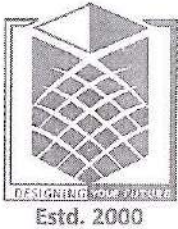


Programme Code & Name: MZ & B.E-Mechatronics Engineering



# **MUTHAYAMMAL ENGINEERING COLLEGE**

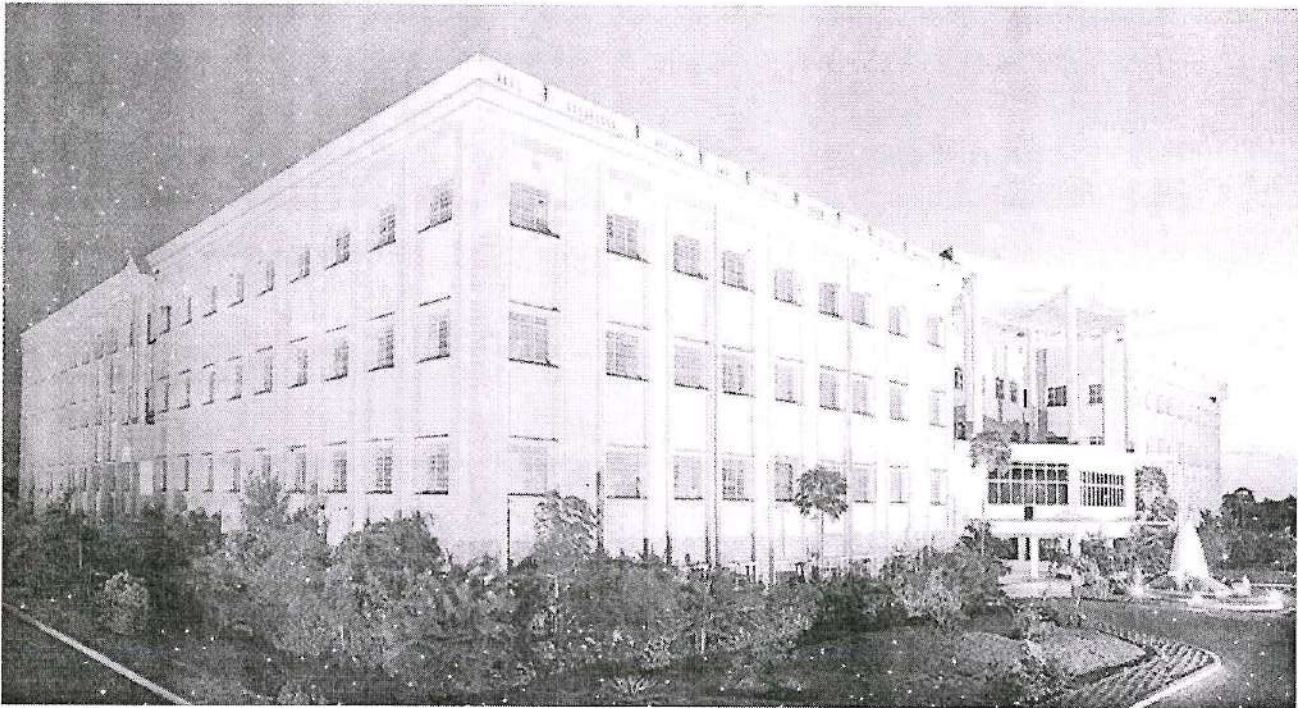
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Rasipuram - 637 408, Namakkal Dist., Tamil Nadu.

## **B.E-Department of Mechatronics**

### **Curriculum/Syllabus**

### **Regulation-2021**



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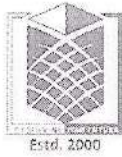
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Rasipuram - 637 408, Namakkal Dt, Tamil Nadu.

Ph. No.: 04287-220837

Email: [principal@mec.edu.in](mailto:principal@mec.edu.in).



Programme Code & Name: MZ & B.E-Mechatronics Engineering

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### DEPARTMENT OF MECHATRONICS

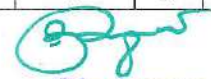
#### GROUPING OF COURSES

#### HUMANITIES AND SOCIAL SCIENCES COURSES (HS)

S.No.	Course Code	Course Title	Category	Contact Hours	Instruction Hours/Week			C
					L	T	P	
1	21HSS01	Business English	HS	3	2	0	0	2
2	21HSS02	English Communicative Skills Laboratory	HS	2	0	0	2	1
3	21HSS03	Life Skills and Workplace Psychology	HS	3	2	0	0	2
4	21HSS04	Technical English For Engineers	HS	3	2	0	0	2
5	21HSS05	Communicative English for Engineers	HS	3	2	0	0	2
6	21HSS06	Basics of Japanese Language	HS	3	2	0	0	2
7	21HSS07	Basics of French Language	HS	3	2	0	0	2

#### BASIC SCIENCES COURSES (BS)

S. No.	Course Code	Course Title	Category	Contact Hours	Instruction Hours/Week			C
					L	T	P	
1.	21BSS01	Engineering Physics	BS	4	3	0	0	3
2.	21BSS02	Physics and Chemistry Laboratory	BS	2	0	0	2	1
3.	21BSS03	Bio and Nanomaterials Sciences	BS	4	3	0	0	3
4.	21BSS04	Material Sciences	BS	4	3	0	0	3
5.	21BSS05	Physics for Mechanical Engineers	BS	4	3	0	0	3
6.	21BSS11	Engineering Chemistry	BS	4	3	0	0	3
7.	21BSS12	Environmental Science and Engineering	BS	4	3	0	0	3
8.	21BSS13	Organic Chemistry	BS	4	3	0	0	3
9.	21BSS14	Physical Chemistry	BS	4	3	0	0	3
10.	21BSS15	Applied Chemistry	BS	4	3	0	0	3
11.	21BSS16	Organic Chemistry Laboratory	BS	3	0	0	3	1
12.	21BSS17	Physical Chemistry Laboratory	BS	3	0	0	3	1
13.	21BSS21	Algebra and Calculus	BS	5	3	1	0	4
14.	21BSS22	Differential Equations and Vector Analysis	BS	5	3	1	0	4
15.	21BSS23	Transform and Partial Differential Equations	BS	5	3	1	0	4
16.	21BSS24	Discrete Mathematics	BS	5	3	1	0	4

  
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Programme Code & Name: MZ & B.E-Mechatronics Engineering

17.	21BSS25	Statistical and Queuing Model	BS	5	3	1	0	4
18.	21BSS26	Numerical Methods	BS	5	3	1	0	4
19.	21BSS27	Probability and Random Processes	BS	5	3	1	0	4
20.	21BSS28	Statistic and Numerical Methods	BS	5	3	1	0	4

**GENERAL ENGINEERING SCIENCE COURSES (GES)**

S. No.	Course Code	Course Title	Category	Contact Hours	Instruction Hours/Week			C
					L	T	P	
1.	21GES01	Programming for Problem Solving Using C	GES	3	3	0	0	3
2.	21GES02	Programming for Problem Solving Technique	GES	3	3	0	0	3
3.	21GES03	Programming in C Laboratory	GES	3	0	0	3	1
4.	21GES04	Programming in C and Python Laboratory	GES	3	0	0	3	1
5.	21GES05	Electrical and Electronic Sciences	GES	3	3	0	0	3
6.	21GES06	Mechanical and Building Sciences	GES	3	3	0	0	3
7.	21GES07	Computer Aided Drafting Laboratory	GES	3	0	0	3	1
8.	21GES08	Python Programming	GES	3	3	0	0	3
9.	21GES09	Programming in Python Laboratory	GES	3	0	0	3	1
10.	21GES10	Soft Skills Laboratory	GES	3	0	0	3	1
11.	21GES11	Electronic Devices	GES	3	3	0	0	3
12.	21GES12	Electronic Simulation Laboratory	GES	3	0	0	3	1
13.	21GES13	Electric Circuits	GES	3	2	1	0	3
14.	21GES14	Electric Circuits Laboratory	GES	3	0	0	3	1
15.	21GES15	Manufacturing Process	GES	3	3	0	0	3
16.	21GES16	Manufacturing Process Laboratory	GES	3	0	0	3	1
17.	21GES17	Mechanical and Building Sciences Laboratory	GES	3	0	0	3	1
18.	21GES18	Construction Materials	GES	3	3	0	0	3
19.	21GES19	Concepts in Product Design	GES	3	3	0	0	3
20.	21GES20	Renewable Energy Sources	GES	3	3	0	0	3

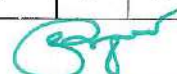
  
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21.	21GES21	Electrical Drives and Control	GES	3	3	0	0	3
22.	21GES22	Electrical Drives and Control Laboratory	GES	3	0	0	3	1
23.	21GES23	Analog and digital communication	GES	3	3	0	0	3
24.	21GES24	Digital Principles and System Design	GES	3	3	0	0	3
25.	21GES25	Digital Principles and System Design Laboratory	GES	3	0	0	3	1
26.	21GES26	Engineering Drawing	GES	4	1	0	3	3
27.	21GES27	Engineering Geology	GES	3	3	0	0	3
28.	21GES28	Engineering Mechanics	GES	4	3	1	0	3

**PROFESSIONAL CORE (PC)**

S. No.	Course Code	Course Title	Category	Contact Hours	Instruction Hours/Week			C
					L	T	P	
1.	21MZC01	Applied hydraulics and pneumatics	PC	3	3	0	0	3
2.	21MZC02	Fluid Mechanics and Machinery	PC	4	2	2	0	3
3.	21MZC03	Manufacturing Technology	PC	3	3	0	0	3
4.	21MZC04	Digital Electronics	PC	3	3	0	0	3
5.	21MZC05	Fluid mechanics and Machinery Laboratory	PC	2	0	0	2	1
6.	21MZC06	Manufacturing Technology Laboratory	PC	2	0	0	2	1
7.	21MZC07	Digital Electronics Laboratory	PC	2	0	0	2	1
8.	21MZC08	Control System Engineering	PC	3	3	0	0	3
9.	21MZC09	Strength of Materials	PC	4	2	2	0	3
10.	21MZC10	Metrology and Measurements	PC	3	3	0	0	3
11.	21MZC11	Computer Aided Design and Manufacturing	PC	3	3	0	0	3
12.	21MZC12	Microprocessors and Applications	PC	3	3	0	0	3
13.	21MZC13	Strength of Materials Laboratory	PC	2	0	0	2	1
14.	21MZC14	Microcontroller Laboratory	PC	2	0	0	2	1
15.	21MZC15	Assembly Drawing and Modeling Laboratory	PC	2	0	0	2	1



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Programme Code & Name: MZ & B.E-Mechatronics Engineering

16.	21MZC16	Dynamics of Machines	PC	4	2	2	0	3
17.	21MZC17	Power Electronics	PC	3	3	0	0	3
18.	21MZC18	Design of Machine Elements	PC	4	2	2	0	3
19.	21MZC19	Principles of Robotics	PC	3	3	0	0	3
20.	21MZC20	Robotics and Machine Vision System	PC	3	3	0	0	3
21.	21MZC21	Dynamics of Machines Laboratory	PC	2	0	0	2	1
22.	21MZC22	Power Electronics Laboratory	PC	2	0	0	2	1
23.	21MZC23	Micro Controller and PLC	PC	3	3	0	0	3
24.	21MZC24	Sensors and Signal Processing	PC	3	3	0	0	3
25.	21MZC25	Automation System Design	PC	3	3	0	0	3
26.	21MZC26	Sensors and Signal Processing Laboratory	PC	2	0	0	2	1
27.	21MZC27	Field and Service Robotics	PC	2	3	0	0	3

**PROFESSIONAL ELECTIVES (PE)**

S. No.	Course Code	Course Title	Category	Contact Hours	Instruction Hours/Week			C
					L	T	P	
1.	21MZE01	Advanced Machining Processes	PE	3	3	0	0	3
2.	21MZE02	Total Quality Management	PE	3	3	0	0	3
3.	21MZE02	Principles of Management	PE	3	3	0	0	3
4.	21MZE04	Automotive Electronics	PE	3	3	0	0	3
5.	21MZE05	Advanced Microprocessors and Microcontrollers	PE	3	3	0	0	3
6.	21MZE06	System Software	PE	3	3	0	0	3
7.	21MZE07	Automobile Engineering	PE	3	3	0	0	3
8.	21MZE08	Intellectual Property Rights	PE	3	3	0	0	3
9.	21MZE09	Design of Pressure Vessel and Piping	PE	3	3	0	0	3
10.	21MZE10	Lean Manufacturing	PE	3	3	0	0	3

  
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11.	21MZE11	Industrial Design and Applied Ergonomics	PE	3	3	0	0	3
12.	21MZE12	Process Planning and Cost Estimation	PE	3	3	0	0	3
13.	21MZE13	Operations Research	PE	3	3	0	0	3
14.	21MZE14	VLSI Design	PE	3	3	0	0	3
15.	21MZE15	Virtual instrumentation	PE	3	3	0	0	3
16.	21MZE16	Artificial Intelligence for Robotics	PE	3	3	0	0	3
17.	21MZE17	Special Machines and Controllers	PE	3	3	0	0	3
18.	21MZE18	Advanced Control Systems	PE	3	3	0	0	3
19.	21MZE19	Foundation Skills in Integrated Product Development	PE	3	3	0	0	3
20.	21MZE20	Maintenance and Safety Engineering	PE	3	3	0	0	3

**EMPLOYABILITY ENHANCEMENT COURSES (EEC)**

S. No.	Course Code	Course Title	Category	Contact Hours	Instruction Hours/Week			C
					L	T	P	
1.	21MZS01	Project work Phase -I	EEC	6	0	0	6	3
2.	21MZS02	Project work Phase -II	EEC	20	0	0	20	10
3.	21MZS03	Value Added Course /Internship	EEC	2	0	0	2	1
4.	21MZS04	Inter Disciplinary Project	EEC	3	0	0	3	1
5.	21MZS05	Constitution of India and professional Ethics	EEC	3	3	0	0	0
6.	21MZS06	Essence of Indian Traditional Knowledge	EEC	3	3	0	0	0

  
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**COURSE COMPONENT SUMMARY**

Sl. No.	Subject Area	Credits per Semester								Credits Total	AICTE Credits
		I	II	III	IV	V	VI	VII	VIII		
1.	HS	3	2	-	-	-	-	-	-	5	12
2.	BS	10	11	4	4	-	-	-	-	29	24
3.	GES	9	7	3	-	-	-	-	-	19	27
4.	PC	-	-	15	18	17	10	3	-	63	58
5.	PE	-	-	-	-	-	3	9	6	18	18
6.	OE	-	-	-	-	3	6	3	3	15	09
7.	EEC	-	-	-	-	-	1	3	10	14	15
<b>Total</b>		22	20	22	22	20	20	18	19	163	163

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Department		Mechatronics			Total Credit: 163			
Programme		B. E.						
SEMESTER - I								
Sl. No.	Course Code	Course Name	Hours/Week			Credit C	Contact Hours	
			L	T	P			
<b>THEORY</b>								
1.	21HSS01	Business English	2	0	0	2	2	
2.	21BSS21	Algebra & Calculus	3	1	0	4	4	
3.	21BSS01	Engineering Physics	3	0	0	3	3	
4.	21BSS11	Engineering Chemistry	3	0	0	3	3	
5.	21GES02	Programming for Problem Solving Techniques	3	0	0	3	3	
6.	21GES05	Electrical and Electronics Sciences	3	0	0	3	3	
<b>PRACTICAL</b>								
7	21GES07	Computer Aided Drafting Laboratory	0	0	4	2	4	
8	21GES04	Programming in C & Python Laboratory	0	0	3	1	3	
9	21HSS02	English Communicative Skills Laboratory	0	0	3	1	3	
<b>Total Credits</b>						<b>22</b>	<b>28</b>	
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Department		Mechatronics						
Programme		B.E.						
SEMESTER - II								
Sl. No.	Course Code	Course Name	Hours/Week			Credit C	Contact Hours	
			L	T	P			
<b>THEORY</b>								
1.	21HSS03	Life Skill Psychology and Ethics	2	0	0	2	2	
2.	21BSS22	Differential Equations and Vector Analysis	3	2	0	4	5	
3.	21BSS03	Bio and Nano Material Sciences	3	0	0	3	3	
4.	21BSS12	Environmental Science and Engineering	3	0	0	3	3	
5.	21GES19	Concepts in Product Design	3	0	0	3	3	
6.	21GES15	Manufacturing Processes	3	0	0	3	3	
<b>PRACTICAL</b>								
7	21BSS02	Physics and Chemistry Laboratory	0	0	2	1	2	
8	21GES16	Manufacturing Processes Laboratory	0	0	3	1	3	
<b>Total Credits</b>						<b>20</b>	<b>24</b>	

  
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Department		Mechatronics						
Programme		B.E.						
<b>SEMESTER – III</b>								
Sl. No.	Course Code	Course Name	Hours/Week			Credit C	Contact Hours	
			L	T	P			
<b>THEORY</b>								
1.	21BSS23	Transform and Partial Differential Equations	3	1	0	4	4	
2.	21MZC01	Applied hydraulics and pneumatics	3	0	0	3	3	
3.	21GES21	Electrical Drives and Control	3	0	0	3	3	
4.	21MZC02	Fluid Mechanics and Machinery	2	2	0	3	4	
5.	21MZC03	Manufacturing Technology	3	0	0	3	3	
6.	21MZC04	Digital Electronics	3	0	0	3	3	
<b>PRACTICAL</b>								
7.	21MZC05	Fluid mechanics and Machinery Laboratory	0	0	2	1	2	
8.	21MZC06	Manufacturing Technology Laboratory	0	0	2	1	2	
9.	21MZC07	Digital Electronics Laboratory	0	0	2	1	2	
<b>Total Credits</b>						<b>22</b>	<b>26</b>	
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Department		Mechatronics						
Programme		B.E.						
<b>SEMESTER - IV</b>								
Sl. No.	Course Code	Course Name	Hours/Week			Credit C	Contact Hours	
			L	T	P			
<b>THEORY</b>								
1.	21BSS28	Statistics and Numerical Methods	3	1	0	4	4	
2.	21MZC08	Control System Engineering	3	0	0	3	3	
3.	21MZC09	Strength of Materials	2	2	0	3	4	
4.	21MZC10	Metrology and Measurements	3	0	0	3	3	
5.	21MZC11	Computer Aided Design and Manufacturing	3	0	0	3	3	
6.	21MZC12	Microprocessors and Applications	3	0	0	3	3	
<b>PRACTICAL</b>								
7.	21MZC13	Strength of Materials Laboratory	0	0	2	1	2	
8.	21MZC14	Microcontroller Laboratory	0	0	2	1	2	
9.	21MZC15	Assembly Drawing and Modeling Laboratory	0	0	2	1	2	
<b>Total Credits</b>						<b>22</b>	<b>26</b>	





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Department		Mechatronics						
Programme		B.E.						
SEMESTER - V								
Sl. No.	Course Code	Course Name	Hours/Week			Credit	Contact Hours	
			L	T	P			
1.	21MZC16	Dynamics of Machines	2	2	0	3	4	
2.	21MZC17	Power Electronics	3	0	0	3	3	
3.	21MZC18	Design of Machine Elements	2	2	0	3	4	
4.	21MZC19	Principles of Robotics	3	0	0	3	3	
5.	21MZC20	Robotics and Machine Vision System	3	0	0	3	3	
6.	21MZE**	OPEN ELECTIVE-I	3	0	0	3	3	
PRACTICAL								
7.	21MZC21	Dynamics of Machines Laboratory	0	0	2	1	2	
8.	21MZC22	Power Electronics Laboratory	0	0	2	1	2	
<b>Total Credits</b>						<b>20</b>	<b>24</b>	
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Department		Mechatronics						
Programme		B.E.						
SEMESTER - VI								
Sl. No.	Course Code	Course Name	Hours/Week			Credit	Contact Hours	
			L	T	P			
1.	21MZC23	Micro Controller and PLC	3	0	0	3	3	
2.	21MZC24	Sensors and Signal Processing	3	0	0	3	3	
3.	21MZC25	Automation System Design	3	0	0	3	3	
4.	21MZE**	PROFESSIONAL ELECTIVE -I	3	0	0	3	3	
5.	21*****	OPEN ELECTIVE-II	3	0	0	3	3	
6.	21*****	OPEN ELECTIVE-III	3	0	0	3	3	
PRACTICAL								
6	21MZC26	Sensors and Signal Processing Laboratory	0	0	2	1	2	
7	21MZS04	Interdisciplinary Project	0	0	3	1	3	
<b>Total Credits</b>						<b>20</b>	<b>23</b>	

  
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Department		Mechatronics						
Programme		B.E.						
SEMESTER - VII								
Sl. No.	Course Code	Course Name	Hours/Week			Credit C	Contact Hours	
			L	T	P			
<b>THEORY</b>								
1.	21MZS06	Essence of Indian Traditional Knowledge	3	3	0	0	6	
2.	21MZC27	Field and Service Robotics	3	0	0	3	3	
3.	21MZE**	PROFESSIONAL ELECTIVE -II	3	0	0	3	3	
4.	21MZE**	PROFESSIONAL ELECTIVE -III	3	0	0	3	3	
5.	21MZE**	PROFESSIONAL ELECTIVE -IV	3	0	0	3	3	
6.	21*****	OPEN ELECTIVE-IV	3	0	0	3	3	
<b>PRACTICAL</b>								
6.	21MZS01	Project work Phase –I	0	0	6	3	6	
<b>Total Credits</b>						<b>18</b>	<b>27</b>	
		<b>MUTHAYAMMAL ENGINEERING COLLEGE</b> (An Autonomous Institution) (Approved by AICTE & Affiliated to Anna University), RASIPURAM – 637 408					<b>CURRICULUM</b> UG R - 2019	
Department		Mechatronics						
Programme		B.E.						
SEMESTER - VIII								
Sl. No.	Course Code	Course Name	Hours/Week			Credit C	Contact Hours	
			L	T	P			
1.	21MZS05	Constitution of India and Professional Ethics	3	0	0	0	3	
2.	21MZE**	PROFESSIONAL ELECTIVE -V	3	0	0	3	3	
3.	21MZE**	PROFESSIONAL ELECTIVE -VI	3	0	0	3	3	
4.	21*****	OPEN ELECTIVE-V	3	0	0	3	3	
<b>PRACTICAL</b>								
5.	21MZS02	Project work Phase -II	0	0	20	10	20	
<b>Total Credits</b>						<b>19</b>	<b>32</b>	

  
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 Rasipuram, Namakkal Dist. 637 4088

21HSS01

BUSINESS ENGLISH

L T P C  
2 0 0 2

**COURSE OBJECTIVES**

- To make effective communication in business situations.
- To use English accurately, appropriately and fluently in different situations (academic, social and professional) and familiarize themselves with all speech sounds in English
- To inculcate the effective email writing skills for better business communication.
- To ensure that learners to understand the fundamentals of Business writing and interviews.
- To prepare for and participate in presentations on business topics.

**COURSE OUTCOMES**

- Employ strategies to be a successful employee or employer in the workplace.
- Write cohesively and coherently and flawlessly avoiding grammatical errors, using a wide vocabulary range, organizing their ideas logically on a topic.
- Able to use electronic technology in business communication
- Understanding of lectures, talks and interviews on business topics delivered by authentic business specialists
- Use the phrases and sentences clearly in their written communication

**UNIT I COMMUNICATION AND BUSINESS ENGLISH**

6

Communication meaning – Objectives – Importance – Process of Communication – Barriers to communication – Effective Communication - Make up sentences- the text about business- Business Operations- conversation - giving sentences unity-arranging sentences for clarity- Accent on positive Language - Coherence- Transitional words

**UNIT II GRAMMAR & VOCABULARY**

6

Phrases & Clauses- Kinds of Sentences - Types of sentences and sentence patterns – GRE Vocabulary – Prefix & Suffix - Synonyms - Antonyms - Word Formation- Error Spotting- Sentence Correction- Word Analogy- Idioms and Phrases- Direct and Indirect Speech- 'If' Conditionals

**UNIT III WRITING CV AND LETTER OF APPLICATION**

6

Writing for communicative purposes [Letters – official and personal, Messages / Notices, Reports , Emails, Advertisements , Structure of the Sales Letter- Letter of Authorization- Letter of Recommendation.-Application for a job (covering letter and CV) - Creative Writing ( Stories, Poems,Dialogues )

**UNIT IV JOB INTERVIEWS AND RECRUITMENT**

6

Job Interviewing- appearance and body language - Attending interviews -Public Speaking and Oral Reporting- Overcome Nervousness- Making Formal Speech-Use of Voice- Using Telephone -Use of Visual Aids- Interviewing People-Recruitment - Asking for Information- Asking for Action- Orders- Inquiries about people-claims –Refusing Request- Adjustment Refusals- Credit Refusal- Text Types - Academic Writing [ Paragraphs , Essays ]

**UNIT V PRESENTATION AND GRAMMAR USAGE**

6

Presentation – Types and Importance of Presentation – Standards of Punctuation – Apostrophe, Brackets, Colon, Comma etc...Standards for Grammar- Adjective-Adverb Confusion, Subject-Verb Agreement, Dangling Modifier, Parallelism.

**TOTAL HOURS: 30 Hours**

  
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**TEXT BOOKS:**

Sl.No	Author(s)	Title of the Book	Publisher	Year of Publication
1.	Lesikar, Bamford	Basic Business Communication"	1 <sup>st</sup> Canadian Edition (IRWIN DORSEY), Von Hoffmann Press,	1993
2.	Simon Sweeney	English For Business	Cambridge University Press	2008

**REFERENCE BOOKS:**

SL.No	Author(s)	Title of the Book	Publisher	Year of Publication
1.	Mindscales	English For Technologists and Engineers	Department of English, Anna University, Chennai,	2012
2.	Rutherford, Andrea.	J Basic Communication Skills for Technology.	Pearson New Delhi.	2001
3.	Viswamohan, Aysha.	English for Technical Communication	Tata McGraw-Hill, New Delhi.	2008
4.	Aspinall Tricia, Bethell George.	Test your Business Vocabulary in Use.	Cambridge University Press	2003
5.	Cambridge ESOL.	BEC 1, 3.	Cambridge University Press,	2001



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**Rasipuram, Namakkal Dist 637 408.**

**COURSE OBJECTIVES**

- To instill the basic communication concepts to enhance students' communication skills through various lab sessions.
- To understand the importance of listening and speaking in language acquisition process
- To speak English accurately, appropriately and fluently in different situations (academic, social and professional) and familiarize themselves with all speech sounds in English
- To help students develop the ability to communicate effectively in spoken English and develop their soft skills and interpersonal skills.
- To increase employability by developing students' communication skills in English.

**COURSE OUTCOMES**

- Speak clearly, confidently, comprehensibly, and communicate with one or many listeners using appropriate communicative strategies.
- Write cohesively and coherently and flawlessly avoiding grammatical errors, using a wide vocabulary range, organizing their ideas logically on a topic.
- Read different genres of texts adopting various reading strategies.
- Listen/view and comprehend different spoken discourses/excerpts in different accents
- Communicate with others confidently

**UNIT I FORMAL & INFORMAL CONVERSATION PRACTICE**

Role Play conversations - with family members, neighbours, friends, relatives etc. Simple expressions - agreeing / disagreeing, persuading, wishing, consoling, advising, arguing, expressing opinions etc.- Professional dialogues with superiors - Conversation with different professionals in government and corporate Offices, Official Meetings, educational Institutions, (At the railway junction, malls, post office, bank) etc- every day usage of English

**UNIT II ORAL REVIEW, RADIO SHOW & NARRATIVE TECHNIQUES**

Oral review of books - Presentation of various radio programs like news, announcements, advertisements, entertainment programs etc. as a team activity. Understanding the basic narrative techniques - Narrating short stories. Narrating real life experiences, Oral interpretation of charts, tables, graphs.

**UNIT III RESUME / LETTER WRITING**

Preparation of resume - structure - Types of resume - writing the vision statement - Objectives - Types of Letter - Job Application - accepting / declining a Job offer.

**UNIT IV PRESENTATION SKILLS & GROUP DISCUSSION**

Elements of effective presentation - Structure of a presentation - Speech acts - effective use to presentation tools - Audience analysis - Preparing the PPT slides - Video samples- Importance of GD - in the selection process - Structure of a GD - Moderator - led and other GDs - Strategies inGD - Team work - Body Language - Mock GD -Video samples

**UNIT V INTERVIEW SKILLS**

Kinds of interviews - one to one, group interview, telephone interview, online interview, stress interview - Required Skills - Corporate culture - Mock interviews-Video samples.

**TEXT BOOKS:**

Sl.No	Author(s)	Title of the Book	Publisher	Year of Publication
1.	Sobana.S, Manivannan.R and Immanuel. G,	Communication and Soft Skills	VK Publications, Sivakasi. Chairman Board of Studies	2016

**REFERENCE BOOKS:**

Sl.No	Author(s)	Title of the Book	Publisher	Year of Publication
1.	Anderson, P.V.	Technical Communication	Thomson Edition, New Delhi	2007
2.	Rizvi, Ashraf. M	Effective Technical Communication	Tata McGraw-Hill, New Delhi	2005
3.	Dutt, Kiranmai P and Geetha Rajeevan	Basic Communication Skills .	Foundation Books, New Delhi.	2007



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**COURSE OBJECTIVES:**

- To inculcate critical thinking process and to prepare them on problem solving skills.
- To enable learners to perform in a team.
- To learn leadership qualities and practice them.
- To make the learners to use grammar error free sentences.
- To introduce the essentials of psychology at workplace and gain insights about work place behavior

**COURSE OUTCOMES:**

- Able to think critically on a particular problem.
- Able to do good performance in a team.
- Able to become an effective leader.
- Write cohesively and coherently and flawlessly avoiding grammatical errors, using a wide vocabulary range, organizing their ideas logically on a topic.
- Students will be able to classify and utilize their knowledge In Psychology in the process of employment

**UNIT I**

**CRITICAL THINKING & PROBLEM SOLVING**

6

Creativity, Lateral thinking, Critical thinking, Multiple Intelligence, Problem Solving, Six thinking hats Mind Mapping & Analytical Thinking.

**UNIT II TEAMWORK**

6

Groups, Teams, Group Vs Teams, Team formation process, Stages of Group, Group Dynamics, Managing Team Performance & Team Conflicts.

**UNIT III LEADERSHIP SKILLS**

6

Leadership, Levels of Leadership, Making of a leader, Types of leadership, Professional Etiquette – Prevention of Sexual Violence and Misconduct on Campus.

**UNIT IV GRAMMAR & VOCABULARY**

6

Single Word substitutes – verb patterns- use of dialogue writing - tenses – voices – use of conditionals – comparative Adjectives (affirmative and negative) – expanding– nominal compounds – articles – use of prepositions - phrasal verbs – British and American vocabulary – error detection – abbreviations and acronyms - Instruction - Recommendation.

**UNIT V WORKPLACE PSYCHOLOGY**

6

Nature and Development of Industrial/Work Psychology - Employee Selection Techniques, Fair Employment Practices Recruitment- Biographical Information, Interviews, References & Letters of Recommendation Job Analysis- Types, Newer Developments.

**TOTAL HOURS: 30 Hours**



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**TEXT BOOKS:**

Sl.No	Author(s)	Title of the Book	Publisher	Year of Publication
1.	Matthewman, L., Rose, A. & Hetherington, A	Work Psychology	Oxford University Press, India.	2009
2.	Dr.K.Ravikanth Roa., Dr. P. Dhinakar	Life skills Education	Neel Kamal	2016

**REFERENCE BOOKS:**

Sl.No	Author(s)	Title of the Book	Publisher	Year of Publication
1.	Larry James	The First Book of Life Skills	First Edition; Embassy Books	2016
2.	Shalini Verma	Development of Life Skills and Professional Practice	First Edition; Sultan Chand (G/L) & Company	2014
3.	Viswamohan, Aysha.	English for Technical Communication.	Tata McGraw-Hill, New Delhi.	2008
4.	Landy, F. J. & Conte, J. M	Work in the 21 <sup>st</sup> Century: An Introduction to Industrial and Organizational Psychology.	Wiley India: New Delhi: 2 <sup>nd</sup> Edition.	2010
5.	Schultz, D. & Schultz, S. E.	Psychology and Work Today	Pearson Education : New Delhi.	2002



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21HSS04

TECHNICAL ENGLISH FOR ENGINEERS

L T P C  
2 0 0 2

**COURSE OBJECTIVES**

- To enable learners of Engineering and Technology develop their basic communication skills in English.
- To emphasize specially the development of speaking skills amongst learners of Engineering and Technology.
- To ensure that learners use the electronic media such as internet and supplement the learning materials used in the classroom.
- To inculcate the habit of reading and writing leading to effective and efficient communication.
- To make the learners to use the phrase and clauses error free.

