for transducer, process control system.

PSO 2: Select and use appropriate hardware circuit and software tools to control industrial and automation process

B.E.ELECTRONICS AND INSTRUMENTATION ENGINEERING

Regulation - 2020

AUTONOMOUS SYLLABUS

CHOICE BASED CREDIT SYSTEM (CBCS)

CURRICULUM AND SYLLABI

(V TO VI)

SEMESTER V

S.No	Course Code	Course Title	Category	Periods / Week			Contact Period	Credit
				L	T	P		
THEORY								
1	EE1571	Control Systems	PC	3	1	0	4	4
2	EE1572	Microprocessors and Microcontrollers	PC	3	0	0	3	3
3	EI1501	Process Control	PC	3	0	0	3	3
4		Professional Elective-I	PE	3	0	0	3	3
5		Professional Elective-II	PE	3	0	0	3	3
6		Open Elective I*	OE	3	0	0	3	3
PRACTICALS								
7	EE1581	Microprocessors and Microcontrollers Laboratory	PC	0	0	4	4	2
8	EI1511	Process Control Laboratory	PC	0	0	4	4	2
9	HS1521	Professional Communication	EEC	0	0	2	2	1
			TOTAL	18	1	10	29	24

identification methods.

15. Design of a multi-channel data acquisition system.

TOTAL: 60 PERIODS

OUTCOMES:

Upon Successful Completion of this course, the students will be able to

CO1: Understand and analyze process control engineering problems.

CO2: Build dynamic models using input – output data of a process.

CO3: Work with real time control loops (flow/level/temperature/pressure).

CO4: Implement control algorithms for tuning of controllers.

CO5: Utilize simulation tools such as MATLAB and /LABVIEW.

MAPPING OF COURSE OUTCOMES WITH PROGRAM OUTCOMES

CO	Program Outcomes												Program Specific Outcomes	
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	H	H	M						M	L		L	H	H
CO2	H	H	M	L					M	L		L	H	H
CO3	H	H	M	L					M	L		L	H	H
CO4	H	H	M	L					M	L		L	H	H
CO5	H	H	M						M	L		L	H	H

H- High   M-Medium   L-Low

HS1521   PROFESSIONAL COMMUNICATION

L	T	P	C
0	0	2	1

OBJECTIVES:

The course aims to:

• Enhance the Employability and Career Skills of students

- Orient the students towards grooming as a professional
- Make them Employable Graduates
- Develop their confidence and help them attend interviews successfully.

UNIT I

Introduction to Soft Skills– Hard skills & soft skills – employability and career Skills—Grooming as a professional with values—Time Management—General awareness of Current Affairs

UNIT II

Self-Introduction-organizing the material – Introducing oneself to the audience – introducing the topic – answering questions with clarity and appropriate pharases – individual presentation practice— presenting the visuals effectively – 5 minute presentations

UNIT III

Introduction to Group Discussion— Participating in group discussions – understanding group dynamics – brainstorming the topic -– questioning and clarifying –GD strategies-activities to improve GD skills

UNIT IV

Interview etiquette – dress code – body language – attending job interviews– telephone/skype interview -one to one interview &panel interview – FAQs related to job interviews

UNIT V

Recognizing differences between groups and teams- managing time-managing stress-networking professionally- respecting social protocols-understanding career management-developing a long-term career plan-making career changes

TOTAL: 30 PERIODS

OUTCOMES:

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

• Make effective presentations

• Participate confidently in Group Discussions.

• Attend job interviews and be successful in them.

• Develop adequate Soft Skills required for the workplace

Available Software:

1. Odyll

REFERENCES:

1. Butterfield, 2015, *Jeff Soft Skills for Everyone*., Cengage Learning: New Delhi.

2. E. Suresh Kumar et al. 2015, *Communication for Professional Success*, Orient Blackswan: Hyderabad.

3. *Interact English Lab Manual for Undergraduate Students*,.OrientBalckSwan: 2016, Hyderabad.

4. Raman, 2014, Meenakshi and Sangeeta Sharma. *Professional Communication*.Oxford University Press: Oxford.

5. S. Hariharanet al. 2010, *Soft Skills*. MJP Publishers: Chennai.

MAPPING OF COURSE OUTCOMES WITH PROGRAM OUTCOMES

CO	Program Outcomes												Program Specific Outcomes	
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1										M				
CO2										M				
CO3										M				
CO4										M				

H- High   M-Medium   L-Low

ANNA UNIVERSITY, CHENNAI
AFFILIATED INSTITUTIONS
B.E. CIVIL ENGINEERING
REGULATIONS – 2017
CHOICE BASED CREDIT SYSTEM

PROGRAMME EDUCATIONAL OBJECTIVES (PEOs) :

I.   To prepare students for successful careers in Civil Engineering field that meets the needs of Indian and multinational companies.

II. To develop the confidence and ability among students to synthesize data and technical concepts and thereby apply it in real world problems.

III. To develop students to use modern techniques, skill and mathematical engineering tools for solving problems in Civil Engineering.

IV. To provide students with a sound foundation in mathematical, scientific and engineering fundamentals necessary to formulate, solve and analyse engineering problems and to prepare them for graduate studies.

V.   To promote students to work collaboratively on multi-disciplinary projects and make them engage in life-long learning process throughout their professional life.

PROGRAMME OUTCOMES (POs):

On successful completion of the programme,

1. Graduates will demonstrate knowledge of mathematics, science and engineering.

2. Graduates will demonstrate an ability to identify, formulate and solve engineering problems.

3. Graduate will demonstrate an ability to design and conduct experiments, analyze and interpret data.

4. Graduates will demonstrate an ability to design a system, component or process as per needs and specifications.

5. Graduates will demonstrate an ability to visualize and work on laboratory and multidisciplinary tasks.

6. Graduate will demonstrate skills to use modern engineering tools, software and equipment to analyze problems.

7. Graduates will demonstrate knowledge of professional and ethical responsibilities.

8. Graduate will be able to communicate effectively in both verbal and written form.

9. Graduate will show the understanding of impact of engineering solutions on the society and also will be aware of contemporary issues.

10. Graduate will develop confidence for self education and ability for life-long learning.

PEOs & POs

The B.E. Civil Engineering Program outcomes leading to the achievement of the objectives are summarized in the following Table.

Programme Educational Objectives	Programme Outcomes									
	a	**b**	**c**	**d**	**e**	**f**	**g**	**h**	**i**	**j**
I	X	X		X	X					
II		X	X							
III				X			X			
IV	X				X					
V						X		X	X	X

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
Highway Engineering		✓	✓	✓	✓			✓		✓
Professional Elective II										
Highway Engineering Laboratory								✓		
Irrigation and Environmental Engineering Drawing										
Professional Communication										
Estimation, Costing and Valuation Engineering	✓	✓				✓	✓			✓
Railways, Airports, Docks and Harbour Engineering		✓		✓			✓		✓	✓
Structural Design and Drawing	✓	✓	✓	✓		✓				✓
Professional Elective III										
Open Elective II*										
Creative and Innovative Project (Activity Based - Subject Related)		✓		✓			✓			✓
Industrial Training (4 weeks During VI semester–Summer)				✓			✓	✓		✓
Professional Elective IV										
Professional Elective V										
Project Work		✓		✓			✓			✓

SEM 7

SEM 8

YEAR 4

5

S.No	COURSE CODE	COURSE TITLE	CATEGORY	CONTACT PERIODS	L	T	P	C
THEORY								
1.	CE8701	Estimation, Costing and Valuation Engineering	PC	3	3	0	0	3
2.	CE8702	Railways, Airports, Docks and Harbour Engineering	PC	3	3	0	0	3
3.	CE8703	Structural Design and Drawing	PC	5	3	0	2	4
4.		Professional Elective III	PE	3	3	0	0	3
5.		Open Elective II*	OE	3	3	0	0	3
PRACTICALS								
6.	CE8711	Creative and Innovative Project (Activity Based - Subject Related)	EEC	4	0	0	4	2
7.	CE8712	Industrial Training (4 weeks During VI Semester – Summer)	EEC	0	0	0	0	2
			TOTAL	**21**	**15**	**0**	**6**	**20**

SEMESTER VIII

S.No	COURSE CODE	COURSE TITLE	CATEGORY	CONTACT PERIODS	L	T	P	C
THEORY								
1.		Professional Elective IV	PE	3	3	0	0	3
2.		Professional Elective V	PE	3	3	0	0	3
PRACTICALS								
3.	CE8811	Project Work	EEC	20	0	0	20	10
			TOTAL	**26**	**6**	**0**	**20**	**16**

TOTAL NO. OF CREDITS: 183

*Course from the curriculum of other UG Programmes.

EMPLOYABILITY ENHANCEMENT COURSES (EEC)

S.No	COURSE CODE	COURSE TITLE	CATEGORY	CONTACT PERIODS	L	T	P	C
1.	HS8381	Interpersonal Skills / Listening and Speaking	EEC	2	0	0	2	1
2.	HS8461	Advanced Reading and Writing	EEC	2	0	0	2	1
3.	CE8513	Survey Camp (2 weeks – During IV Semester)	EEC	0	0	0	0	2
4.	HS8581	Professional Communication	EEC	2	0	0	2	1
5.	CE8711	Creative and Innovative Project (Activity Based - Subject Related)	EEC	4	0	0	4	2
6.	CE8712	Industrial Training (4 weeks During VI Semester – Summer)	EEC	0	0	0	0	2
7.	CE8811	Project Work	EEC	20	0	0	20	10

PROFESSIONAL ELECTIVE

SEMESTER V
ELECTIVE - I

S.No	COURSE CODE	COURSE TITLE	CATEGORY	CONTACT PERIODS	L	T	P	C
1.	GI8012	Digital Cadastre	PE	3	3	0	0	3
2.	GI8013	Advanced Surveying	PE	3	3	0	0	3
3.	GI8014	Geographic Information System	PE	3	3	0	0	3
4.	GI8015	Geoinformatics Applications for Civil Engineers	PE	3	3	0	0	3
5.	GI8491	Total Station and GPS Surveying	PE	3	3	0	0	3
6.	GE8071	Disaster Management	PE	3	3	0	0	3
7.	GE8074	Human Rights	PE	3	3	0	0	3

SEMESTER VI
ELECTIVE - II

S.No	COURSE CODE	COURSE TITLE	CATEGORY	CONTACT PERIODS	L	T	P	C
1.	CE8001	Ground Improvement Techniques	PE	3	3	0	0	3
2.	CE8002	Introduction to Soil Dynamics and Machine Foundations	PE	3	3	0	0	3
3.	CE8003	Rock Engineering	PE	3	3	0	0	3
4.	CE8004	Urban Planning and Development	PE	3	3	0	0	3
5.	CE8005	Air Pollution and Control Engineering	PE	3	3	0	0	3
6.	GE8075	Intellectual Property Rights	PE	3	3	0	0	3

SUMMARY

S.No	Subject Area	Credits per Semester								Credits Total
		I	II	III	IV	V	VI	VII	VIII	
1	HS	4	7							11
2	BS	12	7	4	4					27
3	ES	9	9	3						21
4	PC		2	16	19	17	20	10		84
5	PE					3	3	3	6	15
6	OE					3		3		6
7	EEC			1	1	2	1	4	10	19
	Total	25	25	24	24	25	24	20	16	183
8	Non-Credit/Mandatory									

5. SP34 Handbook on Concrete Reinforcement and Detailing, Bureau of Indian Standards, New Delhi.
6. IS 800 (2007) Indian Standard General Construction In Steel—Code of Practice, Bureau of Indian Standards, New Delhi.
7. IS 875 Part 1 (2003) Code of Practice for Design Loads (Other Than Earthquake) for Buildings and Structures, Code of Practice-Dead Load, Bureau of Indian Standards, New Delhi.
8. IS 875 Part 2 (2003) Code of Practice for Design Loads (Other Than Earthquake) for Buildings and Structures, Code of Practice-Imposed Load, Bureau of Indian Standards, New Delhi.
9. IS 875 Part 3 (2003) Code of Practice for Design Loads (Other than Earthquake) for Buildings and Structures, Code of Practice-Wind Load, Bureau of Indian Standards, New Delhi.
10. IS 3370 Part 1 (2009) Indian Standard Concrete Structures for Storage of Liquids-Code of Practice–General Requirements, Code of Practice, Bureau of Indian Standards, New Delhi.
11. IS 3370 Part 2 (2009) Indian Standard Concrete Structures for Storage of Liquids-Code of Practice-Reinforced Concrete Structures, Code of Practice, Bureau of Indian Standards, New Delhi.
12. IS 3370–Part 4 (2008) Indian Standard Code of Practice for Concrete Structures for The Storage of Liquids-Design Tables, Code of Practice, Bureau of Indian Standards, New Delhi.
13. IS 804 (2008) Indian Standard Specification for Rectangular Pressed Steel Tanks, Code of Practice, Bureau of Indian Standards, New Delhi.
14. IS 805 (2006) Indian Standard Code of Practice for Use of Steel in Gravity Water Tanks, Code of Practice, Bureau of Indian Standards, New Delhi.
15. IRC 112-2011, Code of Practice for Concrete Road Bridges, The Indian Roads Congress, New Delhi.
16. IRC 6-2014, Standard Specifications and Code of Practice for Road Bridges Section: II-Loads and Stresses, The Indian Roads Congress, New Delhi.

CE8711	CREATIVE AND INNOVATIVE PROJECT	L T P C
	(Activity Based - Subject Related)	0 0 4 2

OBJECTIVE:
  *   To use the knowledge acquired in Civil Engineering to do a mini project, which allows the students to come up with designs, fabrication or algorithms and programs expressing their ideas in a novel way.

TOTAL: 60 PERIODS

STRATEGY

To identify a topic of interest in consultation with Faculty/Supervisor. Review the literature and gather information pertaining to the chosen topic. State the objectives and develop a methodology to achieve the objectives. Carryout the design / fabrication or develop computer code. Demonstrate the novelty of the project through the results and outputs.

CE8712	INDUSTRIAL TRAINING	L T P C
	(4 Weeks During VI Semester – Summer)	0 0 0 2

OBJECTIVE:
  *   To train the students in field work so as to have a firsthand knowledge of practical problems in carrying out engineering tasks. To develop skills in facing and solving the field problems.

STRATEGY:
The students individually undertake training in reputed civil engineering companies for the specified duration. At the end of the training, a report on the work done will be prepared and presented. The students will be evaluated through a viva-voce examination by a team of internal staff.

OUTCOMES:
At the end of the course the student will be able to understand
- The intricacies of implementation textbook knowledge into practice
- The concepts of developments and implementation of new techniques

CE8811	PROJECT WORK	L T P C
		0 0 20 10

OBJECTIVE:
- To develop the ability to solve a specific problem right from its identification and literature review till the successful solution of the same. To train the students in preparing project reports and to face reviews and viva voce examination.

STRATEGY:
The student works on a topic approved by the head of the department under the guidance of a faculty member and prepares a comprehensive project report after completing the work to the satisfaction. The student will be evaluated based on the report and the viva voce examination by a team of examiners including one external examiner.

TOTAL: 300 PERIODS

OUTCOME:
- On Completion of the project work students will be in a position to take up any challenging practical problems and find solution by formulating proper methodology.

GI8012	DIGITAL CADASTRE	L T P C
		3 0 0 3

OBJECTIVE:
- To introduce the students to the cadastral survey Methods and its applications in generation of Land information system.

UNIT I INTRODUCTION 9
History of cadastral survey - Types of survey - Tax - Real Property – Legal cadastre -Graphical and Numerical Cadastre, Legal Characteristics of Records, Torrens System.

UNIT II CADASTRAL SURVEY METHODS 9
Steps in survey of a village - Instruments used for cadastral survey & mapping - Orthogonal, Polar survey methods - Boundary survey - Rectangulation - Calculation of area of Land- GPS and Total Station in Cadastral survey.

UNIT III PHOTOGRAMMETRIC METHODS 9
Photogrammetry for cadastral surveying and mapping - Orthophoto map – Quality control measures - Organisation of cadastral offices – international scenario.

B.E. CIVIL ENGINEERING

(Regulation 2020 - Autonomous)

CHOICE BASED CREDIT SYSTEM (CBCS)

CURRICULUM AND SYLLABI (V TO VI Semester)

Vision

To make the Department of Civil Engineering, unique of its kind to promote education and research in the various fields of construction industry.

Mission

To impart highly innovative and technical knowledge in the field of Civil Engineering to the urban and rural student folks through ⎺Total Quality Education‖.

Program Education Objectives:

Educational objectives of the course Bachelor of Civil Engineering programme can be divided into

1. **Program Specific Academic Excellence**: Graduates of the program will be creative, able to apply scientific knowledge and computer aided design tools for technical problems in the field of Civil Engineering.

2. **Professional Attitude**: Graduates of the program will be a professional Civil Engineer and/or will pursue higher education in various domains of Civil Engineering by taking competitive examinations.

3. **Core Competence**: Graduates of the program will passionately perform as a competent team member, team leader and/or entrepreneur in the development of a sustainable environment.

PROGRAM OUTCOMES:

After going through the four years of study, the Civil Engineering graduates will have the ability to

PO No.	Graduate Attribute	Programme Outcome
1	Engineering knowledge	Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems
2	Problem analysis	Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences
3	Design/development of solutions	Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.
4	Conduct investigations of complex problems	Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions
5	Modern tool usage	Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations
6	The engineer and society	Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice

7	Environment and sustainability	Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development
8	Ethics	Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.
9	Individual and team work	Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings
10	Communication	Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.
11	Project management and finance	Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments
12	Life-long learning	Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change

PROGRAMME SPECIFIC OUTCOMES (PSOs):

1. **Future ready graduates:** Graduating students will be able to deal complex problems in the field of Civil Engineering to achieve design solutions with modern technological approach and application software.

2. **Socially Aware graduates:** Graduating students will be able to understand the professional Civil Engineering practice and apply contextual knowledge with the appropriate consideration of the society and environment.

S. No	COURSE CODE	COURSE TITLE	CATEGORY	CONTACT PERIODS	L	T	P	C
THEORY								
1.	CE1501	Design of Reinforced Cement Concrete Elements	PC	3	3	0	0	3
2.	CE1502	Foundation Engineering	PC	3	3	0	0	3
3.	CE1503	Structural Analysis I	PC	3	3	0	0	3
4.	CE1504	Water Supply Engineering	PC	3	3	0	0	3
5.	CE1505	Concrete and Highway Engineering (Theory cum Lab)	PC	5	3	0	2	4
6.		Open Elective*	OE	3	3	0	0	3
7.		Online Course**	OL	NPTEL/SWAYAM				
8.		Audit Course	AC	3	3	0	0	0
PRACTICALS								
9.	CE1511	Hydraulic Engineering Laboratory	PC	4	0	0	4	2
10.	CE1521	Survey Camp	EEC	0	0	0	0	2
11.	HS1521	Professional Communication	EEC	2	0	0	2	1
			TOTAL	**29**	**21**	**0**	**8**	**24**

	L	T	P	C
CE1521   **SURVEY CAMP**

L	T	P	C
0	0	0	2

The objective of the survey camp is to enable the students to get practical training in the field work. Groups of not more than six members in a group will carry out each exercise in survey camp. The camp must involve work on a large area of not less than 40 acres outside the campus (Survey camp should not be conducted inside the campus). At the end of the camp, each student shall have mapped and contoured the area. The camp record shall include all original field observations, calculations and plots.

Two weeks Survey Camp will be conducted during summer vacation in the following activities:

1. Traverse - using Total station
2. Contouring
(i). Radial tachometric contouring - Radial Line at Every 45 Degree and Length not less than 60 Meter on each Radial Line
(ii). Block Level/ By squares of size at least 100 Meter x 100 Meter at least 20 Meter interval
(III). L.S & C.S - Road and canal alignment for a Length of not less than 1 Kilo Meter at least L.S at Every 30M and C.S at every 90 M
3. Offset of Buildings and Plotting the Location
4. Sun observation to determine azimuth (guidelines to be given to the students)
5. Use of GPS to determine latitude and longitude and locate the survey camp location
6. Traversing using GPS
7. Curve setting by deflection angle
8. Introduction to geo informatics (Study)

Apart from above students may be given survey exercises in other area also based on site condition to give good exposure on survey.

COURSE OUTCOMES
Upon successful completion of course the students will be able to
CO 1 Examine the area of the field by using the principles of triangulation
CO 2 Examine the area of the field by using the principles of trilateration
CO 3 Take part in astronomical survey and calculate azimuth
CO 4 Construct a contour plan by the application of leveling
CO 5 Make use of advanced surveying equipment's like total station, GPS etc

MAPPING OF COURSE OUTCOMES WITH PROGRAM OUTCOMES

CE1521 – SURVEY CAMP

Course Outcomes	PO												PSO	
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
CO1	H	M	M	M	M	H	M	M	M	M	M	H	H	H
CO2	H	M	M	M	M	H	M	M	M	M	M	H	H	H
CO3	M	M	M	M	M	H	M	M	M	M	M	H	H	H
CO4	H	M	M	M	M	H	M	M	M	M	M	H	H	H
CO5	H	M	M	M	M	H	M	M	L	M	L	H	M	M

H - High; M - Medium; L - Low

HS1521   PROFESSIONAL COMMUNICATION

L	T	P	C
0	0	2	1

Course Objectives:

* Enhance the Employability and Career Skills of students

* Orient the students towards grooming as a professional

* Make them Employable Graduates

* Develop their confidence and help them attend interviews successfully.

UNIT I   SOFT SKILLS   6

Introduction to Soft Skills- Hard skills & soft skills - employability and career Skills– Grooming as a professional with values–Time Management–General awareness of Current Affairs – Error Spotting.

UNIT II   EFFECTIVE PRESENTATIONS   6

Self-Introduction-organizing the material - Introducing oneself to the audience - introducing the topic - answering questions with clarity and appropriate phrases - individual presentation practice– presenting the visuals effectively – 5 minute presentations

UNIT III   GROUP DISCUSSION   6

Introduction to Group Discussion– Participating in group discussions - understanding group dynamics - brainstorming the topic -- questioning and clarifying -GD strategies- activities to improve GD skills

UNIT IV   INTERVIEW ETIQUETTE   6

Interview etiquette – dress code – body language – attending job interviews- telephone/skype interview -one to one interview &panel interview – FAQs related to job interviews

UNIT V   CAREER PLAN   6

Recognizing differences between groups and teams- managing time-managing stress-networking professionally- respecting social protocols-understanding career management-developing a long-term career plan-making career changes

TOTAL: 30 PERIODS

COURSE OUTCOMES
Upon successful completion of course the students will be able to
CO1   Apply hard and soft skills to enhance their employability
CO2   Utilize adequate presentation skills to present a PPT
CO3   Demonstrate the proper usage of grammar in GD
CO4   Make use of the acquired skills while attending interviews
CO5   Develop adequate Soft Skills required for the workplace

REFERENCES:
1. Butterfield, 2015 *Jeff Soft Skills for Everyone. Cengage Learning*: New Delhi.
2. E. Suresh Kumar et al., 2015 *Communication for Professional Success*. Orient Blackswan: Hyderabad
3. *Interact English Lab Manual for Undergraduate* Students,.Orient BalckSwan: Hyderabad, 2016.
4. Raman, Meenakshi and Sangeeta Sharma, 2014, *Professional Communication*. Oxford University Press: Oxford.
5. S. Hariharanet al. 2010, *Soft Skills*. MJP Publishers: Chennai.

MAPPING OF COURSE OUTCOMES WITH PROGRAM OUTCOMES

HS1521 – PROFESSIONAL COMMUNICATION

Course Outcomes	PO												PSO	
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
CO1	-	-	-	-	-	-	-	-	-	M	-	-	-	-
CO2	-	-	-	-	-	-	-	-	-	M	-	-	-	-
CO3	-	-	-	-	-	-	-	-	-	M	-	-	-	-
CO4	-	-	-	-	-	-	-	-	-	M	-	-	-	-
CO5	-	-	-	-	-	-	-	-	-	M	-	-	-	-

H - High; M - Medium; L - Low

B.E. CIVIL ENGINEERING
REGULATIONS – 2021
AUTONOMOUS SYLLABUS
CHOICE BASED CREDIT SYSTEM
III TO IV SEMESTER CURRICULUM AND SYLLABI

VISION:

> To make the Department of Civil Engineering, unique of its kind to promote education and research in the various fields of construction industry.

MISSION:

> To impart highly innovative and technical knowledge in the field of Civil Engineering to the urban and rural student folks through "Total Quality Education".

PROGRAMME EDUCATIONAL OBJECTIVES (PEOs):

PEO 1: Graduates of the program will be creative, able to apply scientific knowledge and computer aided design tools for technical problems in the field of Civil Engineering.

PEO 2: Graduates of the program will be a professional Civil Engineer and/or will pursue higher education in various domains of Civil Engineering by taking competitive examinations.

PEO 3: Graduates of the program will passionately perform as a competent team member, team leader and/or entrepreneur in the development of a sustainable environment.

PROGRAM OUTCOMES:

After going through the four years of study, the Civil Engineering graduates will have the ability to

POs	Graduate Attribute	Programme Outcome
1	Engineering knowledge	Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
2	Problem analysis	Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.
3	Design/Development of solutions	Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.
4	Conduct investigations of complex problems	Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions
5	Modern tool usage	Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations
6	The engineer and society	Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice
7	Environment and sustainability	Understand the impact of the professional engineering solutions in societal and environmental contexts, and

		demonstrate the knowledge of, and need for sustainable development.
8	Ethics	Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.
9	Individual and team work	Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.
10	Communication	Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.
11	Project management and finance	Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.
12	Life-long learning	Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

PROGRAMME SPECIFIC OUTCOMES (PSOs):

PSO1 : Graduating students will be able to deal complex problems in the field of Civil Engineering to achieve design solutions with modern technological approach and application software.

PSO2 : Graduating students will be able to understand the professional Civil Engineering practice and apply contextual knowledge with the appropriate consideration of the society and environment.

REGULATIONS - 2021
CHOICE BASED CREDIT SYSTEM
B.E. CIVIL ENGINEERING
CURRICULUM AND SYLLABI FOR SEMESTER III TO IV
SEMESTER III

S.NO.	COURSE CODE	COURSE TITLE	CATE GORY	CONTACT PERIODS	L	T	P	C
THEORY								
1	MA2202	Transforms and Numerical Solution of Equations	BS	4	3	1	0	4
2	CE2201	Construction Materials	PC	3	3	0	0	3
3	CE2202	Fluid Mechanics	PC	3	3	0	0	3
4	CE2203	Mechanics of Solids	PC	3	3	0	0	3
5	CE2204	Surveying	PC	3	3	0	0	3
6	GE2201	Design Thinking	EM	3	3	0	0	3
7		Audit Course	AU	3	3	0	0	0
PRACTICALS								
8	CE2205	Computer Aided Building Drawing Laboratory	PC	4	0	0	4	2
9	CE2206	Surveying Laboratory	PC	4	0	0	4	2
10	EM2202	Interpersonal Skills - Listening and Speaking	EM	2	0	0	2	1
			TOTAL	32	21	1	10	24

SEMESTER IV

S.NO.	COURSE CODE	COURSE TITLE	CATE GORY	CONTACT PERIODS	L	T	P	C
THEORY								
1	MA2254	Probability, Statistics and Numerical Methods	BS	4	3	1	0	4
2	CE2251	Applied Hydraulic Engineering	PC	3	3	0	0	3
3	CE2252	Concrete Technology	PC	3	3	0	0	3
4	CE2253	Environmental Engineering	PC	3	3	0	0	3
5	CE2254	Geotechnical Engineering – I	PC	3	3	0	0	3
6	CE2255	Strength of Materials	PC	4	3	1	0	4
7	GE2251	Quantitative Aptitude	EM	1	1	0	0	1
8	AUD110	Tamils and Technology	AU	1	1	0	0	0
PRACTICALS								
9	CE2256	Geotechnical Laboratory	PC	3	0	0	3	1
10	CE2257	Strength of Materials Laboratory	PC	3	0	0	3	1
11	EM2252	An Introduction to Advanced Reading and Writing	EM	2	0	0	2	1
			TOTAL	30	20	2	8	24

Course Code	Course Name	L	T	P	C
GE2201	**DESIGN THINKING**	**3**	**0**	**0**	**3**

Category: Employability Enhancement Course

a. Preamble

This course introduces the various principles of design thinking to achieve an effective design and to examine the implementation of the model or process for its successful operation.

b. Course Outcome

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

CO. No.	Course Outcome	Knowledge Level
CO1	Describe the basic principles of design and various stages of design thinking for better conceiving of idea and refinement	K2
CO2	Elucidate the concepts of idea generation and refinement	K3
CO3	Apply various prototype models for solving complex problems	K3
CO4	Analyze real-time problems for effective design, implementation and operation	K3
CO5	Device idea/solution towards development of a prototype for a chosen problem of interest	K4

c. Course Syllabus   **Total : 45 Periods**

INTRODUCTION TO DESIGN THINKING   **9**

Introduction - Product life cycle – Design Ethics – Design Process – Stages in design thinking: Immersion, Analysis and synthesis, Ideation, Prototyping.

IDEA GENERATION AND REFINEMENT   **9**

Basic design - directions - Themes of thinking - Inspiration and references - Brainstorming - Value - Inclusion – Sketching - Presenting ideas - Thinking in images - Thinking in signs - Appropriation - Personification - Visual metaphors - Modification - Thinking in words – Words and language - Thinking in shapes - Thinking in proportions - Thinking in color - Outside the Box.

PROTOTYPING   **9**

Developing designs - Types of prototype - Prototyping for Designing Complex Systems – The Efficacy of Prototyping under Time Constraints.

IMPLEMENTATION 9

Format - Materials - Finishing - Media - Scale - Series/Continuity - Emerging Landscapes of Design - Real-Time Design Interaction Capture and Analysis - Enabling Efficient Collaboration in Digital Design - Spaces Across Time and Distance - Software used in Developing in Virtual Environments.

DESIGN THINKING IN VARIOUS SECTORS 9

. Design & Development of Prototypes for Wall Plastering, Rubber shredding, Separation of Corn seeds, Electric vehicles, Smart gates, Burglar alarm, Tyre pressure monitor, Development of Online Voting System, Online Proctoring System, Online Health Monitoring System, IoT based Home Automation and any other problem of interest in your domain.

d. Activities

Following activities shall be implemented to enhance the knowledge of design thinking in various streams of Engineering

- Brainstorming
- Themes of Thinking
- Seminar
- Protype Making

e. Learning Resources

Text Books

1. Binder, T., De Michelis, G., Ehn, P., Jacucci, G., Linde, P., and Wagner, I., 2011. *Design things*, MIT press

2. Ambrose, G., and Harris, P., 2009. *Basics Design: Design thinking*, Bloomsbury Publishing

Reference Books

1. Meinel, C., and Leifer, L. (Eds.)., 2011. *Understanding Innovation*, Springer.

2. Plattner, H., Meinel, C., and Leifer, L. (Eds.)., 2010. *Design thinking: understand–improve–apply*, Springer Science & Business Media

3. Moran, T. P., and Carroll, J. M., 1996. *Design Rationale: Concepts, Techniques, and Use*, L. Erlbaum Associates Inc.

4. Cross, N., 1984. *Developments in Design Methodology*, Chichester: Wiley.

WEB RESOURCES:

1. https://www.designsociety.org/download publication/39626/Design+prototyping+of+systems

2. https://www.interaction-design.org/literature/article/5-stages-in-the-design- thinking-process

VIDEO LECTURES :(NPTEL OR ANY OTHER VIDEO LECTURES)

1. https://nptel.ac.in/courses/110/106/110106124/#

Course Code	Course Name	L	T	P	C
EM2202	INTERPERSONAL SKILLS - LISTENING AND SPEAKING	0	0	2	1

Category: Employment Enhancement

a. Preamble
The Course will enable learners to:

- Equip students with the English language skills required for the successful undertaking of academic studies with primary emphasis on academic speaking and listening skills.

- Provide guidance and practice in basic general and classroom conversation and to engage in specific academic speaking activities.

- Improve general and academic listening skills

- Make effective presentations.

b. Course Outcome
After successful completion of the course, the students will be able to

CO. No.	Course Outcome	Knowledge Level
CO1	Develop their communicative competence in English with specific reference to listening	
CO2	Prepare conversation with reasonable accuracy	
CO3	Apply lexical Chunking for accuracy in speaking	
CO4	Demonstrate their ability to communicate effectively in GDs	
CO5	Explain directions and instructions in academic and business contexts	

c. Course Syllabus   Total : 30 Periods

LISTENING AS A KEY SKILL   6

Listening as a key skill- its importance- speaking – give personal information – ask for personal information – express ability – enquire about ability – ask for clarification - Improving pronunciation– pronunciation basics — stressing syllables and speaking clearly – intonation patterns – conversation starters: small talk

LISTEN TO A PROCESS INFORMATION   6

Listen to a process information- give information, as part of a simple explanation — taking lecture notes – preparing to listen to a lecture – articulate acomplete idea as opposed to producing fragmented utterances - compare andcontrast information and ideas from multiple sources- converse with reasonable accuracy overa wide range of everyday topics.

LEXICAL CHUNKING   6
Lexical chunking for accuracy and fluency- factors influence fluency, deliver a five-minuteinformal talk – greet – respond to greetings – describe health and symptoms – invite and offer –accept – decline – take leave – listen for and follow the gist- listen for detail

GROUP DISCUSSION   6
Being an active listener: giving verbal and non-verbal feedback – participating in a group discussion – summarizing academic readings and lectures conversational speech listening to and participating in conversations – persuade- negotiate disagreement in group work.

GROUP & PAIR PRESENTATIONS   6
Formal and informal talk – listen to follow and respond to explanations, directions and instructions in academic and business contexts – strategies for presentations and interactive communication – group/pair presentations

d. Activities
Students shall be taken to the Language lab for enhancing their listening and speaking skills.

e. Learning Resources
Text Books

1. Brooks,Margret,2011, *Skills for Success. Listening and Speaking. Level 4,* Oxford University Press,Oxford.
2. Richards, C, Jack and David Bholke,2010, *Speak Now Level 3,*Oxford University Press, Oxford.

Reference Books

1. Bhatnagar, Nitin and MamtaBhatnagar,2010, *Communicative English for Engineers and Professionals,* Pearson, New Delhi.
2. Hughes, Glyn and Josephine Moate,2014, *Practical English Classroom,* Oxford University Press, Oxford.

3. Vargo, Mari,2013, *Speak Now Level 4*, Oxford University Press, Oxford.

4. Richards, C, Jack,2006,*Person to Person (Starter)*, Oxford University Press, Oxford.

5. Ladousse, Gillian Porter,2014, *Role Play*. Oxford University Press, Oxford.

Web resources:

1. https://www.cambridge.org/elt/blog/wp-content/uploads/2019/10/Learning-Language-in-Chunks.pdf

2. https://english.eagetutor.com/english/628-how-to-greet-your-boss-people-in-office.html

3. https://www.groupdiscussionideas.com/group-discussion-topics-with-answers/

4. https://www.bbc.co.uk/worldservice/learningenglish/business/talkingbusiness/unit3presentations/1opening.shtml

Course Code	Course Name	L	T	P	C
GE2251	**QUANTITATIVE APTITUDE**	1	0	0	1

Category: Employability Enhancement Course

a. Preamble

To develop the thinking ability and problem solving skills of students to compete themselves in placement and competitive examinations.

b. Course Outcome

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

CO. No.	Course Outcome	Knowledge Level
CO1	Apply the concept of profit in real life problems	K3
CO2	Solve the problems by using proportion	K3
CO3	Compute accurate speed, time and distance	K3
CO4	Apply the concept of Time & Speed	K3
CO5	Calculate the work done based on various methods	K3

c. Course Syllabus   **Total : 15 Periods**

PROFIT AND LOSS   **3**

Profit and Loss - Cost Price, Selling Price, Profit and Loss %, Marked Price, Discount.

RATIO AND PROPORTION   **3**

Ratio and Proportion - Ratio, Proportion, Comparison of Ratios, Duplicate, Triplcate Ratio.

TIME, SPEED AND DISTANCE   **3**

Time, Speed and Distance - Concept of time, speed and distance, Conversion of units and proportionality, Avearge speed concept.

APPLICATIONS ON TIME, SPEED AND DISTANCE   **3**

Problems on trains - Relative speed concept and application. Boats and Streams - Upstream speed, Downstream speed, Speed of stream, Speed of boat.

TIME AND WORK   **3**

Time & work - Problems based on time and work, Formulae, Computation of work together, Wages based work problems. Pipes & Cisterns - Inlet-outlet, Part of tank filled, Time based problems.

d. Learning Resources

Text Book

1. Dinesh Khattar, *Quantitative Aptitude for Competitive Examinations*, Pearson India Education services Pvt Ltd, Fourth Edition, Uttar Pradesh, 2019.

Reference Books

1. TCY online, *Reasoning ability and Quantitative Aptitude*, Wiley India Pvt. Ltd, First Edition, New Delhi, 2016.

2. Agarwal.R.S, *Quantitative Aptitude for Competitive Examinations*, S.Chand Limited, 2011.

3. Abhijit Guha, *Quantitative Aptitude for Competitive Examinations*, Tata McGraw Hill, 3rd Edition, 2011

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Course Code	Course Name	L	T	P	C
EM2252	**AN INTRODUCTION TO ADVANCED READING AND WRITING**	**0**	**0**	**2**	**1**

Category: Employment Enhancement

a. Preamble

- To strengthen the reading skills of students of engineering.

- To enhance their writing skills with specific reference to technical writing

- To develop their critical thinking skills.

- To provide more opportunities to develop their project and proposal writing skills

b. Course Outcome

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

CO. No.	Course Outcome	Knowledge Level
CO1	Understand how the text positions the reader	K3
CO2	Develop critical thinking while reading a text	K3
CO3	Develop a descriptive paragraph	K3
CO4	Make use of sentence structures effectively when creating an essay.	K3
CO5	Demonstrate proper usage of grammar in writing E-Mails, Job application and project proposals	K3

c. Course Syllabus   **Total : 45 Periods**

EFFECTIVE READING   **6**

Reading - Strategies for effective reading-Use glosses and footnotes to aid reading comprehension - Read and recognize different text types - Predicting content using photos and title. Reading - Read for details - Use of graphic organizers to review and aid comprehension.

CRITICAL READING   **6**

Reading - Understanding pronoun reference and use of connectors in a passage- speed reading techniques. Reading - Genre and Organization of Ideas- Reading - Critical reading and thinking- understanding how the text positions the reader.

PARAGRAPH WRITING 6

Writing-Plan before writing - Develop a paragraph: topic sentence, supporting sentences, concluding sentence.-Write a descriptive paragraph Writing-State reasons and examples to support ideas in writing - Write a paragraph with reasons and examples - Write an opinion paragraph

ESSAY WRITING 6

Writing - Elements of a good essay - Types of essays - descriptive-narrative- issue-based-argumentative-analytical.

EFFECTIVE WRITING 6

Writing - Email writing- visumes - Job application- Report Writing - Project writing-Writing convincing proposals

d.Activities

Students shall be exposed to various passages for reading and trained to write in different forms.

f. Learning Resources

Text Books
1. Gramer, F, Margot & Colin, S, Ward, 2011, *Reading and Writing (Level 3)* ,Oxford University Press, Oxford.
2. Debra Daise, CharlNorloff, and Paul Carne, 2011, *Reading and Writing (Level 4)* Oxford University Press: Oxford.

Reference Books
1. Davis, Jason & Rhonda LIss. 2006 *Effective Academic Writing (Level 3)* Oxford University Press: Oxford.
2. E. Suresh Kumar and et al. 2012, *Enriching Speaking and Writing Skills*, Second Edition, Orient Black swan: Hyderabad.
3. Withrow, Jeans and et al. 2004 *Inspired to Write. Readings and Tasks to develop writing skills*, Cambridge University Press: Cambridge.
4. Goatly, Andrew, 2000 *Critical Reading and Writing, Routledge*: United States of America.
5. Petelin, Roslyn & Marsh Durham, 2004 *The Professional Writing Guide: Knowing Well and Knowing Why*, Business & Professional Publishing: Australia.

ANNA UNIVERSITY, CHENNAI
AFFILIATED INSTITUTIONS
REGULATIONS 2017
B. TECH. BIOTECHNOLOGY
CHOICE BASED CREDIT SYSTEM

1. Program Objectives (POs)

The primary objective of the Bachelor of Industrial Biotechnology program is to prepare professionals with the skills required to work in the Biotechnology industry with particular emphasis on the engineering aspects of manufacturing and design.

They are trained to
1. Achieve successful professional and technical career.
2. Have a strong foundation in Basic Sciences, Mathematics, Medical Sciences, Bioinformatics and process engineering.
3. Have knowledge on the theory and practices in the field of Biotechnology, especially in the areas of Downstream processing, Medical biotechnology and Bioinformatics and allied areas.
4. Engross in life-long learning to keep themselves abreast of new developments.
5. Practice and inspire high ethical values and technical standards.