**COURSE OUTCOMES**

- Speak clearly, confidently, comprehensibly, and communicate with one or many listeners using appropriate communicative strategies.
- Write cohesively and coherently and flawlessly avoiding grammatical errors, using a wide vocabulary range, organizing their ideas logically on a topic.
- Read different genres of texts adopting various reading strategies.
- listen/view and comprehend different spoken discourses/excerpts in different accents
- use the phrases and sentences clearly in their written communication

**UNIT I**

**GRAMMAR & VOCABULARY**

6

Word formation with prefixes and suffixes – synonyms and antonyms – verb patterns – tenses – voices – use of conditionals – comparative adjectives (affirmative and negative) – expanding– nominal compounds – articles – use of prepositions - phrasal verbs – British and American vocabulary.

**UNIT II**

**LISTENING**

6

Extensive listening – listening for general content – listening to fill up gapped texts – intensive listening – listening for specific information: retrieval of factual information – listening to identify topic, context, function, speaker's opinion, attitude, etc. – global understanding skills and ability to infer, extract gist and understand main ideas

**UNIT III**

**SPEAKING**

6

Verbal and non verbal communication – speech sounds – syllables – word stress (structures and content words) – sentences stress – intonation – pronunciation drills, tongue twisters –developing confidence – introducing oneself – asking for or eliciting objects – giving instructions

**UNIT IV**

**READING**

6

Exposure to different reading techniques – reading for gist and global meaning – predicting the content – text – identifying the topic sentence and its role in each paragraph – scanning – inferring / identifying lexical and contextual meanings – transfer of information / guided note-making – understanding discourse coherence – sequencing of sentences – cloze reading.

**UNIT V**

**WRITING**

6

Introductions to the characteristics of technical style – writing definitions and descriptions – paragraph writing (topic sentence and its role, unity, coherence and use of cohesive expressions) – process description (use of sequencing connectives) – comparison and contrast – formal letter writing (letter to the editor, letter for seeking practical training, and letter for undertaking project works in industries)

**TOTAL HOURS: 30 Hours**

**TEXT BOOKS:**

Programme Code & Name: MZ & B.E-Mechatronics Engineering

Sl.No	Author(s)	Title of the Book	Publisher	Year of Publication
1.	Raman, Meenakshi & Sangeetha Sharma.	Technical Communication: Principles and Practice. Oxford University Press,	Oxford University Press, New Delhi.	2011
2	Rizvi, Ashraf. M.	Effective Technical Communication.	Tata McGraw-Hill, New Delhi.	2005

REFERENCE BOOKS:

Sl. No	Author(s)	Title of the Book	Publisher	Year of Publication
1.	Regional Institute of English	English for Engineers.	Cambridge University Press, New Delhi.	2006
2	Mindscapes	English For Technologists and Engineers	Department of English, Anna University, Chennai,	2012
3	Rutherford, Andrea.	J Basic Communication Skills for Technology	Pearson, New Delhi.	2001
4	Viswamohan, Aysha.	English for Technical Communication.	Tata McGraw-Hill, New Delhi.	2008
5	Raman, Meenakshi & Sangeetha Sharma.	Technical Communication: Principles and Practice. Oxford University	Press, New Delhi.	2011

  
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21HSS05

COMMUNICATIVE ENGLISH FOR ENGINEERS

L T P C  
2 0 0 2

**COURSE OBJECTIVES**

- To understand the importance of listening and speaking in language acquisition process
- To engage in conversation intelligibly
- To use English accurately, appropriately and fluently in different situations (academic, social and professional) and familiarize themselves with all speech sounds in English
- To write academic, communicative and creative pieces of writing
- To devise different tasks / methods to enhance their learners' communication skills

**COURSE OUTCOMES**

- Speak clearly, confidently, comprehensibly, and communicate with one or many listeners using appropriate communicative strategies.
- Write cohesively and coherently and flawlessly avoiding grammatical errors, using a wide vocabulary range, organizing their ideas logically on a topic.
- Read different genres of texts adopting various reading strategies.
- listen/view and comprehend different spoken discourses/excerpts in different accents
- Communicate with others confidently

**UNIT I GRAMMAR & VOCABULARY**

6

Phrases & Clauses- Kinds of Sentences - Types of sentences and sentence patterns – GRE Vocabulary - Word Formation- Error Spotting- Sentence Correction- Word Analogy- Idioms and Phrases-Direct and Indirect Speech- 'If' Conditionals

**UNIT II LISTENING**

6

Listening processes: top-down and bottom-up skills - Listening strategies - Sounds of English: Consonants, vowels and diphthongs - Phonemic transcription, tongue twisters, words often mispronounced - Word stress and sentence stress: content words, structural words, strong forms, weak forms - Intonation patterns - Language functions : [Inviting-accepting/declining invitation - Offering /accepting/ refusing help - Thanking/ responding to thanks - Congratulating , Complimenting - Apologizing/ accepting an apology

**UNIT III SPEAKING**

6

Greeting - Introducing Oneself - Invitation - Making Request - Expressing Gratitude - Complimenting and Congratulating - Expressing Sympathy - Apologizing - Asking for Information - Seeking Permission - Complaining and Expressing Regret - Using English in Real Life Situation [ At the Bank/ post office/ College office - At the Green Grocer - At the Temple - At the College Canteen or Restaurant - At the Police station - At the Railway Station/ Bus Station - At the Medical Shop - At the Library

**UNIT IV READING**

6

Importance of Reading - Why develop reading habits among students and How - Reading techniques [Skimming , Scanning , Intensive reading , Extensive ] Reading different text types [ Menu ,Email , Letters , Cartoons , Advertisements, Recipe , Articles , Literary texts – stories, plays, poems, Biographies] – identifying lexical and Contextual meaning- Understanding Discourse Coherence – sequencing of sentences

**UNIT V WRITING**

6

Developing Proficiency in Writing - Writing for communicative purposes [Letters – official and personal , Messages / Notices, Reports , Emails , Advertisements ,Application for a job (covering letter and CV) - Creative Writing ( Stories, Poems , Dialogues )

**TOTAL HOURS: 30**

**TEXT BOOKS:**

Sl. No	Author(s)	Title of the Book	Publisher	Year of Publication

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Programme Code & Name: MZ & B.E-Mechatronics Engineering

1.	Raman, Meenakshi & Sangeetha Sharma.	Technical Communication: Principles and Practice.	Oxford University Press, New Delhi.	2011
2	Rizvi, Ashraf. M	Effective Technical Communication.	Tata McGraw-Hill New Delhi.	2005

REFERENCE BOOKS:

Sl. No	Author(s)	Title of the Book	Publisher	Year of Publication
1	Regional Institute of English	English for Engineers. Cambridge University Press	New Delhi.	2006.
2	Dr.Gunasekaran, Vishu "	Technical English Work Book.	Vishnu "Print Media, Krishna Publications	2011
3	Rutherford, Andrea.	J Basic Communication Skills for Technology.	Pearson, New Delhi.	2001
4	Viswamohan, Aysha.	English for Technical Communication.	Tata McGraw-Hill, New Delhi.	2008
5	Raman, Meenakshi & Sangeetha Sharma.	Technical Communication: Principles and Practice.	Oxford University Press, New Delhi	2011



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Rasipuram, Namakkal Dist 637 408.

**COURSE OBJECTIVES:**

- To develop the reading skill of the students and to familiarize them with Japanese language.
- To instill the communication concepts and enhance the students' conversational skill through various practice sessions.
- To familiarize them with a variety of words and pronunciation.
- To develop the receptive skills such as listening, writing, reading and to make the students well-versed in speaking.
- To assist them in improving their vocabulary in Japanese.

**COURSE OUTCOMES:**

- Learn and write Japanese alphabet.
- Develop their pronunciation skill in Japanese language.
- Enrich the vocabulary in Japanese language.
- Speak in Japanese at various occasions.
- Understand and communicate by constructing sentences.

**UNIT I INTRODUCTION OF JAPANESE LANGUAGE**

6

Introduction about Japan - Japanese people - Language and their culture - Importance of Japanese Language Learning - Japanese writing system - Hiragana - Basic Hiragana syllables - Hiragana with Diacritical Marks - Hiragana words and pronunciation - Katakana - Basic Katakana syllables - Katakana with Diacritical Marks - Katakana words and pronunciation.

**UNIT II BASIC WORDS**

6

Japanese Greetings and daily expressions - Culture and Behavior of Japanese People and body language - bowing - Time of the day; calendar; counting using Japanese numerical classifiers.

**UNIT III PHRASES & CLAUSES**

6

Grammar - Sentence patterns and examples - Making Sentences - Present, Past and Future, Progressive & Perfect Tense - Time- Asking question for numbers and time - Telephone number practice - Translate English into Japanese practice - Describe each person using given cues - Self-Introduction about students - Time and Age making comparisons; talking of daily activities; giving and receiving; shopping; making requests.

**UNIT IV BASIC TENSES**

6

Grammar - Making Sentences - Present, Past and Future, Progressive & Perfect Tenses-verb and its forms- particles - pattern and examples -Adverbs - using frequency adverbs -Sentence making using time and verb with direct object - Translate English sentence to Japanese sentence - Making question sentence and answers.

**UNIT - V KEY BELIEFS AND VALUES OF JAPANESE SOCIETY**


6

Japanese social interaction - Harmony - Order - Self-development - the three of the most important values. Basic ideas about self and the nature of human society- several religious and philosophical traditions.

**TOTAL HOURS: 30**

**TEXT BOOKS:**

SL. No	Author(s)	Title of the Book	Publisher	Year of Publication


  
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Programme Code & Name: MZ & B.E-Mechatronics Engineering

1.	George Trombley , Yukari Takenaka	Japanese from Zero! 1: Proven Techniques to Learn Japanese for Students and	Volume 1) 6th Edition Bay Foreign Language Books Ltd,	2015
2	Living Language Japanese, Complete Edition	Japanese reading & writing guide, and free online learning Paperback	Unabridged	2012

REFERENCE BOOKS:

S.No	Author(s)	Title of the Book	Publisher	Year of Publication
1	Pimsleur	Japanese Level 1 CD: Learn to Speak and Understand Japanese with Pimsleur Language Programs Pimsleur;	3 <sup>rd</sup> edition (Comprehensive)	2002
2	Pimsleur	Japanese Level 2 CD: Learn to Speak and Understand Japanese with Pimsleur Language Programs Pimsleur;	Pimsleur; 3 edition	October 1, 2002
3	Pimsleur	Japanese Level 3 CD: Learn to Speak and Understand Japanese with Pimsleur Language Programs Pimsleur	Pimsleur; 3 edition	October 1, 2002
4	Eriko Sato	Practice Makes Perfect Basic Japanese 1st Edition, McGraw-Hill Education	Pimsleur; 1 edition	April 1, 2014
5	Mr Tae K Kim,	A Guide to Japanese Grammar: A Japanese approach to learning Japanese grammar ,	Create Space Independent Publishing Platform	January23, 2014

  
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**COURSE OBJECTIVES**

200 2

- To develop the reading skill of the students and to familiarize them with French language.
- To instill the communication concepts and enhance the students' conversational skill through various practice sessions.
- To familiarize them with a variety of words and pronunciation.
- To develop the receptive skills such as listening, writing, reading and to make the students well-versed in speaking.
- To assist them in improving their vocabulary in French.

**COURSE OUTCOMES**

- Learn and write French alphabet.
- Develop their pronunciation skill in French language.
- Enrich the vocabulary in French language.
- Speak in French at various occasions.
- Understand and communicate by constructing sentences.

**UNIT I BASIC GRAMMAR 6**

Alphabets - Numbers 0-31 - Nouns - Definite articles - Indefinite articles - verbs - Greetings- adjectives -possessive adjectives - countries and nationality - months of the year

**UNIT II BASIC VOCABULARY 6**

Personality- dresses - colours - interests - adjectives: masculine / feminine - singular / plural - negation -regular verbs

**UNIT III BASIC PHRASES 6**

Time - days of the week - house - numbers 32-69 - irregular verbs : aller, faire, prendre - negation : ne... jamais - questions - near future - pronominal verbs - pronoun : 'on'

**UNIT IV SPEAKING 6**

Name of dishes - shopping - at the restaurant - recipe - numbers: 70 - 1000 - partitive articles: du, de la, del', des - passé composé and negation - irregular past participles- preposition à + definite article

**UNIT V CULTURE AND SOCIETY 6**

Town – directions - public transport - preposition à/en + transport - irregular past participles - adverbs

**TOTAL HOURS: 30 Hours**

**TEXTBOOK:**

Sl.No	Author(s)	Title of the Book	Publisher	Year of Publication
1.	Régine Mérieux and Yves Loiseau.	Connexions 1	Didier	2004

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Resipuram, Namakkal Dist 637 406.



Programme Code & Name: MZ & B.E-Mechatronics Engineering

2.	Rosemary Schell	French for Beginners	Maanu Graphics	2013
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REFERENCE BOOKS:

Sl. No	Author(s)	Title of the Book	Publisher	Year of Publication
1.	R.de Roussy de Sales	French Verbs Drills 5 <sup>th</sup> Edition	McGraw-Hill Education	2017
2.	Annie Heminway	Complete French Grammar	McGraw-Hill Education	2016
3.	David M.Srillman and Ronni L.Gordon	French Vocabulary Drills	McGraw-Hill Education	2014
4	Frederic Bibard	Fluent in French	Talk in French	2016
5.	Gaëlle Graham	Complete French	Teach Yourself	2010



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**COURSE OBJECTIVES**

- To acquire the knowledge in acoustical engineering and ultrasonic
- To enrich the principles involved in laser technology and its applications
- To understand the concept and significance in fiber optics
- To acquire the knowledge on classification and properties of different types of crystal structures
- To understand the concepts in elasticity and transfer of heat energy through materials

**COURSE OUTCOMES**

- A knowledge of contemporary issues on ultrasonic studies
- An ability to apply knowledge in laser technology for engineering practice
- An ability to solve problems in fiber optics technology
- An ability to analyze the crystal structures by applying crystallographic parameters
- An ability to apply knowledge in elasticity and heat transfer

**UNIT I ACOUSTICS AND ULTRASONICS**

9

Introduction of acoustics – Classification of sound-Weber-Fechner law- Reverberation – Reverberation time – Factors affecting acoustics of building and its remedy - Absorption coefficient – Measurement of Absorption coefficient. Introduction to ultrasonics– properties - Detection of ultrasonic waves, Magnetostriction effect - Magnetostriction generator – piezoelectric effect - piezoelectric generator– Cavitations - SONAR - Non Destructive Testing – pulse echo system, through transmission and reflection modes.

**UNIT II LASERS**

9

Introduction – Principle of Spontaneous emission and stimulated emission. Population inversion - pumping methods. Einstein's A and B coefficients – derivation - Types of lasers – He-Ne, Nd-YAG, Semiconductor lasers (homojunction & heterojunction) - Industrial Applications - Lasers in welding, cutting, heat treatment – Medical applications - Holography (construction & reconstruction).

**UNIT III FIBRE OPTICS AND ITS APPLICATIONS**

9

Principle and propagation of light in optical fibers – Numerical aperture and Acceptance angle - Classification based on materials, refractive index profile – Double crucible technique of fiber drawing – Splicing - Loss in optical fiber – attenuation, dispersion, bending - Fibre optical communication system (Block diagram) – Fiber optic Light sources - Detectors - Endoscope.

**UNIT IV - CRYSTAL PHYSICS**

9

Lattice – Unit cell – Bravais lattice – Lattice planes – Miller indices – d spacing in cubic lattice – Calculation of number of atoms per unit cell – Atomic radius – Coordination number – Packing factor for SC, BCC, FCC and HCP structures – Crystal defects – point, line and surface defects- Burger vector.

**UNIT V PROPERTIES OF MATTER AND THERMAL PHYSICS**

9

Elasticity – Hook's law – Relationship between three moduli of elasticity (Qualitative) – stress and strain diagram – Poisson's ratio – factors affecting elasticity – bending moment – depression of a cantilever – young's modulus by uniform bending – I shaped girders. Modes of heat transfer – thermal conductivity – Newton's law of cooling – linear heat flow – lee's disc method – radial heat flow – rubber tube method – conduction through compound media (series and parallel method)

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Programme Code & Name: MZ & B.E-Mechatronics Engineering

TOTAL: 45 Hours

**TEXT BOOKS:**

Sl.No	Author	Title of the Book	Publisher	Year of Publication
1.	B.N.Sankar & S.O.Pillai,	Engineering Physics I	New Age International Publishers	2015
2	Rajagopal K	Engineering Physics	PHI, New Delhi	2011

**REFERENCE BOOKS:**

Sl.No	Author	Title of the Book	Publisher	Year of Publication
1.	Tamilarasan.K &Prabhu.K	Engineering Physics-I	Mc Graw Hill Education	2015
2	Palanisamy P.K	Engineering Physics	SCITECH Publications	2011
3	Senthilkumar G	Engineering Physics I	VRB Publishers	2011
4	Gaur R.K. and Gupta S.L.	Engineering Physics	Dhanpat Rai publishers	2009
5	D.K.Bhattacharya & Poonam Tandon	Engineering Physics	Oxford university Press	2017

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**COURSE OBJECTIVES**

- The students will understand the ultrasonic sounds in liquid medium.
- The students can demonstrate laser and its propagation through optics.
- To understand thermal conductivity of bad conductors.
- The students familiar with characteristics of water and able to estimate hardness and alkalinity of water sample.
- The students will understand the basic concepts conductometric and pH metric titrations.

**COURSE OUTCOMES**

- Ability to determine the velocity of ultrasonic sound in any liquid.
- Capable of understanding the concept of laser and its propagation through Optical fiber.
- Ability to determine the thermal conductivity of the bad conductor and determine the modulus of elasticity.
- Able to analyze hardness and alkalinity of water sample.
- Able to estimate the amount of acid by conductometric, potentiometric and pH metric titrations.

**LIST OF EXPERIMENTS IN PHYSICS**


1. (a) Determination of Wavelength and particle size using Laser, (b) Determination of acceptance angle in an optical fiber.
2. Determination of Velocity of sound and Compressibility of liquid – Ultrasonic Interferometer
3. Determination of Thermal Conductivity of a bad conductor – Lee’s Disc method.
4. Determination of Young’s Modulus by uniform bending method
5. Determination of Moment of Inertia by rigidity modulus

**LIST OF EXPERIMENTS IN CHEMISTRY**

1. Determination of hardness of water by EDTA Method
2. Determination of alkalinity in water sample
3. Conductometric titration of HCl vs NaOH
4. Estimation of hydrochloric acid by pH meter
5. Determination of molecular weight of polymer using Oswald Viscometer

**REFERENCE BOOKS**

Sl. No	Author(s)	Title of the Book	Publisher	Year of Publication
1.	Dr.G.Senthilkumar	Physics Laboratory Manual	VRB Publishers	2017
2.	Dr.P.Mani	Engineering Physics Practical	Dhanm Publications	2017
3.	R.Veerawamy, V.Venkateswaran	Basic Principles of Practical Chemistry	Sultan Chand & Sons	2013
4.	P.Meena Sundari	Engineering Chemistry Laboratory Manual	KKS Publishers	2015

  
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### COURSE OBJECTIVES

- To understand the classification and properties of materials
- To acquire the knowledge in basics of biomaterials
- To enrich the principles involved in nanotechnology
- To understand the synthesis techniques of nanomaterials
- To educate the basic concepts of carbon nanotubes

### COURSE OUTCOMES

- A knowledge on basics of materials
- A knowledge of contemporary issues on bio materials
- An ability to apply knowledge in nanomaterials and its applications
- An ability to solve problems in nanotechnology
- An ability to apply knowledge in carbon nanotubes

#### Unit- I Introduction to Materials

9

Postulates of Rutherford and Bhor atom model-Bhor Theory of Hydrogen atom - Classification of atomic bonds-primary and secondary bonds - Classification of Materials: metals-ceramics-composites-types and its general properties-Significance of Phase diagram.

#### Unit- II Basics of Biomaterials

9

Definition of biomaterials and biocompatibility- classification of biomaterials- shape memory alloys-properties and applications-properties of NiTiNol -properties and application of alumina-polymers in biomedical use-schematic diagram and working of heart lung machine-contact lenses.

#### Unit- III Introduction to Nanotechnology

Definition of Nanoscale system -Theory of Nanotechnology -surface to volume ratio-Classification of nano structures based on dimension: 0D, 1D, 2D, 3D materials - Applications of Nanotechnology

**Unit- IV Synthesis Of Nanomaterials** Bottom up and top down process, difference between bottom up and top down process, Electro deposition method - Plasma arcing method -Ball milling-Chemical vapour deposition-Pulsed laser deposition method- Lithography-Electron beam lithography -properties of nanomaterials-Applications.

#### Unit V Carbon Nano Materials

Bonding in carbon structures-Carbon nanotube types - Single walled and multi walled carbon nanotubes-structure and properties - Synthesis of carbon nanotube: arc discharge-


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chemical vapour deposition method –applications.

**TEXT BOOKS:**

Sl.No	Author(s)	Title of the Book	Publisher	Year of Publication
1.	Pillai S.O.	Solid State Physics	New Age International(P) Ltd	2009
2	Sujata V. Bhatt	Biomaterials	Second Edition Narosa Publishing House	2005
3	T.Pradeep	TheEssentials:Understan ding Nanoscience and Nanotechnology	TataMcGraw- Hill PublishingCompany Limited,NewDelhi,	2008

**REFERENCE BOOKS:**

Sl.No	Author(s)	Title of the Book	Publisher	Year of Publication
1.	James F. Shackelford, Madanapalli K. Muralidhara	Introduction to Materials Science for Engineers	Sixth Edition, Pearson Education Inc.	2007
2	C.M.Agrawal, J.L.Ong, M.R.Appleford ,Gopinath Mani	Introduction to Biomaterials basic theory with Engineering Applications	Cambridge University Press New York	2014
3	B.D. Ratner, A.S. Hoffman F.J. Schoen, J.E. Lemons	Biomaterials Science an Introduction to Materials in Medicine	2 <sup>nd</sup> Edition Elsevier Academic Press, California, USA	2004
4	C.P. Poole and F.J. Owens.	Introduction to Nanotechnology	Wiley, New Delhi	2007
5	M. Meyyappan	Carbon Nanotubes Science & Applications	CRC Pres, Boca Ranton, London, New York, Washington D.C	2005

  
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21BSS04

MATERIAL SCIENCES

L T P C  
3 2 0 4

**COURSE OBJECTIVES**

- To understand the types of atomic structures in crystalline materials
- To understand the basic concepts in magnetism and superconductivity
- To impart knowledge on conducting and semiconducting materials
- To educate the concept of dielectric materials
- To understand the basic concepts in modern engineering materials

**COURSE OUTCOMES**

- An ability to identify the types of crystalline structure
- An ability to apply properties on magnetism and superconducting materials
- An ability to apply knowledge on superconducting materials and its applications
- An ability to apply knowledge on dielectric materials
- An ability to use the synthesis techniques in modern materials

**UNIT I CRYSTAL PHYSICS**

9

Lattice – Unit cell – Bravais lattice – Lattice planes – Miller indices – d spacing in cubic lattice – Calculation of number of atoms per unit cell – Atomic radius – Coordination number – Packing factor for SC, BCC, FCC and HCP structures – Diamond and Graphite structures (Qualitative) – Crystal growth techniques – Bridgeman technique and Czochralski method.

**UNIT II CONDUCTORS AND SEMICONDUCTORS**

9

Classical free electron theory of metals – Electrical and thermal conductivity – Wiedemann-Franz law – Quantum theory – Fermi distribution function – Effect of temperature on Fermi Function – Density of energy states – carrier concentration in metals. Properties of semiconductors - classification – Elemental and Compound semiconductors – Intrinsic and Extrinsic semiconductors - carrier concentration derivation in intrinsic semiconductors - band gap determination - Hall effect – Determination of Hall coefficient – Experimental method - Applications of Hall Effect.

**UNIT III MAGNETIC AND SUPERCONDUCTING MATERIALS**

9

Origin of magnetic moment – Types – Dia, para, Ferro, anti ferromagnetic materials – Domain theory – Hysteresis – Soft and hard magnetic materials – Ferrites – preparation, properties and applications. Properties of superconducting materials - BCS theory of superconductivity (Qualitative) - Types of super conductors – High  $T_c$  superconductors – Applications of superconductors – SQUID, Cryotron, Magnetic levitation.

**UNIT IV DIELECTRIC MATERIALS**

9

Basic definitions - Electrical susceptibility – dielectric constant – Types of polarization - electronic, ionic, orientational and space charge polarization – frequency and temperature dependence of polarisation – internal field – Clausius – Mosotti relation (derivation) – dielectric loss – dielectric breakdown – uses of dielectric materials (capacitor and transformer) – ferroelectricity and applications

**UNIT V ADVANCED ENGINEERING MATERIALS**

9

Metallic glasses: Preparation, properties and applications – metallic glasses as transformer cores. Shape memory alloys (SMA): Types and Characteristics - properties of NiTi alloy- advantages and disadvantages of SMA - applications. Nanomaterials: Synthesis– Electro deposition, Plasma arcing - properties of nanoparticles and applications. Carbon nanotubes: Types - Single walled and multi walled nanotubes – Synthesis of carbon nanotube - pulsed laser deposition, chemical vapour deposition – Properties and applications

**TOTAL: 45 Hours**

**TEXT BOOKS:**

Sl.No	Author(s)	Title of the Book	Publisher	Year of Publication
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Programme Code & Name: MZ & B.E-Mechatronics Engineering

1.	Palanisamy P K	Materials Science	Scitech Publishers	2007
2	V Rajendran	Materials Science	Tata McGraw Hill publications	2008

REFERENCE BOOKS:

SL.N o	Author(s)	Title of the Book	Publisher	Year of Publication
1.	Arumugam,	Materials Science	Anuradha Publications	2010
2	William Smith	Materials science	Tata McGraw Hill publications	2015
3	Raghavan V	Materials science	Prentice Hall India Ltd.	2007
4	O.P.Kanna	Material Science and Metallurgy	Dhanpat Rai Publications	2012
5	G.Sudarmozhi	Material Science	Bharathi Publishers	2015

  
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21BSS05

Programme Code & Name: MZ & B.E-Mechatronics Engineering  
**PHYSICS FOR MECHANICAL ENGINEERS**

**L T P C**  
**3 0 0 3**

### **COURSE OBJECTIVES**

- Define the various moduli of elasticity and explain streamline and turbulent flow of liquid and apply Poiseuille's formula to determine the coefficient of viscosity of a liquid.
- Describe experimental methods to determine thermal conductivity and state the laws of thermodynamics and their applications in the field of Engineering.
- Define and explain electrical and thermal conductivity of conducting materials.
- Explain the theory of semi-conducting materials and its applications.
- Recognize the novel properties of new engineering materials

### **COURSE OUTCOMES**

- An ability to identify the types crystalline structure
- An ability to apply properties on magnetism and superconducting materials
- An ability to apply knowledge on superconducting materials and its applications
- An ability to apply knowledge on dielectric materials
- An ability to use the synthesis techniques in modern materials

### **UNIT I PROPERTIES OF MATTER AND HYDRODYNAMICS**

9

Elasticity - Poisson's ratio and relation between moduli (qualitative) - Stress-strain diagram- Factors affecting elasticity - Bending of beams - Cantilever - expression for bending moment - Measurement of Young's modulus by uniform and non-uniform bending - I shaped girders - Stream line flow - Turbulent flow- Poiseuille's formula for flow of liquid through a capillary tube - Determination of coefficient of viscosity of a liquid

### **UNIT II HEAT AND THERMODYNAMICS**

9

Thermal conductivity - Forbe's and Lee's disc methods- Radial and cylindrical flow of heat -Thermal conductivity of rubber and glass - Thermal insulation of buildings - Thermal insulating materials - Thermal equilibrium - Zeroth law of thermodynamics - Internal Energy - First law of thermodynamics - Indicator diagram - Isothermal process - Work done in an isothermal expansion - Adiabatic process - Work done in an adiabatic expansion - Reversible and irreversible processes - Second law of thermodynamics - Carnot engine - Efficiency of Canot's cycle - Carnot's cycle as heat engine and refrigerator - Carnot's theorem - Comparative study of Ideal Otto and diesel engines and their efficiency (no derivation) - Entropy - temperature diagram of Carnot's cycle.

### **UNIT III CONDUCTING MATERIALS**

9

Conductors - classical free electron theory of metals - Electrical and thermal conductivity - Wiedemann-Franz law - Lorentz number - Drawbacks of classical theory - Quantum theory -band theory of solids( qualitative treatment only) - Fermi distribution function - Effect of temperature on Fermi Function - Density of energy states - Carrier concentration in metals - application of conducting materials in induction furnace

  
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**UNIT IV SEMICONDUCTING MATERIALS**

9

Intrinsic semiconductors – Energy band diagram – direct and indirect band gap semiconductors – Carrier concentration in intrinsic semiconductors - Fermi level – Variation of Fermi level with temperature – Electrical conductivity – Band gap determination – Extrinsic semiconductors – Carrier concentration in N-type and P-type semiconductors (Qualitative Treatment only) – Variation of Fermi level with temperature and impurity concentration – Compound semiconductors – Hall effect – Determination of Hall coefficient – Hall effect applications - application of semiconductors in strain measurements

**UNIT V NEW ENGINEERING MATERIALS**

9

Metallic glasses: Preparation - properties - applications

Shape memory alloys: Characteristics - properties of Ni-Ti alloy – application- advantages and disadvantages of SMA

Advanced Ceramics: Introduction – characteristics – structural ceramics

Nanoscience and Nanotechnology – significance of the nanoscale - different types of nanostructures (Confinement Dimensions 0-D, 1-D, 2-D and 3-D) - Categories of nanomaterials - Fabrication of nanomaterials - Ball milling method and Chemical vapour deposition technique - Carbon nanotubes - Types of carbon nanotubes - CNT structure – properties and applications.

Biomaterials (metals and alloys, ceramics) - classification and applications.


**TOTAL: 45Hours**

**TEXT BOOKS:**

Sl.No	Author(s)	Title of the Book	Publisher	Year of Publication
1.	B.N.Sankar & S.O.Pillai	Engineering Physics I	New Age International Publishers	2015
2	M. Arumugam,	Materials Science	Anuradha Publications	2006

**REFERENCE BOOKS:**

SL.No	Author(s)	Title of the Book	Publisher	Year of Publication
1.	B. K. Pandey and S. Chaturvedi	Engineering Physics	Cengage Learning India Pvt. Ltd., Delhi,	2012
2	Rajendran, V, and Marikani A	Materials science	TMH Publications	2004
3	Jayakumar, S.	Materials science	R.K. Publishers, Coimbatore	2008
4	Palanisamy P.K	Materials science	Scitech Publications (India) Pvt. Ltd	2007
5	Sudarmozhi.G.	Engineering Physics II.	Bharathi Publishers,	2015

  
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21BSS11

ENGINEERING CHEMISTRY

L T P C

3 0 0 3

**COURSE OBJECTIVES**

- The students familiar with characteristics of water and know the specification of boiler feed water. To understand the softening of hard water by using various purification techniques.
- To understand the principles involved in corrosion. The students able to apply these principles towards the prevention of corrosion.
- The students will understand the basic concepts of polymers chemistry and its applications. The students have sound knowledge of plastics and rubbers.
- The students understand the reaction of nuclear fission and fusion and promote the knowledge about process of nuclear reactors and understand various chemical reactions involved in the batteries.
- The students will have knowledge on industrial important abrasives and refractories.

**COURSE OUTCOMES**

- Acquire knowledge conversant with principles of water characterization and treatment of portable water for industrial purpose.
- An ability to apply principles of electrochemistry and corrosion towards the control of corrosion.
- Ability to familiarize different polymers, plastics, rubbers and its applications.
- Ability to apply basic knowledge on nuclear reactors and its use in electrical power generation and working of energy storage devices
- Acquire knowledge on abrasives, refractories in industrial application.

**UNIT I**

**WATER TECHNOLOGY**

9

Characteristics of water – hardness of water – types of hardness – estimation of hardness by EDTA method – alkalinity – types of alkalinity – estimation of alkalinity – Boiler feed water – requirements – disadvantages of using hard water in boilers – boiler troubles – scale and sludge – priming and foaming – caustic embrittlement – boiler corrosion – internal conditioning (phosphate, calgon, colloidal and carbonate conditioning methods) – external conditioning – zeolite and demineralization process – desalination and reverse osmosis.

**UNIT II**

**CORROSION AND CORROSION CONTROL**

9

Corrosion – chemical corrosion – electrochemical corrosion – mechanism of dry and wet corrosion – types of corrosion – galvanic corrosion – differential aeration corrosion – factors influencing rate of corrosion – corrosion control methods – sacrificial anodic method and impressed current cathodic protection method – corrosion inhibitors – types of inhibitors – protective coatings – paints – requirements of paints – constituents and functions of paints – failures of paints – electroplating of gold and copper – electroless plating of nickel.