The Overall objective of the Program is to promote education and research in biotechnology and provide academic and professional excellence for immediate productivity in industrial, governmental, or clinical settings for an ultimate benefit of society and environment.

As a result of this program, the student will be able to:

1. Recall factual information on broad knowledge based proficiency in core themes, principles and components of Basic Sciences.
2. Create and develop strategies that reflect the interdisciplinary nature of science, regulation and enterprise in the biotechnology industry.
3. Define and solve problems using scientific methods in biotechnology and allied subjects.
4. Consider implications of biotechnology in societal, environmental and educational frameworks.
5. Access current information and literature in science and Prepare and present scientific data.
6. Demonstrate knowledge of biological processes from the molecular and cellular perspectives.
7. Approach and solve biological problems critically with scientific literacy in individual and group settings.
8. Able to understand, analyze and apply the process engineering concepts an incredibly wide diversity of applications including pharmaceutical development, crop and livestock improvement, diagnostic and therapeutic medicine, industrial processing, and bioremediation of contaminated environments.

Year	Sem	Course	1	2	3	4	5	6	7	8	9
	SEM 4	Probability and Statistics		✓	✓						✓
		Fluid Mechanics and Heat Transfer Operations		✓							✓
		Molecular Biology	✓				✓				
		Enzyme technology and Bio- Transformations		✓							✓
		Bioprocess Principles	✓	✓							
		Environmental Science and Engineering		✓		✓					✓
		Chemical Engineering Laboratory for Biotechnologists			✓					✓	
		Molecular Biology Laboratory							✓	✓	✓
		Advanced Reading and Writing		✓						✓	
Year 3	SEM 5	Mass Transfer Operations	✓	✓							✓
		Bioprocess Engineering	✓	✓							✓
		Analytical Methods and Instrumentation		✓							✓
		Protein Engineering			✓			✓			✓
		Professional Communication									
		Bioprocess Laboratory I							✓	✓	
		Analytical Methods and Instrumentation Laboratory		✓						✓	
	SEM 6	Bioinformatics			✓						✓
		Genetic Engineering			✓		✓	✓			
		Applied Chemical Reaction Engineering			✓						✓
		Bioprocess Laboratory II	✓							✓	
		Genetic Engineering Laboratory					✓			✓	✓
Year 4	SEM 7	Total Quality Management		✓							✓
		Downstream Processing		✓							✓
		Immunology		✓							
		Downstream Processing Laboratory		✓						✓	✓
		Immunology Laboratory					✓			✓	✓
	SEM 8	Project Work						✓		✓	✓

SEMESTER VII

S. No.	COURSE CODE	COURSE TITLE	CATE GORY	CONTACT PERIODS	L	T	P	C
THEORY								
1	GE8077	Total Quality Management	HS	3	3	0	0	3
2	BT8751	Downstream Processing	PC	3	3	0	0	3
3	BT8791	Immunology	PC	3	3	0	0	3
4		Professional Elective V	PE	3	3	0	0	3
5		Professional Elective VI	PE	3	3	0	0	3
6		Open Elective II *	OE	3	3	0	0	3
PRACTICALS								
7	BT8711	Downstream Processing Laboratory	PC	4	0	0	4	2
8	BT8712	Immunology Laboratory	PC	4	0	0	4	2
			TOTAL	26	18	0	8	22

* - Course from the curriculum of the other UG Programmes

SEMESTER VIII

S. No.	COURSE CODE	COURSE TITLE	CATE GORY	CONTACT PERIODS	L	T	P	C
PRACTICALS								
1	BT8811	Project Work	EEC	20	0	0	20	10
			TOTAL	20	0	0	20	10

TOTAL CREDITS: 179

PROFESSIONAL ELECTIVES (PEs)

PROFESSIONAL ELECTIVE I, SEMESTER V

S. No.	COURSE CODE	COURSE TITLE	CATE GORY	CONTACT PERIODS	L	T	P	C
1.	BT8001	Biophysics	PE	3	3	0	0	3
2.	BT8002	Symbolic Mathematics	PE	3	3	0	0	3
3.	BT8003	Principles of Food Processing	PE	3	3	0	0	3
4.	BT8004	Advanced Biochemistry	PE	3	3	0	0	3
5.	GE8071	Disaster Management	PE	3	3	0	0	3

PROFESSIONAL ELECTIVE II, SEMESTER VI

S. No.	COURSE CODE	COURSE TITLE	CATE GORY	CONTACT PERIODS	L	T	P	C
1.	BT8005	Animal Biotechnology	PE	3	3	0	0	3
2.	BT8006	Systems Biology	PE	3	3	0	0	3
3.	BT8071	Biological Spectroscopy	PE	3	3	0	0	3
4.	CH8791	Transport Phenomena	PE	3	3	0	0	3
5.	PY8023	Chemistry of Medicines	PE	3	3	0	0	3
6.	GE8075	Intellectual Property Rights	PE	3	3	0	0	3

PROFESSIONAL CORE (PC)

S. No.	COURSE CODE	COURSE TITLE	CATE GORY	CONTACT PERIODS	L	T	P	C
1.	BT8251	Biochemistry	PC	3	3	0	0	3
2.	BT8261	Biochemistry Laboratory	PC	4	0	0	4	2
3.	BT8301	Stoichiometry	PC	5	3	2	0	4
4.	BT8302	Applied Thermodynamics for Biotechnologists	PC	3	3	0	0	3
5.	BT8303	Basic Industrial Biotechnology	PC	3	3	0	0	3
6.	BT8304	Biorganic Chemistry	PC	3	3	0	0	3
7.	BT8305	Cell Biology	PC	3	3	0	0	3
8.	BT8361	Microbiology Laboratory	PC	4	0	0	4	2
9.	BT8311	Cell Biology Laboratory	PC	4	0	0	4	2
10.	BT8402	Molecular Biology	PC	3	3	0	0	3
11.	BT8403	Enzyme Technology and Bio-transformations	PC	3	3	0	0	3
12.	BT8404	Bioprocess Principles	PC	3	3	0	0	3
13.	BT8412	Molecular Biology Laboratory	PC	4	0	0	4	2
14.	BT8501	Mass Transfer Operations	PC	3	3	0	0	3
15.	BT8502	Analytical Methods and Instrumentation	PC	3	3	0	0	3
16.	BT8503	Protein Engineering	PC	3	3	0	0	3
17.	BT8511	Bioprocess Laboratory I	PC	4	0	0	4	2
18.	BT8512	Analytical Methods and Instrumentation Laboratory	PC	4	0	0	4	2
19.	BT8651	Bioinformatics	PC	5	3	2	0	4
20.	BT8601	Genetic Engineering	PC	4	4	0	0	4
21.	BT8611	Bioprocess Laboratory II	PC	4	0	0	4	2
22.	BT8612	Genetic Engineering Laboratory	PC	4	0	0	4	2
23.	BT8751	Downstream Processing	PC	3	3	0	0	3
24.	BT8791	Immunology	PC	3	3	0	0	3
25.	BT8711	Downstream Processing Laboratory	PC	4	0	0	4	2
26.	BT8712	Immunology Laboratory	PC	4	0	0	4	2

EMPLOYABILITY ENHANCEMENT COURSES (EEC)

S. No.	COURSE CODE	COURSE TITLE	CATE GORY	CONTACT PERIODS	L	T	P	C
1.	HS8381	Interpersonal Skills/Listening and Speaking	EEC	2	0	0	2	1
2.	HS8461	Advanced Reading and Writing	EEC	2	0	0	2	1
3.	HS8581	Professional Communication	EEC	2	0	0	2	1
4.	BT8811	Project Work	EEC	20	0	0	20	10

SUMMARY

S. No.	SUBJECT AREA	CREDITS PER SEMESTER								TOTAL CREDITS
		I	II	III	IV	V	VI	VII	VIII	
1	HS	4	4	-	3	-	-	3	-	14
2	BS	12	10	4	4	-	-	-	-	30
3	ES	9	6	-	6	3	3	-	-	27
4	PC	-	5	20	11	13	12	10	-	71
5	PE	-	-	-	-	3	9	6	-	18
6	OE	-	-	-	-	3	-	3	-	6
7	EEC	-	-	1	1	1	-	-	10	13
Total		25	25	25	25	23	24	22	10	179

BT8811   **PROJECT WORK**   **L T   P   C**
                                                                  0 0 20 10

OBJECTIVE:
*   To objective of the project work is to make use of the knowledge gained by the student at various stages of the degree programme.

    The students are assigned project work related to product / process development, solution to the technical problems in industry and current research at national and international level. The student is required to submit a report at the end of semester based on the findings. The evaluation is made as per the Regulations of University.

BT8001   **BIOPHYSICS**   **L T P C**
                                                               3 0 0 3

OBJECTIVES:
To enable the students
*   To gain structural knowledge of biological systems.
*   To understand transport and dynamic properties of biological systems.

UNIT I   MOLECULAR STRUCTURE OF BIOLOGICAL SYSTEMS   9
Intramolecular bonds – covalent – ionic and hydrogen bonds – biological structures –general features – water structure – hydration – interfacial phenomena and membranes – self assembly and molecular structure of membranes.

UNIT II   CONFORMATION OF NUCLEIC ACIDS   9
Primary structure – the bases – sugars and the phosphodiester bonds- double helical structure – the a b and z forms – properties of circular DNA – topology – polymorphism and flexibility of DNA – structure of ribonucleic acids – hydration of nucleic acids.

UNIT III   CONFORMATION OF PROTEINS   9
Conformation of the peptide bond – secondary structures – Ramachandran plots – use of potential functions – tertiary structure – folding – hydration of proteins – hydropathy index.

UNIT IV   CELLULAR PERMEABILITY AND ION – TRANSPORT   9
Ionic conductivity – transport across ion channels – mechanism - ion pumps- proton transfer – nerve conduction – techniques of studying ion transport and models.

UNIT V   ENERGETICS & DYNAMICS OF BIOLOGICAL SYSTEMS   9
Concepts in thermodynamics – force and motion – entropy and stability – analyses of fluxes – diffusion potential – basic properties of fluids and biomaterials – laminar and turbulent flows.
                                                               TOTAL: 45 PERIODS
OUTCOMES:
Upon completion of this course, students will be able:
*   To analyze the various forces responsible for biological molecular structure.

REGULATION - 2021
CHOICE BASED CREDIT SYSTEM
B.TECH. BIOTECHNOLOGY
CURRICULUM AND SYLLABI FOR SEMESTER III TO IV

SEMESTER III

S.NO.	COURSE CODE	COURSE TITLE	CATE GORY	CONTACT PERIODS	L	T	P	C
THEORY								
1	MA2202	Transforms and Numerical Solution of Equations	BS	4	3	1	0	4
2	BT2201	Biochemistry	PC	3	3	0	0	3
3	BT2202	Cell Biology	PC	3	3	0	0	3
4	BT2203	Stoichiometry	PC	4	3	1	0	4
5	BT2204	Thermodynamics for Biotechnologist	ES	3	3	0	0	3
6	GE2201	Design Thinking	EM	3	3	0	0	3
7		Audit Course	AU	3	3	0	0	0
PRACTICALS								
8	BT2205	Biochemistry Laboratory	PC	4	0	0	4	2
9	BT2206	Cell Biology Laboratory	PC	4	0	0	4	2
10	EM2202	Interpersonal Skills - Listening and Speaking	EM	2	0	0	2	1
			TOTAL	**33**	**21**	**2**	**10**	**25**

S.NO.	COURSE CODE	COURSE TITLE	CATE GORY	CONTACT PERIODS	L	T	P	C
THEORY								
1	MA2254	Probability, Statistics and Numerical Methods	BS	4	3	1	0	4
2	BT2251	Basic Industrial Biotechnology	PC	3	3	0	0	3
3	BT2252	Enzyme Technology and Biotransformations	PC	3	3	0	0	3
4	BT2253	Fluid Mechanics and Heat Transfer Operations	ES	3	3	0	0	3
5	BT2254	Microbiology	PC	3	3	0	0	3
6	BT2255	Molecular Biology	PC	3	3	0	0	3
7	GE2251	Quantitative Aptitude	EM	1	1	0	0	1
8	AUD110	Tamils and Technology	AU	1	1	0	0	0
PRACTICALS								
9	BT2256	Chemical Engineering Laboratory for Biotechnologist	PC	3	0	0	3	1
10	BT2257	Microbiology Laboratory	PC	3	0	0	3	1
11	EM2252	An Introduction to Advanced Reading and Writing	EM	2	0	0	2	1
			TOTAL	**29**	**20**	**1**	**8**	**23**

Course Code	Course Name	L	T	P	C
GE2201	**DESIGN THINKING**	3	0	0	3

Category: Employability Enhancement Course

a. Preamble

This course introduces the various principles of design thinking to achieve an effective design and to examine the implementation of the model or process for its successful operation.

b. Course Outcome

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

CO. No.	Course Outcome	Knowledge Level
CO1	Describe the basic principles of design and various stages of design thinking for better conceiving of idea and refinement	K2
CO2	Elucidate the concepts of idea generation and refinement	K3
CO3	Apply various prototype models for solving complex problems	K3
CO4	Analyze real-time problems for effective design, implementation and operation	K3
CO5	Device idea/solution towards development of a prototype for a chosen problem of interest	K4

c. Course Syllabus   **Total : 45 Periods**

INTRODUCTION TO DESIGN THINKING   **9**

Introduction - Product life cycle – Design Ethics – Design Process – Stages in design thinking: Immersion, Analysis and synthesis, Ideation, Prototyping.

IDEA GENERATION AND REFINEMENT   **9**

Basic design - directions - Themes of thinking - Inspiration and references - Brainstorming - Value - Inclusion – Sketching - Presenting ideas - Thinking in images - Thinking in signs - Appropriation - Personification - Visual metaphors - Modification - Thinking in words – Words and language - Thinking in shapes - Thinking in proportions - Thinking in color - Outside the Box

PROTOTYPING   **9**

Developing designs - Types of prototype - Prototyping for Designing Complex Systems – The Efficacy of Prototyping under Time Constraints

IMPLEMENTATION   **9**

Format - Materials - Finishing - Media - Scale - Series/Continuity - Emerging Landscapes of Design - Real-Time Design Interaction Capture and Analysis - Enabling Efficient Collaboration in Digital Design - Spaces Across Time and Distance - Software used in Developing in Virtual Environments

DESIGN THINKING IN VARIOUS SECTORS   **9**

Design & Development of Prototypes for Wall Plastering, Rubber shredding, Separation of Corn seeds, Electric vehicles, Smart gates, Burglar alarm, Tyre pressure monitor, Development of Online Voting System, Online Proctoring System, Online Health Monitoring System, IoT based Home Automation and any other problem of interest in your domain.

d. Activities

e. Learning Resources

  Text Books

1. Binder, T., De Michelis, G., Ehn, P., Jacucci, G., Linde, P., and Wagner, I., 2011. *Design things*, MIT press

2. Ambrose, G., and Harris, P., 2009. *Basics Design: Design thinking*, Bloomsbury

  Reference Books

1. Meinel, C., and Leifer, L. (Eds.)., 2011. *Understanding Innovation*, Springer.

2. Plattner, H., Meinel, C., and Leifer, L. (Eds.)., 2010. *Design thinking: understand–improve–apply*, Springer Science & Business Media

3. Moran, T. P., and Carroll, J. M., 1996. *Design Rationale: Concepts, Techniques, and Use,* L. Erlbaum Associates Inc

4. Cross, N., 1984. *Developments in Design Methodology*, Chichester: Wiley.

  Web Resources

1. https://www.designsociety.org/download-publication/39626/
   Design+prototyping+of+systems

2. https://www.interaction-design.org/literature/article/5-stages-in-the-design-thinking-process

  Video lectures: (NPTEL or any other video lectures)

1. https://nptel.ac.in/courses/110/106/110106124/#

Course Code	Course Name	L	T	P	C
EM2202	**INTERPERSONAL SKILLS – LISTENING AND SPEAKING**	0	0	2	1

Category: Employability Enhancement Course

a. Preamble

This course introduces students with the English language skills required for the successful undertaking of academic studies with primary emphasis on academic speaking and listening skills.

b. Course Outcome

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

CO. No.	Course Outcome	Knowledge Level
CO1	Develop their communicative competence in English with specific reference to listening	K3
CO2	Prepare conversation with reasonable accuracy	K3
CO3	Apply lexical Chunking for accuracy in speaking	K3
CO4	Demonstrate their ability to communicate effectively in GDs	K3
CO5	Explain directions and instructions in academic and business contexts	K3

c. Course Syllabus   **Total : 30 Periods**

LISTENING AS A KEY SKILL   **6**

Listening as a key skill- its importance- speaking - give personal information - ask for personal information - express ability - enquire about ability - ask for clarification - Improving pronunciation - pronunciation basics - stressing syllables and speaking clearly - intonation patterns - conversation starters: small talk

LISTEN TO A PROCESS INFORMATION   **6**

Listen to a process information- give information, as part of a simple explanation - taking lecture notes - preparing to listen to a lecture - articulate a complete idea as opposed to producing fragmented utterances - compare and contrast information and ideas from multiple sources- converse with reasonable accuracy over a wide range of everyday topics.

LEXICAL CHUNKING   **6**

Lexical chunking for accuracy and fluency- factors influence fluency, deliver a five-minute informal talk - greet - respond to greetings - describe health and symptoms - invite and offer - accept - decline - take leave - listen for and follow the gist- listen for detail

GROUP DISCUSSION **6**

Being an active listener: giving verbal and non-verbal feedback - participating in a group discussion - summarizing academic readings and lectures conversational speech listening to and participating in conversations - persuade- negotiate disagreement in group work

GROUP & PAIR PRESENTATIONS **6**

Formal and informal talk - listen to follow and respond to explanations, directions and instructions in academic and business contexts - strategies for presentations and interactive communication - group/pair presentations

d. Activities

Students shall be taken to the Language lab for enhancing their listening and speaking skills.

e. Learning Resources

Text Books

1. Brooks,Margret,2011, *Skills for Success. Listening and Speaking. Level 4,* Oxford University Press, Oxford.

2. Richards, C, Jack and David Bholke,2010, *Speak Now Level 3,*Oxford University Press, Oxford

Reference Books

1. Bhatnagar, Nitin and MamtaBhatnagar,2010, *Communicative English for Engineers and Professionals,* Pearson, New Delhi.

2. Hughes, Glyn and Josephine Moate,2014, *Practical English Classroom,* Oxford University Press, Oxford.

3. Vargo, Mari,2013, *Speak Now Level 4*, Oxford University Press, Oxford.

4. Richards, C, Jack,2006, *Person to Person (Starter)*, Oxford University Press, Oxford.

5. Ladousse, Gillian Porter,2014, *Role Play*. Oxford University Press, Oxford

Web Resources:

1. https://www.cambridge.org/elt/blog/wp-content/uploads/2019/10/Learning-Language-in-Chunks.pdf

2. https://english.eagetutor.com/english/628-how-to-greet-your-boss-people-in-office.html

3. https://www.groupdiscussionideas.com/group-discussion-topics-with-answers/

Course Code	Course Name	L	T	P	C
GE2251	**QUANTITATIVE APTITUDE**	**1**	**0**	**0**	**1**

Category: Employability Enhancement Course

a. Preamble

To develop the thinking ability and problem solving skills of students to compete themselves in placement and competitive examinations.

b. Course Outcome

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

CO. No.	Course Outcome	Knowledge Level
CO1	Apply the concept of profit in real life problems	K3
CO2	Solve the problems by using proportion	K3
CO3	Compute accurate speed, time and distance	K3
CO4	Apply the concept of Time & Speed	K3
CO5	Calculate the work done based on various methods	K3

c. Course Syllabus   **Total : 15 Periods**

PROFIT AND LOSS   **3**

Profit and Loss - Cost Price, Selling Price, Profit and Loss %, Marked Price, Discount.

RATIO AND PROPORTION   **3**

Ratio and Proportion - Ratio, Proportion, Comparison of Ratios, Duplicate, Triplcate Ratio.

TIME, SPEED AND DISTANCE   **3**

Time, Speed and Distance - Concept of time, speed and distance, Conversion of units and proportionality, Avearge speed concept.

APPLICATIONS ON TIME, SPEED AND DISTANCE   **3**

Problems on trains - Relative speed concept and application. Boats and Streams - Upstream speed, Downstream speed, Speed of stream, Speed of boat.

TIME AND WORK   **3**

Time & work - Problems based on time and work, Formulae, Computation of work together, Wages based work problems. Pipes & Cisterns - Inlet-outlet, Part of tank filled, Time based problems.

d. Learning Resources

Text Book

1. Dinesh Khattar, *Quantitative Aptitude for Competitive Examinations*, Pearson India Education services Pvt Ltd, Fourth Edition, Uttar Pradesh, 2019.

Reference Books

1. TCY online, *Reasoning ability and Quantitative Aptitude*, Wiley India Pvt. Ltd, First Edition, New Delhi, 2016.
2. Agarwal.R.S, *Quantitative Aptitude for Competitive Examinations*, S.Chand Limited, 2011.
3. Abhijit Guha, *Quantitative Aptitude for Competitive Examinations*, Tata McGraw Hill, 3rd Edition, 2011

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Course Code	Course Name	L	T	P	C
EM2252	**AN INTRODUCTION TO ADVANCED READING AND WRITING**	0	0	2	1

Category: Employability Enhancement Course

a. Preamble

The course will enable learners to

- • To strengthen the reading skills of students of engineering.
- • To enhance their writing skills with specific reference to technical writing
- • To develop their critical thinking skills.
- • To provide more opportunities to develop their project and proposal writing skills

b. Course Outcome

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

CO. No.	Course Outcome	Knowledge Level
CO1	Understand how the text positions the reader	K3
CO2	Develop critical thinking while reading a text	K3
CO3	Develop a descriptive paragraph	K4
CO4	Make use of sentence structures effectively when creating an essay.	K3
CO5	Demonstrate proper usage of grammar in writing E-Mails, Job application and project proposals	K3

c. Course Syllabus   **Total : 30 Periods**

EFFECTIVE READING   **6**

Reading – Strategies for effective reading-Use glosses and footnotes to aid reading comprehension- Read and recognize different text types-Predicting content using photos and title. Reading-Read for details-Use of graphic organizers to review and aid comprehension

CRITICAL READING   **6**

Reading– Understanding pronoun reference and use of connectors in a passage- speed reading techniques. Reading– Genre and Organization of Ideas- Reading– Critical reading and thinking- understanding how the text positions the reader.

PARAGRAPH WRITING   **6**

Writing-Plan before writing- Develop a paragraph: topic sentence, supporting sentences, concluding sentence.-Write a descriptive paragraph Writing-State reasons and examples to support ideas in writing– Write a paragraph with reasons and examples- Write an opinion paragraph

ESSAY WRITING   **6**

Writing– Elements of a good essay - Types of essays- descriptive-narrative- issue-based- argumentative- analytical.

EFFECTIVE WRITING   **6**

Writing– Email writing- visumes – Job application- Report Writing - Project writing-Writing convincing proposals

d. Activities: Students shall be exposed to various passages for reading and trained to write in different forms.

e. Learning Resources

    Text Book

1. Gramer, F, Margot and Colin, S, Ward, 2011, *Reading and Writing* (Level 3) Oxford University Press, Oxford.

2. Debra Daise, Charl Norloff, and Paul Carne, 2011, *Reading and Writing* (Level 4) Oxford University Press: Oxford

    Reference Books

1. Davis, Jason & Rhonda LIss. 2006 *Effective Academic Writing (Level 3)* Oxford University Press: Oxford.

2. E. Suresh Kumar and et al. 2012, *Enriching Speaking and Writing Skills,* Second Edition,Orient Black swan: Hyderabad.

3. Withrow, Jeans and et al. 2004 *Inspired to Write. Readings and Tasks to develop writingskills*, Cambridge University Press: Cambridge.

4. Goatly, Andrew, 2000 *Critical Reading and Writing*, Routledge: United States ofAmerica.

5. Petelin, Roslyn & Marsh Durham, 2004 *The Professional Writing Guide: Knowing Welland Knowing Why*, Business & Professional Publishing: Australia.

B.TECH. BIOTECHNOLOGY

Regulation - 2020

AUTONOMOUS SYLLABUS

CHOICE BASED CREDIT SYSTEM (CBCS)

(V and VI)

SEMESTER V

SI. No.	COURSE CODE	COURSE TITLE	CATE GORY	PERIODS PER WEEK			TOTAL CONTACT PERIODS	CREDITS
				L	T	P		
THEORY								
1	BT1501	Bioprocess Principles	PC	3	0	0	3	3
2	BT1502	Genetic Engineering	PC	3	0	0	3	3
3	BT1503	Mass Transfer Operation	PC	3	0	0	3	3
4		Professional Elective I	PE	3	0	0	3	3
5		Professional Elective II	PE	3	0	0	3	3
6		Open Elective – I	OE	3	0	0	3	3
PRACTICALS								
7	BT1511	Bioprocess Laboratory I	PC	0	0	4	4	2
8	BT1512	Molecular Biology and Genetic Engineering Laboratory	PC	0	0	4	4	2
9	HS1521	Professional Communication	EEC	0	0	2	2	1
			TOTAL	**18**	**0**	**10**	**28**	**23**

SEMESTER VI

SI. No.	COURSE CODE	COURSE TITLE	CATE GORY	L	T	P	TOTAL CONTACT PERIODS	CREDITS
				PERIODS PER WEEK				
THEORY								
1	BT1601	Bioinformatics	PC	3	0	0	3	3
2	BT1602	Bioprocess Engineering	PC	3	1	0	4	4
3		Professional Elective III	PE	3	0	0	3	3
4		Professional Elective IV	PE	3	0	0	3	3
5		Professional Elective V	PE	3	0	0	3	3
6		Online Course	OL	NPTEL / SWAYAM				3
PRACTICALS								
7	BT1611	Bioinformatics Laboratory	PC	0	0	4	4	2
8	BT1612	Bioprocess Laboratory II	PC	0	0	4	4	2
			TOTAL	15	1	8	24	23

Western transfer apparatus (wet) – 2 Nos.

Glasswares / Plasticwares/Chemicals/Media as required

COURSE OUTCOMES

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

CO1 Demonstrate isolation and manipulation of plasmid DNA.

CO2 Apply the process of DNA amplification and transformation in recombinant DNA studies.

CO3 Make use of strategies for optimization of foreign gene expression in host system.

CO4 Illustrate the principles underpinning modern tools for analysis of DNA and protein.

CO5 Make use of appropriate good laboratory practices to carry out recombinant DNA studies.

REFERENCES:

1. Green, M.R., Hughes, H., Sambrook, J. and MacCallum, P., 2012. *Molecular cloning: a laboratory manual. In Molecular cloning: a laboratory manual* (pp. 1890-1890).

2. Flanagan, T.D., 1988. *A Review of: "Current Protocols in Molecular Biology*, Edited by FM Ausubel, R. Brent, RE Kingston, DD Moore, JG Seidman, JA Smith, and K. Struhl, Greene Publishing Associates and Wiley-Interscience John Wiley and Sons, New York,

HS1521 **PROFESSIONAL COMMUNICATION**

L	T	P	C
0	0	2	1

OBJECTIVES:

The course enable the students to:

- Enhance the Employability and Career Skills of students
- Orient the students towards grooming as a professional

- Make them Employable Graduates
- Develop their confidence and help them attend interviews successfully.

UNIT I

Introduction to Soft Skills– Hard skills & soft skills – employability and career Skills—Grooming as a professional with values—Time Management—General awareness of Current Affairs

UNIT II

Self-Introduction-organizing the material – Introducing oneself to the audience – introducing the topic – answering questions with clarity and appropriate pharases – individual presentation practice— presenting the visuals effectively – 5 minute presentations

UNIT III

Introduction to Group Discussion— Participating in group discussions – understanding group dynamics – brainstorming the topic -– questioning and clarifying –GD strategies-activities to improve GD skills

UNIT IV

Interview etiquette – dress code – body language – attending job interviews–telephone/skype interview -one to one interview &panel interview – FAQs related to job interviews

UNIT V

Recognizing differences between groups and teams- managing time-managing stress-networking professionally- respecting social protocols-understanding career management-developing a long-term career plan-making career changes

TOTAL: 30 PERIODS

COURSE OUTCOMES:

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

CO1   Make effective presentations

CO2   Participate confidently in Group Discussions.

CO3   Attend job interviews and be successful in them.

CO4   Develop adequate Soft Skills required for the workplace

AVAILABLE SOFTWARE:

1. Odell

REFERENCES:

1. Butterfield , 2015 *Jeff Soft Skills for Everyone.* Cengage Learning: New Delhi
2. E. Suresh Kumar et al., 2015, *Communication for Professional Success*. Orient Blackswan: Hyderabad
3. *Interact English Lab Manual for Undergraduate Students,* 2016. Orient BalckSwan: Hyderabad,
4. Raman, Meenakshi and Sangeeta Sharma. , 2014, *Professional Communication*. Oxford University Press: Oxford
5. S. Hariharan et al. 2010.*Soft Skills*. MJP Publishers: Chennai,

B.Tech. ARTIFICIAL INTELLIGENCE AND DATA SCIENCE

Regulation - 2020

AUTONOMOUS SYLLABUS

CHOICE BASED CREDIT SYSTEM (CBCS)

CURRICULUM AND SYLLABI

(SEM V & VI)

VISION:

To make the Department of Computer Science and Engineering the unique of its kind in the field of Research and Development activities in this part of world.

MISSION:

To impart highly innovative and technical knowledge to the urban and unreachable rural student folks in Computer Science and Engineering through "Total Quality Education".

PROGRAM EDUCATIONAL OBJECTIVES:

PEO 1: Apply the basic engineering skills and domain knowledge for developing effective computing solutions to address various social issues.

PEO 2: Able to have successful career in technical / managerial roles in multi-disciplinary environment.

PEO 3: To confront the evolving technical challenges and problems in the areas of computing.

PROGRAM OUTCOMES:

After going through the four years of study, the Artificial Intelligence and Data Science will have the ability to

S.NO	GRADUATE ATTRIBUTE	PROGRAMME OUTCOME
1	Engineering knowledge	Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
2	Problem analysis	Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.
3	Design/development of solutions	Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.
4	Conduct investigations of complex problems	Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions
5	Modern tool usage	Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations
6	The engineer and society	Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal

		and cultural issues and the consequent responsibilities relevant to the professional engineering practice
7	Environment and sustainability	Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.
8	Ethics	Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.
9	Individual and team work	Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.
10	Communication	Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.
11	Project management and finance	Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.
12	Life-long learning	Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

PROGRAMME SPECIFIC OUTCOMES (PSOs):

PSO 1: Professional Skills: To apply learned skills to build optimized solutions pertaining to Data Processing, Artificial Intelligence and Machine Learning.

PSO 2: Problem - Solving Skills: To analyze data using domain knowledge to get insights and develop appropriate solutions.

SEMESTER V

SL. NO	COURSE CODE	COURSE NAME	CATEGORY	CREDITS				
				L	T	P	CONTACT PERIODS	C
THEORY								
1	AD1501	Big Data Analytics	PC	3	0	0	3	3
2	AD1502	Networks and Security	PC	3	0	0	3	3
3	AD1503	Object Oriented Programming using Java	PC	2	0	2	4	3
4	PE1	Professional Elective – I	PE	3	0	0	3	3
5	PE2	Professional Elective - II	PE	3	0	0	3	3
6	OE1	Open Elective – I	OE	3	0	0	3	3
		Online Course*						
PRATICALS								
7	AD1511	Big Data Analytics Laboratory	PC	0	0	4	4	2
8	AD1512	Networks and Security Laboratory	PC	0	0	4	4	2
TOTAL				17	0	10	27	22

SEMESTER VI

SL. NO	COURSE CODE	COURSE NAME	CATEGORY	CREDITS				
				L	T	P	CONTACT PERIODS	C
THEORY								
1	AD1601	Computer Vision	PC	3	0	0	3	3
2	AD1602	Deep Learning	PC	3	0	0	3	3
3	GE1671	Total Quality Management	HS	3	0	0	3	3
4	OL1	Online Course – I*	OL	0	0	0	0	3
5	PE3	Professional Elective - III	PE	3	0	0	3	3
6	PE4	Professional Elective - IV	PE	3	0	0	3	3
PRATICALS								
7	CS1681	Mobile Application Development Laboratory	PC	0	0	4	4	2
8	AD1611	Computer Vision Laboratory	PC	0	0	4	4	2
9	AD1612	Deep Learning Laboratory	PC	0	0	4	4	2
10	HS1521	Professional Communication	EEC	0	0	2	2	1
			TOTAL	15	0	14	29	25

*Students shall complete online course in this semester. Credits earned will be added in consolidated mark statement

HS1521   **PROFESSIONAL COMMUNICATION**

OBJECTIVES:

L	T	P	C
0	0	2	1

This course aims to:
- Enhance the Employability and Career Skills of students
- Orient the students towards grooming as a professional
- Make them Employable Graduates.
- Develop their confidence and help them attend interviews successfully

UNIT I

Introduction to Soft Skills – Hard skills & soft skills – employability and career Skills - Grooming as a professional with values - Time Management - General awareness of Current Affairs.

UNIT II

Self-Introduction-organizing the material – Introducing oneself to the audience – introducing the topic – answering questions with clarity and appropriate phrases – individual presentation practice - presenting the visuals effectively – 5 minute presentations

UNIT III

Introduction to Group Discussion - Participating in group discussions – understanding group dynamics – brainstorming the topic - questioning and clarifying – GD strategies- activities to improve GD skills

UNIT IV

Interview etiquette – dress code – body language – attending job interviews– telephone/skype interview - one to one interview &panel interview – FAQs related to job interviews

UNIT V

Recognizing differences between groups and teams - managing time-managing stress - networking professionally - respecting social protocols-understanding career

management -developing a long-term career plan-making career changes - Error spotting.

TOTAL: 30 PERIODS

OUTCOMES:

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

CO1: Make effective presentations

CO2: Participate confidently in Group Discussions.

CO3: Attend job interviews and be successful in them.

CO4: Develop adequate Soft Skills required for the workplace

REFERENCE BOOKS:

1. Butterfield, 2015, *Jeff Soft Skills for Everyone,* Cengage Learning: New Delhi.

2. Suresh Kumar, E, et al., 2015, *Communication for Professional Success*. Orient Blackswan: Hyderabad.

3. *Interact English Lab Manual for Undergraduate Students*, 2016, OrientBalckSwan: Hyderabad.

4. Raman, Meenakshi & Sangeeta Sharma, 2014, *Professional Communication*. Oxford University Press, Oxford.

5. Hariharanet, S, et. al., 2010, *Soft Skills*. MJP Publishers: Chennai.

LIST OF EQUIPMENT FOR A BATCH OF 30 STUDENTS

S. NO.	DESCRIPTION OF EQUIPMENT	QUANTITY REQUIRED
1.	Personal Computers (Intel Core i3, 250 GB, 4 GB RAM)	30
2.	Printer	1
3.	Software: Orell Techno Systems Digital Language Lab Software	30 (Licenses)

B.TECH. ARTIFICIAL INTELLIGENCE AND DATA SCIENCE

REGULATION – 2021

AUTONOMOUS SYLLABUS

CHOICE BASED CREDIT SYSTEM

III TO IV SEMESTER CURRICULUM AND SYLLABI

VISION:

> To make the Department of Computer Science and Engineering of this Institution the unique of its kind in the field of Research and Development activities in this part of world.

MISSION:

> To impart highly innovative and technical knowledge to the urban and unreachable rural student folks in Computer Science and Engineering through "Total Quality Education".

PROGRAMME EDUCATIONAL OBJECTIVES (PEOs):

PEO 1:   Apply the basic engineering skills and domain knowledge for developing effective computing solutions to address various social issues.

PEO 2:   Able to have successful career in technical / managerial roles in multi-disciplinary environment.

PEO 3:   To confront the evolving technical challenges and problems in the areas of computing.

PROGRAM OUTCOMES:

After going through the four years of study, the Artificial Intelligence and Data Science graduates will have the ability to

POs	Graduate Attribute	Programme Outcome
1	Engineering knowledge	Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
2	Problem analysis	Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.
3	Design/Development of solutions	Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.
4	Conduct investigations of complex problems	Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions
5	Modern tool usage	Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations
6	The engineer and society	Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice

7	Environment and sustainability	Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.
8	Ethics	Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.
9	Individual and team work	Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.
10	Communication	Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.
11	Project management and finance	Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.
12	Life-long learning	Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

PROGRAMME SPECIFIC OUTCOMES (PSOs):

PSO1 : **Professional Skills:** To apply learned skills to build optimized solutions pertaining to Data Processing, Artificial Intelligence and Machine Learning.

PSO2 : **Problem - Solving Skills:** To analyze data using domain knowledge to get insights and develop appropriate solutions.

SEMESTER IV

S.NO.	COURSE CODE	COURSE TITLE	CATE GORY	CONTACT PERIODS	L	T	P	C
THEORY								
1	MA2253	Probability and Statistics	BS	4	3	1	0	4
2	CS2251	Database Management Systems	PC	3	3	0	0	3
3	AI2251	Foundations of Data Science and Machine Learning#	PC	5	3	0	2	4
4	AI2252	Introduction to Internet of Things	PC	3	3	0	0	3
5	GE2201	Design Thinking	ES	3	3	0	0	3
6	GE2251	Quantitative Aptitude	EM	1	1	0	0	1
7	AUD110	Tamils and Technology	AU	1	1	0	0	0
PRACTICALS								
8	CS2254	Database Management Systems Laboratory	PC	4	0	0	4	2
9	CS2255	Mobile Application Development Laboratory	PC	4	0	0	4	2
10	AI2253	Internet of Things Laboratory	PC	4	0	0	4	2
TOTAL				**32**	**18**	**1**	**16**	**24**

 # Theory cum Laboratory Course

Course Code	Course Name	L	T	P	C
GE2251	QUANTITATIVE APTITUDE	1	0	0	1

Category: Employability Enhancement Course

a. Preamble

To develop the thinking ability and problem solving skills of students to compete themselves in placement and competitive examinations.

b. Course Outcome

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

CO. No.	Course Outcome	Knowledge Level
CO1	Apply the concept of profit in real life problems	K3
CO2	Solve the problems by using proportion	K3
CO3	Compute accurate speed, time and distance	K3
CO4	Apply the concept of Time & Speed	K3
CO5	Calculate the work done based on various methods	K3

c. Course Syllabus   **Total : 15 Periods**

PROFIT AND LOSS   **3**

Profit and Loss - Cost Price, Selling Price, Profit and Loss %, Marked Price, Discount.

RATIO AND PROPORTION   **3**

Ratio and Proportion - Ratio, Proportion, Comparison of Ratios, Duplicate, Triplcate Ratio.

TIME, SPEED AND DISTANCE   **3**

Time, Speed and Distance - Concept of time, speed and distance, Conversion of units and proportionality, Avearge speed concept.

APPLICATIONS ON TIME, SPEED AND DISTANCE   **3**

Problems on trains - Relative speed concept and application. Boats and Streams - Upstream speed, Downstream speed, Speed of stream, Speed of boat.

TIME AND WORK   **3**

Time & work - Problems based on time and work, Formulae, Computation of work together, Wages based work problems. Pipes & Cisterns - Inlet-outlet, Part of tank filled, Time based problems.

d. Learning Resources

Text Book

1. Dinesh Khattar, *Quantitative Aptitude for Competitive Examinations*, Pearson India Education services Pvt Ltd, 4th Edition, Uttar Pradesh, 2019.

Reference Books

1. TCY online, *Reasoning ability and Quantitative Aptitude*, Wiley India Pvt. Ltd, 1st Edition, New Delhi, 2016.

2. Agarwal R S, *Quantitative Aptitude for Competitive Examinations*, S.Chand Limited, 2011.

3. Abhijit Guha, *Quantitative Aptitude for Competitive Examinations*, Tata McGraw Hill, 3rd Edition, 2011.

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ANNA UNIVERSITY, CHENNAI

AFFILIATED INSTITUTIONS

B.E. MECHANICAL ENGINEERING

REGULATIONS – 2017

CHOICE BASED CREDIT SYSTEM

PROGRAMME EDUCATIONAL OBJECTIVES:
Bachelor of Mechanical Engineering curriculum is designed to impart Knowledge, Skill and Attitude on the graduates to
1. Have a successful career in Mechanical Engineering and allied industries.
2. Have expertise in the areas of Design, Thermal, Materials and Manufacturing.
3. Contribute towards technological development through academic research and industrial practices.
4. Practice their profession with good communication, leadership, ethics and social responsibility.
5. Graduates will adapt to evolving technologies through life-long learning.