**UNIT III**

**POLYMERS**

9

Polymers – definition – polymerization – types of polymerization (addition, condensation and copolymerization only) – mechanism of addition polymerization (free radical mechanism only) – properties of polymers – molecular weights, stereo specific polymers and polydispersive index –Plastics and its classification – thermo plastics and thermosetting plastics – preparation, properties and uses of polyvinyl chloride (PVC), Teflon, polyamides (nylon – 11, nylon – 6 and nylon – 6,6) and polyethylene terephthalate (PET) – Rubber – vulcanization of rubber – preparation, properties, uses of butyl rubber and SBR .

**UNIT IV NON CONVENTIONAL ENERGY SOURCES AND STORAGE DEVICES**

9

Nuclear energy – fission and fusion reactions – nuclear chain reactions – characteristics of nuclear chain reaction – light water nuclear reactor for power generation – breeder reactor – solar energy conversion – solar cells – wind energy – Fuel cells – working of hydrogen and oxygen fuel cell – batteries – types of

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batteries – construction and working of batteries – alkaline battery – lead acid battery, nickel – cadmium battery and lithium battery.

**UNIT V ENGINEERING MATERIALS**

9

Refractories – classification – acidic, basics and neutral refractories – properties – manufacture of alumina, magnesite and zirconia bricks – Abrasives – natural and synthetic abrasives – hardness of abrasives – Mohs scale – manufacture, properties and uses of silicon carbide and boron carbide – application of abrasives.

**TOTAL: 45 Hours**

**TEXT BOOKS**

Sl. No	Author(s)	Title of the Book	Publisher	Year of Publication
1.	B P.C.Jain and Monica Jain	Engineering Chemistry	Dhanpat Rai Pub, Co., New Delhi	2013
2.	Dr.A.Ravikrishnan	Engineering Chemistry I & II	Sri Krishna Hitech Publishing Company Pvt. Ltd	2016

**REFERENCE BOOKS**

Sl. No	Author(s)	Title of the Book	Publisher	Year of Publication
1.	Dr.P.Santhi & S.Elavarasan	Engineering Chemistry	Sri Kanadhan Publications	Aug 2016
2.	S.S. Dara	A text book of engineering chemistry	S.Chand & Co.Ltd., New Delhi	2013
3.	Shradha Sinha	Advanced Engineering Chemistry	Krishna Prakasan Media (P) Ltd., Meerut	2015
4.	B.Sivasankar	Engineering Chemistry	Tata McGraw-Hill Publishing Company, Ltd., New Delhi	2008
5.	V.R.Gowariker N.V.Viswanathan and Jayadev Sreedhar	Polymer Science	New Age International Pvt. Ltd., Chennai	2006



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**TEXT BOOKS**

Sl. No	Author(s)	Title of the Book	Publisher	Year of Publication
1.	Dr.A.Ravikrishnan	Environmental Science and Engineering	Sri Krishna Hitech Publishing Company Pvt. Ltd	June 2016
2.	Gilbert M. Masters	Introduction to Environmental Engineering and Science	Pearson Education Pvt., Ltd., Second Edition. ISBN 81-297-0277-0	2004

**REFERENCE BOOKS**

Sl. No	Author(s)	Title of the Book	Publisher	Year of Publication
1.	Dharmendra S. Sengar	Environmental Law	Prentice hall of India PVT LTD, New Delhi	2007
2.	R.K.Trivedi	Handbook of Environmental Laws, Rules, Guidelines, Compliances and Standards, Vol-I and II	BS Publications	2010
3.	R.Rajagopalan	Environmental Studies	From Crisis to Cure, Oxford University Press	2015
4.	Benny Joseph	Environmental Science and Engineering	Tata McGraw-Hill, New Delhi	2006
5.	T.G.Miller	Environmental Science	Wadsworth Publishing Co.	2007

  
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21BSS13

Programme Code &amp; Name: MZ &amp; B.E-Mechatronics Engineering

**ORGANIC CHEMISTRY****L T P C****3 0 0 3****COURSE OBJECTIVES**

- The students familiar with different types of organic compounds and its characteristics reactions.
- The students will understand the preparation of heterocyclic compounds and organic dyes.
- To understand the mechanism for the preparation of organic compounds with help of reagents.
- The students understand the chemistry of carbohydrates and proteins.
- The students will have knowledge on identification of organic compounds with spectroscopy tools.

**COURSE OUTCOMES**

- Acquire knowledge on various functional groups of organic compounds.
- An ability to prepare heterocyclic compounds and dyes.
- Ability to explain mechanism of various organic reactions.
- Acquire knowledge on types, functions and reactions of carbohydrates and proteins.
- Acquire knowledge on identification of organic compounds by spectroscopy.

**UNIT - I INTRODUCTION TO ORGANIC CHEMISTRY 9**

Introduction – types of organic compounds (aliphatic and aromatic) – various types of functional groups – types of organic reactions (substitution and elimination only) – Aliphatic nucleophilic substitution – mechanism of SN1, SN2 and SNi reactions – Aliphatic elimination reactions – mechanisms of E1 and E2 reactions.

**UNIT - II CHEMISTRY OF HETEROCYCLIC COMPOUNDS AND DYES 9**

Introduction – heterocyclic compounds having not more than one heteroatoms such as oxygen, nitrogen and sulphur – synthesis and properties of furan, pyrrole and thiophene. Dyes – color and constitution – chromophore – auxochrome – classification according to application and structure – preparation and uses of methyl orange, fluorescein and malachite green dyes.

**UNIT - III ORGANIC NAMING REACTIONS AND REAGENTS 9**

Perkin reaction – Reimer Tiemann reaction – Kolbe Schmitt reaction – Ullmann reaction – Diels Alder reaction – Important reagents and their synthetic applications in organic chemistry – LiAlH<sub>4</sub>, NaBH<sub>4</sub>, Ag<sub>2</sub>O, Lead tetra acetate and Osmium tetroxide.

**UNIT - IV CHEMISTRY OF CARBOHYDRATES AND PROTEINS 9**

Carbohydrate – classification – mono saccharides, structure elucidation of mono saccharides (glucose and fructose only), interconversion (aldose to ketose and ketose to aldose only). Amino acids – Zwitter ion – isoelectric point – preparation of amino acids. Peptides – Peptide linkages – proteins – classification of proteins – Structure of proteins.

**UNIT - V ORGANIC SPECTROSCOPY 9**

UV-Visible spectroscopy – types of electronic transitions – Instrumentation – bathochromic shift and hypsochromic shift – IR spectroscopy – number and types of fundamental vibrations – Instrumentation – position of IR absorption frequencies for functional groups like aldehyde, ketone, alcohol, acid, amine and amide.

**TEXT BOOKS**

Sl.No	Author(s)	Title of the Book	Publisher	Year of Publication
1	Arun Bahl and B.S.Bahl	A Text Book of Organic Chemistry	S.Chand & Company Ltd	2012
2	V.K.Ahluwalia and R.K.Parashar	Organic Reaction Mechanism	Narosa Publishing House	2017

**REFERENCE BOOKS**

Sl.No	Author(s)	Title of the Book	Publisher	Year of Publication
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1.	Tantillo Dean J	Applied Theoretical Organic Chemistry	World Scientific	2018
2.	Tom Sorrell	Organic Chemistry	University Science Books,	2016
3.	Mehta Bhupinder & Mehta Manju	Organic Chemistry -II Edition	PHI Learning Pvt. Ltd.	2015
4.	R.T. Morrison and R.N. Boyd	Organic Chemistry	VI Edition Prentice Hall Inc.	1996
5.	K.S. Tiwari, N.K. Vishnoi and S.N. Malhotra	A text book of Organic Chemistry	Second Edition, Vikas Publishing House Pvt. Ltd, Delhi	1998



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21BSS14

PHYSICAL CHEMISTRY

L T P C  
3 0 0 3

COURSE OBJECTIVES:

- To acquire knowledge on electric components and their behavior.
- To demonstrate the kinetics involved in chemical reaction.
- To determine the physical properties of photochemistry.
- To verify various laws involved in physical chemistry.
- To familiarize with different types of alloys.

COURSE OUTCOMES

- Understand the fundamentals of electrochemistry.
- Illustrate the kinetics and theories involved in chemical reactions
- Demonstrate various quantum theories and reactions of photochemistry.
- Summarize the properties of colloids
- Interpret the characteristics of alloys and phase rule.

UNIT I

ELECTROCHEMISTRY

9

Electrical Resistance – Specific Resistance – Electrical conductance – Specific conductance – Equivalent conductance – Cell constant – Determination of cell constant – variation of conductance with dilution – Kohlrausch's law – Single electrode potential – Nernst equation – Applications of Nernst equation – Electrochemical series.

UNIT II

CHEMICAL KINETICS

9

Rate of a reaction – Order of a reaction – Examples and rate equations for Zero order, First order, Second order and Third order reactions – Molecularity of a reaction – Unimolecular and Bimolecular reactions – Half life period – Activation energy – Arrhenius equation – Collision theory of reaction rates.

UNIT III

PHOTOCHEMISTRY

9

Laws of Photochemistry, Beer-Lambert's law- Grothus & Drapper's law- Stark Einstein's law-Quantum efficiency- Reason for difference in quantum efficiency – Method of determination of quantum yield. Jabulanski diagram - Photochemical reactions, Kinetics and mechanism of Hydrogen – Chlorine reaction – Photosensitization - Photo inhibitor - Chemiluminescence.

UNIT IV

COLLOIDS

9


Introduction to colloids – properties of colloids – coagulation of solutions – Origin of charge on colloidal particles – Determination of size of colloidal particles – Donnan Membrane equilibrium – Emulsions – Gels – Applications of colloids – Nanoparticles (Au, Ag, Pt) – Preparation – Characterization – Properties and Application.

UNIT V

PHASE EQUILLIBRIA

9

Phase - Components – Degrees of freedom - The Gibbs Phase rule – Derivation of the Phase rule – One Component system – The water System – Two Component system – Simple Eutectic System – Lead-Silver System - Desilverisation of Lead – Congruent and Incongruent Melting points.

  
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TOTAL: 45 Hours

**TEXT BOOKS:**

Sl. No	Author(s)	Title of the Book	Publisher	Year of Publication
1	B.R.Puri, L.R.Sharma	Principals of Physical Chemistry	Vishal Publishing Co	2017
2	A. S. Negi	A Textbook of Physical Chemistry	New Age International	2007

**REFERENCE BOOKS:**

Sl.No	Author(s)	Title of the Book	Publisher	Year of Publication
1.	David W. Ball	Physical Chemistry	Cengage Learning	2014
2.	Arthur Adamson	A Textbook of Physical Chemistry	Elsevier	2012
3.	V.D. Athawale	Experimental Physical Chemistry	New Age International	2007
4.	Peter Atkins & Julio de Paula	Atkins' Physical Chemistry	Oxford university press	2002
5.	Kund and Jain	Physical Chemistry	S.Chand and Company	1996

  
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21BSS15

Programme Code & Name: MZ & B.E-Mechatronics Engineering

APPLIED CHEMISTRY

L T P C  
3 0 0 3

### COURSE OBJECTIVES

- The students familiar with characteristics of water and know the specification of boiler feed water. To understand the softening of hard water by using various purification techniques.
- To understand the concept and importance of thermodynamics.
- The students will understand the basic concepts of electrochemistry and its applications.
- The students understand about the fuels and its type and understand the combustion of fuels.
- The students will have knowledge on industrial important abrasives, cement, cement and glass.

### COURSE OUTCOMES

- Acquire knowledge conversant with principles of water characterization and treatment of portable water for industrial purpose.
- An ability to apply principles of thermodynamics.
- Ability to familiarize basic concepts of electrochemistry and its applications.
- Ability to apply basic knowledge on the fuels and its uses and acquire knowledge on the combustion of fuels.
- Acquire knowledge on industrial important abrasives, cement and glass.

#### UNIT I PHASE RULE AND ALLOYS 9

Statement and explanation of terms involved – one component system – water system – condensed phase rule – construction of phase diagram by thermal analysis – simple eutectic systems (lead-silver system only) – alloys – importance, ferrous alloys – nichrome and stainless steel – heat treatment of steel, non-ferrous alloys – brass and bronze.

#### UNIT II CHEMICAL THERMODYNAMICS 9

Terminology of thermodynamics - Second law: Entropy - entropy change for an ideal gas, reversible and irreversible processes; entropy of phase transitions; Clausius inequality. Free energy and work function: Helmholtz and Gibbs free energy functions; Criteria of spontaneity; Gibbs-Helmholtz equation, Clausius-Clapeyron equation; Maxwell relations – Van't Hoff isotherm and isochore.

#### UNIT III ELECTROCHEMISTRY 9

Electrochemical cells – reversible and irreversible cells – EMF – measurement of emf – Single electrode potential – Nernst equation (problem) – reference electrodes – Standard Hydrogen electrode - Calomel electrode – Ion selective electrode – glass electrode and measurement of pH – electrochemical series – significance – potentiometer titrations (redox -  $Fe^{2+}$  versus dichromate) and conduct metric titrations (acid-base – HCl vs, NaOH) titrations.

#### UNIT IV FUELS AND COMBUSTION 9

Fuel: Introduction- classification of fuels- calorific value- higher and lower calorific values- coal analysis of coal (proximate and ultimate)- carbonization- Otto Hoffmann method - petroleum- manufacture of synthetic petrol (Bergius process)- knocking, octane number - diesel oil- cetane number - natural gas- compressed natural gas(CNG)-liquefied petroleum gases(LPG) - Combustion of fuels: introduction- theoretical calculation of calorific value- ignition temperature- flue gas analysis (ORSAT Method).

#### UNIT V ENGINEERING MATERIALS 9

Abrasives: definition, classification or types, grinding wheel, abrasive paper and cloth. Portland cement- manufacture and properties - setting and hardening of cement, special cement- waterproof and white cement- properties and uses. Glass - manufacture, types, properties and uses.

TOTAL: 45 Hours

  
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**TEXT BOOKS**

Sl. No	Author(s)	Title of the Book	Publisher	Year of Publication
1.	B.P.C. Jain and Monica Jain	Engineering Chemistry	Dhanpat Rai Pub, Co., New Delhi	2013
2.	Dr.A.Ravikrishnan	Engineering Chemistry I & II	Sri Krishna Hitech Publishing Company Pvt. Ltd	2016

**REFERENCE BOOKS**

Sl. No	Author(s)	Title of the Book	Publisher	Year of Publication
1.	Dr.P.Santhi & S.Elavarasan	Engineering Chemistry	Sri Kandhan Publications	Aug 2016
2.	S.S. Dara	A text book of engineering chemistry	S.Chand & Co.Ltd., New Delhi	2013
3.	Shradha Sinha	Advanced Engineering Chemistry	Krishna Prakasan Media (P) Ltd., Meerut	2015
4.	B.Sivasankar	Engineering Chemistry	Tata McGraw-Hill Publishing Company, Ltd., New Delhi	2008
5.	V.R.Gowariker N.V.Viswanathan and Jayadev Sreedhar	Polymer Science	New Age International Pvt. Ltd., Chennai	2006



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21BSS16

Programme Code & Name: MZ & B.E-Mechatronics Engineering

**ORGANIC CHEMISTRY LABORATORY**

**L T P C**  
**0 0 3 1**

**COURSE OBJECTIVES**

- The students familiar with different types of organic compounds and its characteristics reactions.
- The students will understand the preparation of organic compounds.
- To understand the mechanism for the preparation of organic compounds.
- The students will have skill on preparation of simple organic compounds.
- The students will understand various methods of organic preparations.

**COURSE OUTCOMES**

- Acquire knowledge on various functional groups of organic compounds.
- Acquire knowledge on identification of organic compounds by simple color reactions.
- An ability to identify special elements present in organic compounds.
- Ability to identify functional groups in organic compounds.
- Acquire knowledge on basics in organic compound preparation.

**LIST OF EXPERIMENTS**

**1. Organic Qualitative Analysis**

- a) Detection of elements- nitrogen, sulphur and halogens.
- b) Detection of aliphatic or aromatic.
- c) Detection of whether saturated or unsaturated compounds.
- d) Preliminary tests and detection of functional groups, phenols, aromatic amines, aromatic acids, Urea, benzamide & carbohydrate (monosaccharides only).

**2. Introduction to Organic Synthetic Procedures**

- a) Acetylation – Preparation of acetanilide from aniline.
- b) Hydrolysis – Preparation of salicylic acid from methyl salicylate.
- c) Substitution – Conversion of acetone to iodoform.
- d) Nitration – Preparation of m-dinitrobenzene from nitrobenzene.
- e) Oxidation – Preparation of benzoic acid from benzaldehyde/ benzyl alcohol

**REFERENCE BOOKS**

Sl.No	Author(s)	Title of the Book	Publisher	Year of Publication
1	V.Venkateswaran, R.Veerasingam	Basic Principles of Practical Chemistry	Sultan Chand & Sons	2013
2	Arun Bahl and B.S.Bahl	A Text Book of Organic Chemistry	S.Chand & Company Ltd	2012

  
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21BSS17

Programme Code & Name: MZ & B.E-Mechatronics Engineering

PHYSICAL CHEMISTRY LABORATORY

L T P C  
0 0 3 1

**COURSE OBJECTIVES:**

- To acquire knowledge on conductance measurements.
- To determine the rate of a chemical reaction.
- To determine the physical properties of photochemistry.
- To verify phase rule in physical chemistry.
- To familiarize with different types absorption.

**COURSE OUTCOMES**


- An ability to measure the conductance of a solution.
- Demonstrate phase diagram of simple system.
- Able to determine the rate of reaction of simple reaction.
- Able to estimate the amount of weak acid by conductometric measurements.
- An ability to calculate partition coefficient of two immiscible liquids.

**LIST OF EXPERIMENTS**

1. Determination of molecular weight of a polymer by viscosity method.
2. Determination of partition co-efficient of iodine between two immiscible solvents
3. Determination of  $K_a$  of the weak acid
4. Conductometric experiments - Verification of Oswald's Dilution Law
5. Titration of Weak Acid Vs Weak Base
6. Determination of Rate Constant (K)
7. To study the adsorption of Acetic acid on charcoal and construct the isotherm.
8. Determination of pH metric titration of Strong Acid Vs Strong Base
9. Enzyme catalytic reaction by varying pH.
10. Application of Phase Rule to Phenol-Water system
11. To study the inversion of cane sugar by polarimeter.

**TEXT BOOKS:**

Sl.No	Author(s)	Title of the Book	Publisher	Year of Publication
1	V.Venkateswaran, R.Veerasingam	Basic Principles of Practical Chemistry	Sultan Chand & Sons	2013
2	B.R.Puri, L.R.Sharma	Principals of Physical Chemistry	Vishal Publishing Co	2017

  
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21BSS21 ALGEBRA AND CALCULUS

L T P C  
3 1 0 4

**COURSE OBJECTIVES**

- To realize the use of matrix algebra techniques in engineering applications and to develop for future applications.
- To familiarize the student with differential calculus concepts. This is needed in almost all branches of engineering.
- To impart knowledge on the functions with several variables which finds applications in many engineering branches
- To familiarize the students with integral calculus concepts.
- To acquaint the student with mathematical tools needed in evaluating multiple integrals and their usage.

**COURSE OUTCOMES**

- This course equips students to have basic knowledge in matrix algebra techniques with its engineering applications.
- This course helps students in understanding the concepts of differential calculus.
- The students will have knowledge on functions with several variables.
- The students will gain understanding of the basic techniques of integration.
- The students will have the ability to solve the real time engineering problems with multiple integrals and their usage

**UNIT - I MATRICES**

9+3

Characteristic equation – Eigenvalues and Eigenvectors of a real matrix – Properties of eigenvalues and eigenvectors – Cayley-Hamilton Theorem (Without Proof) – Orthogonal transformation of a symmetric matrix to Diagonal form – Reduction of a quadratic form to canonical form by orthogonal transformation

**UNIT – II DIFFERENTIAL CALCULUS**

9+3

Representation of Functions, Limits, Continuity, Derivatives, Differentiability Rules-Maxima and Minima of functions of one variable- Mean Value Theorem.

**UNIT – III FUNCTIONS OF SEVERAL VARIABLES**

9+3

Functions of two variables – Taylor series - Partial derivatives – Maxima and minima – Constrained maxima and minima – Lagrange’s multipliers method – Jacobians

**UNIT – IV INTEGRALCALCULUS**

9+3

Definite and Indefinite Integrals-Substitution Rule-Integration by parts-Trigonometric Integrals, Integration of rational functions by partial fractions -Improper Integrals.

**MULTIPLE INTEGRALS**

UNIT – V  
9+3

Double integrals in Cartesian coordinates – Change of order of integration – Area between two curves –Area of double integral - Triple integration in Cartesian coordinates – Volume as triple integrals

**TOTAL: 45 + 15**

**TEXT BOOKS:**

Sl.N o	Author(s)	Title of the Book	Publisher	Chairman Board of Studies	Year of Publication
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1	James Stewart	Calculus with Early Transcendental Functions	Cengage Learning, New Delhi	2008
2.	Grewal. B.S	Higher Engineering Mathematics, 43 <sup>rd</sup> Edition	Khanna Publications, Delhi	2014

REFERENCE BOOKS:

Sl.No	Author(s)	Title of the Book	Publisher	Year of Publication
1.	Veerarajan. T	Engineering Mathematics for first year	Tata McGraw-Hill Publishing Company Ltd., New Delhi	2015
2.	Erwin Kreyszig	Advanced Engineering Mathematics, 9 <sup>th</sup> Edition	John Wiley and Sons, New Delhi	2018
3.	Jain R.K. , Iyengar S.R.K.	Advanced Engineering Mathematics, 4 <sup>th</sup> edition	Alpha Science International Ltd	2014
4.	Bali N. P Manish Goyal	A Text book of Engineering Mathematics, 9 <sup>th</sup> edition	Laxmi Publications Pvt Ltd.	2016
5.	Dass, H.K. , Er. RajnishVerma	Higher Engineering Mathematics, 3 <sup>rd</sup> Revised Edition	S. Chand Private Ltd	2014

  
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21BSS22

Programme Code & Name: MZ & B.E-Mechatronics Engineering  
**DIFFERENTIAL EQUATIONS AND VECTOR ANALYSIS**

**L T P C**  
**3 1 0 4**

**COURSE OBJECTIVES**

- To make the student acquire sound knowledge of techniques in solving ordinary differential equations that model engineering.
- To construct relatively simple quantitative models of change, and to deduce their consequences.
- To develop an understanding of the standard techniques of analytic theory.
- To enable the student to apply complex integration theory with confidence, in application areas of engineering fields.
- To have a sound knowledge of Laplace transform and learn the inverse Laplace transformations for solving real time Engineering problems.

**COURSE OUTCOMES**

- The knowledge gained on ordinary differential equations will provide a strong platform to solve the research problems in model engineering.
- The knowledge gained on vector calculus provides a framework for modeling systems. Use Gauss, Stokes and Greens theorems to simplify calculations of integrals and prove simple results.
- Using analytical functions for real world problems, engineer makes models of projects and then simulates its models in real world conditions.
- To enable the student to apply complex integration efficiently solving the problems that occur in various branches of engineering disciplines.
- This course equips students to have basic knowledge in inverse Laplace transforms with its engineering applications

**UNIT - I      ORDINARY DIFFERENTIAL EQUATIONS      9+3**

Linear differential equations of second and higher order with constant coefficient when the R.H.S is  $e^{ax}$ ,  $\sin ax$ ,  $\cos ax$ ,  $e^{ax}\sin bx$ ,  $e^{ax}\cos bx$  – Cauchy's Euler's equations and Legendre's linear equations – simultaneous first order linear equations with constant co-efficients – Method of variation of parameter when the R.H.S is  $\sec ax$ ,  $\operatorname{cosec} ax$ ,  $\tan ax$ ,  $\cot ax$ .

**UNIT - II      VECTOR CALCULUS      9+3**

Gradient, divergence and curl – Line, surface and volume integrals – Green's, Gauss divergence theorem and Stokes' theorem (excluding proofs) – Verification of the above theorems and evaluation of integrals using them

**UNIT - III      ANALYTIC FUNCTIONS      9+3**

Functions of a complex variable – Analytic function: Necessary conditions – Cauchy-Riemann equations and sufficient conditions (excluding proofs) – Properties of analytic function – Harmonic conjugate – Construction of analytic functions – Conformal mapping:  $w = az$ ,  $1/z$  and bilinear transformation.

**UNIT - IV      COMPLEX INTEGRATION      9+3**

Cauchy's integral theorem (excluding proof) and Cauchy's integral formula(excluding proof) – Taylor's and Laurent's series expansions(excluding proof) – Singular points – Classifications – Cauchy's residue theorem – Contour integration- circle and semi-circle Contour (excluding poles on the real axis).

**UNIT - V      LAPLACE TRANSFORMS AND INVERSE LAPLACE TRANSFORMS      9+3**

Laplace transforms – Basic properties – Initial and final value theorems - Problems - Transform of periodic functions. Inverse Laplace transforms – statement of convolution theorem - Problems – Partial fraction method – Problems – Solution of linear ODE of second order with constant coefficients.

**UNIT - V      ORDINARY DIFFERENTIAL EQUATIONS      9+3**

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Linear differential equations of second and higher order with constant coefficient when the R.H.S is  $e^{ax}$ ,  $\sin ax$ ,  $\cos ax$ ,  $e^{ax}\sin bx$ ,  $e^{ax}\cos bx$  – Cauchy's Euler's equations and Legendre's linear equations – simultaneous first order linear equations with constant co-efficients – Method of variation of parameter when the R.H.S is  $\sec ax$ ,  $\operatorname{cosec} ax$ ,  $\tan ax$ ,  $\cot ax$ .

**TOTAL: 45 + 15 = 60 Hours**

**TEXT BOOKS:**

Sl.No	Author(s)	Title of the Book	Publisher	Year of Publication
1.	Glyn James	Advanced Modern Engineering Mathematics, 4 <sup>th</sup> Edition	Pearson Education	2016
2.	Grewal. B.S	Higher Engineering Mathematics, 43 <sup>rd</sup> Edition	Khanna Publications, Delhi	2014

**REFERENCE BOOKS:**

Sl.No	Author(s)	Title of the Book	Publisher	Year of Publication
1.	Bali N. P Manish Goyal	A Text book of Engineering Mathematics, 9 <sup>th</sup> edition	Laxmi Publications Pvt Ltd.	2016
2.	Erwin Kreyszig	Advanced Engineering Mathematics, 9 <sup>th</sup> Edition	John Wiley and Sons, New Delhi	2014
3.	Tony Croft, Anthony Croft, Robert Davison, Martin Hargreaves, James Flint	Engineering Mathematics: A Foundation for Electronic, Electrical, Communications and Systems Engineers, 4 <sup>th</sup> Revised Edition	Pearson Education	2012
4.	Peter V. O.Neil	Advanced Engineering Mathematics, 7 <sup>th</sup> Edition	Cengage learning	2012
5.	Dass, H.K. , Er. RajnishVerma	Higher Engineering Mathematics, 3 <sup>rd</sup> Revised Edition	S. Chand Private Ltd	2014



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**21BSS23 TRANSFORMS AND PARTIAL DIFFERENTIAL EQUATIONS**

**L T P C**  
**3 1 0 4**

**COURSE OBJECTIVES**

- To acquaint the student with Fourier transform techniques used in wide variety of situations.
- To develop Z transform techniques for discrete time systems
- To introduce Fourier series analysis which is central to many applications in engineering
- To develop the basic knowledge in solving the boundary value problems
- To introduce the effective mathematical tools for the solutions of partial differential equations that model several physical processes

**COURSE OUTCOMES**

- This course enables the students to apply Fourier transform techniques to many engineering problems.
- Using this course, a student develops Z transform techniques for discrete time systems for real world problems.
- Provides the students to have sound knowledge Fourier series analysis.
- The students will have the ability to solve boundary value problems.
- It equips students to find the solutions of partial differential equations that model real time processes

**UNIT – I      FOURIER TRANSFORMS**

**9+3**

Statement of Fourier integral theorem - Fourier transforms pair – Fourier sine and cosine transforms – Properties – Transforms of simple functions – Convolution theorem – Parseval's identity-Problems .

**UNIT – II      Z - TRANSFORMS AND DIFFERENCE EQUATIONS**

**9+3**

Z- transforms - Elementary properties – Initial and final value theorem – Inverse Z - transforms – Partial fraction method – Residue method – Convolution theorem - Formation of difference equations – Solution of difference equations using Z - transforms

**UNIT - III      FOURIER SERIES**

**9+3**

Dirichlet's conditions – General Fourier series – Odd and even functions – Half range sine series – Half range cosine series – Parseval's identity – Harmonic analysis

**UNIT – IV      BOUNDARY VALUE PROBLEMS**

**9+3**

Classification of PDE - Solutions of one dimensional wave equation – One dimensional equation of heat conduction – Fourier series solution in Cartesian coordinates – Steady state solution of two dimensional equation of heat conduction (excluding insulated edges) on finite square plates (excluding circular plates).

**UNIT – V      PARTIAL DIFFERENTIAL EQUATIONS**

**9+3**

Formation of partial differential equations – Singular integrals – Solutions of standard types of first order partial differential equations - Lagrange's linear equation - Linear partial differential equations of second and higher order with constant coefficients of homogeneous when the R.H.S is  $e^{ax+by}$ ,  $x^m y^n$   $m,n>0$ ,  $\sin(ax+by)$ ,  $\cos(ax+by)$

**TOTAL: 45 + 15=60 Hours**

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Programme Code & Name: MZ & B.E-Mechatronics Engineering

**TEXT BOOKS:**

Sl.No	Author(s)	Title of the Book	Publisher	Year of Publication
1.	Erwin Kreyszig	Advanced Engineering Mathematics, 9 <sup>th</sup> Edition	John Wiley and Sons, New Delhi	2014
2.	Grewal. B.S	Higher Engineering Mathematics, 43 <sup>rd</sup> Edition	Khanna Publications, Delhi	2014

**REFERENCE BOOKS:**

Sl.No	Author(s)	Title of the Book	Publisher	Year of Publication
1.	Glyn James	Advanced Modern Engineering Mathematics, 4 <sup>th</sup> Edition	Pearson Education	2016
2.	Bali N. P Manish Goyal	A Text book of Engineering Mathematics, 9 <sup>th</sup> edition	Laxmi Publications Pvt Ltd.	2016
3.	Datta.K.B.	Mathematical Methods of Science and Engineering	Cengage Learning India Pvt Ltd, Delhi	2013
4.	Ray Wylie. C, Barrett.L.C	Advanced Engineering Mathematics, 6 <sup>th</sup> Edition	Tata Mc Graw Hill Education Pvt Ltd, New Delhi	2012
5.	Ramana.B.V.	Higher Engineering Mathematics	Tata Mc Graw Hill Publishing Company, New Delhi	2008

  
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**COURSE OBJECTIVES**

- To extend student's Logical and Mathematical maturity.
- To deal with abstraction and the counting principles.
- To identify the basic properties of graphs and model simple applications.
- To study the concepts and properties of algebraic structures.
- To learn discrete objects and their properties.

**COURSE OUTCOMES**

- Have knowledge of the concepts needed to test the logic of a program.
- Ability to distinguish between the notion of discrete and continuous mathematical structures
- Have an understanding in identifying structures on many levels.
- Be aware of the counting principles.
- Be exposed to concepts and properties of algebraic structures such as groups, rings and fields.

**UNIT - I LOGIC AND PROOFS 9+3**

Propositional Logic – Propositional equivalences-Predicates and quantifiers- Rules of inference- introduction to Proofs-Proof Methods and strategy.

**UNIT – II COMBINATORICS 9+3**

Mathematical inductions-Strong induction and well ordering-.The basics of counting-The pigeonhole principle – Permutations and combinations-Recurrence relations-Solving Linear recurrence relations- generating functions- inclusion and exclusion and applications.

**UNIT – III GRAPHS 9+3**

Graphs and graph models-Graph terminology and special types of graphs-Representing graphs and graph isomorphism - connectivity-Euler and Hamilton paths.