PROGRAMME OUTCOMES
1. An ability to apply knowledge of mathematics and engineering sciences to develop mathematical models for industrial problems.
2. An ability to identify, formulates, and solve complex engineering problems. with high degree of competence.
3. An ability to design and conduct experiments, as well as to analyze and interpret data obtained through those experiments.
4. An ability to design mechanical systems, component, or a process to meet desired needs within the realistic constraints such as environmental, social, political and economic sustainability.
5. An ability to use modern tools, software and equipment to analyze multidisciplinary problems.
6. An ability to demonstrate on professional and ethical responsibilities.
7. An ability to communicate, write reports and express research findings in a scientific community.
8. An ability to adapt quickly to the global changes and contemporary practices.
9. An ability to engage in life-long learning.

PEO / PO Mapping

Programme Educational Objectives	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9
I	✓	✓	✓	✓	✓	✓	✓	✓	✓
II	✓	✓	✓		✓			✓	
III		✓		✓	✓	✓		✓	
IV					✓	✓	✓		✓
V		✓	✓	✓	✓				✓

		COURSE TITLE	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9
YEAR 3		Strength of Materials for Mechanical Engineers	✓	✓	✓	✓					
		Thermal Engineering- I	✓	✓			✓				
		Manufacturing Technology Laboratory–II			✓						
		Strength of Materials and Fluid Mechanics Machinery Laboratory			✓						
		Advanced Reading and Writing							✓		✓
		COURSE TITLE	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**
	SEM 5	Thermal Engineering- II	✓	✓			✓			✓	
		Design of Machine Elements		✓		✓			✓	✓	✓
		Metrology and Measurements	✓		✓	✓			✓	✓	
		Dynamics of Machines	✓	✓	✓		✓		✓		✓
		Kinematics and Dynamics Laboratory	✓	✓	✓	✓					
		Thermal Engineering Laboratory	✓	✓	✓						
		Metrology and Measurements Laboratory	✓	✓	✓	✓			✓		
		COURSE TITLE	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**
	SEM 6	Design of Transmission Systems		✓		✓			✓		✓
		Computer Aided Design and Manufacturing		✓	✓		✓				
		Heat and Mass Transfer	✓	✓	✓	✓				✓	✓
		Finite Element Analysis	✓	✓		✓					✓
		Hydraulics and Pneumatics	✓	✓		✓			✓		
		C.A.D. / C.A.M. Laboratory		✓	✓			✓			
		Design and Fabrication Project						✓	✓		✓
		Professional Communication				✓	✓	✓	✓		✓
		COURSE TITLE	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**
YEAR 4	SEM 7	Power Plant Engineering	✓	✓	✓	✓				✓	
		Mechatronics	✓	✓	✓		✓			✓	✓
		Process Planning and Cost Estimation		✓		✓					
		Simulation and Analysis Laboratory	✓				✓		✓		
		Mechatronics Laboratory	✓	✓	✓		✓			✓	✓
		Technical Seminar						✓			
	SEM 8	Project Work	✓	✓	✓			✓	✓		
		Principles of Management						✓			✓

SL. NO.	COURSE CODE	COURSE TITLE	CATEGORY	CONTACT PERIODS	L	T	P	C
THEORY								
1.	ME8792	Power Plant Engineering	PC	3	3	0	0	3
2.	ME8793	Process Planning and Cost Estimation	PC	3	3	0	0	3
3.	ME8791	Mechatronics	PC	3	3	0	0	3
4.		Open Elective - II	OE	3	3	0	0	3
5.		Professional Elective – II	PE	3	3	0	0	3
6.		Professional Elective – III	PE	3	3	0	0	3
PRACTICAL								
7.	ME8711	Simulation and Analysis Laboratory	PC	4	0	0	4	2
8.	ME8781	Mechatronics Laboratory	PC	4	0	0	4	2
9.	ME8712	Technical Seminar	EEC	2	0	0	2	1
			TOTAL	**28**	**18**	**0**	**10**	**23**

SEMESTER VIII

SL. NO.	COURSE CODE	COURSE TITLE	CATEGORY	CONTACT PERIODS	L	T	P	C
THEORY								
1.	MG8591	Principles of Management	HS	3	3	0	0	3
2.		Professional Elective– IV	PE	3	3	0	0	3
PRACTICAL								
3.	ME8811	Project Work	EEC	20	0	0	20	10
			TOTAL	**29**	**9**	**0**	**20**	**16**

TOTAL NUMBER OF CREDITS TO BE EARNED FOR AWARD OF THE DEGREE = 184

SEMESTER VIII, ELECTIVE IV

SL. NO.	COURSE CODE	COURSE TITLE	CATEGORY	CONTACT PERIODS	L	T	P	C
1.	IE8693	Production Planning and Control	PE	3	3	0	0	3
2.	MG8091	Entrepreneurship Development	PE	3	3	0	0	3
3.	ME8094	Computer Integrated Manufacturing Systems	PE	3	3	0	0	3
4.	ME8074	Vibration and Noise Control	PE	3	3	0	0	3
5.	EE8091	Micro Electro Mechanical Systems	PE	3	3	0	0	3
6.	GE8076	Professional Ethics in Engineering	PE	3	3	0	0	3

EMPLOYABILITY ENHANCEMENT COURSES (EEC)

SL. NO.	COURSE CODE	COURSE TITLE	CATEGORY	CONTACT PERIODS	L	T	P	C
1.	HS8381	Interpersonal Skills/Listening &	EEC	4	0	0	4	2
2.	ME8712	Technical Seminar	EEC	2	0	0	2	1
3.	ME8811	Project Work	EEC	20	0	0	20	12
4.	HS8461	Advanced Reading and Writing	EEC	2	0	0	2	1
5.	ME8682	Design and Fabrication Project	EEC	4	0	0	4	2
6.	HS8581	Professional Communication	EEC	2	0	0	2	1

SUMMARY

SL. NO.	SUBJECT AREA	CREDITS PER SEMESTER								CREDITS TOTAL	Percentage %
		I	II	III	IV	V	VI	VII	VIII		
1.	HS	4	7	-	-	-		-	3	**14**	**7.61%**
2.	BS	12	7	4	4	-	-	-	-	**27**	**14.67%**
3.	ES	9	11	9	5	-	-	-	-	**33**	**17.80%**
4.	PC	-	-	11	14	19	18	13	-	**74**	**40.22%**
5.	PE	-	-	-	-	-	3	6	3	**15**	**8.15%**
6.	OE	-	-	-	-	3	-	3		**6**	**3.26%**
7.	EEC	-	-	1	1	-	3	1	10	**16**	**7.6%**
	Total	**25**	**25**	**25**	**24**	**22**	**24**	**23**	**16**	**184**	
8.	Non Credit / Mandatory										

ME8781   **MECHATRONICS LABORATORY**   **L   T   P   C**
                                                                                  0   0   4   2

OBJECTIVE:
- To know the method of programming the microprocessor and also the design, modeling & analysis of basic electrical, hydraulic & pneumatic Systems which enable the students to understand the concept of mechatronics.

LIST OF EXPERIMENTS:
1. Assembly language programming of 8085 – Addition – Subtraction – Multiplication – Division – Sorting – Code Conversion.
2. Stepper motor interface.
3. Traffic light interface.
4. Speed control of DC motor.
5. Study of various types of transducers.
6. Study of hydraulic, pneumatic and electro-pneumatic circuits.
7. Modelling and analysis of basic hydraulic, pneumatic and electrical circuits using Software.
8. Study of PLC and its applications.
9. Study of image processing technique.

                                                     TOTAL: 60 PERIODS

OUTCOMES:
Upon the completion of this course the students will be able to
CO1   Demonstrate the functioning of mechatronics system with various pneumatic, hydraulic and electrical systems.
CO2   Demonstrate the functioning of control systems with the help of PLC and microcontrollers.

LIST OF EQUIPMENT FOR A BATCH OF 30 STUDENTS

Sl. No.	NAME OF THE EQUIPMENT	Qty.
1	Basic Pneumatic Trainer Kit with manual and electrical controls/ PLC Control each	1 No.
2	Basic Hydraulic Trainer Kit	1 No
3	Hydraulics and Pneumatics Systems Simulation Software	10 No
4	8051 - Microcontroller kit with stepper motor and drive circuit sets	2 No
5	Image processing system with hardware & software	1 No.

ME8712   **TECHNICALSEMINAR**   **L   T   P   C**
                                                                                  0   0   2   1

To enrich the communication skills of the student and presentations of technical topics of interest, this course is introduced. In this course, a student has to present three Technical papers or recent advances in engineering/technology that will be evaluated by a Committee constituted by the Head of the Department.

                                                     TOTAL: 30 PERIODS

ME8811	**PROJECT WORK**	L	T	P	C
		0	0	20	10

OBJECTIVE:
- To develop the ability to solve a specific problem right from its identification and literature review till the successful solution of the same. To train the students in preparing project reports and to face reviews and viva voce examination.

The students in a group of 3 to 4 works on a topic approved by the head of the department under the guidance of a faculty member and prepares a comprehensive project report after completing the work to the satisfaction of the supervisor. The progress of the project is evaluated based on a minimum of three reviews. The review committee may be constituted by the Head of the Department. A project report is required at the end of the semester. The project work is evaluated based on oral presentation and the project report jointly by external and internal examiners constituted by the Head of the Department.

TOTAL: 300 PERIODS

OUTCOME:
- On Completion of the project work students will be in a position to take up any challenging practical problems and find solution by formulating proper methodology.

ME8091	**AUTOMOBILE ENGINEERING**	L	T	P	C
		3	0	0	3

OBJECTIVES:
- To understand the construction and working principle of various parts of an automobile.
- To have the practice for assembling and dismantling of engine parts and transmission system

UNIT I   VEHICLE STRUCTURE AND ENGINES   9
Types of automobiles vehicle construction and different layouts, chassis, frame and body, Vehicle aerodynamics (various resistances and moments involved), IC engines –components-functions and materials, variable valve timing (VVT).

UNIT II   ENGINE AUXILIARY SYSTEMS   9
Electronically controlled gasoline injection system for SI engines, Electronically controlled diesel injection system (Unit injector system, Rotary distributor type and common rail direct injection system), Electronic ignition system (Transistorized coil ignition system, capacitive discharge ignition system), Turbo chargers (WGT, VGT), Engine emission control by three way catalytic converter system, Emission norms (Euro and BS).

UNIT III   TRANSMISSION SYSTEMS   9
Clutch-types and construction, gear boxes- manual and automatic, gear shift mechanisms, Over drive, transfer box, fluid flywheel, torque converter, propeller shaft, slip joints, universal joints, Differential and rear axle, Hotchkiss Drive and Torque Tube Drive.

UNIT IV   STEERING, BRAKES AND SUSPENSION SYSTEMS   9
Steering geometry and types of steering gear box-Power Steering, Types of Front Axle, Types of Suspension Systems, Pneumatic and Hydraulic Braking Systems, Antilock Braking System (ABS), electronic brake force distribution (EBD) and Traction Control.

B.E. MECHANICAL ENGINEERING
REGULATION – 2020
AUTONOMOUS SYLLABUS
CHOICE BASED CREDIT SYSTEM
VTO VI SEMESTER CURRICULUM AND SYLLABI

VISION:

To make the Department of Mechanical Engineering the unique of its kind in the field of Research and Development activities in the prominent field of Mechanical Engineering in this part of the world.

MISSION:

To impart highly innovative and technical knowledge in the field of Mechanical Engineering to the urban and unreachable rural student folks through "Total Quality Education".

PROGRAMME EDUCATIONAL OBJECTIVES (PEOs):

PEO 1: Graduates of the Programme will excel in Technical knowledge and apply Innovative skills in the field of Mechanical Engineering.

PEO 2: Graduates will contribute to the Technological Development and Research Activities through "Total Quality Education".

PEO 3: Graduates of the Programme will accomplish the Leadership Qualities and Social Responsibilities through "Life Long Learning".

PROGRAM OUTCOMES:

After going through the four years of study, the Mechanical Engineering graduates will have the ability to

POs	Graduate Attribute	Programme Outcome
1	Engineering knowledge	Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
2	Problem analysis	Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.
3	Design/evelopment of solutions	Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.
4	Conduct investigations of complex problems	Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions
5	Modern tool usage	Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations
6	The engineer and society	Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice

7	Environment and sustainability	Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.
8	Ethics	Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.
9	Individual and team work	Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.
10	Communication	Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.
11	Project management and finance	Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.
12	Life-long learning	Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

PROGRAMME SPECIFIC OUTCOMES (PSOs):

PSO1 :   Graduates will be able to create and analyze the Research and Development activities related to Design and Manufacturing

PSO2 :   Graduates will be able to design, develop need based products in Mechanical Engineering and Allied Industries

SEMESTER V

S.NO.	COURSE CODE	COURSE TITLE	CATE GORY	CONTACT PERIODS	L	T	P	C
THEORY								
1	ME1501	Applied Hydraulics and Pneumatics	PC	3	3	0	0	3
2	ME1502	Artificial Intelligence in Manufacturing	PC	3	3	0	0	3
3	ME1503	Design of Machine Elements	PC	3	3	0	0	3
4	ME1504	Dynamics of Machines#	PC	4	2	0	2	3
5	ME1505	Conventional and Electric Vehicles	PC	3	3	0	0	3
6	ME1506	Metrology and Measurement Techniques#	PC	5	3	0	2	4
7		Open Elective – I *	OE	3	3	0	0	3
		Online Course**(12 week course)						
PRACTICALS								
8	ME1511	CAD Laboratory	PC	4	0	0	4	2
			TOTAL	28	22	0	8	24

SEMESTER VI

S.NO.	COURSE CODE	COURSE TITLE	CATE GORY	CONTACT PERIODS	L	T	P	C
THEORY								
1	ME1601	Computer Integrated Manufacturing	PC	3	3	0	0	3
2	ME1602	Design of Transmission Systems	PC	3	3	0	0	3
3	ME1603	Heat and Mass Transfer	PC	3	3	0	0	3
4		Professional Elective – I (from Bucket)	PE	3	3	0	0	3
5		Professional Elective – II (from Bucket)	PE	3	3	0	0	3
6		Online course – 1** (12-week course)		0	0	0	0	3
PRACTICALS								
7	ME1611	Simulation and Analysis Laboratory	PC	4	0	0	4	2
8	ME1612	Thermal Engineering Laboratory	PC	4	0	0	4	2
9	ME1621	Design and Fabrication Project	EEC	4	0	0	4	2
			TOTAL	27	15	0	12	24

* Course from the Curriculum of other UG programmes. # Theory cum Laboratory Course
** The students shall complete the online course in this semester and credits would be
   added in consolidated sheet

ME1621   DESIGN AND FABRICATION PROJECT

L	T	P	C
0	0	4	2

OBJECTIVE:

- The main objective is to give an opportunity to the student to get hands on training in the fabrication of one or more components of a complete working model, which is designed by them.

GUIDELINE FOR REVIEW AND EVALUATION

The students may be grouped into 2 to 4 and work under a project supervisor. The device/ system/component(s) to be fabricated may be decided in consultation with the supervisor and if possible with an industry. A project report to be submitted by the group and the fabricated model, which will be reviewed and evaluated for internal assessment by a Committee constituted by the Head of the Department.

At the end of the semester examination the project work is evaluated based on oral presentation and the project report jointly by external and internal examiners constituted by the Head of the Department.

TOTAL : 60 PERIODS

COURSE OUTCOMES:

CO1: Identify, select the need based potential problem related to engineering.

CO2: Develop the solution by applying the design principles

CO3: Create the design model and find solution

CO4: Develop the detailed design in manufacturing aspect by preparing the bill ofmaterials and cost estimation

CO5: Fabrication of the model and implementation / Testing

	L	T	P	C
ME1631 **BASICS OF FINITE ELEMENT ANALYSIS**	3	0	0	3

OBJECTIVES:

- To introduce to fundamentals of finite element techniques.
- To appreciate the use of FEM to a range of Engineering Problems
- To analyze one dimensional phenomenon using finite element techniques.
- To impart knowledge in the area of finite element methods and its application in mechanical engineering.

UNIT I   INTRODUCTION   9

Historical Background – Mathematical Modeling of field problems in Engineering – Need for weighted integral forms – Boundary, Initial and Eigen Value problems– Weak Formulation of Boundary Value Problems – Weighted Residual Methods – Variational methods of approximation – Ritz Technique – Basic concepts of the Finite Element

B.E. MECHANICAL ENGINEERING
REGULATIONS – 2021
AUTONOMOUS SYLLABUS
CHOICE BASED CREDIT SYSTEM
III TO IV SEMESTER CURRICULUM

VISION:

To make the Department of Mechanical Engineering the unique of its kind in the field of Research and Development activities in the prominent filed of Mechanical Engineering in this part of the world.

mech@kamarajengg.edu.in

MISSION:

To impart highly innovative and technical knowledge in the field of Mechanical Engineering to the urban and unreachable rural student folks through Total Quality Education.

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After going through the four years of study, the Mechanical Engineering graduates will have the ability to

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1	Engineering knowledge	Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
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3	Design/Development of solutions	Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.
4	Conduct investigations of complex problems	Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions
5	Modern tool usage	Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modelling to complex engineering activities with an understanding of the limitations
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

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10	Communication	Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.
11	Project management and finance	Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.
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PROGRAMME SPECIFIC OUTCOMES (PSOs):

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PSO2: Graduates will be able to design, develop need based products in Mechanical Engineering and allied Industries.

REGULATIONS - 2021
CHOICE BASED CREDIT SYSTEM
B.E. MECHANICAL ENGINEERING
III & IV SEMESTER CURRICULUM

SEMESTER III

S.NO.	COURSE CODE	COURSE TITLE	CATE GORY	CONTACT PERIODS	L	T	P	C
THEORY								
1	GE2201	Design Thinking	EM	3	3	0	0	3
2	ME2201	Engineering Mechanics	PC	3	3	0	0	3
3	ME2202	Engineering Thermodynamics	PC	3	3	0	0	3
4	EE2208	Electrical Drives and Control	ES	3	3	0	0	3
5	ME2203	Fluid Mechanics andMachinery	PC	3	3	0	0	3
6	ME2204	Manufacturing Technology –I	PC	3	3	0	0	3
7		Audit Course	AU	3	3	0	0	0
PRACTICALS								
8	ME2205	Computer Aided Machine Drawing	PC	4	0	0	4	2
9	EE2209	Electrical Engineering Laboratory	ES	4	0	0	4	2
10	EM2202	Interpersonal skills - Listening and Speaking	EM	2	0	0	2	1
			TOTAL	31	21	0	10	23

S.NO.	COURSE CODE	COURSE TITLE	CATE GORY	CONTACT PERIODS	L	T	P	C
THEORY								
1	MA2254	Probability Statistics and Numerical Methods	BS	4	3	1	0	4
2	ME2251	Engineering Materials and Metallurgy	PC	3	3	0	0	3
3	ME2252	Manufacturing Technology-II	PC	3	3	0	0	3
4	ME2253	Strength of Materials for Mechanical Engineers	PC	3	3	0	0	3
5	ME2254	Theory of Machines	PC	4	3	1	0	4
6	ME2255	Thermal Engineering	PC	3	3	0	0	3
7	GE2251	Quantitative Aptitude	EM	1	1	0	0	1
8	AUD110	Tamils and Technology	AU	1	1	0	0	0
PRACTICALS								
9	ME2256	Fluid Mechanics and Strength of Materials Laboratory	PC	3	0	0	3	1
10	ME2257	Manufacturing Technology Laboratory	PC	3	0	0	3	1
11	ME2258	Theory of Machines Laboratory	PC	3	0	0	3	1
			TOTAL	31	20	2	9	24

Course Code	Course Name	L	T	P	C
GE2201	**DESIGN THINKING**	3	0	0	3

Category: Employability Enhancement Courses

a. Preamble

This course introduces the various principles of design thinking to achieve an effective design and to examine the implementation of the model or process for its successful operation

b. Course Outcome

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

CO. No.	Course Outcome	Knowledge Level
CO1	Describe the basic principles of design and various stages of design thinking for better conceiving of idea and refinement	K2
CO2	Elucidate the concepts of idea generation and refinement	K3
CO3	Apply various prototype models for solving complex problems	K3
CO4	Analyze real-time problems for effective design, implementation and operation	K3
CO5	Device idea/solution towards development of a prototypefor a chosen problem of interest	K4

c. Course Syllabus   **Total: 45 Periods**

INTRODUCTION TO DESIGN THINKING   **9**

Introduction - Product life cycle – Design Ethics – Design Process – Stages in design thinking: Immersion, Analysis and synthesis, Ideation, Prototyping.