**UNIT – IV ALGEBRAIC STRUCTURES 9+3**

Algebraic systems-Semi groups and monoids-Groups-Subgroups and homomorphisms- Cosets and Lagrange's Theorem - Ring & Fields (Definitions and examples)

**UNIT – V LATTICES AND BOOLEAN ALGEBRA 9+3**

Partial ordering-Posets-Lattices as Posets- Properties of lattices-Lattices as Algebraic systems –Sublattices –direct product and Homomorphism-Some Special lattices- Boolean Algebra

**TOTAL: 45 + 15**

**TEXT BOOKS:**

Sl.No	Author(s)	Title of the Book	Publisher	Year of Publication
1.	Narsingh Deo	Graph Theory with Applications to Engineering and Computer Science, Reprint edition	Dover Publications Inc.	2016
2.	Tremblay J.P, Manohar R	Discrete Mathematical Structures with application to computer science, 30 <sup>th</sup> Reprint	Tata Mc Graw Hill Pub.Co.Ltd, New Delhi, India	2011

Programme Code & Name: MZ & B.E-Mechatronics Engineering

REFERENCE BOOKS:

Sl.No	Author(s)	Title of the Book	Publisher	Year of Publication
1.	Bernard Kolman , Robert C.Busby, Sharan Culter Ross	Discrete Mathematical Structures, 6 <sup>th</sup> Edition	Pearson Education Pvt Ltd. ,New Delhi	2015
2.	Richard Johnsonbaugh	Discrete Mathematics , 7 <sup>th</sup> Edition	Pearson Education Asia, New Delhi	2014
3.	Seymour Lipschutz, Mark Lipson, Varsha H. Patil	Discrete Mathematics Schaum's Outlines , Revised 3 <sup>rd</sup> Edition	Mc Graw Hill Pub.Co.Ltd.,New Delhi	2013
4.	Ralph. P.Grimaldi	Discrete and combinatorial Mathematics : An Applied Introduction, 5 <sup>th</sup> Edition	Pearson Education Asia,Delhi	2012
5.	Kenneth H. Rosen	Discrete Mathematics and its Applications, 7 <sup>th</sup> Edition	Tata Mc Graw Hill Pub . co.Ltd.,New Delhi,Special Indian Edition	2011

  
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**COURSE OBJECTIVES**

- To understand concepts of testing of hypothesis
- To develop design of experiments model for research problems
- To understand the basic concepts of Control charts for measurements.
- Identify the concept of queueing models and apply in engineering.
- To understand the significance of advanced queueing models.

**COURSE OUTCOMES**

- Provides knowledge to apply testing of hypothesis to real life problems.
- This course enhances the students in design of experiments model for research problems
- Apply the concept of Statistical Quality Control in engineering disciplines.
- Acquire skills in analyzing queueing models.
- Understand and characterize phenomenon which evolve with respect to time in a probabilistic manner

**UNIT I TESTING OF HYPOTHESIS**

9 + 3

Sampling distributions - Estimation of parameters - Statistical hypothesis -Tests based on t, Chi-square and F distributions for mean, variance and proportion - Contingency table (test for independent) -Goodness of fit.

**UNIT II DESIGN OF EXPERIMENTS**

9 + 3

One way and Two way classifications - Completely randomized design – Randomized block design – Latin square design.

**UNIT III STATISTICAL QUALITY CONTROL**

9 + 3

Control charts for measurements (X and R charts) – Control charts for attributes (p, c and np charts) – Tolerance limits - Acceptance sampling.

**UNIT IV QUEUEING MODELS**

9 + 3

Markovian queues – Birth and death processes – Single and multiple server queueing models – Little’s formula – Queues with finite waiting rooms – Queues with impatient customers : Balking and renegeing.

**UNIT V ADVANCED QUEUEING MODELS**

9 + 3

Finite source models – M/G/1 queue – Pollaczek Khinchin formula – M/D/1 and M/EK/1 as special cases – Series queues – Open Jackson networks.

**TOTAL: 45 + 15=60 Hours**

**TEXT BOOKS:**

SLNo	Author(s)	Title of the Book	Publisher	Year of Publication
1.	Devore. J.L.,	"Probability and Statistics for Engineering and the Sciences	Cengage Learning, New Delhi	2014

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Programme Code & Name: MZ & B.E-Mechatronics Engineering

2.	John F. Shortle, James M.Thompson, Carl M. Harris Donald Gross	Fundamentals of Queueing Theory, 4 <sup>th</sup> Edition	Wiley	2012
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REFERENCE BOOKS:

Sl.No	Author(s)	Title of the Book	Publisher	Year of Publication
1.	Douglas C. Montgomery, George C. Runger	Applied Statistics and Probability for Engineers (International Student Version)", 6 <sup>th</sup> Edition	John Wiley & Sons, Inc.	2016
2.	Spiegel. M.R., Schiller. J., Srinivasan.R.A.	Schaum's Outlines on Probability and Statistics, 4 <sup>th</sup> Edition	Tata McGraw Hill Education	2013
3.	Johnson. R.A., and Gupta. C.B.	Miller,Freund's Probability and Statistics for Engineers,11 <sup>th</sup> Edition	Pearson Education, Asia	2011
4.	Yates, R.D. and Goodman. D. J	"Probability and Stochastic Processes"	Wiley India Pvt. Ltd., Bangalore	2012
5.	Trivedi.K.S.,	Probability and Statistics with Reliability, Queueing and Computer Science Applications, 2 <sup>nd</sup> Edition	John Wiley and Sons	2008



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21BSS26

NUMERICAL METHODS

L T P C  
3 2 0 4

### COURSE OBJECTIVES

- To solve a set of algebraic equations representing steady state models formed in engineering problems
- To deal with interpolation and approximation for the application of finite element analysis
- To find the trend information from discrete data set through numerical differentiation and summary information through numerical integration
- To predict the system dynamic behaviour through solution of ODEs modeling the system
- To solve PDE models representing spatial and temporal variations in physical systems through numerical methods

### COURSE OUTCOMES

- The students will have a clear perception of the power of numerical techniques
- The students will have the ability to solve a set of algebraic equations representing steady state models formed in engineering problems
- The students can deal with interpolation and approximation for the application of finite element analysis
- It equips the knowledge in numerical differentiation and numerical integration
- This course makes students easy in solving initial and boundary value problems

#### UNIT - I SOLUTION OF EQUATIONS AND EIGENVALUE PROBLEMS 9+3

Solution of algebraic and transcendental equations - Newton Raphson method – Solution of linear system of equations - Gauss elimination method –Gauss Jordan method - Iterative methods of Gauss Jacobi and Gauss-Seidel - Eigen value of a matrix by power method

#### UNIT – II INTERPOLATION AND APPROXIMATION 9+3

Interpolation with unequal intervals – Lagrange’s interpolation – Newton’s divided difference interpolation – Interpolation with equal intervals – Newton’s forward and backward difference formulae.

#### UNIT – III NUMERICAL DIFFERENTIATION AND INTEGRATION 9+3

Approximation of derivatives using interpolation polynomials – Numerical integration using Trapezoidal, Simpson’s 1/3 rule – Two point and three point Gaussian quadrature formulae – Evaluation of double integrals by trapezoidal and Simpsons’s 1/3 rules.

#### UNIT – IV INITIAL VALUE PROBLEMS FOR ORDINARY DIFFERENTIAL EQUATIONS 9+3

Single step methods – Taylor’s series method – Euler’s method – Modified Euler’s method – Fourth order Runge-Kutta method for solving first order equations – Multi step methods – Milne’s and Adams-Bashforth predictor corrector methods for solving first order equations.

#### UNIT – V BOUNDARY VALUE PROBLEMS IN ORDINARY AND PARTIAL DIFFERENTIAL EQUATIONS 9+3

Finite difference methods for solving two-point linear boundary value problems – Finite difference techniques for the solution of two Laplace’s and Poisson’s equations on rectangular domain – one dimensional heat equation by explicit and implicit (Crank Nicholson) methods – One dimensional wave equation by explicit method.

Programme Code & Name: MZ & B.E-Mechatronics Engineering


TOTAL: 45 + 15 Hours

TEXT BOOKS:

Sl.No	Author(s)	Title of the Book	Publisher	Year of Publication
1.	S. K. Gupta	Numerical Methods for Engineers, 3 <sup>rd</sup> Edition	New Age International Pvt Ltd Publishers	2015
2.	Chapra. S.C., Canale.R.P.	Numerical Methods for Engineers, 6 <sup>th</sup> Edition	Tata McGraw Hill, New Delhi	2012

REFERENCE BOOKS:

Sl.No	Author(s)	Title of the Book	Publisher	Year of Publication
1.	Grewal. B.S.	Numerical Methods in Engineering & Science: with Programs in C and C++, 10 <sup>th</sup> Edition	Khanna Publishers, New Delhi	2010
2.	M.K. Jain	Numerical Methods for Scientific & Engineering Computation, 6 <sup>th</sup> Edition	New Age International Publishers	2010
3.	Sankara Rao. K.	Numerical methods for Scientists and Engineers, 3 <sup>rd</sup> Edition	Prentice Hall of India Private, New Delhi	2007
4.	Brian Bradie	A friendly introduction to Numerical analysis	Pearson Education, Asia, New Delhi	2007
5.	Gerald. C. F. Wheatley. P. O.	Applied Numerical Analysis, 6 <sup>th</sup> Edition	Pearson Education, Asia, New Delhi	2006

  
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**21BSS27 PROBABILITY & RANDOM PROCESSES**

**L T P C**  
**3 2 0 4**

**COURSE OBJECTIVES**

- Analyze random or unpredictable experiments and investigate important features of random experiments.
- Construct probabilistic models for observed phenomena through distributions which play an important role in many engineering applications.
- To acquire the knowledge the concept of convergence of random sequence and the study of random signals
- To be familiar with application of auto correlation and cross correlation functions.
- To learn the concept of spectral density

**COURSE OUTCOMES**

- The students will have a fundamental knowledge of the probability concepts.
- It helps to use standard distributions to the real life problems.
- Associate random variables by designing joint distributions and correlate the random variables.
- It also helps to understand and characterize phenomenon which evolve with respect to time in a probabilistic manner.
- Gained knowledge in correlation and spectral densities

**UNIT - I PROBABILITY AND RANDOM VARIABLES 9+3**

Axioms of probability–conditional probability– Baye’s theorem, random variables– Discrete and continuous random variables – MGF

**UNIT – II STANDARD DISTRIBUTIONS 9+3**

Discrete distributions : Binomial, Poisson, Geometric, Negative Binomial and their properties – Continuous distributions : Uniform, Exponential, Gamma, Normal distributions and their properties

**UNIT – III TWO - DIMENSIONAL RANDOM VARIABLES 9+3**

Joint distributions – Marginal and conditional distributions – Covariance – Correlation and regression – Transformation of random variables

**UNIT – IV RANDOM PROCESSES 9+3**

Classification – Stationary process – Markov process - Poisson process – Discrete parameter Markov chain – Chapman Kolmogorov equations

**UNIT – V CORRELATION AND SPECTRAL DENSITIES 9+3**

Auto correlation - Cross correlation - Properties – Power spectral density – Cross spectral density - Properties – Wiener-Khintchine relation – Relationship between cross power spectrum and cross correlation function

**TOTAL: 45 + 15=60 Hours**



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**TEXT BOOKS:**

Sl.No	Author(s)	Title of the Book	Publisher	Year of Publication
1.	Oliver. C Ibe.	Fundamentals of Applied Probability and Random Processes, 2 <sup>nd</sup> Edition	Academic Press	2014
2.	Stark. H., Woods. J.W.	Probability and Random Processes with Applications to Signal Processing, 4 <sup>th</sup> Edition	Pearson Education, Asia	2014

**REFERENCE BOOKS:**

Sl.No	Author(s)	Title of the Book	Publisher	Year of Publication
1.	HweiP.Hsu	Schaum's Outline of Theory and Problems of Probability, Random Variables and Random Processes	Mc Graw Hill Publishing Company, New Delhi	2014
2.	Henry Stark , John W. Woods	Probability, Statistics, and Random Processes for Engineers" , 2 <sup>nd</sup> Edition	Pearson Education	2014
3.	Miller. S.L., Childers. D.G.	Probability and Random Processes with Applications to Signal Processing and Communications , 2 <sup>nd</sup> Edition	Academic Press (Elsevier)	2012
4.	Yates. R.D., Goodman. D.J.	Probability and Stochastic Processes, 2 <sup>nd</sup> Edition	Wiley India Pvt. Ltd., Bangalore	2012
5.	Peyton Peebles	Problems and Solutions in Probability, Random Variables and Random Signal Principles (SIE), 1 <sup>st</sup> Edition	Mc Graw Hill Publishing Company, New Delhi	2012

  
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21BSS28

STATISTICS AND NUMERICAL METHODS

L T P C

3 2 0 4

### COURSE OBJECTIVES

- To understand concepts of testing of hypothesis
- To develop design of experiments model for research problems
- To find the trend information from discrete data set through numerical differentiation and summary information through numerical integration
- To predict the system dynamic behaviour through solution of ODEs modeling the system
- To introduce numerical tools for the solutions of ordinary differential equations that model several physical processes

### COURSE OUTCOMES

- Provides knowledge to apply testing of hypothesis to real life problems.
- This course enhances the students in design of experiments model for research problems
- The students will have a clear perception of the power of numerical techniques
- It equips the knowledge in numerical differentiation and numerical integration
- This course makes students easy in solving ordinary differential equations

#### UNIT - I TESTING OF HYPOTHESIS

9+3

Sampling distributions - Tests for single mean, Difference of means (large and small samples) – Tests for single variance and equality of variances – chi-square test for goodness of fit – Independence of attributes.

#### UNIT – II DESIGN OF EXPERIMENTS

9+3

Completely randomized design – Randomized block design – Latin square design – One way- Two way Classification.

#### UNIT – III SOLUTION OF EQUATIONS AND EIGENVALUE PROBLEMS

9+3

Newton-Raphson method- Gauss Elimination method – Gauss-Jordan methods – Iterative methods of Gauss-Jacobi and Gauss-Seidel - Horner's Method – Eigen values of a matrix by Power method .

#### UNIT – IV INTERPOLATION, NUMERICAL DIFFERENTIATION AND NUMERICAL INTEGRATION

9+3

Lagrange's and Newton's divided difference interpolation –Newton's forward and backward difference interpolation - Approximation of derivatives using interpolation polynomials - Numerical integration using Trapezoidal and Simpson's 1/3 rules

#### UNIT – V NUMERICAL SOLUTION OF ORDINARY DIFFERENTIAL EQUATIONS

9+3  
TOTAL: 45 + 15

  
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**TEXT BOOKS:**

Sl.No	Author(s)	Title of the Book	Publisher	Year of Publication
1.	S. K. Gupta	Numerical Methods for Engineers , 3 <sup>rd</sup> Edition	New Age International Pvt Ltd Publishers	2015
2.	Walpole. R.E., Myers. R.H., Myers. S.L., Ye. K.	Probability and Statistics for Engineers and Scientists, 8th Edition	Pearson Education, Asia	2013

**REFERENCE BOOKS:**

Sl.No	Author(s)	Title of the Book	Publisher	Year of Publication
1.	Douglas C. Montgomery, George C. Runger	Applied Statistics and Probability for Engineers (International Student Version)", 6 <sup>th</sup> Edition	John Wiley & Sons, Inc.	2016
2.	Spiegel. M.R., Schiller. J., Srinivasan.R.A.	Schaum's Outlines on Probability and Statistics, 4 <sup>th</sup> Edition	Tata McGraw Hill Education	2013
3.	Chapra. S.C., Canale.R.P.	Numerical Methods for Engineers, 6 <sup>th</sup> Edition	Tata McGraw Hill, New Delhi	2012
4.	Johnson. R.A., and Gupta. C.B.	Miller,Freund's Probability and Statistics for Engineers, 11 <sup>th</sup> Edition	Pearson Education, Asia	2011
5.	Grewal. B.S.	Numerical Methods in Engineering & Science: with Programs in C and C++, 10 <sup>th</sup> Edition	Khanna Publishers, New Delhi	2010

  
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**21GES01                      PROGRAMMING FOR PROBLEM SOLVING USING C                      L T P C**  
**3 0 0 3**

**COURSE OBJECTIVES**

- To understand basic programming concepts
- To provide knowledge for problem solving through
- To provide hands-on experience with the concepts programming

**COURSE OUTCOMES**

- Understand the fundamentals of C programming
- Choose the loops and decision making statements to solve the problem
- Implement different Operations on arrays and Use functions to solve the given problem
- Understand String and structures
- Understand pointers and Implement file Operations in C programming for a given application

**UNIT I    INTRODUCTION TO C PROGRAMMING    9 HOURS**

Introduction to computer software, Program Design Tools: Algorithms, Flowcharts, Pseudo codes, Structure of a C program, Writing the first C program, Keywords, Identifiers, Basic Data Types in C, Variables, Constants, Input / Output Statements in C, Operators in C Arithmetic, Relational, Logical, Conditional, Typeconversion and Typecasting.

**UNIT II    CONDITIONAL AND LOOPING STATEMENTS    9 HOURS**

Conditional branching statements, if, if-else, if-else-if and switch statements, Iterative statements, while, do-while and for loop statements, Nested loops, the break and continue statements.

**UNIT III    FUNCTIONS AND ARRAYS    9 HOURS**

Functions: Function Declaration/Function Prototype, Function definition, Function call, passing parameters to functions. Arrays: Declaration of arrays, accessing the elements of an array, storing values in arrays, operations on 1-d arrays – Inserting an Element of an array, Deleting an Element from an Array, searching for a Value in an Array, two-dimensional arrays, operations on twodimensional arrays – Sum, Difference.

**UNIT IV    STRINGS AND STRUCTURES    9 HOURS**

Strings: Introduction, Operations on Strings – finding the length of a String, converting characters of a string into upper case, Converting characters of a string into lower case. Structures: Introduction to Structures, Copying and comparing structures, Nested structures.

**UNIT V    POINTERS AND FILE PROCESSING    9 HOURS**

Pointers: Introduction to Pointers, Declaring pointer variables, Passing arguments to function using pointers. File Processing: Introduction to Files, Read Data from Files, Writing data to Files.

**Total Periods:                      45 hours**

  
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Programme Code & Name: MZ & B.E-Mechatronics Engineering

**TEXT BOOK**

Sl.No	AUTHOR(s)	TITLE OF THE BOOK	PUBLISHER	YEAR OF PUBLICATION
1.	Reema Thareja	Computer Fundamentals and Programming in C	Oxford University Press	Second Edition.
2.	Reema Thareja	Programming in C	Oxford University Press	Second Edition.

**REFERENCE BOOK**

Sl.No	AUTHOR(s)	TITLE OF THE BOOK	PUBLISHER	YEAR OF PUBLICATION
1.	Reema Thareja	Programming in C	Oxford University Press	Second Edition.
2.	B S Gottfried: Schaums	Programming with C	Outline Series	2003

  
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**TEXT BOOK**

Sl.No	AUTHOR(s)	TITLE OF THE BOOK	PUBLISHER	YEAR OF PUBLICATION
1.	Reema Thareja	Computer Fundamentals and Programming in C	Oxford University Press	Second Edition
2.	John V Guttag	Introduction to Computation and Programming Using Python	Revised and expanded Edition, MIT Press	2013

**REFERENCE BOOK**

Sl.No	AUTHOR(s)	TITLE OF THE BOOK	PUBLISHER	YEAR OF PUBLICATION
1.	Reema Thareja	Programming in C	Oxford University Press	Second Edition
2.	Robert Sedgewick, Kevin Wayne, Robert Dondero	Introduction to Programming in Python: An Inter-disciplinary Approach	Pearson India Education Services Pvt. Ltd.,	2016
3.	Timothy A. Budd	Exploring Python	Mc-Graw Hill Education (India) Private Ltd	2015
4.	Kenneth A. Lambert	Fundamentals of Python: First Programs	CENGAGE Learning	2012.

  
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21GES03

PROGRAMMING IN C LAB

L	T	P	C
0	0	3	1

### LIST OF EXPERIMENTS

1. Develop a program to find the largest of three numbers.
2. Develop an interactive program to calculate roots of quadratic equation by accepting the coefficients.
3. Develop a program to sum the series:  $1/1! + 4/2! + 27/3! + \dots$  using functions.
4. Develop a program to insert a number at a given location in an array.
5. Implement a program to perform a binary search on 1D sorted Array.
6. Develop a program to read a two dimensional array "marks" which stores marks of 5 students in three subjects. Display the highest marks in each subject
7. Develop a program to concatenate two strings and determine the length of the concatenated string
8. Develop a program to read and display the information about a student using structures.
9. Implement a program to enter a character and then determine whether it is a vowel or not using pointers.
10. Develop a program to read data from the keyboard, write it to a file called "Input", again read the same data from the "Input" file and display it on the screen.



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21GES04 PROGRAMMING IN C AND PYTHON LAB

L	T	P	C
0	0	3	1

**LIST OF EXPERIMENTS**

1. Develop a C program to find the largest of three numbers.
2. Develop an interactive C program to calculate roots of quadratic equation by accepting the coefficients.
3. Develop a C program to sum the series:  $1/1! + 4/2! + 27/3! + \dots$  using functions.
4. Develop a C program to insert a number at a given location in an array.
5. Implement a C program to perform a Fibonacci series.
6. Develop a C program to read a two dimensional array "marks" which stores marks of 5 students in three subjects. Display the highest marks in each subject.
7. Write a Python program to find GCD of two numbers.
8. Write a Python Program to find the square root of a number by Newton's Method.
9. Write a Python program to find the exponentiation of a number.
10. Write a Python Program to find the maximum from a list of numbers.
11. Write a Python Program to perform Linear Search.

  
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21GES05

ELECTRICAL AND ELECTRONICS SCIENCES

L T P C  
3 0 0 3

**COURSE OBJECTIVES**

- To impart knowledge on DC & AC circuits and its analysis
- To impart knowledge of measuring instruments.
- To study the operation of electrical machines.
- To impart the fundamentals of semiconductor.
- To understand the principles of micro computing.

**COURSE OUTCOMES**

- Able to analyze DC and AC circuits
- Able to explain the different type of measuring instruments
- Able to exhibit the operation of electrical machines
- Able to demonstrate the operation of rectifier and DAC/ADC
- Able to explain the principles of micro computing

**UNIT I ELECTRICAL CIRCUITS**

9

Ohm's law - Kirchhoff's laws - Resistors in series and parallel circuits (simple problem) - Introduction to ac circuits and its parameters - Three phase power supply - Star connection - Delta connection - Balanced and Unbalanced Loads.

**UNIT II MEASUREMENTS AND INSTRUMENTATION**

Operating principles of Moving Coil and Moving Iron instruments - Principles of Electrical Instruments, Multimeters, Oscilloscopes - Static and Dynamic Characteristics of Measurement - Errors in Measurement - Transducers - Classification of Transducers

**UNIT III ELECTRICAL MACHINES**

9

Construction, Principle of operation, Basics equation, of DC Motor and Generators - Single phase Induction motors, Construction, Types and speed control methods - Single Phase Transformer, voltage regulation and efficiency (Qualitative & Quantitative treatment only)

**UNIT IV SEMICONDUCTOR DEVICES AND DIGITAL ELECTRONICS**

9

Operation and characteristics of PN Junction Diode - Half wave Rectifiers - Full wave Rectifiers - Bipolar Junction Transistor - Binary Number System - Logic Gates - Boolean algebra - Half and Full Adders - Registers and Counters - A/D and D/A Conversion.

**UNIT V INTRODUCTION TO MICROCOMPUTING**

9

Architecture of 8051 - instruction set - addressing mode - serial port programming - interrupts - ADC/DAC

**TOTAL: 45 Hours**

  
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**TEXT BOOKS:**

Sl.No	Author(s)	Title of the Book	Publisher	Year of Publication
1.	D P Kothari and LJ Nagarath	Basic Electrical and Electronics Engineering	McGraw Hill Education(India) Private Limited	2016
2.	S.K.Bhattacharya	Basic Electrical and Electronics Engineering	Pearson India	2011

**REFERENCE BOOKS:**

Sl.No	Author(s)	Title of the Book	Publisher	Year of Publication
1.	Giorgio Rizzoni	Principles and Applications of Electrical Engineering	McGraw Hill Education(India) Private Limited	2010
2.	A.E.Fitzgerald, David E Higginbotham and Arvin Grabel,	Basic Electrical Engineering	McGraw Hill Education(India) Private Limited	2009
3.	Mittle N	Basic Electrical Engineering	Tata McGraw Hill Edition	2016
4.	Rajendra Prasad	Fundamentals of Electrical engineering	Prentice Hall of India	2006
5.	Del Toro	Electrical Engineering Fundamentals	Pearson Education, New Delhi	2015

  
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21GES06

MECHANICAL AND BUILDING SCIENCES

L T P C  
3 0 0 3

**COURSE OBJECTIVES**

- To get the knowledge on various type of power generation,
- To know about IC Engines and Boilers.
- To familiarize on Refrigeration and Air Conditioning.
- To possess knowledge about Surveying
- To know about the Civil Engineering materials and Building Elements

**COURSE OUTCOMES**

- Demonstrate the various power generation techniques.
- Outline the working principles of IC Engines and Boilers.
- Familiarize the Refrigeration and Air Conditioning systems.
- Understand the principles of field measurement in surveying.
- Gathered knowledge in civil engineering materials and Building Elements

**A. MECHANICAL ENGINEERING**

**UNIT I: POWER PLANT ENGINEERING**

8

Introduction, Classification of Power Plants – Working principle of steam, Gas, Diesel, Hydro-electric and Nuclear Power plants – Merits and Demerits – Pumps– working principle of Reciprocating pumps (single acting and double acting) – Centrifugal Pump.

**UNIT II: IC ENGINES**

8

Internal combustion engines– Working principle of Petrol and Diesel Engines – Four stroke and two stroke cycles – Comparison of four stroke and two stroke engines – Boiler –fire tube–water tube–Benson boiler.

**UNIT III: REFRIGERATION AND AIR CONDITIONING SYSTEM**

7

Terminology of Refrigeration and Air Conditioning, Principle of vapor compression and absorption system – Layout of typical domestic refrigerator – Window and Split type room Air conditioner.

**B. BUILDING SCIENCES**

**UNIT IV : FUNDAMENTALS OF SURVEYING** – Surveying – objectives – divisions – classification – principles – measurements of distances – angles –leveling – determination of areas – illustrative examples.

**UNIT V : MATERIALS AND FOUNDATIONS**

7

Civil Engineering Materials: Bricks – stones – sand – cement – concrete – steel sections – Foundations:Types, Bearing capacity – Requirement of good foundations.

**UNIT VI : BUILDING ELEMENTS AND STRUCTURES**

8

Superstructure: Brick masonry – stone masonry – beams – columns – lintels – roofing – flooring –plastering – basics of interior design – Bridges – Dams.

**TOTAL: 45 Hours**

**TEXT BOOKS:**

Sl.No	Author(s)	Title of the Book	Publisher	Year of Publication
1.	Shanmugam G and Palanichamy M S	Basic Civil and Mechanical Engineering	McGraw Hill Publishing Co., New	1996
2.	Ramamrutham S	Basic Civil Engineering	DhanpatRai Publishing Co. (P) Ltd.	2015

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REFERENCE BOOKS:

Sl.No	Author(s)	Title of the Book	Publisher	Year of Publication
1.	Venugopal K. and Prahu Raja V	Basic Mechanical Engineering	Anuradha Publishers, Kumbakonam	2016
2.	Shantha Kumar S R J	Basic Mechanical Engineering	Hi-tech Publications, Mayiladuthurai	2014
3.	Prabhu T.J, Jai Ganesh, V and Jebaraj.S	Basic Mechanical Engineering	Scitech Publications, Chennai	2010
4.	Seetharaman S	Basic Civil Engineering	Anuradha Agencies	2015
5.	Satheesh Gopi	Basic Civil Engineering	Pearson Publishers	2009

  
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**21GES07 COMPUTER AIDED DRAFTING LABORATORY**

**L T P C**  
**0 0 3 1**

**COURSE OBJECTIVES**

- To construct various curves in engineering applications.
- To understand the principles of projection to project points, lines and planes.
- To draw the orthographic views of solids.
- To draw the projection of solids in simple position and with their axis inclined.
- To be able to construct the development of surfaces.

**COURSE OUTCOMES**

- Understand the basics of drawing instruments and standards.
- Construct various curves used in engineering applications.
- Comprehend and draw orthographic views of various solids
- Explain and draw the projection of points, lines and planes
- Draw the projection of solids and development of surfaces using CAD software.

**CONCEPTS AND CONVENTIONS**

(Not for Examination) Importance of graphics in engineering applications, Use of drafting instrument, BIS conventions and specifications - Size, layout and folding of drawing sheets, Lettering and dimensioning. **4**

**COMPUTER AIDED DRAFTING (Not for Examination)**

Importance 2d Drafting, sketching, modifying, transforming and dimensioning **6**

**UNIT I: PLANE CURVES**

Curves used in engineering practices, Conics, Construction of ellipse, Parabola and hyperbola by eccentricity method, Construction of cycloid, construction of involutes of square and circle, Drawing of tangents and normal to the above curves. **10**

**UNIT II: PROJECTION OF POINTS, LINES AND PLANES**

General Principles of Orthographic projection, Need for importance of multiple views and their placement, First angle projection, layout of views, Projection of points, Projection of straight lines located in the first quadrant, Projection of polygonal surface inclined to both reference planes. **10**

**UNIT III: ISOMETRIC TO ORTHOGRAPHIC VIEWS**

Representation of three dimensional objects, Developing visualization skills through free hand sketching of multiple views from pictorial views of objects, Drawing orthographic views of various solids, Dimensioning. **10**

**UNIT IV: PROJECTION OF SOLIDS**

Projection of simple solids like prisms, pyramids, cylinder and cone when the axis is inclined to one reference plane. **10**

**UNIT V SECTION OF SOLIDS AND DEVELOPMENT OF SURFACES**

Sectioning of simple solids like prisms, pyramids, cylinder and cone in simple vertical position by cutting planes inclined to one reference plane and perpendicular to the other, Development of lateral surfaces of simple and truncated solids, Prisms, pyramids, cylinders and cones. **10**

**\*\*NOTE: Students have to give descriptive answers to the questions from first two units and need to draw the answer figures using CAD software for the questions from the last three units in end semester exam.**

**TOTAL: P: 60 = 60**

Programme Code & Name: MZ & B.E-Mechatronics Engineering

**TEXT BOOKS:**

Sl.No	Author(s)	Title of the Book	Publisher	Year of Publication
1.	Natrajan K.V	A text book of Engineering Graphics	Dhanalakshmi Publishers, Chennai	2015
2.	Basant Agrawal and C.M. Agrawal	Engineering Drawing	McGraw Hill Education; Second edition	2013

**REFERENCE BOOKS:**

Sl.No	Author(s)	Title of the Book	Publisher	Year of Publication
1.	Gopalakrishnan K.R	Engineering Drawing (Vol. I&II combined)	Subhas Stores Bangalore	2007
2	Luzzader, Warren.J. and Duff,John M	Fundamentals of Engineering Drawing with an introduction to Interactive Computer Graphics for Design and Production	Eastern Economy Edition, Prentice Hall of India Pvt. Ltd, New Delhi	2005
3	Shah M.B., and Rana B.C	Engineering Drawing	Pearson, 2nd Edition	2009
4	Venugopal K. and Prabhu Raja V	Engineering Graphics	New Age International (P) Limited	2008
5	Bhatt N.D. and Panchal V.M	Engineering Drawing	Charotar Publishing House, 50 <sup>th</sup> Edition	2010

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21GES08

PYTHON PROGRAMMING

L T P C

3 0 0 3

### COURSE OBJECTIVES

1. To read and write simple Python programs.
2. To develop Python programs with conditionals and loops.
3. To define Python functions and call them.
4. To use Python data structures -- lists, tuples, dictionaries.
5. To do input/output with files in Python

### COURSE OUTCOMES

1. Read, write, execute by hand simple Python programs.
2. Structure simple Python programs for solving problems.
3. Decompose a Python program into functions.
4. Represent compound data using Python lists, tuples, dictionaries.
5. Read and write data from/to files in Python Programs.

#### UNIT I INTRODUCTION 9 HOURS

The way of programming-What is programming- debugging - formal and natural languages - Python: Features - Installing - Running - Python interpreter and interactive mode.

#### UNIT II VARIABLES, EXPRESSIONS, CONDITIONALS 9 HOURS

Values and types: int, float, boolean, string, and list; variables, expressions, statements, tuple assignment, precedence of operators, comments; Conditionals: Boolean values and operators, conditional (if), alternative (if-else), chained conditional (if-elif-else); Iteration: state, while, for, break, continue, pass;

#### UNIT III FUNCTIONS, STRINGS 9 HOURS

Functions, function definition and use, flow of execution. Fruitful functions: return values, parameters, local and global scope, function composition, recursion; Strings: string slices, immutability, string functions and methods, string module; Lists as arrays.

#### UNIT IV LISTS, TUPLES, DICTIONARIES 9 HOURS

Lists: list operations, list slices, list methods, list loop, mutability, aliasing, cloning lists, list parameters; Tuples: tuple assignment, tuple as return value; Dictionaries: operations and methods; advanced list processing - list comprehension.

#### UNIT V FILES, MODULES, PACKAGES 9 HOURS

Files and exception: text files, reading and writing files, format operator; command line arguments, errors and exceptions, handling exceptions, modules, packages.