IDEA GENERATION AND REFINEMENT   **9**

Basic design - directions - Themes of thinking - Inspiration and references - Brainstorming - Value - Inclusion – Sketching - Presenting ideas - Thinking in images - Thinking in signs - Appropriation - Personification - Visual metaphors - Modification - Thinking in words – Words and language - Thinking in shapes - Thinking in proportions - Thinking in color - Outside the Box.

PROTOTYPING   **9**

Developing designs - Types of prototypes - Prototyping for Designing Complex Systems

– The Efficacy of Prototyping under Time Constraints

IMPLEMENTATION 9
Format - Materials - Finishing - Media - Scale - Series/Continuity - Emerging Landscapes of Design - Real-Time Design Interaction Capture and Analysis - Enabling Efficient Collaboration in Digital Design - Spaces Across Time and Distance - Software used in Developing in Virtual Environments

DESIGN THINKING IN VARIOUS SECTORS 9
Design & Development of Prototypes for Wall Plastering, Rubber shredding, Separation of Corn seeds, Electric vehicles, Smart gates, Burglar alarm, Tyre pressure monitor, Development of Online Voting System, Online Proctoring System, Online Health Monitoring System, IoT based Home Automation and any other problem of interest in your domain.

d. Activities
Students shall be exposed to the different aspects of design thinking, prototyping and idea implementation

e. Learning Resources

Text Books
1. Binder, T., De Michelis, G., Ehn, P., Jacucci, G., Linde, P., and Wagner, I., *Design things,* MIT press, 2011.
2. Ambrose, G., and Harris, P., *Basics Design: Design thinking,* Bloomsbury Publishing, 2009.

Reference Books
1. Meinel, C., and Leifer, L. (Eds.)., *Understanding Innovation,* Springer, 2011.
2. Plattner, H., Meinel, C., and Leifer, L. (Eds.)., *Design thinking: understand–improve–apply*, Springer Science & Business Media, 2010.
3. Moran, T. P., and Carroll, J. M., L. *Design Rationale: Concepts, Techniques, and Use,* Erlbaum Associates Inc., 1996.
4. Cross, N., Chichester, *Developments in Design Methodology*, Wiley, 1984.

Web Resources:
1. https://www.designsociety.org/download-publication/39626/Design prototyping of systems

2. https://www.interaction-design.org/literature/article/5-stages-in-the-design-thinking-process

Course Code	Course Name	L	T	P	C
EM2202	**INTERPERSONAL SKILLS – LISTENING AND SPEAKING**	**0**	**0**	**2**	**1**

Category: Employability and Enhancement courses

a. Preamble

The Course will enable learners to:

- Equip students with the English language skills required for the successful undertaking of academic studies with primary emphasis on academic speaking and listening skills.
- Provide guidance and practice in basic general and classroom conversation and to engage in specific academic speaking activities.
- Improve general and academic listening skills

Make effective presentations

b. Course Outcome

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

CO. No.	Course Outcome	Knowledge Level
CO1	Develop their communicative competence in English with specific reference to listening	K3
CO2	Prepare conversation with reasonable accuracy	K3
CO3	Apply lexical Chunking for accuracy in speaking	K3
CO4	Demonstrate their ability to communicate effectively in GDs	K3
CO5	Explain directions and instructions in academic andbusiness contexts	K3

c. Course Syllabus   **Total: 30 Periods**

LISTENING AS A KEY SKILL   **6**

Listening as a key skill- its importance- speaking – give personal information – ask for personal information – express ability – enquire about ability – ask for clarification - Improving pronunciation– pronunciation basics — stressing syllables and speaking clearly – intonation patterns – conversation starters: small talk.

LISTEN TO A PROCESS INFORMATION 6

Listen to process information- give information, as part of a simple explanation — taking lecture notes – preparing to listen to a lecture – articulate a complete idea as opposed to producing fragmented utterances - compare and contrast information and ideas from multiple sources- converse with reasonable accuracy over a wide range of everyday topics.

LEXICAL CHUNKING 6

Lexical chunking for accuracy and fluency- factors influence fluency, deliver a five- minute informal talk – greet – respond to greetings – describe health and symptoms – invite and offer –accept – decline – take leave – listen for and follow the gist- listen for detail.

GROUP DISCUSSION 6

Being an active listener: giving verbal and non-verbal feedback – participating in a group discussion – summarizing academic readings and lectures conversational speech listening to and participating in conversations – persuade- negotiate disagreement in group work.

GROUP & PAIR PRESENTATIONS 6

Formal and informal talk – listen to follow and respond to explanations, directions and instructions in academic and business contexts – strategies for presentations and interactive communication – group/pair presentations

d. Activities

Students shall be taken to the Language lab for enhancing their listening and speaking skills.

e. Learning Resources

Text Books

1. Brooks, Margret, *Skills for Success. Listening and speaking. Level 4*, Oxford University Press, Oxford, 2011

2. Richards, C, Jack and David Bholke, *Speak Now Level 3*, Oxford University Press, Oxford, 2010

Reference Books

1. Bhatnagar, Nitin and Mamta Bhatnagar, *Communicative English forEngineers and Professionals,* Pearson, New Delhi, 2010

2. Hughes, Glyn and Josephine Moate, *Practical English Classroom*, Oxford University Press, Oxford,2014

3. Vargo, Mari, *Speak Now Level 4*, Oxford University Press, Oxford,2013.

4. Richards, C, Jack, *Person to Person (Starter)*, Oxford University Press,Oxford, 2006.

5. Ladousse, Gillian Porter, *Role Play*. Oxford University Press, Oxford,2014

WEB RESOURCES

1. https://www.cambridge.org/elt/blog/wp-content/uploads/2019/10/Learning-Language-in-Chunks.pdf

2. https://english.eagetutor.com/english/628-how-to-greet-your-boss-people-in-office.html

3. https://www.groupdiscussionideas.com/group-discussion-topics-with-answers/

4. https://www.bbc.co.uk/worldservice/learningenglish/business/talkingbusiness/unit3presentations/1opening.shtml

5. https://www.cambridge.org/elt/blog/wp-content/uploads/2019/10/Learning-Language-in-Chunks.pdf

Course Code	Course Name	L	T	P	C
GE2251	**QUANTITATIVE APTITUDE**	1	0	0	1

Category: Employability Enhancement Course

a. Preamble

To develop the thinking ability and problem solving skills of students to compete themselves in placement and competitive examinations.

b. Course Outcome

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

CO. No.	Course Outcome	Knowledge Level
CO1	Apply the concept of profit in real life problems	K3
CO2	Solve the problems by using proportion	K3
CO3	Compute accurate speed, time and distance	K3
CO4	Apply the concept of Time & Speed	K3
CO5	Calculate the work done based on various methods	K3

c. Course Syllabus   **Total : 15 Periods**

PROFIT AND LOSS   **3**

Profit and Loss - Cost Price, Selling Price, Profit and Loss %, Marked Price, Discount.

RATIO AND PROPORTION   **3**

Ratio and Proportion - Ratio, Proportion, Comparison of Ratios, Duplicate, Triplcate Ratio.

TIME, SPEED AND DISTANCE   **3**

Time, Speed and Distance - Concept of time, speed and distance, Conversion of units and proportionality, Average speed concept.

APPLICATIONS ON TIME, SPEED AND DISTANCE   **3**

Problems on trains - Relative speed concept and application. Boats and Streams - Upstream speed, Downstream speed, Speed of stream, Speed of boat.

TIME AND WORK   **3**

Time & work - Problems based on time and work, Formulae, Computation of work together, Wages based work problems. Pipes & Cisterns - Inlet-outlet, Part of tank filled, Time based problems.

d. Learning Resources

Text Book

1 Dinesh Khattar, *Quantitative Aptitude for Competitive Examinations*, Pearson India Education services Pvt Ltd, Fourth Edition, Uttar Pradesh, 2019.

Reference Books

1 TCY online, *Reasoning ability and Quantitative Aptitude*, Wiley India Pvt. Ltd, First Edition, New Delhi, 2016.

2 Agarwal.R.S, *Quantitative Aptitude for Competitive Examinations*, S.Chand Limited, 2011.

3 Abhijit Guha, *Quantitative Aptitude for Competitive Examinations*, Tata McGraw Hill, 3rd Edition, 2011

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ANNA UNIVERSITY, CHENNAI

AFFILIATED INSTITUTIONS

B.E. MECHATRONICS ENGINEEERING

REGULATIONS – 2017

CHOICE BASED CREDIT SYSTEM

1. **PROGRAMME EDUCATIONAL OBJECTIVES:**

   Bachelor of Mechatronics curriculum is designed to prepare the graduates having attitude and knowledge to

   1. Develop innovative and sustainable products with multidisciplinary Engineering expertise.
   2. Solve complex engineering problems by applying mechanical, electrical and computer knowledge and engage in lifelong learning in their profession
   3. Work or pursue higher education in multicultural, multilingual and multinational environment with competent oral and written communication.
   4. Lead and contribute in a team entrusted with professional, social and ethical responsibilities.

2. **PROGRAMME OUTCOMES:**

   a. Will be able to apply the laws of science and mathematics to provide engineering solutions to solve complex problems.
   b. Will be able to identify and analyze complex problems by modeling with the help of literature survey and validate the solution with experiments.
   c. Will be able to design and develop Mechatronics systems by selecting and integrating, sensors, appropriate materials, mechanics, thermal systems, manufacturing and automation methods.
   d. Will be able to collect, condition monitor and interpret data to provide engineering solutions.
   e. Will be able to create applications, products as well as modernizing the existing systems by using latest tools and technologies.
   f. Will be able to develop solutions for local and global requirements by applying engineering knowledge and professional ethics.
   g. Will have professional values on environmental and energy consumption for sustainability.
   h. Will be able to become a leader and contribute in a team with entrepreneurial qualities.
   i. Will be able to interact effectively in both oral and written format.
   j. Will continuously update their knowledge and skills to meet the ever changing global needs.

3. **PEO / PO Mapping**

PEO / PO	a	b	c	d	e	f	g	h	i	j
1	✓	✓	✓	✓	✓	✓	✓			
2	✓	✓	✓	✓	✓	✓				✓
3									✓	✓
4							✓	✓	✓	

		Course	1	2	3	4	5	6	7	8	9	10	11	12
YEAR IV	**SEMESTER VII**	Design of Machine Elements	✓	✓	✓							✓		
		Industrial Automation		✓	✓	✓	✓				✓	✓		
		Principles of Management											✓	
		Professional Elective – I												
		Applied Hydraulics and Pneumatics Laboratory	✓		✓	✓	✓	✓			✓	✓	✓	
		Industrial Automation Laboratory		✓	✓		✓	✓			✓	✓		
		Design and Fabrication Project	✓	✓	✓		✓	✓			✓		✓	✓
		Computer Aided Design and Manufacturing		✓				✓			✓			
		Robotics and Machine Vision System	✓	✓	✓	✓						✓		✓
		Embedded System Design	✓	✓	✓	✓		✓			✓			✓
		Open Elective - II												
	SEMESTER VIII	Professional Elective – II												
		Professional Elective - III												
		Computer Aided Design and Manufacturing Laboratory		✓				✓						
		Robotics Laboratory	✓	✓	✓	✓						✓		✓
		Automotive Electronics			✓	✓						✓	✓	
		Professional Elective - IV												
		Professional Elective – V												
		Project Work	✓	✓	✓	✓		✓			✓	✓	✓	✓

SEMESTER VII

SL. NO.	COURSE CODE	COURSE TITLE	CATEGORY	CONTACT PERIODS	L	T	P	C
THEORY								
1.	ME8691	Computer Aided Design and Manufacturing	PC	3	3	0	0	3
2.	MT8701	Robotics and Machine Vision System	PC	3	3	0	0	3
3.	MT8791	Embedded System Design	PC	4	2	0	2	3
4.		Open Elective - II	OE	3	3	0	0	3
5.		Professional Elective – II	PE	3	3	0	0	3
6.		Professional Elective - III	PE	3	3	0	0	3
PRACTICALS								
7.	MT8711	Computer Aided Design and Manufacturing Laboratory	PC	4	0	0	4	2
8.	MT8781	Robotics Laboratory	PC	4	0	0	4	2
			TOTAL	**27**	**17**	**0**	**10**	**22**

SEMESTER VIII

SL. NO.	COURSE CODE	COURSE TITLE	CATEGORY	CONTACT PERIODS	L	T	P	C
THEORY								
1.	MT8801	Automotive Electronics	PC	3	3	0	0	3
2.		Professional Elective - IV	PE	3	3	0	0	3
3.		Professional Elective – V	PE	3	3	0	0	3
PRACTICALS								
4.	MT8811	Project Work	EEC	20	0	0	20	10
			TOTAL	**29**	**9**	**0**	**20**	**19**

TOTAL NO. OF CREDITS:186

SEMESTER VIII, ELECTIVE V

SL. NO.	COURSE CODE	COURSE TITLE	CATEGORY	CONTACT PERIODS	L	T	P	C
1.	CS8492	Database Management Systems	PE	3	3	0	0	3
2.	MG8892	Marketing Management	PE	3	3	0	0	3
3.	IM8071	Product Design and Development	PE	3	3	0	0	3
4.	GE8076	Professional Ethics in Engineering	PE	3	3	0	0	3

EMPLOYABILITY ENHANCEMENT COURSES (EEC)

SL. NO.	COURSE CODE	COURSE TITLE	CATEGORY	CONTACT PERIODS	L	T	P	C
1.	HS8381	Interpersonal Skills/Listening & Speaking	EEC	2	0	0	2	1
2.	ME8682	Design and Fabrication Project	EEC	4	0	0	4	2
3.	HS8461	Reading and Writing Skills	EEC	2	0	0	2	1
4.	HS8581	Professional Communication	EEC	2	0	0	2	1
5.	MT8811	Project Work	EEC	20	0	0	20	10

SUMMARY

	B.E. MECHATRONICS										
	Subject Area	Credits Per Semester								Credits Total	Percentage %
	Semester	I	II	III	IV	V	VI	VII	VIII		
1.	Humanities and Social Studies (HS)	4	7				3			14	8
2.	Basic Sciences (BS)	12	7	4	4					27	15
3.	Engineering Sciences (ES)	9	11	17		8				45	24
4.	Professional Core (PC)			3	18	11	16	13	3	64	34
5.	Professional Electives (PE)						3	6	6	15	8
6.	Open Electives (OE)				3		3			6	3
7.	Project Work (PR/EEC)			1	1	1	2		10	15	8
	TOTAL	25	25	25	23	23	24	22	19	186	
8.	Non-Credit/ (Mandatory)										

UNIT V   CHASSIS AND SAFETY SYSTEMS   10

Traction control system – Cruise control system – electronic control of automatic transmission – antilock braking system – electronic suspension system – working of airbag and role of MEMS in airbag systems – centralized door locking system – climate control of cars.

TOTAL :   45 PERIODS

OUTCOMES:
After successful completion of this course, the students should be able to
CO1: Know the importance of emission standards in automobiles.
CO2: Understand the electronic fuel injection/ignition components and their function.
CO3: Choose and use sensors and equipment for measuring mechanical quantities, temperature and appropriate actuators.
CO4: Diagnose electronic engine control systems problems with appropriate diagnostic tools.
CO5: Analyses the chassis and vehicle safety system.

TEXT BOOK:
  1. Ribbens, "Understanding Automotive Electronics", 8th Edition, Elsevier, Indian Reprint, 2013

REFERENCES
  1. Barry Hollembeak, "Automotive Electricity, Electronics & Computer Controls", Delmar Publishers, 2001.
  2. Richard K. Dupuy "Fuel System and Emission controls", Check Chart Publication, 2000.
  3. Ronald. K. Jurgon, "Automotive Electronics Handbook", McGraw-Hill, 1999.
  4. Tom Denton, "Automobile Electrical and Electronics Systems", Edward Arnold Publishers, 2000.

MT8811	PROJECT WORK	L	T	P	C
		0	0	20	10

OBJECTIVES:
  • To develop knowledge to formulate a real world problem and project's goals.
  • To identify the various tasks of the project to determine standard procedures.
  • To identify and learn new tools, algorithms and techniques.
  • To understand the various procedures for validation of the product and analysis the cost effectiveness.
  • To understand the guideline to Prepare report for oral demonstrations.

Students in the form of group, not exceeding 3 members in a group to carry out their main project. It should be a Mechatronics project. However, special considerations can be given for interdisciplinary measurement and computer based simulation projects. This exception should be recorded and approved by the department committee. Management related projects will not be allowed. The interdisciplinary projects will carry more weight age. It is mandatory to publish their main project in national/international level conferences to appear in the viva-voce exam.

TOTAL: 300 PERIODS

OUTCOMES:
After successful completion of this course, the students should be able to
CO1: Design, analyze, realize / simulate a physical system by using the technology they learnt during the program.
CO2: Integrate various systems into one Mechatronics product.
CO3: Work in a team with confined time duration.
CO4: Disseminate his work both in oral and written format.

BE-MECHATRONICS ENGINEERING

Regulation - 2020

AUTONOMOUS SYLLABUS

CHOICE BASED CREDIT SYSTEM (CBCS)

CURRICULUM

(V & VI semester)

VISION:

To make the Department of Mechatronics Engineering the unique of its kind in the field of Research and Development towards Industrial Automation & Robotics.

MISSION:

To impart highly innovative and technical knowledge in Mechatronics Engineering to the urban and unreachable rural student folks through "Total Quality Education"

PROGRAM EDUCATION OBJECTIVES:

Educational objectives of the course Bachelor of Mechatronics Engineering programme can be divided into

PEO 1: Graduates will be able to apply their multi-disciplinary knowledge to formulate, design, develop and analyse Mechatronics Systems.

PEO 2: Graduates will be able to come up with solution for any real time problems in the field of Mechatronics Engineering and allied areas demanded by the Industry and Society.

PEO 3: Graduates will be able to get familiarized with economical issues in Mechatronics Engineering and work in multi-disciplinary teams with ethical code of conduct.

PROGRAM OUTCOMES:

After going through the four years of study, the Mechatronics Engineering graduates will have the ability to

	Graduate Attribute	Programme Outcome
1	Engineering knowledge	Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems
2	Problem analysis	Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences
3	Design/development of solutions	Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.
4	Conduct investigations of complex problems	Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions
5	Modern tool usage	Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations
6	The engineer and society	Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional

			engineering practice
7	Environment and sustainability		Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.
8	Ethics		Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.
9	Individual and team work		Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings
10	Communication		Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.
11	Project management and finance		Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments
12	Life-long learning		Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change

PROGRAMME SPECIFIC OUTCOMES (PSOs):

PSO1: Graduates will be able to apply their knowledge in sensors, drives, actuators, controls, mechanical design and modern software & hardware tools to design & develop cost effective Mechatronics systems.

PSO2: Graduates will be able to become Technocrats and Entrepreneurs, build the attitude of developing new concepts on emerging fields and pursuing higher studies.

BE-MECHATRONICS ENGINEERING

Regulation - 2020

AUTONOMOUS SYLLABUS

CHOICE BASED CREDIT SYSTEM (CBCS)

CURRICULUM AND SYLLABI

(V & VI semester)

SEMESTER V

SI. No.	COURSE CODE	COURSE TITLE	CATEGORY	PERIODS PER WEEK			TOTAL CONTACT PERIODS	CREDITS
				L	T	P		
THEORY								
1.	IT1471	Object Oriented Programming using JAVA (Theory Cum Lab)	PC	3	0	2	5	4
2.	MT1501	Machine Design	PC	3	0	0	3	3
3.	MT1502	Machine Dynamics for Mechatronics Engineers	PC	3	0	0	3	3
4.	MT1503	Power Electronic Converters and Drives	PC	3	0	0	3	3
5.	PE1	Professional Elective I	PE	3	0	0	3	3
6.	OE1	Open Elective I	OE	3	0	0	3	3
PRACTICAL								
7.	MT1511	Power Electronic Converters and	PC	0	0	4	4	2

SI. No.	COURSE CODE	COURSE TITLE	CATEGORY	L	T	P	TOTAL CONTACT PERIODS	CREDITS
		Drives laboratory						
8.	MT1512	Kinematics and Dynamics Laboratory	PC	0	0	4	4	2
9.	HS1521	Professional Communication	EE	0	0	2	1	1
		TOTAL		**18**	**0**	**12**	**29**	**24**

SEMESTER VI

SI. No.	COURSE CODE	COURSE TITLE	CATEGORY	PERIODS PER WEEK			TOTAL CONTACT PERIODS	CREDITS
				L	T	P		
THEORY								
1.	MT1601	Design of Mechatronics System	PC	3	0	0	3	3
2.	MT1602	Fluid Power Systems (Theory Cum Lab)	PC	3	0	2	5	4
3.	MT1603	Industrial Automation (Theory Cum Lab)	PC	3	0	2	5	4
4.	PEII	Professional Elective–II	PE	3	0	0	3	3
5.	PEIII	Professional Elective–III	PE	3	0	0	3	3
6.		Online Course	OC	NPTEL/SWAYAM				3
PRACTICAL								
7.	MT1621	Design and Fabrication Project for Mechatronics Engineering	EE	0	0	4	4	2
		TOTAL		**15**	**0**	**8**	**23**	**22**

HS1521   **PROFESSIONAL COMMUNICATION**

L	T	P	C
0	0	2	1

OBJECTIVES:

The course aims to:

- Enhance the Employability and Career Skills of students
- Orient the students towards grooming as a professional
- Make them Employable Graduates
- Develop their confidence and help them attend interviews successfully.