Total: 45 Hours

  
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21GES09

PROGRAMMING IN PYTHON LAB

L T P C

0 0 3 1

### LIST OF EXPERIMENTS

1. Compute the GCD of two numbers.
2. Find the square root of a number (Newton's method)
3. Exponentiation (power of a number)
4. Find the maximum of a list of numbers
5. Linear search and Binary search
6. Selection sort, Insertion sort
7. Merge sort
8. First n prime numbers
9. Multiply matrices
10. Programs that take command line arguments (word count)
11. Find the most frequent words in a text read from a file
12. Simulate elliptical orbits in Pygame
13. Simulate bouncing ball using Pygame

### PLATFORM NEEDED

Python 3 interpreter for Windows/Linux

  
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21GES10

SOFT SKILLS LABORATORY

L T P C  
0 0 3 2

**COURSE OBJECTIVES**

- To Analyse the Strength and Weakness of an Individual
- To build an effective team in work place
- To develop effective Time Management Skills
- To describe the qualities of an Effective Presenter
- To improve Health and Social life

**COURSE OUTCOMES**

- Identifying the Career Path
- Developing the leadership Qualities for the betterment of the team
- Developing Effective Time Management Skill
- Understanding the importance of Effective Communication
- Handling Stress and Developing Problem Solving Skill

**UNIT I Self Analysis**

SWOT Analysis – Intra Personal Skill – Inter Personal Skill

**UNIT II Team Work**

Importance of a Team Player – Leadership Quality – Decision Making Skill

**UNIT III Time management**

Effective Planning – Goal Setting – Spending right time on right job

**UNIT IV Presentation skill**

Verbal Communication – Non Verbal Communication

**UNIT V Stress Management**

Eustress – Distress – Emotional Intelligence – Fear Management (Crowd Fear, Exam Fear, StageFear)



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21GES11	ELECTRONIC DEVICES	L	T	P	C
		3	0	0	3

**COURSE OBJECTIVES:**

- To know about the basics of Semiconductor Diodes
- To know about the working principle and characteristics of BJT.
- To know about the operation and characteristics of FET.
- To know about the biasing techniques of BJT and FET.
- To understand the working function and applications of special diodes and optoelectronic devices.

**COURSE OUTCOMES:**

After the completion of the course, the students can able to

- Understand the theory, operation and characteristics of semiconductor diodes.
- Explain the basics and characteristics of BJT
- Describe the construction, working principle and characteristics of FET
- Discuss about the biasing of BJT and FET.
- Understand the working function and applications of special diodes and optoelectronics devices.

<b>UNIT I:</b>	<b>SEMICONDUCTOR DIODES</b>	9
Review of Semiconductor Physics-Drift and diffusion currents-Continuity Equation-Theory of PN Junction Diode-Diode Current Equation-Current Voltage Characteristics-Effect of Temperature on PN Junction diodes-Diffusion Capacitance-Applications: Rectifiers, Clippers, Clampers-Avalanche Breakdown Mechanism-Zener Diode as a Voltage Regulator.		
<b>UNIT II:</b>	<b>BIPOLAR JUNCTION TRANSISTORS</b>	9
Bipolar Junction Transistor Operations-Configurations: CC, CB, CE-Transistor Current Components- Ebermoll's Model of Transistor-Small Signal Low Frequency Hybrid-High Frequency Effects-Transistor as an Amplifier and Switch.		
<b>UNIT III:</b>	<b>FIELD EFFECT TRANSISTORS</b>	9
Operation and Characteristics of JFET-Configurations of JFET-JFET as Amplifier, Switch, Voltage Variable Resistor-Metal Oxide Semiconductor Field Effect Transistor (MOSFET)-Enhancement and Depletion Mode MOSFET-Characteristics of n-MOS and p-MOS-Introduction to CMOS.		
<b>UNIT IV:</b>	<b>BIASING OF BJT AND FET</b>	9
DC operating point and Load line-Q point-Bias Stability-Transistor Biasing Methods: Fixed Bias- Collector to Base Bias-Self biasing, Thermal Runaway, Thermal Stability-FET biasing methods: Self bias-Source bias-Voltage divider bias-Biasing MOSFETs.		
<b>UNIT V:</b>	<b>SPECIAL DIODES AND OPTO ELECTRONIC DEVICES</b>	9 Theory and
Characteristics of Schottky Diode-Tunnel Diode-Varactor Diode-SCR-TRIAC-LDR-UJT- Photoemissivity and Photoconductivity-Photoconductive Cell-Photo Voltaic Cell-Photodiode- Phototransistors-Construction and Characteristics of LCD and LED-LASER Diodes- Opto Couplers, FINFET.		

**TOTAL: 45**

  
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**TEXT BOOKS**

Sl. No	Author(s)	Title of the Book	Publisher	Year of Publication
1	Jacob Millman, Christos Halkias & Satyabrata Jit, Millman's	Electronic Devices and Circuits	McGraw Hill	2nd Edition, 2008.
2	Robert L.Boylestad, Louis Nashelsky	Electronic Devices and Circuit Theory	Pearson education	11th Edition,2012

**REFERNCE BOOKS**

SLN o	Author(s)	Title of the Book	Publisher	Year of Publication
1	Allen Mottershead	Electronic Devices and Circuits	Prentice Hall of India	2008
2	Douglas.A.Pucknell, Kamran Eshraghian	Basic VLSI Design, Principles and Application	Prentice Hall of India	2009
3	S.Salivahanan, N.Sureshkumar and A.Vallavaraj	Electronic Devices and Circuits	Tata McGraw Hill	2nd Edition, , 2008
4	Donald A. Neamen	Semiconductor Physics and Devices	Tata McGraw Hill	Third Edition
5	S. M. Sze	Semiconductor Devices: Physics and Technology	Wiley	Second Edition

  
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21GES13

ELECTRIC CIRCUITS

L T P C  
2 1 0 3

**COURSE OBJECTIVES**

- To communicate the knowledge on DC circuits and its analysis.
- To impart knowledge on AC circuits and its analysis. To impart knowledge on solving circuits equations using network theorems.
- To introduce the concept of resonance circuits and transient response in circuits.
- To impart knowledge on balanced and unbalanced in three phase circuits.

**COURSE OUTCOMES**

- Able to analyze DC circuits
- Able to give details on the AC circuits and analyze.
- Able to solve the different type of network problems
- Able to implement the resonance condition in the power circuits.
- Able to analyze the different type of load in three phase circuits.

**UNIT I DC CIRCUITS**

6+3

Basic circuit elements - Ohm's law - Resistors in series and parallel circuits - Voltage division and current division - Kirehloff's laws - Source transformation - Star-Delta conversion - Mesh and nodal analysis.

**UNIT II AC CIRCUITS**

6+3

Introduction to AC circuits- Form Factor - Phase and phase difference - Sinusoidal Voltage and Current - Single phase AC circuits - Series and parallel RL, RC and RLC circuits - Power - Power factor.

**UNIT III NETWORK THEOREMS FOR DC AND AC CIRCUITS**

6+3

Superposition theorem - Thevenin's theorem - Norton's theorem - Maximum power transfer theorem - Reciprocity theorem- Compensation theorem

**UNIT IV RESONANCE CIRCUITS AND TRANSIENT RESPONSE**

6+3

Series and parallel resonance - Quality factor and bandwidth - Transient response of RL, RC and RLC Circuits using Laplace transform for DC input.

**UNIT V THREE PHASE CIRCUITS**

6+3

Three phase balanced / unbalanced voltage sources - Analysis of three phase 3-wire and 4-wire circuits with star and delta connected loads, balanced & unbalanced loads - Phasor diagram of voltages and currents - Power and Power factor measurements in three phase circuits.

**TOTAL: 45 Hours**

**TEXT BOOKS:**

Sl.No	Author(s)	Title of the Book	Publisher	Year of Publication
1.	Charles K. Alexander, Mathew N.O. Sadiku	Fundamentals of Electric Circuits	McGraw Hill	2013
2.	William H. Hayt Jr, Jack E. Kemmerly and Steven M. Durbin	Engineering Circuits Analysis	McGraw Hill publishers New Delhi	2013

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Programme Code & Name: MZ & B.E-Mechatronics Engineering

21GES12	ELECTRONIC SIMULATION LABORATORY	L	T	P	C
		0	0	3	1

**COURSE OBJECTIVES:**

The objectives of this laboratory course are,

- To understand the operation of semiconductor devices using laboratory equipments and simulation software.
- To design and test the electronic circuits using laboratory devices, equipments and simulation software.

**COURSE OUTCOMES:**

After the completion of the course, the students can able to

- Measure and interpret the parameters of diodes and transistors
- Construct and analyze the amplifier using BJT.
- Construct and analyze the voltage regulator.
- Design and measure various wave shaping circuits using diodes.
- Measure and interpret the parameters of different special diodes.

**LIST OF EXPERIMENTS:**

1. Analyze the Device Behaviour of Semiconductor Diodes.
2. Analyze the Characteristics of Bipolar Junction Transistors.
3. Design and Analysis of BJT as an amplifier.
4. Analyze the Device Behaviour of FETs.
5. Design and Analysis of Voltage Regulators.
6. Design and Analysis of Rectifiers.
7. Design and Analysis of Clippers and Clampers.
8. Analyze the device Behaviour of UJT.
9. Analyze the device Behaviour of SCR.
10. Analyze the characteristics of LED, LDR and Photodiode.

  
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**TEXT BOOK**

Sl.No	AUTHOR(s)	TITLE OF THE BOOK	PUBLISHER	YEAR OF PUBLICATION
1.	Allen B. Downey	Think Python: How to Think Like a Computer Scientist	O'Reilly Publishers	2016
2.	Guido van Rossum and Fred L. Drake Jr	An Introduction to Python	Network Theory Ltd	2011

**REFERENCE BOOK**

Sl.No	AUTHOR(s)	TITLE OF THE BOOK	PUBLISHER	YEAR OF PUBLICATION
1.	Charles Dierbach	Introduction to Computer Science using Python: A Computational Problem-Solving Focus	Wiley India Edition	2013
2.	John V Guttag	Introduction to Computation and Programming Using Python	MIT Press	2013
3.	Kenneth A. Lambert	Fundamentals of Python: First Programs	CENGAGE Learning	2012
4.	Paul Gries, Jennifer Campbell and Jason Montojo	Practical Programming: An Introduction to Computer Science using Python 3	Pragmatic Programmers,LLC	2013
5.	Timothy A. Budd	Exploring Python	Mc-Graw Hill Education (India) Private Ltd	2015

  
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REFERENCE BOOKS:

Sl.No	Author(s)	Title of the Book	Publisher	Year of Publication
1.	Jegatheesan, R	Analysis of Electric Circuits	McGraw Hill	2015
2.	Mahadevan, K., Chitra, C	Electric Circuits Analysis	Prentice-Hall of India Pvt Ltd., New Delhi	2015
3.	Sudhakar A and Shyam Mohan SP	Circuits and Network Analysis and Synthesis	McGraw Hill	2015
4.	M E Van Valkenburg	Network Analysis	Prentice-Hall of India Pvt Ltd, New Delhi	2015
5.	Chakrabarti A	Circuits Theory (Analysis and synthesis)	Dhanpath Rai & Sons, New Delhi	2011

  
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21GES14

ELECTRIC CIRCUITS LABORATORY

L T P C  
0 0 3 1

**COURSE OBJECTIVES**

- To simulate various electric circuits using Matlab
- To gain practical experience on electric circuits and verification of theorems

**COURSE OUTCOMES**

- Able to simulate the electrical circuits
- Able to design the circuit and implement in hardware

**LIST OF EXPERIMENTS:**

1. Verification of ohm's law
2. Verification of Kirchhoff's voltage and current laws.
3. Verification of Thevenin's theorem
4. Verification of Norton's theorem
5. Verification of Superposition theorem
6. Verification of Maximum Power Transfer Theorem.
7. Study of CRO and measurement of sinusoidal voltage and frequency.
8. Determination of time constant of series R-C electric circuits.
9. Determination of frequency response of series & parallel RLC circuits.
10. Calibration of single phase energy meter.
11. Determination of power in three phase circuits by two-watt meter method.

  
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TOTAL: 45 Hours

21GES15

**MANUFACTURING PROCESSES**

**L T P C**

**3 0 0 3**

**COURSE OBJECTIVES**

- To introduce the students to the concept of some basic production processes and fabrication techniques.
- Understand the Concept of metal casting processes.
- To understand metal joining processes.
- Understanding metal forming Processes.
- To study the Plastic and composite material moulding processes

**COURSE OUTCOMES**

- Understand the concepts of casting processes..
- Study about fabrication processes to join the different metals.
- Understand the concept of bulk deformation process.
- Study about the metal forming processes.
- Understand the process of composite materials.

**UNIT I**

**CASTING PROCESSES**

9

Introduction–Patterns, Requirements of a good pattern, pattern materials, types of patterns, pattern allowances–Mould making, types of moulds, moulding processes, types of sand moulding–Coremaking, types of cores, core prints, core box–Moulding Sand Properties of mouldings and, types of moulding sand–Melting equipment, cupola furnace, crucible furnace, electric furnace–Gating system–Casting processes, Sand casting, Shell-mould casting, Investment casting, Die casting, centrifugal casting –Defects, Cleaning and Inspection of casting.

**UNIT II**

**FABRICATION PROCESSES**

9

Introduction–Classification of welding processes–Resistance welding, spot, seam, projection, butt welding–Gas welding, oxy-acetylene welding, equipments–Arc welding, shielded arc welding, TIG, MIG, submerged arc welding, electro-slag welding, ultrasonic welding, plasma arc welding, laser beam welding, friction welding–Soldering and Brazing–Testing and Inspection of welded joints, Defects in welds.

**UNIT III**

**BULK DEFORMATION PROCESSES**

9

Introduction–Cold and hot working processes Rolling, classification of rolling, principle, rolling stand arrangement, defects in rolling–Forging, classification of forging, methods of forging, defects in forging–Extrusion, Classification of extrusion, Hot and cold extrusion processes, extrusion defects and equipments–Drawing, Drawing of rods, wire and tubes.

**UNIT IV**

**METAL FORMING PROCESSES**

9

Introduction–Metal stamping and forming, bending, deep drawing, stretch forming, metals pinning, blanking, piercing, embossing and coining, notching, punching, roll forming, rubber press forming, hydro-mechanical forming–Comparison of metal forming processes–Defects in sheet metal formed parts.

**UNIT V**

**PLASTIC AND COMPOSITE MATERIAL PROCESSES**

9

Processing of plastics, compression moulding, transfer moulding, injection moulding, blow moulding, thermo forming and calendaring–advantages of plastic materials–Introduction to composite material–Classification of composite materials–advantages of composite materials.

TOTAL: 45 Hours

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**TEXT BOOKS:**

Sl. No	Author(s)	Title of the Book	Publisher	Year of Publication
1.	Rajput R.K	A Text Book of Manufacturing Technology	Laxmi Publications (P) Ltd, New Delhi,	2008
2.	Sharma P.C	A Text Book of Production Technology	S.Chand and Company IV Edition,	2004

**REFERENCE BOOKS:**

Sl. No	Author(s)	Title of the Book	Publisher	Year of Publication
1.	Rao P.N,	Manufacturing Technology Vol. 1	Tata McGraw Hill publishing company limited, New Delhi, 3 <sup>rd</sup> edition,	2009
2.	Hajra Choudhury	Elements of Workshop Technology Vol. 1 & 2.	Media promoters Pvt Ltd., Mumbai	2007.
3.	Serope Kalpajian and Steven R. Schmid	Manufacturing Engineering and Technology	Pearson Education Inc. Second Indian Reprint	2002
4.	Jain R.K	Production Technology	Khanna Publications	2001
5.	Luqman Midhat	Production Processes	CBS; 1ST edition	2010

  
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21GES16

MANUFACTURING PROCESSES LAB

L T P C  
0 0 3 1

**COURSE OBJECTIVES**

- To introduce the students to the concept of some basic production processes and fabrication techniques.
- Understand the Concept of metal casting processes.
- To understand metal joining processes.
- Understanding metal forming Processes.
- To study the Plastic and composite material moulding processes

**COURSE OUTCOMES**

- Understand the concepts of casting processes..
- Study about fabrication processes to join the different metals.
- Understand the concept of bulk deformation process.
- Study about the metal forming processes.
- Understand the process of composite materials.

**List of Experiments**

1. Fitting work :preparation of l joint, v-joint
2. Carpentry work :Preparation of T-Joint, Lap joint, Dovetail Joint
3. Plumbing Work : Basic pipe connections (PVC) involving the fittings like Valves, Taps, and Bends., Mixed pipe (PVC and G.I) connections involving the fitting like Valves, Taps, and Bends
4. Sheet metal Work: Construction of Tray, Funnel and cone
5. Foundry : Solid pattern Moulding, Split pattern Moulding , Core making
6. Welding : Vertical Welding and Horizontal Welding
7. Lathe Work : Plain Turning, Step Turning, Taper Turning, and Knurling operation.

TOTAL: 30 Hours



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16GES17

MECHANICAL AND BUILDING SCIENCES LAB

L T P C  
0 0 3 1

**COURSE OBJECTIVES:**

- At the end of course the student will plan the pipe connections in PVC, G.I pipes.
- Analyze to separate the woods with tools and made of several pieces with proper types of joints using tools and machines.
- Demonstrate and remove materials from metal components and assemble the components.
- Join two metals by melting their edges by electric arc welding.
- Demonstrate Residential house wiring and Fluorescent lamp wiring.

**COURSE OUTCOMES**

- The students are able to make different pipe connections using PVC, G.I pipes.
- The students demonstrate different types of joints using carpentry and power tools.
- They categories various sheet metal working tools and fitting tools.
- They are able to use welding equipments to join structures.
- Students organize household wirings.

**UNIT I:**

**CIVIL ENGINEERING PRACTICE**

25

**1. PLUMBING WORK**

1. Study of pipeline joints, its location and functions: valves, taps, couplings, unions, reducers, Elbows and household fittings.
2. Basic pipe connections (PVC) involving the fittings like Valves, Taps, and Bends.
3. Mixed pipe (PVC and G.I) connections involving the fitting like Valves, Taps, and Bends

**2. CARPENTRY WORK**

1. Study of Carpentry Tools
2. Preparation of T-Joint
3. Preparation of Lap joint
4. Preparation of Dovetail Joint

**UNIT II**

**MECHANICAL ENGINEERING PRACTICE**

25

**FITTING WORK**

1. Study of Sheet Metal Work.
2. Preparation of L joint
3. Preparation of V-joint

**WELDING**

1. Study of Welding Equipments and Tools
2. Preparation of Butt joint
3. Preparation of Lap joint
4. Preparation of Tee joint
- 5.

**MACHINE ASSEMBLY PRACTICE**

1. Assembly and Dismantling for gear box.
2. Assembly and Dismantling for the two wheeler wheel.

**UNIT III**

**ELECTRICAL ENGINEERING PRACTICE**

10

1. Residential house wiring
2. Fluorescent lamp wiring.
3. Stair-case Wiring and Door bell wiring



21GES18

CONSTRUCTION MATERIALS

L T P C  
3 0 0 3

**COURSE OBJECTIVES**

- To introduce students to various materials commonly used in civil engineering construction and their properties.
- To study about the concrete design mix.
- To know about the procedures in concreting.
- To understand special concrete and their use.
- To know about the manufacture of cement.

**COURSE OUTCOMES**

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

- Demonstrate knowledge of construction materials and their usages in building projects.
- Learning to further research in advancement of civil engineering materials field.
- Identify the materials including their sources and production and properties.
- Understood characteristics of conventional building materials like stone, brick, wood etc.
- Learned about new and composite materials and their value adding characteristic of being lightweight, energy efficient, speedy construction among others.

**UNIT I: STONES – BRICKS – CONCRETE BLOCKS**

9

Stone as building material – Criteria for selection – Tests on stones – Deterioration and Preservation of stone work – Bricks – Classification – Manufacturing of clay bricks – Tests on bricks – brick earth – composition and harmful constituents – Efflorescence – Bricks for special use – Refractory bricks – Cement, Concrete blocks – Light weight concrete blocks.

**UNIT II : CEMENT – AGGREGATES – MORTAR**

9

Cement – Ingredients – Manufacturing process – Types and Grades – Properties of cement and Cement mortar – Hydration – Tests on cement – Industrial byproducts – Fly ash Aggregates – Natural stone aggregates – Crushing strength – Impact strength – Flakiness Index – Elongation Index – abrasion Resistance – Grading – Sand Bulking.

**UNIT III : CONCRETE**

9

Concrete – Ingredients – Manufacturing Process – RMC – Tests on fresh and hardened concrete – Modulus of rupture – Mix specification – Mix proportioning – BIS method – Admixtures and their functions – High Strength Concrete and HPC – Other types of Concrete – Durability of Concrete – Corrosion – Causes and effects – remedial measures – Thermal properties of concrete – Micro cracking of concrete – Quality of Water for mixing and curing – use of sea water for mixing concrete.

**UNIT IV : TIMBER AND OTHER MATERIALS**

9

**Timber** – Market forms – Industrial timber – Plywood – Veneer – Thermacole – Panels of laminates. **Ferrous metals:** Iron and steel, basic metallurgy, composition and grades, market forms and heat treatment of Steel as reinforcement – Corrosion of metals and protection.  
**Non-ferrous metals:** Aluminum, copper, brass and glass products – properties – applications.

**UNIT V : MODERN MATERIALS**

9

Glass – Ceramics – Sealants for joints – Fiber glass reinforced plastic – Clay products – Refractory's – Composite materials – Types – Applications of laminar composites – Fiber textile – Geo membranes and Geotextiles for earth reinforcement – polymers and plastics: walls, pipes and sanitary ware, glues and mastics – acid and chemical resistant products.

**TOTAL : 45 Periods**

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**TEXT BOOKS:**

Sl.No	Author(s)	Title of the Book	Publisher	Year of Publication
1	Duggal.S.K	Building Materials	4th Edition, New Age International	2016
2	Edward Allen and Joseph Iano	Fundamentals of Building Construction: Materials and Methods	Wiley, 6th Edition	2013

**REFERENCE BOOKS:**

Sl.No	Author(s)	Title of the Book	Publisher	Year of Publication
1.	Varghese. P.C	Building construction	Prentice Hall of India Pvt. Ltd, New Delhi	2012
2	Shetty.M.S	Concrete Technology (Theory and Practice)	S. Chand and Company Ltd	2014
3	Arora S.P. and Bindra S.P	The Text Book of Building Construction	Dhanpat Rai and Sons	1999
4	G.S.Birdie, T.D.Ahuja	Building Construction and construction materials	Dhanpat Rai publishing company, New Delhi.	2007
5	Gambhir.M.L	Concrete Technology	3rd Edition, Tata McGraw Hill Education	2009



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21GES19

CONCEPTS IN PRODUCT DESIGN

L T P C

3 0 0 3

### COURSE OBJECTIVES

- To apply different ideas to manage innovation and development
- To analyze the product specification
- To know the concepts of CAD ,CAM ,CAE
- To develop product geometry, fundamental and conceptualization management
- To estimate and also to analyse the manufacturing components and assembly cost

### COURSE OUTCOMES

- Apply different ideas enabling people to manage to work with innovation and development in organization.
- Examine the product specification select concept, product performance and manufacturing
- Develop product geometry, layout, fundamental and incidental interaction
- Design the integrated process robust design, conceptualization and management of industrial design.
- Estimate and Analyze the manufacturing components and assembly cost, planning for prototypes.

#### UNIT I: INTRODUCTION

9

Strategic importance of Product development - integration of customer, designer, material supplier and process planner. Competitor and customer - behavior analysis. Understanding customer-promoting customer understanding-involve customer in development and managing requirements

#### UNIT II : CONCEPT GENERATION, SELECTION AND TESTING

9

Plan and establish product specifications. Task - Structured approaches - clarification – search externally and internally- reflect on the solutions and processes -concept selection - methodology - benefits. Implications - product performance – manufacturability.

#### UNIT III: PRODUCT ARCHITECTURE

9

Product development management - creation - clustering -geometric layout development - Fundamental and incidental interactions - related system level design issues - secondary systems -architecture of the chunks - creating detailed interface specifications-Portfolio Architecture.

#### UNIT IV: INDUSTRIAL DESIGN

9

Integrate process design - Managing costs - Robust design - Integrating CAE, CAD, CAM tools – Simulating product performance and manufacturing processes electronically - Need for industrial design- impact – design process - investigation of customer needs – conceptualization- refinement - management of the industrial design process.

#### UNIT V: DESIGN FOR MANUFACTURING AND PRODUCT DEVELOPMENT

9

Definition - Estimation of Manufacturing cost-reducing the component costs and assembly costs –Minimize system complexity - Prototype basics - Principles of prototyping – Planning for prototypes - Economic Analysis.

**TOTAL: L: 45 Hours**

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**TEXT BOOKS**

Sl. No	Author(s)	Title of the Book	Publisher	Year of Publication
1	Ulrich K.T. and Eppinger S.D	Product Design and Development	McGraw -Hill International Editions	1999
2	Kevin Otto	Product Design	Pearson Education,	2004

**REFERENCE BOOKS**

Sl. No	Author(s)	Title of the Book	Publisher	Year of Publication
1	Rosenthal S	Business One Orwin	Business One	1992
		Homewood	Orwin, Homewood	
2	Rosenthal S	Effective Product Design and Development	Business One Orwin, Homewood	1992
3	Pugh S	Total Design – Integrated Methods for successful Product Engineering	Addison Wesley Publishing	1991
4	Clive L.Dym	Engineering Design: A Project-based Introduction	John Wiley & Sons	2009
5	Yousef Haik	Engineering Design Process	Cengage Learning	2010



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21GES20

RENEWABLE ENERGY SOURCES

L T P C

3 0 0 3

**COURSE OBJECTIVES**

- At the end of the course, the students are expected to identify the new methodologies/ technologies for effective utilization of renewable energy sources.
- To understand reverse of energy recourses.
- Understand solar energy production and applications.
- To understand wind energy systems.
- Other energy recourses are studied and learned.

**COURSE OUTCOMES**

- Understand the fundamentals of energy scenario.
- Illustrate the techniques used in utilization and measurement of solar energy
- Demonstrate the types and performance of wind energy systems
- Comprehend and identify the bio-mass energy sources and applications.
- Outline the utilization techniques of tidal, wave, Hydro, geothermal, fuel cell systems and hybrid system energy sources.

<b>UNIT I:</b>	<b>INTRODUCTION</b>	<b>9</b>
World Energy Use – Reserves of Energy Resources – Environmental Aspects of Energy Utilisation – Renewable Energy Scenario in Tamilnadu, India and around the World - Potentials - Achievements / Applications – Economics of renewable energy systems.		
<b>UNIT II:</b>	<b>SOLAR ENERGY</b>	<b>9</b>
Solar Radiation – Measurements of Solar Radiation - Flat Plate and Concentrating Collectors – Solar direct Thermal Applications – Solar thermal Power Generation - Fundamentals of Solar Photo Voltaic Conversion – Solar Cells – Solar PV Power Generation – Solar PV Applications.		
<b>UNIT III:</b>	<b>WIND ENERGY</b>	<b>9</b>
Wind Data and Energy Estimation – Types of Wind Energy Systems – Performance - Site Selection – Details of Wind Turbine Generator – Safety and Environmental Aspects.		
<b>UNIT IV:</b>	<b>BIO - ENERGY</b>	<b>9</b>
Biomass direct combustion – Biomass gasifiers – Biogas plants – Digesters – Ethanol production – Biodiesel – Cogeneration - Biomass Applications.		
<b>UNIT V:</b>	<b>OTHER RENEWABLE ENERGY SOURCES</b>	<b>9</b>
Tidal energy – Wave Energy – Open and Closed OTEC Cycles – Small Hydro-Geothermal Energy Hydrogen and Storage - Fuel Cell Systems – Hybrid Systems.		

**TOTAL: L: 45 Hours**

**TEXT BOOKS:**


Sl. No	Author(s)	Title of the Book	Publisher	Year of Publication
1.	G.D. Rai	Non Conventional Energy Sources,	Khanna Publishers, New Delhi,	2011.
2.	Twidell, J.W. & Weir	A., Renewable Energy Sources	EFN Spon Ltd., UK,	2006

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REFERENCE BOOKS:

Sl. No	Author(s)	Title of the Book	Publisher	Year of Publication
1.	David M. Mousdale	Introduction to Biofuels,	CRC Press Taylor & Francis Group, USA	2010
2.	Chetan Singh Solanki	Solar Photovoltaic, Fundamentals, Technologies and Applications,	PHI Learning Private Limited, New Delhi	2009
3.	S.P. Sukhatme	Solar Energy	Tata McGraw Hill Publishing Company Ltd., New Delhi,	1997.
4.	Sinduja S	Renewable Energy Sources	Anuradha Publications	2012
5.	Tasneem abbasi and T.A Abbasi	Renewable Energy Sources: Their Impact on Global Warming and Pollution	Prentice Hall India Learning Private Limited	2010

  
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21GES21

**ELECTRICAL DRIVES AND CONTROLS**

L T P C  
3 0 0 3

**COURSE OBJECTIVES**

- To understand the basics of electrical drives.
- To study the drive motor characteristics,
- To study the different methods of starting D.C motors and Induction Motors.
- To study the Conventional and Solid-State DC Drives.
- To study the Speed Control of AC Drives.

**COURSE OUTCOMES**

1. Able to explain the basics of electrical drives.
2. Able to describe drive motor characteristics
3. Able to demonstrate the methods of starting D.C motors and Induction Motors.
4. Able to describe speed control of DC drives.
5. Able to explain the conventional and solid state speed control of AC drives.

**UNIT I INTRODUCTION**

9

Basic Elements - Types of Electric Drives - Factors influencing the choice of Electrical Drives - Heating and Cooling Curves - Loading conditions and classes of duty - Selection of power rating for drive motors with regard to thermal overloading and Load variation factors.

**UNIT II DRIVE MOTOR CHARACTERISTICS**

9

Dynamics of Motor load system – Multi-quadrant operation – DC Motor (Types, Torque Equation, Characteristics and Applications) - Single phase induction motor (Types and Applications) - Three phase induction motors (Types, Characteristics) - Braking of Electric motors.

**UNIT III STARTING METHODS**

9

Necessity of a starters – Types of DC Motor Starters – Types of 3 phase squirrel cage and slip ring Induction Motor Starters.

**UNIT IV CONVENTIONAL AND SOLID STATE SPEED CONTROL OF DC DRIVES**

9

Speed control of DC series and shunt motors - Armature and field control - Ward-Leonard control system using controlled rectifiers and DC choppers.

**UNIT V CONVENTIONAL AND SOLID STATE SPEED CONTROL OF AC DRIVES**

9

Speed control of three phase induction motor - Voltage control, voltage / frequency control and slip power recovery scheme using inverters and AC voltage regulators.

**TOTAL: 45 Hours**

**TEXT BOOKS:**

Sl.No	Author(s)	Title of the Book	Publisher	Year of Publication
1.	G. K. Dubey	Fundamentals of Electrical Drives	CRC press	2002
2.	Vedam Subrahmaniam	Electric Drives (Concepts and Applications)	Tata McGraw-Hill	2010

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REFERENCE BOOKS:

Sl.No	Author(s)	Title of the Book	Publisher	Year of Publication
1.	Gnanavadivel J Karthikeyan J Chitra Selvi S	Electrical Drives and Controls	Anuradha Publishers	2004
2.	Thiyagarajan V	Electrical Drives and Controls	A.R. Publications	2015
3.	Pillai SK	A First Course on Electric Drives	New age international publishers	2013
4.	Jagadeesh Babu V	Electrical Drives and Controls	Scitech Publications	2015
5.	Austin Hughes and Bill Drury	Electric Motors and Drives	Newness Heinemann Publishers	2018



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21GES22 ELECTRICAL DRIVES AND CONTROLS LABORATORY

L T P C  
3 0 0 1

**OBJECTIVES:**

- To study the conventional and solid-state drives
- To study the different methods of starting D.C motors and induction motors.
- To understand the basic concepts of different types of electrical machines and their performance.

**LIST OF EXPERIMENTS:**

1. Load test on DC Shunt & DC Series motor.
2. O.C.C & Load characteristics of DC Shunt and DC Series generator.
3. Speed control of DC shunt motor (Armature, Field control).
4. Load test on single phase transformer.
5. O.C & S.C Test on a single phase transformer.
6. V curves and inverted V curves of synchronous Motor.
7. Load test on three phase squirrel cage Induction motor.
8. Speed control of three phase slip ring Induction Motor.
9. Load test on single phase Induction Motor.
10. Study of DC & AC Starters.