UNIT I   6

Introduction to Soft Skills– Hard skills & soft skills – employability and career Skills—Grooming as a professional with values—Time Management—General awareness of Current Affairs- Error Spotting

UNIT II   6

Self-Introduction-organizing the material – Introducing oneself to the audience – introducing the topic – answering questions with clarity and appropriate pharases – individual presentation practice— presenting the visuals effectively – 5 minute presentations

UNIT III   6

Introduction to Group Discussion— Participating in group discussions – understanding group dynamics – brainstorming the topic –- questioning and clarifying –GD strategies- activities to improve GD skills

UNIT IV   6

Interview etiquette – dress code – body language – attending job interviews– telephone/skype interview -one to one interview &panel interview – FAQs related to job interviews

UNIT V   6

Recognizing differences between groups and teams - managing stress- networking professionally- respecting social protocols-understanding career management-developing a long-term career plan-making career changes

TOTAL: 30 PERIODS

COURSE OUTCOMES:

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

CO1:   Make effective presentations

CO2:   Participate confidently in Group Discussions.

CO3:   Participate confidently in Group Discussions.

CO4:   Develop adequate Soft Skills required for the workplace

REFERENCES:

1. Butterfield, Jeff., 2015, *Soft Skills for Everyone*, Cengage Learning: New Delhi.
2. E. Suresh Kumar et al., 2015 , *Communication for Professional Success. Orient Blackswan*: Hyderabad.
3. OBS Exports ,2018 *Interact English Lab Manual for Undergraduate Students.* OrientBalckSwan: Hyderabad, .
4. Raman, Meenakshi and Sangeeta Sharma. 2014 *Professional Communication.* Oxford University Press: Oxford,
5. S. Hariharanet al , 2010 *Soft Skills.* MJP Publishers: Chennai,

MT1621 DESIGN AND FABRICATION PROJECT FOR MECHATRONICS ENGINEERING

L	T	P	C
0	0	4	2

OBJECTIVE:

The main objective is to give an opportunity to the student to get hands on training in the fabrication of one or more components of a complete working model, which is designed by them.

GUIDELINE FOR REVIEW AND EVALUATION

The students may be grouped into 2 to 4 and work under a project supervisor. The device/ system/component(s) to be fabricated may be decided in consultation with the supervisor and if possible with an industry. A project report to be submitted by the group and the fabricated model, which will be reviewed and evaluated for internal assessment by a Committee constituted by the Head of the Department. At the end of the semester examination the project work is evaluated based on oral presentation and the project report jointly by external and internal examiners constituted by the Head of the Department.

TOTAL : 60 PERIODS

COURSE OUTCOMES:

Upon the completion of this course the students will be able to

CO1: To identify specific problems prevailing in the society or industry in the field of Mechatronics Engineering& allied areas.

CO2: To carry out the literature survey for the identified problem.

CO3: Develop Mechatronics product from various systems.

CO4: To develop an appropriate solution for the identified problem using modern tool or methodology

CO5: To impart communication and presentation skills through effective documentation and delivery.

B.E. MECHATRONICS ENGINEERING
REGULATIONS – 2021
AUTONOMOUS SYLLABUS
CHOICE BASED CREDIT SYSTEM
III TO IV SEMESTER CURRICULUM AND SYLLABI

VISION:

To make the Department of Mechatronics Engineering of this Institution the unique of its kind in the field of Research and Development activities in this part of world.

MISSION:

To impart highly innovative and technical knowledge in the field of Mechatronics Engineering to the urban and unreachable rural student folks through Total Quality Education.

PROGRAMME EDUCATIONAL OBJECTIVES (PEOs):

PEO 1: Graduates will be able to apply their multi-disciplinary knowledge to formulate, design, develop and analyse Mechatronics Systems.

PEO 2: Graduates will be able to come up with solution for any real time problems in the field of Mechatronics Engineering and allied areas demanded by the Industry and Society.

PEO 3: Graduates will be able to get familiarized with economical issues in Mechatronics Engineering and work in multi-disciplinary teams with ethical code of conduct.

PROGRAM OUTCOMES:

After going through the four years of study, the Mechatronics Engineering graduates will have the ability to

POs	Graduate Attribute	Programme Outcome
1	Engineering knowledge	Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
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3	Design/Development of solutions	Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.
4	Conduct investigations of complex problems	Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions
5	Modern tool usage	Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations
6	The engineer and society	Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice

7	Environment and sustainability	Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.
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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.
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PSO2 : Graduates will be able to become Technocrats and Entrepreneurs, build the attitude of developing new concepts on emerging fields and pursuing higher studies.

REGULATIONS - 2021
CHOICE BASED CREDIT SYSTEM
B.E. MECHATRONICS ENGINEERING
CURRICULUM AND SYLLABI FOR SEMESTER III TO IV
SEMESTER III

S.NO.	COURSE CODE	COURSE TITLE	CATE GORY	CONTACT PERIODS	L	T	P	C
THEORY								
1	MA2202	Transforms and Numerical Solution of Equations	BS	4	3	1	0	4
2	GE2201	Design Thinking	EM	3	3	0	0	3
3	ME2201	Engineering Mechanics	BS	3	3	0	0	3
4	MT2201	Analog Devices and Circuits	PC	3	3	0	0	3
5	MT2202	Electrical Circuits and Machines	BS	3	3	0	0	3
6	MT2203	Fluid Mechanics and Thermal Sciences	PC	3	3	0	0	3
PRACTICALS								
7	MT2204	Computer Aided Drafting Laboratory	BS	4	0	0	4	2
8	MT2205	Electrical Circuits and Machines Laboratory	BS	4	0	0	4	2
9	MT2206	Fluid Mechanics Laboratory	PC	4	0	0	4	2
		TOTAL		31	18	1	12	25

S.NO.	COURSE CODE	COURSE TITLE	CATE GORY	CONTACT PERIODS	L	T	P	C
THEORY								
1	MA2254	Probability, Statistics and Numerical Methods	BS	4	3	1	0	4
2	EE2259	Control Systems Engineering	ES	3	3	0	0	3
3	MT2251	Digital Electronics and Microprocessors	PC	3	3	0	0	3
4	MT2252	Manufacturing Technology	PC	3	3	0	0	3
5	MT2253	Sensors and Instrumentation	PC	3	3	0	0	3
6	MT2254	Solid Mechanics[#]	PC	4	2	0	2	3
7	GE2251	Quantitative Aptitude	EM	1	1	0	0	1
8	AUD110	Tamils and Technology	AU	1	1	0	0	0
PRACTICALS								
9	MT2255	Manufacturing Technology Laboratory for Mechatronics Engineers	PC	3	0	0	3	1
10	MT2256	Sensors and Instrumentation Laboratory	PC	3	0	0	3	1
11	EM2252	An Introduction to Advanced Reading and Writing	EEC	2	0	0	2	1
		TOTAL		30	19	1	10	23

[#] Theory cum Laboratory Course

Course Code	Course Name	L	T	P	C
GE2251	**QUANTITATIVE APTITUDE**	**1**	**0**	**0**	**1**

Category: Employability Enhancement Course

a. Preamble

To develop the thinking ability and problem solving skills of students to compete themselves in placement and competitive examinations.

b. Course Outcome

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

CO. No.	Course Outcome	Knowledge Level
CO1	Apply the concept of profit in real life problems	K3
CO2	Solve the problems by using proportion	K3
CO3	Compute accurate speed, time and distance	K3
CO4	Apply the concept of Time & Speed	K3
CO5	Calculate the work done based on various methods	K3

c. Course Syllabus   **Total : 15 Periods**

PROFIT AND LOSS   **3**

Profit and Loss - Cost Price, Selling Price, Profit and Loss %, Marked Price, Discount.

RATIO AND PROPORTION   **3**

Ratio and Proportion - Ratio, Proportion, Comparison of Ratios, Duplicate, Triplcate Ratio.

TIME, SPEED AND DISTANCE   **3**

Time, Speed and Distance - Concept of time, speed and distance, Conversion of units and proportionality, Avearge speed concept.

APPLICATIONS ON TIME, SPEED AND DISTANCE   **3**

Problems on trains - Relative speed concept and application. Boats and Streams - Upstream speed, Downstream speed, Speed of stream, Speed of boat.

TIME AND WORK   **3**

Time & work - Problems based on time and work, Formulae, Computation of work together, Wages based work problems. Pipes & Cisterns - Inlet-outlet, Part of tank filled, Time based problems.

d. Learning Resources

Text Book

1. Dinesh Khattar, *Quantitative Aptitude for Competitive Examinations*, Pearson India Education services Pvt Ltd, Fourth Edition, Uttar Pradesh, 2019.

Reference Books

1. TCY online, *Reasoning ability and Quantitative Aptitude*, Wiley India Pvt. Ltd, First Edition, New Delhi, 2016.

2. Agarwal.R.S, *Quantitative Aptitude for Competitive Examinations*, S.Chand Limited, 2011.

3. Abhijit Guha, *Quantitative Aptitude for Competitive Examinations*, Tata McGraw Hill, 3rd Edition, 2011.

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Course Code	Course Name	L	T	P	C
EM2252	AN INTRODUCTION TO ADVANCED READING AND WRITING	0	0	2	1

Category: Employability Enhancement Course

a. Preamble

The course will enable learners

- To strengthen the reading skills of students of engineering.
- To enhance their writing skills with specific reference to technical writing.
- To develop their critical thinking skills.
- To provide more opportunities to develop their project and proposal writing skills.

b. Course Outcome

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

CO. No.	Course Outcome	Knowledge Level
CO1	Understand how the text positions the reader	K3
CO2	Develop critical thinking while reading a text	K3
CO3	Develop a descriptive paragraph	K3
CO4	Make use of sentence structures effectively when creating an essay	K3
CO5	Demonstrate proper usage of grammar in writing E-Mails, Job application and project proposals	K3

c. Course Syllabus   **Total : 45 Periods**

EFFECTIVE READING   **6**

Reading – Strategies for effective reading-Use glosses and footnotes to aid reading comprehension- Read and recognize different text types-Predicting content using photos and title . Reading-Read for details-Use of graphic organizers to review and aid comprehension.

CRITICAL READING   **6**

Reading– Understanding pronoun reference and use of connectors in a passage- speed reading techniques. Reading– Genre and Organization of Ideas- Reading– Critical reading and thinking- understanding how the text positions the reader.

PARAGRAPH WRITING 6

Writing - Plan before writing- Develop a paragraph: topic sentence, supporting sentences, concluding sentence -Write a descriptive paragraph Writing-State reasons and examples to support ideas in writing - Write a paragraph with reasons and examples - Write an opinion paragraph.

ESSAY WRITING 6

Writing - Elements of a good essay - Types of essays - descriptive-narrative - issue-based-argumentative-analytical.

EFFECTIVE WRITING 6

Writing–Email writing- visumes - Job application- Report Writing - Project writing-Writing convincing proposals

d. Activities

Students shall be exposed to various passages for reading and trained to write in different forms.

e. Learning Resources

Text Books

1. Gramer, F, Margot and Colin, S, Ward, 2011, *Reading and Writing* (Level 3) Oxford University Press, Oxford.

2. Debra Daise, Charl Norloff, and Paul Carne, 2011, *Reading and Writing* (Level 4) Oxford University Press: Oxford.

Reference Books

1. Davis, Jason and Rhonda LIss.2006 *Effective Academic Writing* (Level 3) Oxford University Press: Oxford

2. E. Suresh Kumar 2012 *Enriching Speaking and Writing Skills,* Second Edition. Orient Black swan: Hyderabad.

3. Withrow, Jeans 2004 *Inspired to Write. Readings and Tasks to develop writing skills.* , Cambridge University Press: Cambridge.

4. Goatly, Andrew.2000 *Critical Reading and Writing, Routledge*: United States of America.

5. Petelin, Roslyn and Marsh Durham, 2004 *The Professional Writing Guide: Knowing Well and Knowing Why*, Business& Professional Publishing: Australia.

ANNA UNIVERSITY: CHENNAI
AFFILIATED INSTITUTIONS
REGULATIONS 2017
B.TECH. POLYMER TECHNOLOGY
CHOICE BASED CREDIT SYSTEM

1. Program Educational Objectives (PEOs)

Bachelor of Technology in Polymer Technology curriculum and syllabus is designed to prepare graduates:

PEO 1: who will be technically proficient in Polymer Technology with a commitment to quality, timeliness and compete with confidence in their career.

PEO 2: who will be professionals with integrity and strong ethical values and will contribute to the professional society.

PEO 3: who will engage in lifelong learning or continuous education opportunities.

PEO 4: who will contribute towards research and professional development and entrepreneurship.

2. Programme Outcomes (POs)

A graduate of this major should be able to:

a. **Engineering Knowledge**: Select and apply the engineering knowledge, technique and skills in Polymer Science and Technology.
b. **Problem Analysis**: Select and apply knowledge of mathematics, science, engineering, and technology to Polymer Technology and engineering problems that require the application of principles and applied procedures or methodologies.
c. **Design/development of solutions**: conduct standard tests and measurements; conduct, analyze, and interpret experiments; and apply experimental results to improve processes.
d. **Conduct investigations of complex problems**: design systems, components, or processes for broadly defined Polymer Technology problems.
e. **Modern Tool Usage**: select and apply appropriate techniques, resources and modern tools in Polymer Science and Technology.
f. **The Engineer and Society**: understand the need for and engage in self-directed continuing professional development.
g. **Environment and Sustainability:** understand the impact of Polymer Technology solutions in a societal and global context
h. **Ethics:** demonstrate an understanding of and a commitment to professional and ethical responsibilities, including a respect for diversity
i. **Individual and team work**: function effectively as a member or leader on a technical team.
j. **Communication:** communicate effectively regarding broadly defined Polymer Technology and Engineering activities.
k. **Project Management and Finance**: Demonstrate knowledge and understanding of engineering and management principles which apply to Polymer Engineering areas.
l. **Life-long learning:** exhibit a commitment to quality, timeliness, and continuous improvement.

3. Programme Specific Outcomes (PSOs)

The graduate is expected to:

PSO1 Polymer industry oriented preparedness: Reveal an ability to identify careers in polymer technology domains like, synthesis of polymers, processing and quality control, which adopt skills required to work in a polymer technology laboratory or a manufacturing facility.

PSO2 Higher Education Preparedness: Demonstrate an ability to appear for competitive examinations to pursue higher studies.

4. PEOs / POs MAPPING

PEOs/ POs	a	b	C	d	e	f	g	h	I	j	k	l	PSO 1	PSO2
PEO 1	✓	✓	✓	✓	✓					✓		✓	✓	✓
PEO 2							✓		✓	✓	✓	✓		✓
PEO 3						✓	✓	✓	✓	✓		✓	✓	✓
PEO 4	✓	✓	✓	✓	✓						✓	✓	✓	✓

5. Semester Course Wise POs Mapping

		Course Title	a	b	c	d	e	f	g	h	i	j	k	l	PSO1	PSO2
I YEAR	**SEMESTER I**	Communicative English	√	√											√	√
		Engineering Mathematics I	√	√	√	√	√								√	√
		Engineering Physics	√	√	√	√									√	√
		Engineering Chemistry	√	√	√	√		√							√	√
		Problem Solving and Python Programming	√	√	√			√	√						√	√
		Engineering Graphics	√	√	√	√	√	√							√	√
		Physics and Chemistry Laboratory	√	√	√			√	√		√				√	√
		Problem Solving and Python Programming Laboratory	√	√	√			√	√		√			√	√	√
	SEMESTER II	Technical English	√	√	√	√	√								√	√
		Engineering Mathematics II	√	√	√	√	√								√	√
		Physics of Materials	√	√	√										√	√
		Physical and Organic Chemistry	√	√	√			√	√						√	√
		Basic Electrical and Electronics Engineering	√	√	√	√	√								√	√

Year	Semester	Course	1	2	3	4	5	6	7	8	9	10	11	12	13	14
		Production Processes	√	√	√	√	√								√	√
		Engineering Practices Laboratory	√	√	√			√	√		√			√	√	√
		Computer Aided Drafting and Modeling Laboratory	√	√		√	√					√		√	√	√
II YEAR	SEMESTER III	Probability and Statistics														
		Fundamentals of Polymer Science	√	√			√	√	√			√	√	√	√	√
		Environmental Science and Engineering	√	√				√	√			√		√	√	√
		Mechanics of Solids	√	√	√		√				√	√		√	√	√
		Introduction to Chemical Engineering	√	√	√		√					√	√	√	√	√
		Polymer Physics	√	√	√		√		√			√	√	√	√	√
		Chemical Engineering Laboratory	√	√	√	√	√	√	√			√			√	√
		Polymer Identification and Analysis Laboratory	√		√		√		√	√	√	√	√	√	√	√
		Interpersonal Skills/Listening and Speaking							√	√	√		√	√	√	√
	SEMESTER IV	Numerical Methods	√	√	√										√	√
		Fluid Mechanics and Polymer Rheology	√	√	√		√				√	√		√	√	√
		Plastics Materials I	√				√	√	√			√	√	√	√	√
		Rubber Materials	√		√		√		√			√	√	√	√	√
		Process Instrumentation for Polymer Technologist	√	√			√	√				√	√	√	√	√
		Mould Manufacturing Technology	√		√		√					√	√	√	√	√
		Mould Manufacturing Technology Laboratory	√		√		√		√	√					√	√
		Advanced Reading and Writing							√	√	√		√	√	√	√
III YEAR	SEMESTER V	Plastics Processing	√	√			√					√	√	√	√	√
		Characterization of Polymers	√	√	√	√	√	√	√	√	√	√	√	√	√	√
		Plastics Materials II	√				√	√	√			√	√	√	√	√
		Rubber Compounding	√	√	√		√		√			√	√	√	√	√
		Professional Communication														
		Polymer Preparation Laboratory	√	√	√		√	√		√	√	√	√	√	√	√
		Plastics Processing Laboratory	√	√			√	√	√	√	√	√	√	√	√	√
	SEMESTER VI	Design of Moulds and Dies for Polymers	√	√	√	√	√					√	√	√	√	√
		Rubber Processing and Machinery	√	√	√		√		√			√	√	√	√	√
		Testing of Polymers	√	√	√		√	√	√	√		√	√	√	√	√
		Polymer Blends and Alloys	√	√	√	√	√				√	√	√	√	√	√
		Rubber Processing Laboratory	√	√	√		√			√	√	√	√	√	√	√
		Polymer Testing Laboratory	√	√	√	√	√	√	√	√	√	√	√	√	√	√
IV	SEME S	Polymer Product Design	√	√	√		√	√	√			√	√	√	√	√
		Rubber Product Manufacturing	√				√		√			√	√	√	√	√
		Polymer Composites	√	√	√		√	√	√			√	√	√	√	√

		Computer Aided Polymer Product Design	√	√	√	√	√			√	√	√	√	√	√		√
		Comprehension								√	√		√	√		√
	SEM VIII	Project Work	√	√	√	√	√	√	√	√	√	√	√	√	√		√

S. No.	COURSE CODE	COURSE TITLE	CATE GORY	CONTACT PERIODS	L	T	P	C
THEORY								
1	PT8701	Polymer Product Design	PC	4	4	0	0	4
2	PT8702	Rubber Product Manufacturing	PC	3	3	0	0	3
3	PT8751	Polymer Composites	PC	3	3	0	0	3
4		Professional Elective IV	PE	3	3	0	0	3
5		Professional Elective V	PE	3	3	0	0	3
6		Professional Elective VI	PE	3	3	0	0	3
7		Open Elective II*	OE	3	3	0	0	3
PRACTICALS								
8	PT8711	Computer Aided Polymer Product Design Laboratory	PC	4	0	0	4	2
9	PT8712	Comprehension	EEC	2	0	0	2	1
			TOTAL	28	22	0	6	25