**TOTAL: 45 Hours**

  
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21GES23

ANALOG AND DIGITAL COMMUNICATION

L T P C

3 0 0 3

### COURSE OBJECTIVES

1. To Understand basic elements of a communication system
2. To Conduct analysis of baseband signals in time domain and in frequency domain
3. To Demonstrate understanding of various analog and digital modulation and demodulation techniques technique
4. To Analyses the performance of modulation and demodulation techniques in various transmission environments
5. To appreciate the importance of synchronization in communication systems

### COURSE OUTCOMES

6. Explain and apply various types of modulation and demodulation in analog and digital Communication.
7. Describe the concept of digital communication techniques.
8. Describe the concept of various digital transmission techniques.
9. Comprehend the Cellular communication techniques.
10. Explain the concepts of Satellite communication and Optical communication

### UNIT I FUNDAMENTALS OF ANALOG COMMUNICATION

9

Principles of amplitude modulation - AM envelope - frequency spectrum and bandwidth - modulation index and percent modulation - AM Voltage distribution - AM power distribution - Angle modulation - FM and PM waveforms - phase deviation and modulation index - frequency deviation and percent modulation  
Frequency analysis of angle modulated waves - Bandwidth requirements for Angle modulated waves.

### UNIT II DIGITAL COMMUNICATION

9

Shannon limit for information capacity - Digital amplitude modulation - Frequency Shift Keying - FSK bitrate and baud - FSK transmitter - BW consideration of FSK - FSK receiver - Phase Shift Keying - BPSK, QPSK - PSK - Quadrature Amplitude modulation - 8-QAM - bandwidth efficiency - Carrier recovery - squaring loop, Costas loop - DPSK.

### UNIT III DIGITAL TRANSMISSION

9

Pulse modulation - PCM - PCM sampling - Sampling rate - Signal to Quantization noise rate - Commanding-analog and digital - Delta modulation PCM - Adaptive Delta modulation PCM - Differential PCM - Inter symbol interference - Eye patterns.

### UNIT IV CELLULAR COMMUNICATION

9

Fundamental concept of Cellular telephone - Frequency reuse, Interference - Co-channel Interference, Adjacent channel Interference - Cell splitting - Cell sectoring - Segmentation and Dualization - Roaming and Handoff.

### UNIT V SATELLITE AND OPTICAL COMMUNICATION

9

Kepler's Law - Satellite Orbits - Geo synchronous satellites - satellite system link models - Optical Fiber Communication system - Optical Fiber configurations - Optical Fiber classification Losses in Optical fiber cables - Optical sources - LED, Injection laser diode - Light detector - PIN diodes, Avalanche photo diode.

  
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**TEXT BOOK**

Sl.No	AUTHOR(s)	TITLE OF THE BOOK	PUBLISHER	YEAR OF PUBLICATION
1.	Wayne Tomasi,	Electronic Communication Systems Fundamentals through Advanced	Pearson Education	2008
2.	H.Taub,D L Schilling,G Saha	Principles of Communication	Pearson Education	2008

**REFERENCE BOOK**

Sl.No	AUTHOR(s)	TITLE OF THE BOOK	PUBLISHER	YEAR OF PUBLICATION
1.	B.P.Lathi	Modern Analog and Digital Communication systems	Oxford University Press	2008
2.	Blake	Electronic Communication Systems	Thomson Delmar Publications	2002
3.	Martin S.Roden	Analog and Digital Communication System	PHI	2002
4.	B.Sklar	Digital Communication Fundamentals and Applications	Pearson Education	2007
5.	Simon Haykin	Communication Systems	John Wiley & Sons	2010.

  
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**COURSE OBJECTIVES:**

- To know about the basics of Boolean Algebra and Logic Gates.
- To Design and Implement Combinational Logic.
- To Design and Implement Synchronous Sequential Logic.
- To Design and Implement of Asynchronous Sequential Logic.
- Be familiar with the theory, construction, and operation of Basic Memory And Programmable Logic.

**COURSE OUTCOMES:**

- To Learn about the basics of Boolean Algebra and Logic Gates.
- To Learn about the basics Combinational Logic.
- To Learn about the basics Synchronous Sequential Logic.
- To Learn about the basics of Asynchronous Sequential Logic.
- Be familiar with the theory, construction, and operation of Basic Memory and Programmable Logic.

**UNIT I: BOOLEAN ALGEBRA AND LOGIC GATES 6**

Review of Number Systems –Arithmetic Operations -Binary Codes–Boolean Algebra and Theorems – Boolean Functions–Simplification of Boolean Functions using Karnaugh Map and Tabulation Methods –Logic Gates–NAND and NOR Implementations.

**UNIT II :COMBINATIONAL LOGIC 6**

Combinational Circuits –Analysis and Design Procedures–Circuits for Arithmetic Operations, Code Conversion – Decoders and Encoders –Multiplexers and Demultiplexers –Introduction to HDL –HDL Models of Combinational circuits.

**UNIT III:SYNCHRONOUS SEQUENTIAL LOGIC 6**

Sequential Circuits –Latches and Flip Flops –Analysis and Design Procedures –State Reduction and State Assignment –Shift Registers–Counters –HDL for Sequential Logic Circuits.

**UNIT IV:ASYNCHRONOUS SEQUENTIAL LOGIC 6**

Analysis and Design of Asynchronous Sequential Circuits–Reduction of State and Flow Tables –Race-free State Assignment–Hazards.

**UNIT V:MEMORY AND PROGRAMMABLE LOGIC 6**

RAM and ROM –Memory Decoding –Error Detection and Correction –Programmable Logic Array – Programmable Array Logic –Sequential Programmable Devices –Application Specific Integrated Circuits.

**TOTAL: 30 Hours**

Programme Code & Name: MZ & B.E-Mechatronics Engineering

**TEXT BOOKS:**

Sl.No	Author(s)	Title of the Book	Publisher	Year of Publication
1.	Morris Mano M. and Michael D. Ciletti	Digital Design	Pearson Education	IV Edition, 2008.
2.	John F. Wakerly,	Digital Design Principles and Practices	Pearson Education	IV Edition, 2007

**REFERENCE BOOKS:**

Sl.No	Author(s)	Title of the Book	Publisher	Year of Publication
1.	Charles H. Roth Jr,	Fundamentals of Logic Design	Jaico Publishing House	Fifth Edition-, Mumbai, 2003
2.	Donald D. Givone	Digital Principles and Design	Tata Mcgraw Hill	2003
3.	Kharate G. K	Digital Electronics	Oxford University Press	2010
4.	Thomas L. Floyd	Digital Fundamentals	Pearson Education Inc	10th Edition, 2011
5.	Donald D.Givone	Digital Principles and Design	TMH	2003

  
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**21GES25 DIGITAL PRINCIPLES AND SYSTEM DESIGN LABORATORY**

L	T	P	C
3	0	0	3

**LIST OF EXPERIMENTS**

1. Verification of Boolean theorems using digital logic gates
2. Design and implementation of combinational circuits using basic gates
3. Design and implementation of 4-bit binary adder / subtractor using basic gates and MSI devices.
4. Design and implementation of parity generator / checker using basic gates and MSI devices
5. Design and implementation of magnitude comparator.
6. Design and implementation of application using multiplexers/ Demultiplexers.
7. Design and implementation of Shift registers
8. Design and implementation of Synchronous and Asynchronous counters
9. Design and implementation of Coding combinational / sequential circuits using HDL




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21GES26

ENGINEERING DRAWING

L	T	P	C
1	0	3	3

  
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**COURSE OBJECTIVES**

- To construct various curves in engineering applications.
- To draw the projection of three dimensional objects representing machine structure.
- To analyze the principles of projection of various planes by different angle to project points, lines and planes.
- To draw the projection of simple solid when axis is inclined to one reference plane by change of position method.
- To identify the interior components of machinery (or) buildings by sectioning the solid, and to study the development of simple solids for fabrication of sheet metals.
- To transform the manual drawings to CAD drawings.

**COURSE OUTCOMES**

- Construct various curves in engineering applications.
- Draw the projection of three dimensional objects representing machine structure.
- Analyze the principles of projection of various planes by different angle to project points, lines and planes.
- Draw the projection of simple solid when axis is inclined to one reference plane by change of position method.
- Identify the interior components of machinery (or) buildings by sectioning the solid, and to study the development of simple solids for fabrication of sheet metals.
- Transform the manual drawings to CAD drawings.

**CONCEPTS AND CONVENTIONS (Not for Examination)**

4

Importance of graphics in engineering applications, Use of drafting instrument, BIS conventions and specifications - Size, layout and folding of drawing sheets, Lettering and dimensioning.

**COMPUTER AIDED DRAFTING (Not for Examination)**

6

Importance 2d Drafting, sketching, modifying, transforming and dimensioning.

**UNIT I: PLANE CURVES**

13

Curves used in engineering practices, Conics, Construction of ellipse, Parabola and hyperbola by eccentricity method, Construction of cycloid, construction of involutes of square and circle, Drawing of tangents and normal to the above curves.

**UNIT II: ISOMETRIC TO ORTHOGRAPHIC VIEWS**

13

Representation of three dimensional objects, General Principles of Orthographic projection, Need for importance of multiple views and their placement, First angle projection, layout of views, Developing visualization skills through free hand sketching of multiple views from pictorial views of objects.

**UNIT III: PROJECTION OF POINTS, LINES AND PLANE**

13

(Free hand sketching) Projection of points, Projection of straight lines located in the first quadrant, Determination of true lengths and true inclinations, Projection of polygonal surface and circular lamina inclined to both reference planes.

**UNIT IV: PROJECTION OF SOLIDS**

13

(Free hand sketching) Projection of simple solids like prisms, pyramids, cylinder and cone when the axis is inclined to one reference plane by change of position method.

**UNIT V SECTION OF SOLIDS AND DEVELOPMENT OF SURFACES**

13

(Free hand sketching) Sectioning of simple solids like prisms, pyramids, cylinder and cone in simple vertical position by cutting planes inclined to one reference plane and perpendicular to the other, (Obtaining true shape of section is not required). Development of lateral surfaces of simple and truncated solids, Prisms, pyramids, cylinders and cones.

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TOTAL: L: 15 + P: 60 = 7

**TEXT BOOKS:**

Sl.No	Author(s)	Title of the Book	Publisher	Year of Publication
1.	Natrajan K.V	A text book of Engineering Graphics	Dhanalakshmi Publishers, Chennai	2015
2.	Basant Agrawal and C.M. Agrawal	Engineering Drawing	McGraw Hill Education; Second edition	2013

**REFERENCE BOOKS:**

Sl.No	Author(s)	Title of the Book	Publisher	Year of Publication
1.	Gopalakrishnan K.R	Engineering Drawing (Vol. I&II combined)	Subhas Stores Bangalore	2007
2	Luzzader, Warren.J. and Duff,John M	Fundamentals of Engineering Drawing with an introduction to Interactive Computer Graphics for Design and Production	Eastern Economy Edition, Prentice Hall of India Pvt. Ltd, New Delhi	2005
3	Shah M.B., and Rana B.C	Engineering Drawing	Pearson, 2nd Edition	2009
4	Venugopal K. and Prabhu Raja V	Engineering Graphics	New Age International (P) Limited	2008
5	Bhatt N.D. and Panchal V.M	Engineering Drawing	Charotar Publishing House, 50 <sup>th</sup> Edition	2010

  
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21GES27

ENGINEERING GEOLOGY

L T P C  
3 0 0 3

**COURSE OBJECTIVES**

- To impart the concepts of geological agents and their processes.
- To provide knowledge on various properties of minerals and their engineering significance.
- To give knowledge on various classifications of rocks.
- To understand the importance of geological investigations and mapping.
- To understand the applications of geological surveys in civil engineering structures.
- To give knowledge on various minerals.

**COURSE OUTCOMES**

- Understand the application of geology knowledge to Civil Engineering construction.
- Understand the concepts of various geological materials.
- Understand the properties, behaviour and engineering significance of different type of rocks and minerals.
- Learned the interpretation skills of geological maps having different type of geological features.
- Learned consideration and importance of geological aspects in civil engineering related infrastructure projects.
- Understand the concepts of various weathering processes.

**UNIT I: PHYSICAL GEOLOGY**

9

Role of Geology in civil engineering – Branches of geology – Earth structures and composition – Elementary knowledge on continental drift and plate tectonics – Earth processes – weathering – soils – Geological work of river, wind and sea – Engineering importance.– Earthquake belts in India – Ground water – Mode of occurrence – Prospecting .

**UNIT II : MINEROLOGY**

9

Elementary knowledge on symmetry elements of important crystallographic systems – Physical properties of minerals – Study of the rock forming minerals – Quartz family – Feldspar family – Mica – Pyroxene family minerals – Fundamentals of process of formation of ore minerals – Properties, behaviour and engineering significance of clay minerals – Coal and petroleum – Their origin and occurrence in India.

**UNIT III : PETROLOGY**

9

Classification of rocks – Distinction between igneous, sedimentary and metamorphic rocks – Occurrence, Engineering properties and distribution – Igneous rocks – Granite, syenite, diorite, gabbro, pegmatite, dolerite and basalt – sedimentary rocks – Sandstone, limestone, shale, conglomerate and breccias – Metamorphic rocks – Quartzite, marble, slate, phyllite, gneiss and schist.

**UNIT IV : STRUCTURAL GEOLOGY AND MAP**

9

Attitude of beds – Outcrops – Contours – Introduction to geological maps – Folds – Faults and joints – Their bearing on engineering construction – Seismic and electrical methods for civil engineering investigations. Study of structures.

**UNIT V : GEOLOGICAL INVESTIGATION**

9

Remote sensing for civil engineering applications; Geological conditions necessary for design and construction of Dams, Reservoirs, Tunnels, and Road cuttings. Causes and preventions – Sea erosion and Coastal protection.

**TOTAL: (L:45):45**

  
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**TEXT BOOKS:**

Sl. No	Author(s)	Title of the Book	Publisher	Year of Publication
1.	Parbin Singh.	A Text book of Engineering and General Geology	Katson publishing house, Ludhiana.	2010
2	Varghese, P.C	Engineering Geology for Civil Engineering	PHI Learning Private Limited, New Delhi	2012

**REFERENCE BOOKS:**

Sl. No	Author(s)	Title of the Book	Publisher	Year of Publication
1.	Muthiayya, V.D	A Text of Geology	Oxford IBH Publications, Calcutta.	2010
2	Blyth F.G.H. and De Freitas M.H	Geology for Engineers	Edward Arnold, London	2010
3	F.G.Bell.	Fundamentals of Engineering Geology	B.S. Publications. Hyderabad	2011
4	Dobrin, M.B	An introduction to geophysical prospecting	McGrawOHill, New Delhi	2010
5	KVGK Gokhale	Principles of Engineering Geology	BS Publications, Hyderabad	2011



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21GES28

ENGINEERING MECHANICS

L T P C

3 1 0 3

**COURSE OBJECTIVES**

- To generalize the scalar and vector representation of forces and moments.
- To explore truss, beam, frame and cable problems and respond to the distributed force systems.
- To predict Centroid and Moment of Inertia.
- To realize the Laws of Motion, Principle of Work and Energy, Kinematics & Kinetics of Motion and the interrelationship.
- To recognize the effect of impact of elastic bodies.
- To comprehend the effect of friction on equilibrium.

**COURSE OUTCOMES**

- Generalize the scalar and vector representation of forces and moments.
- Explore truss, beam, frame and cable problems and respond to the distributed force systems.
- Predict Centroid and Moment of Inertia.
- Realize the Laws of Motion, Principle of Work and Energy, Kinematics & Kinetics of Motion and the interrelationship.
- Recognize the effect of impact of elastic bodies.
- Comprehend the effect of friction on equilibrium.

**UNIT I: BASICS AND STATICS OF PARTICLES**

15

Introduction – Units and Dimensions – Laws of Mechanics – Lami's theorem, Parallelogram and triangular Law of forces – Vectorial representation of forces – Vector operations of forces – additions, subtraction, dot product, cross product – Coplanar Forces – rectangular components – Equilibrium of a particle – Forces in space – Equilibrium of a particle in space – Equivalent systems of forces – Principle of transmissibility .

**UNIT II: EQUILIBRIUM OF RIGID BODIES**

15

Free body diagram – Types of supports – Action and reaction forces – stable equilibrium – Moments and Couples – Moment of a force about a point and about an axis – Vectorial representation of moments and couples – Scalar components of a moment – Varignon's theorem – Single equivalent force -Equilibrium of Rigid bodies in two dimensions – Equilibrium of Rigid bodies in three dimensions

**UNIT III: PROPERTIES OF SURFACES AND SOLIDS**

15

Centroids and centre of mass – Centroids of lines and areas – Rectangular, circular, triangular areas by integration – T section, I section, Angle section, Hollow section by using standard formula – Theorems of Pappus – Area moments of inertia of plane areas – Rectangular, circular, triangular areas by integration – T section, I section, Angle section, Hollow section by using standard formula – Parallel axis theorem and perpendicular axis theorem – Principal moments of inertia of plane areas – Principal axes of inertia-Mass moment of inertia

**UNIT IV: DYNAMICS OF PARTICLES**

15

Displacements, Velocity and acceleration, their relationship – Relative motion – Curvilinear motion – Newton's laws of motion – Work Energy Equation – Impulse and Momentum – Impact of elastic bodies.

**UNIT V: FRICTION**

15

Friction force – Laws of sliding friction – equilibrium analysis of simple systems with sliding friction – wedge friction – Rolling – resistance.

**TOTAL:L : 45 + T :30 = 75**

  
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**TEXT BOOKS:**

Sl.No	Author(s)	Title of the Book	Publisher	Year of Publication
1.	Beer, F.P and Johnston. E.R.,	Vector Mechanics for Engineers: Statics and Dynamics	Tata McGraw-Hill Publishing company, New Delhi	2013
2.	S. Timoshenko, D.H. Young, J.V. Rao and Sukumar Pati	Engineering Mechanics	McGraw Hill Education; 5 edition	2013

**REFERENCE BOOKS:**

Sl. No	Author(s)	Title of the Book	Publisher	Year of Publication
1.	Hibbeler, R.C and Ashok Gupta	Engineering Mechanics: Statics and Dynamics	Pearson Education	2010
2	Irving H. Shames and Krishna Mohana Rao. G	Engineering Mechanics – Statics and Dynamics	Pearson Education	2006
3	Meriam J.L. and Kraige L.G	Engineering Mechanics	John Wiley & Sons	2013
4	Rajasekaran S and Sankarasubramanian G	Engineering Mechanics	Vikas Publishing House Pvt. Ltd	2005
5	Bhavikatti, S.S	Engineering Mechanics	New Age International (P) Limited Publishers	2015



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## **PROFESSIONAL CORES**

**(PC)**

**For**

**Mechatronics**

Programme Code & Name: MZ & B.E-Mechatronics Engineering

**21MZC01 APPLIED HYDRAULICS AND PNEUMATICS L T P C**  
3 0 0 3

**COURSE OBJECTIVES**

- To impart the knowledge on applications of Fluid Power Engineering in Powertransmission system.
- To familiarize hydraulic system and its components.
- To design hydraulic circuits for various application.
- To understand pneumatic systems, related components used in a system.
- To design the pneumatic system circuits.

**COURSE OUTCOMES**

- 21MZC01.CO1 Apply the fundamental laws of fluid power systems on real time applications.  
 21MZC01.CO2 Select the hydraulic pumps and actuators to the various engineering applications.  
 21MZC01.CO3 Design the hydraulic circuits for engineering applications.  
 21MZC01.CO4 Design the basic pneumatic circuits using various pneumatic components.  
 21MZC01.CO5 Design the hydro-pneumatic circuits using advanced fluid power techniques.

Course Outcomes	Program Outcomes												PSOs		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
21MZC01.CO1	X	X	X	X	-	X	X	-	-	X	-	X	X	-	-
21MZC01.CO2	X	X	X	-	-	X	X	-	-	X	-	X	X	-	-
21MZC01.CO3	X	X	X	-	-	-	X	-	X	X	-	-	X	-	-
21MZC01.CO4	X	X	X	-	-	X	X	-	-	X	-	-	X	-	-
21MZC01.CO5	X	X	X	-	-	-	X	-	X	X	-	-	X	-	-

**UNIT I: FLUID POWER SYSTEMS AND FUNDAMENTALS**

9

Introduction to fluid power, Advantages of fluid power, Application of fluid power system. Types of fluid power systems, Properties of hydraulic fluids – General types of fluids –Fluid power symbols. Basics of Hydraulics-Applications of Pascal’s Law- Laminar and Turbulent flow – Reynold’s number – Darcy’s equation – Losses in pipe, valves and fittings.

**UNIT II: HYDRAULIC SYSTEM & COMPONENTS**

9

Sources of Hydraulic Power: Pumping theory – Pump classification – Gear pump, Vane Pump, piston pump, construction and working of pumps – pump performance – Variable displacement pumps. Fluid Power Actuators: Linear hydraulic actuators – Types of hydraulic cylinders – Single acting, Double acting special cylinders like tandem, Rodless, Telescopic, Cushioning mechanism, Construction of double acting cylinder, Rotary actuators – Fluid motors, Gear, Vane and Piston motors.

**UNIT III: DESIGN OF HYDRAULIC CIRCUITS**

9

Construction of Control Components: Directional control valve – 3/2-way valve – 4/2-way valve – Shuttle valve – check valve – pressure control valve – pressure reducing valve, sequence valve, Flow control valve – Fixed and adjustable, electrical control solenoid valves, Relays, ladder diagram. Accumulators and Intensifiers: Types of accumulators – Accumulators circuits, sizing of accumulators, intensifier – Applications of Intensifier – Intensifier circuit.

**UNIT IV: PNEUMATIC SYSTEMS AND COMPONENTS**

9

Pneumatic Components: Properties of air – Compressors – Filter, Regulator, and Lubricator Unit – Air control valves, Quick exhaust valves, and pneumatic actuators. Fluid Power Circuit Design, Speed control circuits, synchronizing circuit, Pneumatic hydraulic circuit, Sequential circuit design for simple applications using cascade method.

  
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**UNIT V: DESIGN OF PNEUMATIC CIRCUITS**

9

Servo systems – Hydro Mechanical servo systems, Electro hydraulic servo systems and proportional valves. Fluidics – Introduction to fluidic devices, simple circuits, Introduction to Electro Hydraulic Pneumatic logic circuits, ladder diagrams, PLC applications in fluid power control. Fluid power circuits; failure and troubleshooting.

**TOTAL: L: 45**

**TEXT BOOKS**

Sl. No.	Author(s)	Title of the Book	Publisher	Year of Publication
1	Anthony Esposito	Fluid Power with Applications	Pearson Education	2013
2	Majumdar S.R	Oil Hydraulics Systems- Principles and Maintenance	Tata McGraw-Hill	2001

**REFERENCE BOOKS**

Sl. No.	Author(s)	Title of the Book	Publisher	Year of Publication
1	Srinivasan.R	Hydraulic and Pneumatic controls	Vijay Nicole	2006
2	Shanmugasundaram.K	Hydraulic and Pneumatic controls	Chand & Co.	2006
3	Majumdar S.R	Pneumatic systems– Principles and maintenance	Tata McGraw Hill	2001
4	Anthony Lal	Oil hydraulics in the service of industry	Alliced publishers	1982
5	Harry L. StevartD.B	Practical guide to fluid power	Taraocala sons and Port Ltd.	1976



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**21MZC02 FLUID MECHANICS AND MACHINERY**

**LTPC**

**3003**

**COURSE OBJECTIVES**

- To understand the applications of fluid in various engineering requirements.
- To explain the various losses in pipes.
- To understand the importance of dimensional analysis.
- To interpret the various types of pumps and its principles.
- To comprehend the types of flow in turbines.

**COURSE OUTCOMES**

- 21MZC02.CO1 Interpret the concepts of fluid properties and its characteristics  
 21MZC02.CO2 Analyze major and minor losses that can be applied in Engineering applications.  
 21MZC02.CO3 Identify the nature of physical quantities with dimensional analysis  
 21MZC02.CO4 Demonstrate the performance characteristics of hydraulic pumps  
 21MZC02.CO5 Demonstrate the performance characteristics of hydraulic turbines

Course Outcomes	Program Outcomes												PSOs		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
21MZC02.CO1	X	X	X	-	-	X	X	X	-	X	-	X	X	-	-
21MZC02.CO2	X	X	X	X	-	-	X	X	-	X	-	X	X	-	-
21MZC02.CO3	X	X	X	X	-	-	X	X	-	X	-	X	X	-	-
21MZC02.CO4	X	X	X	X	-	-	X	X	-	X	-	X	X	-	-
21MZC02.CO5	X	X	X	X	-	-	X	X	-	X	-	X	X	-	-

**UNIT I: FLUID PROPERTIES AND FLOW CHARACTERISTICS**

9

Units and dimensions- Properties of fluids- mass density, specific weight, specific volume, specific gravity, viscosity, compressibility, vapor pressure, surface tension and capillarity. Flow characteristics concept of control volume - application of continuity equation, energy equation and momentum equation

**UNIT II: FLOW THROUGH CIRCULAR CONDUITS**

9

Hydraulic and energy gradient - Laminar flow through circular conduits and circular annuli-Boundary layer concepts - types of boundary layer thickness - Darcy Weisbach equation -friction factor- Moody diagram-commercial pipes- minor losses - Flow through pipes in series and parallel.

**UNIT III: DIMENSIONAL ANALYSIS**

9

Need for dimensional analysis - methods of dimensional analysis - Similitude -types of similitude Dimensionless parameters- application of dimensionless parameters - Model analysis.

**UNIT IV: PUMPS**

9

Impact of jets - Euler's equation - Theory of roto-dynamic machines - various efficiencies- velocity components at entry and exit of the rotor- velocity triangles - Centrifugal pumps- working principle -work done by the impeller - performance curves - Reciprocating pump- working principle - Rotary pumps classification.

**UNIT V: TURBINES**

9

Classification of turbines - heads and efficiencies - velocity triangles, axial, radial and mixed flow turbines, Pelton wheel, Francis turbine and Kaplan turbines- working principles - work done by water on the runner - draft tube. Specific speed - unit quantities - performance curves for turbines - governing of turbines.

**TOTAL: L: 45: = 45**

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**TEXT BOOKS**

S.No	Author(s)	Title of the Book	Publisher	Year of Publication
1.	Dr. P.N. Modi & Dr. S.M. Seth	Hydraulics and Fluid Mechanics Including Hydraulics Machines	Rajsons Publications Pvt. Ltd. 20th edition	2015
2.	Dr. R. K. Bansal	A Textbook of Fluid Mechanics and Hydraulic Machines	Laxmi Publications, Ninth edition	2017

**REFERENCE BOOKS**

S. No	Author(s)	Title of the Book	Publisher	Year of Publication
1.	Streeter, V. L. and Wylie E. B.	Fluid Mechanics	McGraw Hill Publishing Co.	2010
2	Kumar K. L.	Engineering Fluid Mechanics	Eurasia Publishing House(p) Ltd., New Delhi	2004
3	Robert W.Fox, Alan T. McDonald, Philip J.Pritchard,	Fluid Mechanics	Wiley, 9 <sup>th</sup> Edition	2015
4	Graebel, W.P,	Engineering Fluid Mechanics	Taylor & Francis, Indian Reprint	2011
5	R.K.Rajput	A text book of Fluid Mechanics	S.Chand & co, New Delhi	2007

  
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21MZC03

MANUFACTURING TECHNOLOGY

L T P C

3 0 0 3

### COURSE OBJECTIVES

- To impart knowledge on the concepts and basic mechanism of metal cutting.
- To understand the constructional features and working principle of centre lathe, and special purpose lathes.
- To familiarize the working principle of various machining operations such as milling, shaping, planing, slotting, drilling and broaching.
- To understand the various abrasive processes.
- To understand the concepts of computer numerical control (CNC) machine tool and CNC programming

### COURSE OUTCOMES

- 21MZC03.CO1 Analysis the metal cutting tool parameters for various machine tool working conditions.  
 21MZC03.CO1 Suggest the suitable Lathe machine and its operations for various engineering applications.  
 21MZC03.CO1 Suggest the suitable shaper and milling machines and its operations for making gears.  
 21MZC03.CO1 Select the suitable machine operation in grinding and broaching machine tool for engineering applications.  
 21MZC03.CO1 Write the various CNC part programming produce the engineering components.

Course Outcomes	Program Outcomes												PSOs		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
21MZC03.CO1	X	X	X	-	-	X	-	-	-	-	-	X	-	-	X
21MZC03.CO2	X	X	-	X	X	X	-	-	-	-	-	X	-	-	X
21MZC03.CO3	X	-	X	X	X	-	-	-	-	-	-	X	-	-	X
21MZC03.CO4	X	X	-	-	-	-	-	-	-	-	-	X	-	-	X
21MZC03.CO5	X	X	-	-	-	-	-	-	-	-	-	X	-	-	X

#### UNIT I: THEORY OF METAL CUTTING

9

Mechanics of chip formation, single point cutting tool, forces in machining, Types of chip, cutting tools– nomenclature, orthogonal metal cutting, thermal aspects, cutting tool materials, tool wear, tool life, surface finish, cutting fluids and Machinability.

#### UNIT II: TURNING MACHINES

9

Centre lathe, constructional features, specification, operations – taper turning methods, thread cutting methods, special attachments, machining time and power estimation. Capstan and turret lathes- tool layout – automatic lathes: semi-automatic – single spindle: Swiss type, automatic screw type – multi spindle

#### UNIT III: SHAPER, MILLING AND GEAR CUTTING MACHINES

9

Shaper - Types of operations. Drilling, reaming, boring, Tapping. Milling operations-types of milling cutter. Gear cutting – forming and generation principle and construction of gear milling, hobbling and gear shaping processes – finishing of gears.

#### UNIT IV: ABRASIVE PROCESS AND BROACHING

9


Abrasive processes: grinding wheel – specifications and selection, types of grinding process– cylindrical grinding, surface grinding, centerless grinding and internal grinding- Typical applications – concepts of surface integrity, broaching machines: broach construction – push, pull, surface and continuous broaching machines

#### UNIT V: CNC MACHINING

9

Numerical Control (NC) machine tools – CNC types, constructional details, special features, machining center, part programming fundamentals CNC – manual part programming – micromachining – wafer machining

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**TEXT BOOKS:**

Sl.No	Author(s)	Title of the Book	Publisher	Year of Publication
1.	Hajra Choudhury	Elements of Workshop Technology	Media Promoters	2008
2	Rao. P.N	Manufacturing Technology - Metal Cutting and Machine Tools	Tata McGraw-Hill	2013

**REFERENCE BOOKS:**

S. No	Author(s)	Title of the Book	Publisher	Year of Publication
1.	Richerd R Kibbe, John E. Neely, Roland O. Merges and Warren J.White	Machine Tool Practices	Prentice Hall of India	2010
2	Jain.R.K	Production Technology: Manufacturing Processes, Technology and Automation	Khanna Publishers	2011
3	GeofreyBoothroyd	Fundamentals of Metal Machining and Machine Tools	McGraw Hill	2007
4	Roy. A.Lindberg	Manufacturing Technology - Metal Cutting and Machine Tools	PHI/Pearson Education	2006
5	Dr. B. Kumar	Manufacturing Technology	Khanna Publishers	2009

  
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**COURSE OBJECTIVES**

- To understand the basic postulates of Boolean algebra and shows the correlation between Boolean expressions
- To impart the knowledge on procedures for the analysis and design of combinational circuits
- To understand the procedures for the analysis and design of sequential circuits
- To understand the principles of synchronous and asynchronous sequential circuits
- To understand the concept of VHDL and programmable logic devices.

**COURSE OUTCOMES**

- 21MZC04.CO1 Apply Boolean algebra, K-Map and Tabulation method for simplification of Boolean expression.  
 21MZC04.CO2 Design combinational logic circuits for various applications.  
 21MZC04.CO3 Design shift registers, Modulo-N asynchronous and synchronous counters.  
 21MZC04.CO4 Design and analyze state machines for the given specifications.  
 21MZC04.CO5 Design Logic Memories and built VHDL Program.

Course Outcomes	Program Outcomes												PSOs		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
21MZC04.CO1	X	X	X	-	X	-	-	-	-	-	-	-	X	-	-
21MZC04.CO2	X	X	X	-	X	-	-	-	-	-	-	-	X	X	-
21MZC04.CO3	X	X	X	-	X	-	-	-	-	-	-	-	X	X	-
21MZC04.CO4	X	X	X	-	X	-	-	-	-	-	-	-	X	X	-
21MZC04.CO5	X	X	X	-	X	-	-	-	-	-	-	-	X	X	-

**UNIT I: BASIC CONCEPTS OF DIGITAL SYSTEMS AND LOGIC FAMILIES**

9

Review of Number systems, Number Representation, Boolean algebra, Boolean postulates and laws - De-Morgan's Theorem - Principle of Duality, Simplification using Boolean algebra, Canonical forms - Sum of product and Product of sum - Minimization using Karnaugh map and Tabulation method, Digital Logic Families- TTL, ECL, CMOS

**UNIT II: COMBINATIONAL CIRCUITS**

9

Realization of combinational logic using gates, Design of combinational circuits: Adder, Subtractor, Parallel adder Subtractor, carry look ahead adder, Magnitude Comparator, Parity generator and checker, Encoder, Decoder, Multiplexer, De-Multiplexer - Function realization using Multiplexer, Decoder - Code converters

**UNIT III: SEQUENTIAL CIRCUITS**

9

Flip-flops - SR, JK, D and T- Master-Slave - Triggering - Characteristic table and equation - Application table - Asynchronous and synchronous counters - Shift registers - Types - Universal shift registers - Ring counter - Johnson Counters- Serial adder / Subtractor.