* - Course from the curriculum of the other UG Programmes

SEMESTER VIII

S. No.	COURSE CODE	COURSE TITLE	CATE GORY	CONTACT PERIODS	L	T	P	C
PRACTICALS								
1	PT8811	Project Work	EEC	20	0	0	20	10
			TOTAL	20	0	0	20	10

TOTAL CREDITS:178

<u>PROFESSIONAL ELECTIVES</u>

PROFESSIONAL ELECTIVE I, SEMESTER V

S. No.	COURSE CODE	COURSE TITLE	CATE GORY	CONTACT PERIODS	L	T	P	C
1.	PT8001	Design of Machine Elements	PE	3	3	0	0	3
2.	PT8072	Fiber Technology	PE	3	3	0	0	3
3.	PT8073	Plastics Packaging Technology	PE	3	3	0	0	3
4.	GE8071	Disaster Management	PE	3	3	0	0	3

PROFESSIONAL ELECTIVE II, SEMESTER VI

S. No.	COURSE CODE	COURSE TITLE	CATE GORY	CONTACT PERIODS	L	T	P	C
1.	GE8075	Intellectual Property Rights	PE	3	3	0	0	3
2.	PL8075	Polyurethane Technology	PE	3	3	0	0	3
3.	PL8074	Plastics Waste Management and Recycling Techniques	PE	3	3	0	0	3
4.	PT8074	Polymer Nanocomposites	PE	3	3	0	0	3
5.	PL8072	Biodegradable Polymers	PE	3	3	0	0	3

2.	PT8354	Polymer Physics	PC	3	3	0	0	3
3.	PT8311	Polymer Identification and Analysis Laboratory	PC	4	0	0	4	2
4.	PT8451	Fluid Mechanics and Polymer Rheology	PC	3	3	0	0	3
5.	PL8451	Plastics Materials I	PC	3	3	0	0	3
6.	PT8401	Rubber Materials	PC	3	3	0	0	3
7.	PT8452	Mould Manufacturing Technology	PC	3	3	0	0	3
8.	PT8461	Mould Manufacturing Technology Laboratory	PC	4	0	0	4	2
9.	PT8501	Plastics Processing	PC	3	3	0	0	3
10.	PT8502	Characterization of Polymers	PC	3	3	0	0	3
11.	PL8551	Plastics Materials II	PC	3	3	0	0	3
12.	PT8503	Rubber Compounding	PC	4	4	0	0	4
13.	PT8561	Polymer Preparation Laboratory	PC	4	0	0	4	2
14.	PT8511	Plastics Processing Laboratory	PC	4	0	0	4	2
15.	PT8601	Design of Moulds and Dies for Polymers	PC	3	3	0	0	3
16.	PT8602	Rubber Processing and Machinery	PC	4	4	0	0	4
17.	PT8603	Testing of Polymers	PC	3	3	0	0	3
18.	PT8611	Rubber Processing Laboratory	PC	4	0	0	4	2
19.	PT8612	Polymer Testing Laboratory	PC	4	0	0	4	2
20.	PT8651	Polymer Blends and Alloys	PC	3	3	0	0	3
21.	PT8701	Polymer Product Design	PC	4	4	0	0	4
22.	PT8702	Rubber Product Manufacturing	PC	3	3	0	0	3
23.	PT8751	Polymer Composites	PC	3	3	0	0	3
24.	PT8711	Computer Aided Polymer Product Design Laboratory	PC	4	0	0	4	2

EMPLOYABILITY ENHANCEMENT COURSES (EEC)

S. No.	COURSE CODE	COURSE TITLE	CATE GORY	CONTACT PERIODS	L	T	P	C
1.	HS8381	Interpersonal Skills/Listening and Speaking	EEC	2	0	0	2	1
2.	HS8461	Advanced Reading and Writing	EEC	2	0	0	2	1
3.	HS8581	Professional Communication	EEC	2	0	0	2	1
4.	PT 8712	Comprehension	EEC	2	0	0	2	1
5.	PT8811	Project Work	EEC	20	0	0	20	10

SUMMARY

Subject Area/Semester	HS	BS	ES	PC	PE	OE	EEC	Total
I	4	12	9					**25**
II	4	10	11					**25**
III	3	4	8	8			1	**24**
IV		4	3	14			1	**22**
V				17	3	3	1	**24**
VI				17	6			**23**
VII				12	9	3	1	**25**
VIII							10	**10**
Total	**11**	**30**	**31**	**68**	**18**	**6**	**14**	**178**

- Will design the blow and extrusion molding die for polymer products.
- Will develop new polymer products.

LIST OF EQUIPMENT FOR BATCH OF 30 STUDENTS
1. Computers with LAN - 8 Nos.
2. Software packages
   Pro-E - 1 No
3. Printer - 1 No.

TEXT BOOKS:
1. R.G.W.Pye, Injection Mould Design, SPE Publication.
2. P.S.Cracknell and R.W.Dyson, Hand Book of thermoplastics injection mould design, Chapman & Hall, 1993.

REFERENCES:
1. Herbert Rees, Mould Engineering, Hanser publishers, Munich, Vienna N.Y. 1994.
2. Technical Directory on Design and Tooling for plastics, CIPET, Guindy, Chennai.
3. Design calculations for Compression moulds, Machinery publications, Yellow series, U.K.
4. Mould Flow Manual & Part - Adviser Manual - MOULD FLOW
5. LaszcoSors and ImreBlazs, Design of Plastic Moulds and Dies, Elsevier, Amsterdam - Oxford - Tokyo - NY, 1989.

PT 8712	**COMPREHENSION**	**L T P C**
		0 0 2 1

In the VII Semester a comprehension test will be conducted with at least one written test in the middle of the Semester with Objective type of questions and a terminal viva-voce test in order to evaluate the comprehension of the students in all the subjects covered in the all previous semester subjects.

PT8811	**PROJECT WORK**	**L T P C**
		0 0 20 10

Each student will be assigned a project involving some design and fabrication work as well as theoretical and experimental studies on issues related to Polymer Technology. Continuous internal assessment marks for the project will be given during project review meeting. The student has to prepare and present a detailed project report at the end of the semester and give a presentation about the work done. End semester examination mark will be based on viva voce examination.

PT8001	**DESIGN OF MACHINE ELEMENTS**	**L T P C**
		3 0 0 3

OBJECTIVES
- To familiarize the various steps involved in design process
- To design the different types of joints, bolts and keys
- To design the shafts, couplings & brakes
- To design the different types of drives, belt drives
- To design the springs and bearings

KAMARAJ COLLEGE OF ENGINEERING AND TECHNOLOGY

B.E. / B.TECH. DEGREE PROGRAMMES

FIRST YEAR COURSES

(Regulations 2021 – Autonomous)

SEMESTER I

Sl.No	Course Code	Course Name	Credits			
			L	T	P	C
Theory						
1	SH2101	Technical English	3	0	0	3
2	MA2101	Matrices and Differential Calculus	3	1	0	4
3	PH2101	Engineering Physics	3	0	0	3
4	GE2101	Principles of Engineering	3	0	0	3
5	EM2101	Coding Techniques - I	3	0	0	3
6	CY2101	Engineering Chemistry	3	0	0	3
Practical						
7	MA2102	Mathematics Laboratory	0	0	2	1
8	PH2102	Physics Laboratory	0	0	3	1
9	EM2102	Coding Techniques - I Laboratory	0	0	3	1
Total Credits			**18**	**1**	**8**	**22**

Course Code	Course Name	L	T	P	C
EM2101	Coding Techniques – I	3	0	0	3

Category: Employability Enhancement Courses (Programming Courses)

a. Preamble

This course enables the students to understand the importance of coding to solve the real-time challenges by computer. Coding emphasizes the need to enrich the logical skills of the students to instruct the computer for solving theproblems. This course focuses on problem solving using structured programming language.

b. Course Outcomes

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

CO.No.	Course Outcome	Knowledge Level
CO1	Understand the importance of programming, Analyze any given problem and Develop algorithm to solve it	K3
CO2	Understanding to applying basic concepts of C Programming	K4
CO3	Insightful analysis of arrays and pointers	K3
CO4	Understanding to applying collective data types and file handling	K4
CO5	Developing simple applications using advanced concepts	K6

c. Course Syllabus   Total: 45 Periods

PROBLEM SOLVING FUNDAMENTALS   9

Programs and Algorithms – Problem Definition – Flow Chart – Fundamental Algorithms (Exchange of values of two variables, Counting, Summation of a set of numbers, Factorial Computation, Sine Function Computation, Generation of Fibonacci Sequence, Reversing the Digits of an Integer, Base Conversion): Problem – Algorithm Development – Algorithm Description – Design Consideration – Applications.

C PROGRAMMING FUNDAMENTALS   9

Types and Values – Pre-processors – Declaration and Prototypes - Constants and Variables – Pre-defined Libraries - Storage Classes – Expressions – Operator Precedence and Associativity - Input and Output Statements – Decision Making and Looping Constructs – Type Casting – Concept of Functions – Parameter Passing mechanism.

ARRAYS AND POINTERS   9

Representation of Single and Multidimensional Arrays – Concept of Pointers – Pointer Arithmetic – Strings – Call by Reference – Dynamic Memory Allocation – Function Pointers.

COLLECTIVE DATA TYPES AND FILE HANDLING   9

Structure and Union – Enumeration – Type Defining Structures – Structures and Pointers - Self Referential Structure - Sequential and Random Access File Handling – Opening and Closing of a File - Input and Output Operations on a File – Handling of Binary files.

APPLICATION DEVELOPMENT AND ADVANCED CONCEPTS   9

Bit Fields – Type def – Macro Functions - User Defined Libraries – Variable Arguments – Command Line Arguments – Recursive Functions – Modular Programming – Package Development.

d. Activities: Students shall be exposed to UNIX C or TURBO C Programming tosolve simple problems and able to develop simple C Applications.

e. Learning Resources

  i. TEXT BOOKS

  1. Dromey R.G, "How to Solve it by Computer", Prentice Hall, 1982.

  2. Brian W. Kernighan and Dennis M. Ritchie, "The C Programming Language"Second Edition, Pearson Education, 2015.

  ii. REFERENCE BOOKS

  1. Paul Deitel and Harvey Deitel, "C How to Program", Eighth Edition, PearsonEducation, 2016.

  2. Byron S. Gottfried, "Theory and Problems of Programming with C", Schaum'sOutlines, Second Edition, McGraw-Hill, 1996.

  3. Yashavant Kanetkar, "Let Us C", Sixteenth Edition, BPB Publications, 2018.

  4. Thomas H. Cormen, Charles E. Leiserson, Ronald L. Rivest and Clifford Stein.,"Introduction to Algorithms", Third Edition, The MIT Press, 2009.

Course Code	Course Name	L	T	P	C
EM2102	**Coding Techniques - I Laboratory**	0	0	3	1

Category: Employability Enhancement Courses (Programming Courses)

a. Preamble

This course enables the students to develop simple applications in C using basic constructs, arrays, strings, pointers, functions, files, structures and packages

b. Course Outcomes

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

CO.No.	Course Outcome	Knowledge Level
CO1	Construct simple C programs using basic expressions and control structures	K3
CO2	Implement the concepts of functions in C	K3
CO3	Insightful analysis of arrays and pointers	K3
CO4	Build C programs to solve simple applications using structures and files	K3
CO5	Developing simple applications using packages	K3

c. Course Syllabus   **Total: 45 Periods**

1. Simple programs - to be familiar with syntax and structure of C programming
2. Programs using library functions and user-defined functions
3. Programs on conditional constructs (if, if-else-if ladder, switch)
4. Programs on looping constructs (while, do-while, for)
5. Programs using pointers with single and multidimensional arrays

     i. Searching and Sorting

     ii. Matrices manipulations

     iii. String manipulations (palindrome, anagram, etc.,)

6. Programs using function definition , types of function calls and recursion
7. Programs on structures and union, passing entire structure to functions
8. Programs on files

     i. Creating a text file to store records of N persons, retrieve and display the nth record from a file

     ii. Copy the content of one file to another file using command line arguments

9. Simple applications using packages

d. Learning Resources

REFERENCE BOOKS

1. Yashavant Kanetkar, "Let Us C", Sixteenth Edition, BPB Publications, 2018.
2. Brian W. Kernighan and Dennis M. Ritchie, "The C Programming Language" Second Edition, Pearson Education, 2015.
3. Paul Deitel and Harvey Deitel, "C How to Program", Eighth Edition, Pearson Education, 2016.

B.E. / B.TECH. DEGREE PROGRAMMES

FIRST YEAR COURSES

(Regulations 2021)

SEMESTER II

Sl.No	Course Code	Course Name	Credits			
			L	T	P	C
Theory						
1	SH2151	Professional English	3	0	0	3
2	MA2151	Vector Calculus, Complex Integration and Laplace Transforms	3	1	0	4
3	PH2151	Physics of Non-Conventional Energy Sources	3	0	0	3
4	GE2151	Engineering Graphics	2	0	3	3
5	GE2152	Environmental Science and Engineering	3	0	0	3
6	EM2151	Coding Techniques - II	3	0	0	3
Practical						
7	CY2151	Chemistry Laboratory	0	0	3	1
8	EM2152	Coding Techniques – II Laboratory	0	0	3	1
9	GE2153	Engineering Practices Laboratory	0	0	4	2
Total Credits			**17**	**1**	**13**	**23**

Course Code	Course Name	L	T	P	C
EM2151	Coding Techniques – II	3	0	0	3

Category: Employability Enhancement Courses (Programming Courses)

a. Preamble

This course enables the students to understand the importance of coding using python to solve the real-time challenges by computer. This course enriches the logical skills of the students to instruct the computer for solving the problems. This course focuses on problem solving using Python programming language.

b. Course Outcomes

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

CO.No.	Course Outcome	Knowledge Level
CO1	Develop simple computational problems	K3
CO2	Solve simple real world problems using looping statements and functions	K3
CO3	Make use of string, list and tuple to represent compound data	K3
CO4	Develop simple programs using built-in and user defined packages	K3
CO5	Illustrate the use of exception handling and file handling in Python Programming	K2

c. Course Syllabus   **Total: 45 Periods**

INTRODUCTION TO PYTHON AND DECISION MAKING CONSTRUCTS 9

Introduction to Python Programming - Python Interpreter and Interactive Mode - Variables and Identifiers - Arithmetic Operators - Values and Types - Statements - Operators - Boolean Values - Operator Precedence - Expression - Conditionals: If - else Constructs.

LOOPING AND FUNCTIONS   9

Loop Structures/Iterative Statements – While Loop – For Loop – Break Statement – Continue Statement – Functions: Function Call and Returning Values – Parameter Passing - Local and Global Scope – Recursive Functions.

STRING, LIST AND TUPLE   9

Strings: Introduction, Indexing, Traversing, Concatenating, Appending, Multiplying, Formatting, Slicing, Comparing, Iterating - Basic Built-in String Functions - Introduction to Data Structures - List - Adding Items to a List - Finding and Updating an Item - Nested Lists - Cloning Lists - Looping Through a List – Sorting a List - List Concatenation - List Slices - List Methods - List Loop - Mutability - Aliasing - Tuples: Creation, Accessing, Updating, Deleting Elements in a Tuple, Tuple Assignment, Tuple as Return Value, Nested Tuples, Basic Tuple Operations – Sets.

DICTIONARIES MODULES AND PACKAGES   9

Dictionary: Creating, Accessing, Adding Items, Modifying, Deleting, Sorting, Looping, Nested Dictionaries Built-in Dictionary Function - Finding Key and Value in a Dictionary - Modules - Module Loading and Execution - Packages - Standard Libraries (Time, Math, Numpy, Pandas, PyGame) - User-defined Packages.

FILE HANDLING AND EXCEPTION HANDLING   9

Introduction to Files - File Path - Opening and Closing Files - Reading and Writing Files - File Position - Exception: Errors and Exceptions, Exception Handling, Multiple Exceptions.

d. **Activities:** Students shall be exposed to basic Python programming concepts and to solve simple problems using python.

e. **Learning Resources**

i. TEXT BOOKS

1. Allen B. Downey, *"Think Python: How to Think Like a Computer Scientist"*, 2nd edition, Shroff/O'Reilly Publishers.

2. Guido van Rossum & Fred L. Drake Jr., 2011, *"An Introduction to Python – Revised and Updated for Python 3.2"*, Network Theory Ltd.

ii. REFERENCE BOOKS

1. John V Guttag 2013, *"Introduction to Computation and Programming Using Python"*, Revised and Expanded Edition, MIT Press.

2. Charles Dierbach 2016, *"Introduction to Computer Science using Python"*, Wiley India Edition.

3. Timothy A. Budd 2015, *"Exploring Python"*, Mc-Graw Hill Education (India) Private Ltd.

4. Kenneth A. Lambert 2012, *"Fundamentals of Python: First Programs"*, Cengage Learning.

5. Reema Thareja 2017, *"Python Programming: Using Problem Solving Approach"*, Oxford University Press.

Course Code	Course Name	L	T	P	C
EM2152	Coding Techniques - II Laboratory	0	0	3	1

Category: Employability Enhancement Courses (Programming Courses)

a. Preamble

This course enables the students to develop simple applications in Python using basic constructs, I/O statements and expressions, decision making and looping statements, functions, usage of packages, file and exception handling

b. Course Outcomes

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

CO.No.	Course Outcome	Knowledge Level
CO1	Implement Python codes to solve simple problems using Statements, Expressions and conditional statements	K3
CO2	Develop simple applications using functions for effective code reuse and debugging	K3
CO3	Build solutions for simple problems using Strings, lists, tuples and dictionaries in Python	K3
CO4	Use packages in Python for solving simple applications	K3
CO5	Develop simple real world applications involving file operations and Exception handling mechanisms using Python Programming	K3

c. Course Syllabus   **Total: 45 Periods**

1. **PYTHON PROGRAMS USING I/O STATEMENTS AND EXPRESSIONS TO**:
    a. Find simple interest and compound interest
    b. Find gross salary of a person, given basic pay, DA%, TA% and PF%
    c. Find the area of shapes (triangle, circle)
    d. Swap two numbers
    e. Display the student information (collect the information from the end user)

2. **PYTHON PROGRAMS USING DECISION-MAKING AND LOOPING CONSTRUCTS TO:**

   a. Find GCD of two given numbers

   b. Find LCM of two given numbers

   c. Generate 'n' prime numbers

   d. Exponentiation (power of two given numbers)

   e. Check if a given number is Happy number or not

   f. Solve quadratic equation

3. **PYTHON PROGRAMS USING FUNCTIONS TO:**

   a. Convert the given decimal number into binary, octal and hexadecimal numbers using user defined functions

   b. To print all pronic numbers between a range

   c. Display Fibonacci series using recursion

   d. Find the sum of digits of a given number using recursion

4. **PYTHON PROGRAMS USING STRINGS TO:**

   a. Find the ASCII value of a character

   b. Check if a string contains any special character

   c. Sort strings in alphabetical order

   d. Find all close matches of input string from a list

5. **PYTHON PROGRAMS USING LIST AND TUPLE TO :**

   a. Display the duplicate elements

   b. Right rotate the elements

   c. Matrix Multiplication

   d. Create a list of tuples from given list having number and its cube in each tuple

6. **PYTHON PROGRAMS USING DICTIONARY TO:**

   a. Sort list of dictionaries by values in Python – Using lambda function

   b. Merging two Dictionaries

   c. Scraping And Finding Ordered Words In A Dictionary using Python

7. PYTHON PROGRAMS USING NUMPY, PANDAS AND PYGAME TO:

    a. Sort an array using Numpy

    b. Using Pandas,create a Student dataframe and display first and last 'n' rows

    c. Draw basic shapes (Circle, Rectangle)

8. PYTHON PROGRAMS USING FILES AND EXCEPTION HANDLING MECHANISMS TO:

    a. Take command line arguments and count number of words in it

    b. Find the most frequent words in a text read from a file

    c. Read the necessary information from text file to generate an electricity bill and catch the corresponding exceptions

d. Learning Resources

REFERENCE BOOKS

1. Allen B. Downey, *"Think Python: How to Think Like a Computer Scientist"*, 2nd edition, Shroff/O'Reilly Publishers.

2. Guido van Rossum & Fred L. Drake Jr., 2011, *"An Introduction to Python – Revised and Updated for Python 3.2"*, Network Theory Ltd.