**UNIT IV: SYNCHRONOUS AND ASYNCHRONOUS SEQUENTIAL CIRCUITS**

9


Mealy and Moore models - State diagram - State table - State minimization - State assignment - Excitation table - Design of Synchronous sequential circuits: Counters and Sequence generators- Circuit implementation - Asynchronous sequential circuits - Asynchronous sequential circuits, Hazard free combinational circuits.

**UNIT V: PROGRAMMABLE LOGIC DEVICES MEMORY AND VHDL**

9

Memories: ROM, PROM, EPROM, PLA, PLD, FPGA - VHDL Programming: RTL Design - Combinational Logic - Types - Operators - Packages - Sequential Circuits - Sub Programs - Testbenches. (Examples: adders, counters, flip flops, FSM, Multiplexers / De-Multiplexers).

TOTAL: L: 45: =

  
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**TEXT BOOKS:**

Sl.No	Author(s)	Title of the Book	Publisher	Year of Publication
1.	Morris Mano M. and Michael D. Ciletti	Digital Design	Pearson Education	2013
2	Donald D.Givone,	Digital Principles and Design	Tata Mc-Graw Hill Publishing company limited, New Delhi	2002

**REFERENCE BOOKS:**

S.No.	Author(s)	Title of the Book	Publisher	Year of Publication
1.	Thomas L. Floyd	Digital Fundamentals	Pearson Education Inc	2011
2	Charles H. Roth Jr,	Fundamentals of Logic Design	Jaico Publishing House	2003
3	Leach D, Malvino A P &Saha	Digital Principles and Applications	Tata McGraw-Hill Publishing Company	2014
4	John F. Wakerly,	Digital Design Principles and Practices	Pearson Education	2007
5	John.M Yarbrough	Digital Logic Applications and Design	Thomson – VikasPublishing House	2002

  
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**COURSE OBJECTIVES**

- To train to conduct the experiments using fluid flow measuring instruments.
- To train to conduct fluid flow losses using pipe line instrument.
- To train to conduct centrifugal /submergible pumps experiments.
- To train to conduct Reciprocating / gear pumps experiments.
- To train to conduct Pelton/ Francis/ Kaplan turbines experiments.

**COURSE OUTCOMES**

- 21MZC05.CO1 Interpret the results observed from the experiments using fluid flow measuring instruments.  
 21MZC05.CO2 Analysis the results observed from fluid flow losses in pipe lines.  
 21MZC05.CO3 Analysis the performance characteristics of centrifugal /submergible pumps  
 21MZC05.CO4 Analysis the performance characteristics of Reciprocating / gear pumps  
 21MZC05.CO5 Analysis the performance characteristics of Pelton/ Francis/ Kaplan turbines

Course Outcomes	Program Outcomes												PSOs		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
21MZC05.CO1	X	-	-	X	-	-	-	-	-	-	-	X	-	-	X
21MZC05.CO2	X	-	-	X	-	-	-	-	-	-	-	X	-	-	X
21MZC05.CO3	X	-	-	X	-	-	-	-	-	-	-	X	-	-	X
21MZC05.CO4	X	-	-	X	-	-	-	-	-	-	-	X	-	-	X
21MZC05.CO5	X	-	-	X	-	-	-	-	-	-	-	X	-	-	X

**List of Experiments**

1. Determination of the Coefficient of discharge of given Orifice meter.
2. Determination of the Coefficient of discharge of given Venturi meter.
3. Calculation of the rate of flow using Rota meter.
4. Determination of friction factor for a given set of pipes.
5. Conducting experiments and drawing the characteristic curves of centrifugal pump/submergible pump
6. Conducting experiments and drawing the characteristic curves of reciprocating pump.
7. Conducting experiments and drawing the characteristic curves of Gear pump.
8. Conducting experiments and drawing the characteristic curves of Pelton wheel.
9. Conducting experiments and drawing the characteristics curves of Francis turbine.
10. Conducting experiments and drawing the characteristic curves of Kaplan turbine.

TOTAL: P: 30 = 30

  
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**21MZC06 MANUFACTURING TECHNOLOGYLABORATORY**

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**COURSE OBJECTIVES**

- To train to operate the Lathe machine tool.
- To train to make the simple engineering components using Milling machine tool.
- To train to make the gears using Milling/ Gear Hobbing/ Gear Shaping machine tools.
- To train to make the simple engineering components using various grinding machine tools.
- To train to measure the cutting force on the Milling / Turning machine tools.

**COURSE OUTCOMES**


- 21MZC06.CO1 Make the simple components using Lathe Machine tool.  
 21MZC06.CO2 Make the simple components using Milling machine tool  
 21MZC06.CO3 Make the various Gear using Milling/ Gear Hobbing/ Gear Shaping machine tools.  
 21MZC06.CO4 Make the simple engineering components using different Grinding machine tools.  
 21MZC06.CO5 Analysis the various cutting forces in the Milling / Turning machine tools.

Course Outcomes	Program Outcomes												PSOs		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
21MZC06.CO1	-	-	-	X	-	-	-	-	-	-	-	X	-	-	X
21MZC06.CO2	-	-	-	X	-	-	-	-	-	-	-	X	-	-	X
21MZC06.CO3	-	-	-	X	-	-	-	-	-	-	-	X	-	-	X
21MZC06.CO4	-	-	-	X	-	-	-	-	-	-	-	X	-	-	X
21MZC06.CO5	-	-	-	X	-	-	-	-	-	-	-	X	-	-	X

**LIST OF EXPERIMENTS**

1. Eccentric Turning, Thread Cutting
2. Contour milling using vertical milling machine
3. Spur gear cutting in milling machine
4. Helical Gear Cutting in hobbing machine
5. Gear generation in hobbing machine
6. Gear generation in gear shaping machine
7. Plain Surface grinding
8. Cylindrical grinding
9. Tool angle grinding with tool and Cutter Grinder
10. Centreless grinding
11. Measurement of cutting forces in Milling / Turning Process

**TOTAL: P : 30= 30**

  
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**21MZC07 DIGITAL ELECTRONICS LABORATORY**

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**COURSE OBJECTIVES**

- To train to use the different logic gate.
- To train to make the different flip flops circuits.
- To train to construct the various electronic logical circuits using registers
- To train to construct the various electronic logical circuits using counters.

**COURSE OUTCOMES**

- 21MZC07.CO1 Demonstrate various Logical Gate and its circuits.  
 21MZC07.CO2 Demonstrate various flip flops circuits.  
 21MZC07.CO3 Make the electronic logical circuits using registers for various engineering applications.  
 21MZC07.CO4 Make the electronic logical circuits using counters for various engineering applications.

Course Outcomes	Program Outcomes												PSOs		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
21MZC07.CO1	X	X	X	-	X	-	-	-	-	-	-	-	X	-	-
21MZC07.CO2	X	X	X	X	X	-	-	-	-	-	-	-	X	-	-
21MZC07.CO3	X	X	X	X	X	-	-	-	-	-	-	-	X	-	-
21MZC07.CO4	X	X	X	X	X	-	-	-	-	-	-	-	X	-	-

**LIST OF EXPERIMENT**

1. Logic Gates
  1. AND, OR, NOT, XOR, XNOR
- 2: Flip flops
  1. SR
  2. JK
  3. D-Type Flip flop
  4. T- Type Flip Flop
3. Registers
4. Counters

**TOTAL: P : 30= 30**



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**21MZC08 CONTROL SYSTEM ENGINEERING**

**L T P C**

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003

**COURSE OBJECTIVES**

- To introduce the elements of control system and their modeling using various Techniques.
- To impart knowledge for analyzing the time response of control system
- To introduce the frequency response of given system
- To impart the knowledge to analysis of stability of systems
- To introduce the state variable analysis method

**COURSE OUTCOMES**

- 21MZC08.CO1 Determine the transfer functions and analogy of control systems.  
 21MZC08.CO2 Analysis the time responses of the controller system using MATLAB program.  
 21MZC08.CO3 Analysis of frequency responses of control system using various frequency response plots using MATLAB program.  
 21MZC08.CO4 Analysis the stabilities of control system using MATLAB program.  
 21MZC08.CO5 Apply the various state variable analysis methods to engineering applications.

Course Outcomes	Program Outcomes												PSOs		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
21MZC08.CO1	X	X	X	-	-	-	-	-	-	-	-	-	X	-	-
21MZC08.CO2	X	X	X	X	-	-	-	-	-	-	-	-	X	X	-
21MZC08.CO3	X	X	X	X	-	-	-	-	-	-	-	-	X	X	-
21MZC08.CO4	X	X	X	X	-	-	-	-	-	-	-	-	X	X	-
21MZC08.CO5	X	X	X	X	-	-	-	-	-	-	-	-	X	-	-

**UNIT I: CONTROL SYSTEM MODELING**

9

Basic Elements of Control System – Open loop and Closed loop systems – Differential equation – Transfer function, Modeling of Electric systems, Translational and rotational mechanical systems – Block diagram reduction Techniques – Signal flow graph

**UNIT II: TIME RESPONSE ANALYSIS**

9

Time response analysis – First Order Systems – Impulse and Step Response analysis of second order systems – Steady state errors – P, PI, PD and PID Compensation, Analysis using MATLAB

**UNIT III: FREQUENCY RESPONSE ANALYSIS**

9

Frequency Response – Bode Plot, Polar Plot, Nyquist Plot – Frequency Domain specifications from the plots – Constant M and N Circles – Nichol’s Chart – Use of Nichol’s Chart in Control System Analysis. Series, Parallel, series-parallel Compensators – Lead, Lag, and Lead Lag Compensators, Analysis using MATLAB.

**UNIT IV: STABILITY ANALYSIS**

9

Stability, Routh-Hurwitz Criterion, Root Locus Technique, Construction of Root Locus, Stability, Dominant Poles, Application of Root Locus Diagram – Nyquist Stability Criterion – Relative Stability, Analysis using MATLAB

**UNIT V: STATE VARIABLE ANALYSIS**

9

State space representation of Continuous Time systems – State equations – Transfer function from State Variable Representation – Solutions of the state equations – Concepts of Controllability and Observability – State space representation for Discrete time systems. Sampled Data control systems – Sampling Theorem – Sampler & Hold – Open loop & Closed loop sampled data systems.

**TOTAL: L : 45 = 45**

  
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**TEXTBOOK**

S.No	Author(s)	Title of the Book	Publisher	Year of Publication
1.	J.Nagrath and M.Gopal	Control System Engineering	New Age International Publishers, 5th Edition	2007

**REFERENCES**

S.No	Author(s)	Title of the Book	Publisher	Year of Publication
1.	Benjamin.C.Kuo	Automatic control systems	PrenticeHall of India, 7 <sup>th</sup> Edition	1995
2	M.Gopal	Control System– Principles and Design	TataMcGrawHill, 2 <sup>nd</sup> Edition	2002
3	Schaum's Outline Series	Feedback and Control Systems	TataMcGraw-Hill	2007
4	John J.D'Azzo & Constantine H. Houpis	Linear Control System Analysis and Design?	TataMcGraw-Hill	1995
5	Richard C. Dorf and Robert H. Bishop	Modern Control Systems	Addison–Wesley	1999



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**21MZC09 STRENGTH OF MATERIALS**

L T P C

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**COURSE OBJECTIVES**

- To provide the theoretical knowledge on simple stress, strain concepts.
- To understand the Shear force, Bending Moment and deflection diagrams for different beams.
- To impart the analytical skill to solve various torsion and spring problems.
- To provide the analytical skill to solve slope and deflection problems on different beams.
- To impart the knowledge on analysis of thick and thin cylinders

**COURSE OUTCOMES**

- 21MZC09.CO1 Apply the various stress and strain principles to solve the engineering problems.  
 21MZC09.CO2 Draw Shear force, Bending Moment and deflection diagrams for different beams and load configurations.  
 21MZC09.CO3 Apply the concepts of mechanics to solve various torsion and spring problems.  
 21MZC09.CO4 Analysis the slope and deflections of different beams.  
 21MZC09.CO5 Analysis the thick and thin cylinders for different engineering applications.

Course Outcomes	Program Outcomes												PSOs		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
21MZC09.CO1	X	X	X	X	-	-	-	-	-	-	-	X	X	X	X
21MZC09.CO2	X	X	X	X	-	-	-	-	-	-	-	X	X	-	-
21MZC09.CO3	X	X	X	X	-	-	-	-	-	-	-	X	X	X	X
21MZC09.CO4	X	X	X	X	-	-	-	-	-	-	-	X	X	X	X
21MZC09.CO5	X	X	X	X	-	-	-	-	-	-	-	X	X	-	-

**UNIT I: STRESS, STRAIN AND DEFORMATION OF SOLIDS**

9

Rigid bodies and deformable solids – Tension, Compression and Shear Stresses – Deformation of simple and compound bars – Thermal stresses – Elastic constants – Volumetric strains – Stresses on inclined planes – principal stresses and principal planes – Mohr’s circle of stress.

**UNIT II: TRANSVERSE LOADING ON BEAMS AND STRESSES IN BEAM**

9

Beams – types transverse loading on beams – Shear force and bending moment in beams – Cantilevers – Simply supported beams and over – hanging beams. Theory of simple bending – bending stress distribution – Load carrying capacity – Proportioning of sections – Shear stress distribution.

**UNIT III: TORSION**

9

Torsion formulation stresses and deformation in circular and hollow shafts – Stepped shafts – Deflection in shafts fixed at the both ends – Stresses in helical springs – Deflection of helical springs, carriage springs

**UNIT IV: DEFLECTION OF BEAMS**

9

Slope and deflection of simply supported beams and cantilevers- Double integration- Macaulay’s Method-moment area method- conjugate beam method.

**UNIT V: THIN CYLINDERS, SPHERES AND THICK CYLINDERS**


9

Stresses in thin cylindrical shell due to internal pressure circumferential and longitudinal stresses and deformation in thin and thick cylinders – spherical shells subjected to internal pressure – Deformation in spherical shells – Lamé’s theorem.

**TOTAL: L : 45= 45**

**TEXT BOOKS:**


Sl. No	Author(s)	Title of the Book	Publisher	Year of Publication
1.	Bansal, R.K	Strength of Materials	Laxmi Publications (P) Ltd.,	2017
2.	Egor. P.Popov	Engineering Mechanics of Solids	Prentice Hall of India, New Delhi	2015

  
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**REFERENCE BOOKS:**

Sl. No	Author(s)	Title of the Book	Publisher	Year of Publication
1.	Jindal U.C	Strength of Materials	Asian Books Pvt. Ltd., New Delhi	2007
2.	Subramanian R.	Strength of Materials	Oxford University Press, Oxford Higher Education Series	2007
3.	Ferdinand P. Beer, Russell Johnson, J.r. and John J. Dewole	Mechanics of Materials	TataMcGraw Hill Publishingco. Ltd., New Delhi	2005
4.	D. K. Singh	Mechanics of Solids	Pearson Education New Delhi	2006
5.	B. K. Sarkar	Strength of Materials	Tata McGraw Hill Publishing Company Pvt Ltd, New Delhi	2006

  
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21MZC10

METROLOGY AND MEASUREMENTS

L T P C

3 0 0 3

**COURSE OBJECTIVES**

- To provide knowledge on various terminologies used in metrology.
- To provide knowledge on the correct procedure to be adopted to measure linear or angular dimensions.
- To introduce advanced measurement instruments.
- To familiarize students with various form measuring instruments.
- To introduce the various Power, Flow and Temperature measuring instruments.

**COURSE OUTCOMES**

- 21MZC10.CO1 Suggest various terminologies used while using measuring instruments.
- 21MZC10.CO2 Use the linear or angular instruments to measure linear or angular measurements.
- 21MZC10.CO3 Suggest the suitable advanced measurement instruments for the various engineering applications.
- 21MZC10.CO4 Analyse the observation results from various form measurements.
- 21MZC10.CO5 Suggest the suitable measuring instruments for Power, Flow and Temperature measurements.

Course Outcomes	Program Outcomes												PSOs		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
21MZC10.CO1	X	X	-	-	X	X	-	-	-	-	-	-	X	-	-
21MZC10.CO2	X	X	-	-	X	X	-	-	-	-	-	-	-	-	-
21MZC10.CO3	X	X	-	-	X	X	-	-	-	-	-	-	X	X	-
21MZC10.CO4	X	X	-	-	X	X	-	-	-	-	-	-	-	X	-
21MZC10.CO5	X	X	-	-	X	X	-	-	-	-	-	-	X	X	-

**UNIT I: BASICS OF METROLOGY**

5

Introduction to Metrology –Need–Elements–Workpiece, Instruments–Persons–Environment–their effect on Precision and Accuracy–Errors–Errors in Measurements–Types–Control–Types of standards.

**UNIT II: LINEAR AND ANGULAR MEASUREMENTS**

10

Linear Measuring Instruments–Evolution –Types–Classification–Limit gauges–gaugedesign– terminology – procedure – concepts of interchange ability and selective assembly – Angular measuring instruments– Types– Bevel protractor clinometers angle gauges, spirit level sine bar– Angle alignment telescope– Autocollimator – Applications.

**UNIT III: ADVANCES IN METROLOGY**

12

Basic concept of lasers Advantages of lasers– laser Interferometers–types–DC and AC Lasers interferometer– Applications–Straightness–Alignment. Basic concept of CMM–Types of CMM – Constructional features–Probes– Accessories – Software – Applications – Basic concepts of Machine Vision System–Element–Applications.

**UNIT IV: FORM MEASUREMENT**

10

Principles and Methods of straightness–Flatness measurement– Thread measurement, gear measurement, surface finish measurement, Roundness measurement–Applications.

**UNIT V: MEASUREMENT OF POWER, FLOW AND TEMPERATURE**

8

Force, torque, power- mechanical, Pneumatic, Hydraulic and Electrical type. Flow measurement: Venturimeter, Orifice meter, rotameter, pitot tube– Temperature: bimetallic strip, thermocouples, electrical resistance thermometer– Reliability and Calibration –Readability and Reliability.

**TOTAL: L:45 =45**

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S.No	Author(s)	Title of the Book	Publisher	Year of Publication
1.	JainR.K	EngineeringMetrology	KhannaPublishers	2018
2	Gupta. I.C.,	EngineeringMetrology	DhanpatraiPublications	2018

**REFERENCE BOOKS:**

S.No	Author(s)	Title of the Book	Publisher	Year of Publication
1.	Charles ReginaldShotbolt	Metrology for Engineers	Cengage Learning EMEA	1990
2	Backwith,Marangoni,L ienhard	Mechanical Measurements	Pearson Education	2006
3	Jay.L.Bucher	The Metrology Handbook	Measurement Quality Division (ASQ)	2015
4	L.V. Ragavendra and L.Krishnamoorthy	Engineering Metrology and Measurements	Oxford Higher Education	2013
5	Anand K. Bewoor Vinay A .Kulgarni	Metrology and Measurements	McGraw Hill Companies	2016

  
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**COURSE OBJECTIVES**

- To provide the basic computer graphics knowledge used in mechanical engineering field.
- To understand the characteristics of geometric curves, surfaces, solids elements
- To impart the knowledge on CAD Standards.
- To understand the fundamental concepts and part programming concepts.
- To learn the principles of cellular manufacturing and flexible manufacturing systems.

**COURSE OUTCOMES**

21MZC11.CO1 Determine the geometric transformations matrix for simple two/ three dimensional objects.

21MZC11.CO2 Apply the various representation of geometric curves, surfaces, solids elements.

21MZC11.CO3 Suggest the geometrical data exchanging formats to transfer CAD Models between various platforms.

21MZC11.CO4 Write the CNC part programming for the making engineering parts in CNC machines.

21MZC11.CO5 Demonstrate the cellular manufacturing and flexible manufacturing systems used in industrial processes.

Course Outcomes	Program Outcomes												PSOs		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
21MZC11.CO1	X	-	X	-	X	-	-	-	-	-	-	-	X	-	-
21MZC11.CO2	X	-	X	-	X	-	-	-	-	-	-	-	X	-	-
21MZC11.CO3	X	-	X	-	X	-	-	-	-	-	-	-	X	-	-
21MZC11.CO4	X	-	X	-	X	-	-	-	-	-	-	-	X	-	-
21MZC11.CO5	X	-	X	-	X	-	-	-	-	-	-	-	-	X	-

**UNIT I: INTRODUCTION**

9

Introduction to CAD/CAM –CAD/CAM concept - Computer aided design – CAD system architecture- Computer graphics – co-ordinate systems- 2D and 3D transformations– Manufacturing Planning, Manufacturing controls – Types of production.

**UNIT II: GEOMETRIC MODELING**

9

Representation of curves- Hermite curve- Bezier curve- B-spline curves-rational curves-Techniques for surface modeling – surface patch- Coons and bicubic patches- Bezier and B-spline surfaces. Solid modeling techniques- CSG and B-rep.

**UNIT III: CAD STANDARDS**

9

Standards for computer graphics- Graphical Kernel System (GKS) - standards for exchange images Open Graphics Library (OpenGL) - Data exchange standards - IGES, STEP, CALS etc. - communication standards.

**UNIT IV: FUNDAMENTAL OF CNC AND PART PROGRAMING**

9

Introduction to NC systems and CNC – Machine axis and Co-ordinate system- CNC machine tools- Principle of operation CNC- Construction features including structure- Drives and CNC controllers- 2D and 3D machining on CNC- Introduction of Part Programming, types – Detailed Manual part programming on Lathe & Milling machines using G codes and M codes- Cutting Cycles, Loops, Sub program and Macros- Introduction of CAM package.

**UNIT V: CELLULAR MANUFACTURING AND FLEXIBLE MANUFACTURING SYSTEM (FMS)**

9

Group Technology (GT),Part Families–Parts Classification and coding–Simple Problems in Opitz Part Coding system–Production flow Analysis–Cellular Manufacturing–Composite part concept–Types of Flexibility – FMS – FMS Components – FMS Application & Benefits – FMS Planning and Control–Quantitative analysis in FMS ME8691 Computer Aided Design and Manufacturing

TOTAL: L:45 =45

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**TEXT BOOKS:**

S.No	Author(s)	Title of the Book	Publisher	Year of Publication
1.	Ibrahim Zeid	CAD CAM	Tata McGraw-Hill	2007
2	Radhakrishnan P, Subramanyan S. and Raju V.	CAD/CAM/CIM	New Age International (P) Ltd, New Delhi	2007

**REFERENCE BOOKS:**

S.No	Author(s)	Title of the Book	Publisher	Year of Publication
1.	Chris McMahon and Jimmie Browne	CAD/CAM Principles, Practice and Manufacturing management	Pearson Education	1999
2	Donald Hearn and M. Pauline Baker	Computer Graphics	Prentice Hall, Inc.	2010
3	Foley, Wan Dam, Feiner and Hughes	Computer graphics principles & practice	Pearson Education	2003

  
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**21MZC12 MICROPROCESSORS AND APPLICATIONS**

**L T P C**

**3 00 3**

**COURSE OBJECTIVES**

- To provide the basic knowledge on microprocessor and instructions sets.
- To understand the various interfacing techniques with microprocessor circuits.
- To understand the interface devices with microprocessors.
- To provide the various microprocessor circuits using peripheral devices.
- To provide the knowledge micro controller products using case studies.

**COURSE OUTCOMES**

- 21MZC12.CO1 Use microprocessor kit to execute the basic 8085 programs.
- 21MZC12.CO2 Apply the various interfacing techniques to develop the microprocessor circuits.
- 21MZC12.CO3 Interface the various controllers with microprocessors.
- 21MZC12.CO4 Design the various microprocessor circuits using peripheral devices.
- 21MZC12.CO5 Demonstrate the various micro controller applications and case studies.

Course Outcomes	Program Outcomes												PSOs		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
21MZC12.CO1	X	X	X	-	X	X	-	-	-	-	-	-	X	-	-
21MZC12.CO2	X	X	X	X	X	-	-	-	-	-	-	-	X	X	-
21MZC12.CO3	X	X	X	X	X	-	-	-	-	-	-	-	X	X	-
21MZC12.CO4	X	X	X	X	X	-	-	-	-	-	-	-	X	X	-
21MZC12.CO5	X	X	X	X	X	-	-	-	-	-	-	-	X	X	-

**UNIT I: INTRODUCTION**

**10**

Organization of 8085: Architecture, Internal Register Organization and Pin Configuration– Instruction Set of 8085–addressing modes–instruction machine cycles with states and timing diagram.–8085 assembly language programming–Examples.

**UNIT II: INTERFACING TECHNIQUES**

**9**

Need for Interfacing–Memory Interfacing, address space partitioning–address map–Address decoding–Designing decoders circuit. I/O Interfacing: Data transfer schemes–programmed Synchronous and asynchronous– Interrupt driven Transfer–Multiple devices and multiple interrupt levels–enabling disabling and masking of interrupts. DMA transfer: Cycle stealing–Burst mode– Multiple DMA devices–DMA transfer in 8085 system–serial data transfer.

**UNIT III: INTERFACING DEVICES**

**9**

Programmable peripheral device (8255) –programmable interval timer (8353)–Programmable communication interface (8251)(USART)–Programmable interrupt controller–Programmable DMA Controller (8257)–Programmable Keyboard/display controllers (8279)

**UNIT IV: DESIGN USING PERIPHERAL DEVICES**

**9**

Interfacing A/D and D/A converters –Matrix Keyboard design using 8255 with 8085 programs. Designing real time clock, detecting power failure, detecting presence of objects using 8253–Design of Keyboard and display interfacing using 8279–Design of digital transmission with modems and telephone lines using 8251A.

**UNIT V: MICROPROCESSOR APPLICATIONS**

**8**

Temperature monitoring system– Automotive applications – Closed loop process control – Stepper motor control.

**TOTAL: L:45 =45**

  
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TEXT BOOKS:

S.No	Author(s)	Title of the Book	Publisher	Year of Publication
1.	Rafiquzzaman	Microprocessors and Microcomputer-Based System Design	Taylor & Francis,	2009
2	Ramesh Gonakar	Microprocessor Architecture, Programming and Applications with the 8085	Penram International Publishing (India) Private Limited	2005

REFERENCES:

S.No	Author(s)	Title of the Book	Publisher	Year of Publication
1.	Aditya P Mathur	Introduction to Microprocessor	3 <sup>rd</sup> Edition, Tata McGraw Hill Publishing, Co Ltd., New Delhi	2003
2	Douglas V. Hall	Microprocessors and Interfacing, Programming and Hardware	Tata McGraw-Hill Publishing Company Ltd., New Delhi	1997

  
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**21MZC13 STRENGTH OF MATERIALS LABORATORY**

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

**COURSE OBJECTIVES**

- To impart knowledge on the concepts and basic methods of material testing process.
- To understand the procedure of Tension test, Shear test, torsion test impact test of Steel material.
- To familiarize the testing procedure of hardness test of Rockwell and Brinell Hardness Testing Apparatus.
- To understand the various deflection tests on metal beam using given apparatus.
- To impart the knowledge of compression and deflection tests procedure of helical and carriage springs.

**COURSE OUTCOMES**

- 21MZC13.CO1 Demonstrate tensile and shear testing as per ASTM Standards.  
 21MZC13.CO2 Demonstrate torsion and impact testing as per ASTM Standards.  
 21MZC13.CO3 Demonstrate hardness test of given specimens  
 21MZC13.CO4 Analysis the defection of given specimen using deflection tester.  
 21MZC13.CO5 Demonstrate compression and deflection test of given springs.

Course Outcomes	Program Outcomes												PSOs		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
21MZC13.CO1	X	X	X	X	-	-	-	-	-	-	-	X	X	X	X
21MZC13.CO2	X	X	X	X	-	-	-	-	-	-	-	X	X	-	-
21MZC13.CO3	X	X	X	X	-	-	-	-	-	-	-	X	X	X	X
21MZC13.CO4	X	X	X	X	-	-	-	-	-	-	-	X	X	X	X
21MZC13.CO5	X	X	X	X	-	-	-	-	-	-	-	X	X	-	-

**LIST OF EXPERIMENTS**

1. Tension test on mild steel rod
2. Double shear test on metal
3. Torsion test on mild steel rod
4. Impact test on metal specimen (Izod and Charpy)
5. Hardness test on metals (Rockwell and Brinell Hardness Tests)
6. Deflection test on metal beam
7. Compression test on helical spring
8. Deflection test on carriage spring

**TOTAL: P:30 = 30**

  
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**COURSE OBJECTIVES**

- To demonstrate microcontroller kit to execute the various programs.
- To provide skill to interface stepper and DC motors with microcontrollers kit.
- To provide the training on the microcontroller program using instructions set.
- To impart the knowledge to develop the micro controller system.
- To impart the knowledge to develop the micro controller system Programmable Logic controller system.

**COURSE OUTCOMES**

- 21MZC14.CO1 Use the microcontroller kit to execute the various programs.  
 21MZC14.CO2 Interface stepper and DC motors with microcontrollers kit.  
 21MZC14.CO3 Write the microcontroller program using instructions set to perform the various tasks.  
 21MZC14.CO4 Develop the various micro controller system with interfacing of various actuators and sensors.  
 21MZC14.CO5 Develop the various real time control system using Programmable Logic controller.

Course Outcomes	Program Outcomes												PSOs		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
21MZC14.CO1	X	-	-	X	-	X	-	X	-	-	-	-	X	X	-
21MZC14.CO2	X	-	-	X	-	-	-	X	-	-	-	-	X	X	-
21MZC14.CO3	X	-	-	X	-	-	-	X	-	-	-	-	X	X	-
21MZC14.CO4	X	-	-	X	-	-	-	X	-	-	-	-	X	X	-
21MZC14.CO5	X	-	-	X	-	-	-	X	-	-	-	-	X	X	-

**LIST OF EXPERIMENTS**

1. Study of Microcontroller Kits.
2. 8051/ 8031 Programming Exercises.
3. Stepper Motor interface.
4. D.C. motor controller interface.
5. Study of interrupt structure of 8051.
6. Interfacing high power devices to microcomputer port lines, LED relays and LCD displays.
7. Linear actuation of hydraulic cylinder with counter and speed control.
8. Hydraulic rotation with timer and speed control.
9. Sequential operation of pneumatic cylinders.
10. Traffic light controller.
11. Speed control of DC motor using PLC.
12. Testing of Relays using PLC.

TOTAL: P:30 = 30



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**COURSE OBJECTIVES**

- To develop skill to use software for creating 2 Dimensional models.
- To provide an overview of how computers are being used in mechanical component design.
- To make the students understand the computer graphics fundamentals.
- To build the students to identify with the various file types used in the CAD software.
- To provide an overview of how computers are being used in component manufacturing.

**COURSE OUTCOMES**

- Ability to use the software packers for drafting and modeling.
- Demonstrate proficiency in CAD skills by creating complex 2D drawings from 3D solid modeling techniques.
- Plan critically and use creativity in the design of mechanical components and systems.
- Ability to export / import CAD drawings for different applications.
- Ability to generate CNC part programming using CAM package

Course Outcomes	Program Outcomes												PSOs		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
21MZC15.CO1	X	-	X	-	X	-	-	-	-	-	-	-	X	-	-
21MZC15.CO2	X	-	X	-	X	-	-	-	-	-	-	-	X	-	-
21MZC15.CO3	X	-	X	-	X	-	-	-	-	-	-	-	X	-	-
21MZC15.CO4	X	-	X	-	X	-	-	-	-	-	-	-	X	-	-
21MZC15.CO5	X	-	X	-	X	-	-	-	-	-	-	-	-	X	-

**CAD**

Drawing of Parts and assembly drawings of following components using any CAD package.

1. Fasteners (Square and Hexagonal headed bolt and nut)
2. Flange coupling (Unprotected),
3. Footstep Journal Bearing
4. Screw Jack
5. Plummer block.
6. Gib and cotter joint
7. Cotter joint with sleeve.

**CAM**

1. COMPUTER AIDED PART PROGRAMMING  
Generate CL Data and Post process data using CAM packages for Machining and Turning Centre.
2. STUDY OF CNC EDM
3. STUDY OF ADDITIVE MANUFACTURING PROCESS: FDM or SLA or SLS or LOM

**Note:** Plotting of drawings must be made for each exercise and attached to the records written by Students.

**TOTAL P: 30=30**



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21MZC15 ASSEMBLY DRAWING AND MODELING LABORATORY

L T P C  
0 0 2 1

COURSE OBJECTIVES

- To develop skill to use software for creating 2 Dimensional models.
- To provide the skill on three-dimensional modeling.
- To provide the skills of creating special features in the three-dimensional models.
- To provide the skills to create assembly drawing.
- To provide the skill to draw the various views of CAD models.

COURSE OUTCOMES

- 21MZC15.CO1 Draw the two-dimensional and three-dimensional models of the given engineering components.  
 21MZC15.CO2 Analysis of structural characteristics of simple engineering components using FEM software.  
 21MZC15.CO3 Analysis of dynamic and vibration characteristics of engineering components using FEM software  
 21MZC15.CO4 Analysis of thermal characteristics of engineering components using FEM software.  
 21MZC15.CO5 Analysis the Kinematic and Dynamic of given simple mechanisms.

Course Outcomes	Program Outcomes												PSOs		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
21MZC15.CO1	X	-	X	-	X	-	-	-	-	-	-	-	X	-	-
21MZC15.CO2	X	-	X	-	X	-	-	-	-	-	-	-	X	-	-
21MZC15.CO3	X	-	X	-	X	-	-	-	-	-	-	-	X	-	-
21MZC15.CO4	X	-	X	-	X	-	-	-	-	-	-	-	X	-	-
21MZC15.CO5	X	-	X	-	X	-	-	-	-	-	-	-	-	X	-

LIST OF EXERCISES USING SOFTWARE CAPABLE OF DRAFTING AND MODELING

1. Solid modeling of engineering components and assembly.
2. Determination of stresses and factor of safety in simple machine components by FEM and experimental validation of the results by strain measurement.
3. Dynamic analysis of chassis frame of an automobile by FEM.
4. Thermal analysis using FEA software.
5. Kinematic and Dynamic analysis of mechanisms using mechanism analysis software.

TOTAL P: 30=30

  
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**COURSE OBJECTIVES**

- To learn about the force-motion relationship in components subjected to external forces and analysis of standard mechanisms.
- To impart knowledge on static and dynamic balancing.
- To understand the concept of single degree of freedom of vibrations and its damping mechanism.
- To gain knowledge on the basic vibrations on the constrained body and its critical position of vibrations.
- To understand principles in mechanisms used for governing of machines.

**COURSE OUTCOMES**

21MZC16.CO1: Gain knowledge on forces like static, dynamic forces and Inertia force and inertia torque on the reciprocating engines

21MZC16.CO2: Acquire knowledge on turning moment diagrams of flywheels and follower mechanisms.

21MZC16.CO3: Know the concepts of balancing mechanisms of different types of engines and machines.

21MZC16.CO4: Understand different types of vibration occurring in the moving system.

21MZC16.CO5: Understand the effect of Dynamics of undesirable vibrations

Course Outcomes	Program Outcomes												PSOs		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
21MZC16.CO1	X	X	X	X	-	X	-	-	-	X	-	-	X	-	-
21MZC16.CO2	X	X	-	X	-	X	-	-	-	X	-	X	X	-	-
21MZC16.CO3	X	X	X	X	-	X	-	-	X	X	-	X	X	-	-
21MZC16.CO4	X	X	X	X	-	X	-	-	X	X	-	X	X	-	-
21MZC16.CO5	X	X	-	X	-	X	-	-	X	X	-	X	X	-	X

**UNIT I: FORCE ANALYSIS**

9

Applied and constraint forces – Free body diagrams – Static equilibrium conditions – Static force analysis of simple mechanisms – Dynamic force analysis – Inertia force and Inertia torque – D Alembert’s principle – Dynamic Analysis in reciprocating engines – Gas forces – Inertia effect of connecting rod– Bearing loads – Crank shaft torque – Turning moment diagrams – Fly Wheels – Flywheels of punching presses- Dynamics of Cam-follower mechanism.

**UNIT II: BALANCING**

9

Static and dynamic balancing – Balancing of rotating masses – Balancing a single cylinder engine – Balancing Multi-cylinder engines – Partial balancing in locomotive engines – Balancing of linkages – Balancing machines.

**UNIT III: SINGLE DEGREE FREE VIBRATION**

9

Basic features of vibratory systems – Degrees of freedom – single degree of freedom – Free vibration – Equations of motion – Natural frequency – Types of Damping – Damped vibration – Torsional vibration of shaft – Critical speeds of shafts – Torsional vibration – Two and three rotor torsional systems.

**UNIT IV: FORCED VIBRATION**

9

Response of one degree freedom systems to periodic forcing – Harmonic disturbances – Disturbance caused by unbalance – Support motion –transmissibility– Vibration isolation vibration measurement.

**UNIT V: MECHANISM FOR CONTROL**

9

Governors – Types – Centrifugal governors – Gravity controlled and spring controlled centrifugal governors – Characteristics – Effect of friction – Controlling force. Gyroscopes- Gyroscopic forces and torques – Gyroscopic stabilization – Gyroscopic effects in Automobiles, ships and airplanes

TOTAL: L: 45 = 45

  
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**TEXT BOOKS:**

Sl.No	Author(s)	Title of the Book	Publisher	Year of Publication
1.	Shigley	Theory of Machines and Mechanisms	Oxford University Press	2016
2.	Sadhu Singh	Theory of Machines	Pearson Education	2005

**REFERENCES:**

Sl. No.	Author(s)	Title of the Book	Publisher	Year of Publication
1.	Rattan. S.S	Theory of Machines	Tata McGraw-Hill	2009
2.	Thomas Bevan	Theory of Machines	CBS Publishers and Distributors	2005
3.	Cleghorn. W. L,	Mechanisms of Machines	Oxford University Press	2005
4	Benson H. Tongue	Principles of Vibrations	Oxford University Press	2007
5	Ballaney.P.L	Theory of Machines	Khanna Publishers	2001



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**COURSE OBJECTIVES**

- To get an overview of different types of power semiconductor devices and their switching characteristics.
- To understand the operation, characteristics and performance parameters of controlled rectifiers
- To study the operation, switching techniques and basic topologies of DC-DC switching regulators.
- To learn the different modulation techniques of pulse width modulated inverters and to understand harmonic reduction methods.
- To study the operation of AC voltage controller and various configurations.

**COURSE OUTCOMES**

- 21MZC17.CO1: Explain the working principles of various Power-semi-Conductor Devices  
 21MZC17.CO2: Understand the various Phase-Controlled Converters.  
 21MZC17.CO3: Understand the various principles on DC to DC Converter.  
 21MZC17.CO4: Understand the various phase changing inverters  
 21MZC17.CO5: Understand the various principles on AC to AC Converter.

Course Outcomes	Program Outcomes												PSOs		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
21MZC17.CO1	X	X	-	X	X	X	-	-	-	-	-	-	X	-	-
21MZC17.CO2	X	X	-	X	X	-	-	-	-	-	-	-	X	X	-
21MZC17.CO3	X	X	-	X	X	-	-	-	-	-	-	-	X	X	-
21MZC17.CO4	X	X	-	X	X	-	-	-	-	-	-	-	X	X	-
21MZC17.CO5	X	X	-	X	X	-	-	-	-	-	-	-	X	-	-

**UNIT I : POWER SEMI-CONDUCTOR DEVICES**

Study of switching devices, Diode, SCR, TRIAC, GTO, BJT, MOSFET, IGBT- Static and Dynamic characteristics  
 Triggering and commutation circuit for SCR- Design of Driver and snubber circuit.

9

**UNIT II: PHASE-CONTROLLED CONVERTERS**

2-pulse, 3-pulse and 6-pulse converters—performance parameters—Effect of source inductance— Gate Circuit Schemes for Phase Control—Dual converters.

9

**UNIT III: DC TO DC CONVERTER**

Step-down and step-up chopper control strategy—Forced commutated chopper—Voltage commutated, Current commutated, Load commutated, Switched mode regulators—Buck, boost, buck-boost converter, Introduction to Resonant Converters.

9

**UNIT IV: INVERTERS**

Single phase and three phase voltage source inverters (both 120° mode and 180° mode)—Voltage & harmonic control— PWM techniques: Sinusoidal PWM, modified sinusoidal PWM- multiple PWM— Introduction to space vector modulation— Current source inverter.

9

**UNIT V: AC TO AC CONVERTERS**

Single phase and Three phase AC voltage controllers—Control strategy—Power Factor Control— Multistage sequence control - single phase and three phase cycloconverters—Introduction to Matrix converters.

9

**TOTAL: L: 45 = 45**

**TEXTBOOKS:**

Sl.No	Author(s)	Title of the Book	Publisher	Year of Publication
1.	M.H.Rashid	Power Electronics: Circuits, Devices and Applications	Pearson Education, 3 <sup>rd</sup> Edition New Delhi,	2004
2.	P.S.Bimbra	Power Electronics	Khanna Publishers	2003

**REFERENCES:**

Sl.No	Author(s)	Title of the Book	Publisher	Year of Publication
1.	L.Umanand	Power Electronics Essentials and Applications	Wiley	2010
2.	Daniel.W.Hart	Power Electronics	Indian Edition McGraw Hill	2013

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3.	M.D.SinghandK.B. Khanchandani	PowerElectronics	Mc GrawHill India	2013
4.	JosephVithayathil	PowerElectronics, PrinciplesandApplications	McGrawHillSeries	2013
5.	PhilipT.Krein	ElementsofPower Electronics	OxfordUniversityPress	2004

  
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21MZC18

**DESIGN OF MACHINE ELEMENTS**

L T P C  
3 0 0 3

(Use of approved Design Data book is permitted)

**COURSE OBJECTIVES**

- To select the materials based on mechanical properties, different types of loading, simple, steady and variable stresses.
- To know the design procedure for various types of shafts, keys and couplings.
- To design the threaded fasteners, bolted joints including eccentric loading and welded joints for pressure vessels and structures.
- To design the various types of springs like helical, leaf, disc and torsional springs.
- To state the design procedure for various types of bearings and flywheel

**COURSE OUTCOMES**

- 21MZC18.CO1: Select the materials based on mechanical properties, different types of loading and introduction about simple, steady and variable stresses.
- 21MZC18.CO2: Know the design procedure for various types of shafts, keys and couplings.
- 21MZC18.CO3: Design the threaded fasteners, bolted joints including eccentric loading and welded joints for pressure vessels and structures.
- 21MZC18.CO4: Design the various types of springs like helical, leaf, disc and torsional springs.
- 21MZC18.CO5: Design various types of bearings like sliding contact, rolling contact bearing and flywheels.

Course Outcomes	Program Outcomes												PSOs		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
21MZC18.CO1	X	X	-	-	-	X	-	-	-	-	-	-	X	-	-
21MZC18.CO2	X	X	X	-	-	X	-	-	-	-	-	-	X	-	-
21MZC18.CO3	X	-	X	-	-	X	-	-	-	-	-	-	X	-	-
21MZC18.CO4	X	X	X	-	-	X	-	-	-	-	-	-	X	-	-
21MZC18.CO5	X	-	X	-	-	X	-	-	-	-	-	-	X	-	-

**UNIT I: STEADY AND VARIABLE STRESSES**

9

Introduction to the design process - factor influencing machine design, selection of materials based on mechanical properties, preferred numbers – direct, bending and torsional stress equations – calculation of principle stresses for various load combinations, eccentric loading – design of curved beams – crane hook and ‘c’ frame - factor of safety - theories of failure – stress concentration – design for variable loading – Soderberg, Goodman and Gerber relations.

**UNIT II: DESIGN OF SHAFTS AND COUPLINGS**

9

Design of Solid And Hollow Shafts Based on Strength And Rigidity – Design Of Keys - Design Of Rigid And Flexible Couplings.

**UNIT III: DESIGN OF FASTNERS AND WELDED JOINTS**

9

Threaded fasteners - design of bolted joints including eccentric loading – design of welded joints for structures.

**UNIT IV: DESIGN OF SPRINGS**

9


Design of helical, leaf and torsional springs under constant loads and varying loads – concentric torsion springs - belleville springs introduction to modern spring like wave spring, constant force spring (theory only).

**UNIT V: DESIGN OF BEARINGS AND FLYWHEELS**

9

Design of bearings – sliding contact and rolling contact types. – cubic mean load – design of journal bearings – mckees equation – lubrication in journal bearings – calculation of bearing dimensions – design of flywheels involving stresses in rim and arm.

**TOTAL: L: 45 =45**

  
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**TEXT BOOKS**

Sl. No.	Author(s)	Title of the Book	Publisher	Year of Publication
1	Richard G Budynas J.Keith Nisbett	Shigley's Mechanical Engineering Design	Mc Graw Hill	2011
2	Khurmi R.S, Gupta J.K	Machine Design	Eurasia publishing house	2005

**REFERENCE BOOKS**

Sl. No.	Author(s)	Title of the Book	Publisher	Year of Publication
1	Norton R.L	Design of Machinery	Tata McGraw-hill book co	2002
2	Orthwein W	Machine Component Design	Jaico Publishing co	2003
3	Ugural A.C	Mechanical Design – An Integral Approach	Mcgraw-hill book co	2004
4	Spotts M.F., Shoup T.E	Design and Machine Elements	Pearson Education	2004
5	V B Bhandari	Design of Machine Elements	Tata McGraw-hill.	2007

  
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21MZC19

**PRINCIPLES OF ROBOTICS**

**L T P C**  
**3 0 0 3**

**COURSE OBJECTIVES:**

- To introduce the functional elements of Robotics
- To impart knowledge on the direct and inverse kinematics
- To introduce the manipulator differential motion and control
- To educate on various path planning techniques
- To introduce the dynamics and control of manipulators

**COURSE OUTCOMES:**

- 21MZC19.CO1: Understand basic concept of robotics.  
 21MZC19.CO1: Analyze Instrumentation systems and their applications to various  
 21MZC19.CO1: Explain differential motion and statics in robotics  
 21MZC19.CO1: Understand about the various path planning techniques.  
 21MZC19.CO1: Explain dynamics and control in robotics industries.

Course Outcomes	Program Outcomes												PSOs		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
21MZC19.CO1	X	X	X	X	X	-	-	-	-	-	-	-	X	X	X
21MZC19.CO2	X	X	X	X	X	-	-	-	-	-	-	-	X	X	X
21MZC19.CO3	X	X	X	X	X	-	-	-	-	-	-	-	X	X	X
21MZC19.CO4	X	X	X	X	X	-	-	-	-	-	-	-	X	X	X
21MZC19.CO5	X	X	X	X	X	-	-	-	-	-	-	-	X	X	X

**UNIT I: BASIC CONCEPTS**

9

Brief history-Types of Robot-Technology-Robot classifications and specifications-Design and Control issues- Various manipulators – Sensors - work cell - Programming languages.

**UNIT II: DIRECT AND INVERSE KINEMATICS**

9

Mathematical representation of Robots - Position and orientation – Homogeneous transformation Various joints- Representation using the Denavit Hattenberg parameters -Degrees of freedom-Direct kinematics-Inverse kinematics- SCARA robots- Solvability – Solution methods-Closed form solution.

**UNIT III: MANIPULATOR DIFFERENTIAL MOTION AND STATICS**

9

Linear and angular velocities-Manipulator Jacobian-Prismatic and rotary joints-Inverse -Wrist and arm singularity - Static analysis - Force and moment Balance.

**UNIT IV: PATH PLANNING**

9

Definition-Joint space technique-Use of p-degree polynomial-Cubic polynomial-Cartesian space technique - Parametric descriptions - Straight line and circular paths - Position and orientation planning.

**UNIT V: DYNAMICS AND CONTROL**


9

Lagrangian mechanics-2DOF Manipulator-Lagrange Euler formulation-Dynamic model – Manipulator control problem- Linear control schemes-PID control scheme-Force control of robotic manipulator.

**TOTAL: L: 45 = 45**

**TEXT BOOKS:**


Sl. No.	Author(s)	Title of the Book	Publisher	Year of Publication
1	R.K.Mittal and I.J.Nagrath	Robotics and Control	Tata McGraw Hill, New Delhi, 4th Reprint	2005
2	John J. Craig	Introduction to Robotics Mechanics and Control	Third edition, Pearson Education,	2009.

  
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**REFERENCES:**

Sl. No.	Author(s)	Title of the Book	Publisher	Year of Publication
1	Ashitava Ghoshal	Robotics-Fundamental Concepts and Analysis	Oxford University Press, Sixth impression	2010
2	K. K.AppuKuttan	Robotics	I K International	2007
3	Edwin Wise	Applied Robotics	Cengage Learning	2003
4	R.D.Klafter,T.A.Chimielewski and M.Negin	Robotic Engineering-An Integrated Approach	Prentice Hall of India, New Delhi	1994
5	S.Ghoshal	Embedded Systems & Robotics Projects using the 8051 Microcontroller	Cengage Learning	2009

  
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**COURSE OBJECTIVES:**

- To learn about basics of robots, programming and Machine vision applications in robots.
- To learn the working principles of various robots end effectors.
- To learn robot mechanics
- To understand the mission vision concepts.
- To learn the robotics programmes.

**COURSE OUTCOMES:**

- 21MZC20.CO1: Understand the basics of robots, programming and Machine vision applications in robots.  
 21MZC20.CO2: Explain working principles of various robots end effectors.  
 21MZC20.CO3: Explain the various robot mechanics  
 21MZC20.CO4: Explain the various applications using mission vision concepts.  
 21MZC20.CO5: Write the various robotics programmes.

Course Outcomes	Program Outcomes												PSOs		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
21MZC20.CO1	X	-	-	X	X	X	X	-	-	-	-	X	X	X	-
21MZC20.CO2	X	-	-	X	X	-	X	-	-	-	-	X	X	X	-
21MZC20.CO3	X	-	-	X	X	-	X	-	-	-	-	X	X	X	-
21MZC20.CO4	X	-	-	X	X	-	X	-	-	-	-	X	X	X	-
21MZC20.CO5	X	-	-	X	X	-	X	-	-	-	-	X	X	X	-

**UNIT I : BASICS OF ROBOTICS**

9

Introduction- Basic components of robot-Laws of robotics- classification of robot-work space- accuracy-resolution – repeatability of robot. Power transmission system: Rotary to rotary motion, Rotary to linear motion, Harmonic drives

**UNIT II: ROBOT END EFFECTORS**

9

Robot End effectors: Introduction- types of End effectors-Mechanical gripper- types of gripper mechanism- gripper force analysis-other types of gripper-special purpose grippers.

**UNIT III: ROBOT MECHANICS**

10

Robot kinematics: Introduction-Matrix representation-rigid motion & homogeneous transformation- forward & inverse kinematics-trajectory planning. Robot Dynamics: Introduction-Manipulator dynamics-Lagrange- Euler formulation- Newton- Euler formulation

**UNIT IV: MACHINE VISION FUNDAMENTALS**

9

Machine vision: image acquisition, digital images-sampling and quantization-level of computation Feature extraction-windowing technique-segmentation-Thresholding-edge detection-binary morphology-grey morphology

**UNIT V: ROBOT PROGRAMMING**

8

Robot programming: Robot Languages- Classification of robot language-Computer control and robot software-Val system and Languages- application of robots.

**TOTAL: L: 45: = 45**

**TEXT BOOKS:**

Sl. No.	Author(s)	Title of the Book	Publisher	Year of Publication
1	M.P.Groover, M.Weiss, R.N. Nagal, N.G.Odrey	Industrial Robotics - Technology, programming and Applications	Tata McGraw-Hill Education Pvt Limited	2008



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REFERENCES:

Sl. No.	Author(s)	Title of the Book	Publisher	Year of Publication
1	SathyaRanjanDeb	RoboticsTechnology&flexible Automation	Sixthedition,TataMcGraw- Hill Publication	2003
2	K.S.Fu,R.C.Gonzalez,C.S.G.Lee	Robotics:Sensing,Vision&Intelligence	TataMcGraw-Hill Publication	1987
3	John.J.Craig	Introduction to Robotics: Mechanics&control	TataMcGraw-Hill Secondedition	2002
4	Jazar	TheoryofAppliedRobotics: Kinematics,DynamicsandControl	Springer,Indian Reprint	2010

  
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21MZC21

DYNAMICS OF MACHINES LABORATORY

L T P C  
0 0 3 1

**COURSE OBJECTIVES:**

- To learn about basics of various links and mechanisms.
- To learn the working principles of gyroscopes and cams
- To learn various governors.
- To understand the mission vibrating instruments.
- To learn the balancing of rotating and reciprocating masses.

**COURSE OUTCOMES:**

- 21MZC21.CO1: Understand the basics of various links and mechanisms  
 21MZC21.CO2: Use gyroscopes and cams.  
 21MZC21.CO3: Operate the various governors.  
 21MZC21.CO4: Measure the various parameters using vibrating instruments.  
 21MZC21.CO5: Analysis the balancing of rotating and reciprocating masses.

Course Outcomes	Program Outcomes												PSOs		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
21MZC21.CO1	X	X	X	X	-	X	-	-	-	X	-	-	X	-	-
21MZC21.CO2	X	X	-	X	-	X	-	-	-	X	-	X	X	-	-
21MZC21.CO3	X	X	X	X	-	X	-	-	X	X	-	X	X	-	-
21MZC21.CO4	X	X	X	X	-	X	-	-	X	X	-	X	X	-	-
21MZC21.CO5	X	X	-	X	-	X	-	-	X	X	-	X	X	-	X

**LIST OF EXPERIMENTS**

1. a) Study of gear parameters.
2. b) Experimental study of velocity ratios of simple, compound, Epicyclic and differential gear trains.
3. a) Kinematics of Four Bar, Slider Crank, Crank Rocker, Double crank, Double rocker, Oscillating cylinder Mechanisms.
4. b) Kinematics of single and double universal joints.
5. a) Determination of Mass moment of inertia of Fly wheel and Axle system.
6. b) Determination of Mass Moment of Inertia of axisymmetric bodies using Turn Table apparatus.
7. c) Determination of Mass Moment of Inertia using bifilar suspension and compound pendulum.
8. Motorized gyroscope – Study of gyroscopic effect and couple.
9. Governor - Determination of range sensitivity, effort etc., for Watts, Porter, Proell, and Hartnell
10. Governors.
11. Cams – Cam profile drawing, Motion curves and study of jump phenomenon
12. a) Single degree of freedom Spring Mass System – Determination of natural frequency and verification of Laws of springs – Damping coefficient determination.
13. b) Multi degree freedom suspension system – Determination of influence coefficient.
14. a) Determination of torsional natural frequency of single and Double Rotor systems. - Undamped and Damped Natural frequencies.
15. b) Vibration Absorber – Tuned vibration absorber.
16. Vibration of Equivalent Spring mass system – undamped and damped vibration.
17. Whirling of shafts – Determination of critical speeds of shafts with concentrated loads.
18. a) Balancing of rotating masses.
19. b) Balancing of reciprocating masses.
20. a) Transverse vibration of Free-Free beam – with and without concentrated masses.
21. b) Forced Vibration of Cantilever beam – Mode shapes and natural frequencies.
22. c) Determination of transmissibility ratio using vibrating table

TOTAL: P: 30: = 30

  
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21MZC22

POWER ELECTRONICS LABORATORY

L T PC  
00 32

**COURSE OBJECTIVES:**

- To train for using the SCR, MOSFET & IGBT characteristics.
- To understand the electronics components.
- To train for using the Controller circuits
- To train for using the Control the AC and DC motors
- To train for using the Chopper and Invertors

**COURSE OUTCOMES:**

- 21MZC22.CO1: Use SCR, MOSFET, TRIAC in electronic circuit  
 21MZC22.CO2: Perform characteristic study on the electronics components.  
 21MZC22.CO3: Make the various Controller circuits  
 21MZC22.CO4: Control the AC and DC motors  
 21MZC22.CO5: Use the Chopper and Invertors

Course Outcomes	Program Outcomes												PSOs		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
21MZC22.CO1	X	-	-	X	X	-	-	-	-	-	-	-	X	X	-
21MZC22.CO2	X	-	-	X	X	-	-	-	-	-	-	-	X	X	-
21MZC22.CO3	X	-	-	X	X	-	-	-	-	-	-	-	X	X	-
21MZC22.CO4	X	-	-	X	X	-	-	-	-	-	-	-	X	X	-
21MZC22.CO5	X	-	-	X	X	-	-	-	-	-	-	-	X	X	-

**LIST OF EXPERIMENTS**

1. Study of SCR, MOSFET & IGBT characteristics
2. UJT, R, RC firing circuits for SCR
3. Voltage & current commutated chopper
4. SCR phase control circuit
5. TRIAC phase control circuit
6. Study of half controlled & fully controller converters
7. Study of three phase AC regulator
8. Speed control of DC shunt motor using three phase fully controlled converter.
9. SCR single-phase cyclo-converter
10. SCR series and parallel inverters
11. IGBT Chopper
12. IGBT based PWM inverter (single phase)

**TOTAL: P: 30: = 30**

  
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21MZC23

MICROCONTROLLER AND PLC

LTPC  
30 03

**COURSE OBJECTIVES:**

- To impart basics of various microcontrollers.
- To impart the knowledge on 8051 microcontrollers Programme.
- To impart the knowledge on interfacing various microcontrollers.
- To impart the knowledge on PLC.
- To impart the knowledge on Applications of various PLC.

**COURSE OUTCOMES**

- 21MZC23.CO1: Familiarize various microcontrollers.
- 21MZC23.CO2: Write the 8051 microcontrollers Programme.
- 21MZC23.CO3: Interface various microcontrollers.
- 21MZC23.CO4: Explain various PLC systems.
- 21MZC23.CO5: Illustrate the various applications of PLC.

Course Outcomes	Program Outcomes												PSOs		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
21MZC23.CO1	X	-	-	X	X	X	-	-	-	-	-	X	X	-	-
21MZC23.CO2	X	-	-	X	X	-	-	-	-	-	-	X	X	X	-
21MZC23.CO3	X	-	-	X	X	-	-	-	-	-	-	X	X	X	-
21MZC23.CO4	X	-	-	X	X	-	-	-	-	-	-	X	X	X	-
21MZC23.CO5	X	-	-	X	X	-	-	-	-	-	-	X	X	-	-

**UNIT I: INTRODUCTION TO MICROCONTROLLER**

9

8051 Architecture: –Memory map–Addressing modes, I/O Ports–Counters and Timers –Serial data- I/O– Interrupts– Instruction set, Data transfer instructions, Arithmetic and Logical Instructions, Jump and Call Instructions, Assembly Language Programming tools.

**UNIT II: MICROCONTROLLER PROGRAMMING**

9

8051 Assembly Language Programming–Block transfer, arithmetic operations, Code conversion, Time delay generation, Interrupt programming, Look up table techniques

**UNIT III: MICROCONTROLLER APPLICATIONS**

8

Interfacing of Keyboards–Interfacing of Display Devices–Pulse measurement–Analog to Digital and Digital to Analog Converter –Interfacing Hardware Circuit– Serial Data Communication– Network Configuration.

**UNIT IV: PROGRAMMABLE LOGIC CONTROLLERS**

9

Introduction—Principles of operation–PLC Architecture and specifications –PLC hardware components Analog & digital I/O modules, CPU & memory module–Programming devices–PLC ladder diagram, Converting simple relay ladder diagram into PLC relay ladder diagram. PLC programming Simple instructions– Manually operated switches–Mechanically operated Proximity switches–Latching relays,

**UNIT V: APPLICATIONS OF PROGRAMMABLE LOGIC CONTROLLERS.**

9

Timer instructions–On delay, Off delay, Cyclic and Retentive timers, Up/Down Counters, control instructions –Data manipulating instructions, math instructions; Applications of PLC – Simple materials handling applications, Automatic control of warehouse door, Automatic lubrication of supplier Conveyor belt, motor control, Automatic car washing machine, Bottle label detection and process control application.

TOTAL: L: 45: = 45

**TEXT BOOKS:**

Sl. No.	Author(s)	Title of the Book	Publisher	Year of Publication
1	Muhammad Ali Mazdi, J.G. Mazdi & R.D. McKinlay	The 8051 Microcontroller & Embedded systems Using assembly & C	2 <sup>nd</sup> Edition Pearson Education	2006
2	Udayasankarav & Mallikarjunaswamy.M.S	8051 Microcontroller, Hardware, Software & Applications	Tata McGraw Hill Education Pvt Limited, New Delhi	2009
3	Gary Dunning	Introduction	Thomson Learning	2001

Programme Code & Name: MZ & B.E-Mechatronics Engineering

	toProgrammableLogicControllers		
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**REFERENCES:**

Sl. No.	Author(s)	Title of the Book	Publisher	Year of Publication
1	Singh, B.P	Microprocessors and Microcontrollers	GalcotiaPublications (P) Ltd, First edition, New Delhi	1997
2	Parr	Programmable Controllers: An Engineers Guide	3rd Edition, Elsevier, Indian Reprint	2013
3	Valdes-Perez	Microcontrollers: Fundamentals and Applications with PIC	Taylor & Francis, Indian Reprint	2013
4	Bolton	Programmable Logic Controllers	5th Edition Newnes	2009

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21MZC24

SENSORS AND SIGNAL PROCESSING

L T P C

30 03

**COURSE OBJECTIVES:**

- To impart basics of sensors and the methods of processing their signals.
- To impart the knowledge on instruments for mechanical measurements.
- To impart the knowledge on instruments for Electrical Measurement.
- To impart the knowledge on smart sensors.
- To impart the knowledge on signal conditioning and data acquisition.

**COURSE OUTCOMES**

- 21MZC24.CO1: Familiarize sensors and the methods of processing their signals.  
 21MZC24.CO2: Explain the working principle of mechanical measurements.  
 21MZC24.CO3: Explain the working principle of instruments for Electrical Measurement.  
 21MZC24.CO4: Illustrate the working principle of smart sensors.  
 21MZC24.CO5: Illustrate the working principle of signal conditioning and data acquisition.

Course Outcomes	Program Outcomes												PSOs		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
21MZC24.CO1	X	X	X	-	X	-	-	-	-	-	-	X	X	-	-
21MZC24.CO2	X	X	X	X	X	-	-	-	-	-	-	X	X	X	-
21MZC24.CO3	X	X	X	X	X	-	-	-	-	-	-	X	X	X	-
21MZC24.CO4	X	X	X	X	X	-	-	-	-	-	-	X	X	X	-
21MZC24.CO5	X	X	X	X	X	-	-	-	-	-	-	X	X	-	-

**UNIT I: SCIENCE OF MEASUREMENT**

9

Units and Standards – Calibration techniques – Errors in Measurements – Generalized Measurement System – Static and dynamic characteristics of transducers – Generalized Performance of Zero Order and First Order Systems – Response of transducers to different time varying inputs – Classification of transducers

**UNIT II: MECHANICAL MEASUREMENTS**

9

Temperature: Filled thermometer – Bimetallic thermometer – monometers – elastic transducers – bourdon gauge – bellows – diaphragm. Vacuum: McLeod gauge, thermal conductivity gauge – Ionization gauge, flow measurement: orifice, venturi, nozzle, pitot tube, turbine flow meter, hot wire anemometer.

**UNIT III: ELECTRICAL MEASUREMENTS**

9

Resistive transducers – Potentiometer – RTD – Thermistor – Thermocouple – Strain gauges – use in displacement, temperature, force measurement – Inductive transducer – LVDT – RVDT – use in displacement – Capacitive transducer – Piezoelectric transducer – Digital displacement transducers.

**UNIT IV: SMART SENSORS**

9

Radiation Sensors – Smart Sensors – Film sensor, MEMS & Nano Sensors – applications – Automobile, Aerospace, Home appliances, Manufacturing, Medical diagnostics, Environmental monitoring.

**UNIT V: SIGNAL CONDITIONING AND DATA ACQUISITION**

9


Amplification – Filtering – Sample and Hold circuits – Data Acquisition: Single channel and multi channel data acquisition – Data logging.

TOTAL: L: 45: = 45

**TEXT BOOKS:**

Sl. No.	Author(s)	Title of the Book	Publisher	Year of Publication
1	Doebelin, E. O	Measurement Systems – Applications and Design	Tata McGraw Hill	1992
2	Patranabis, D	Sensors and Transducers	2 <sup>nd</sup> Edition PHI, New Delhi	2003

**REFERENCES:**

  
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Sl. No.	Author(s)	Title of the Book	Publisher	Year of Publication
1	IanSinclair. R	Sensorsandtransducers	Newnes ,ElaiverIndianprint	2011
2	Beckwith,Marangonian dLienhard	Mechanical Measurements	AddisonWesley	2000
3	Venkatesan. S.P	Mechanical Measurements	AneBooksPvtLtd,Indi a	2008



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**21MZC25AUTOMATION SYSTEM DESIGN**

**L T P C**  
**3 0 0 3**

**COURSE OBJECTIVES**

- To know about the basic concepts in industrial automation
- To design automated systems.
- To know about transfer lines and automated assembly
- To expose to pneumatic, electric, hydraulic and electronic systems in automation of mechanical operations.
- To know about the advancement in hydraulics and pneumatics

**COURSE OUTCOMES**

- 21MZC25.CO1: Familiarize the industrial automation by transfer lines and automated assembly lines.  
 21MZC25.CO2: Design an automated system  
 21MZC25.CO3: Understanding of automated controls using pneumatic and hydraulic systems  
 21MZC25.CO4: Understand the electronic control systems in metal machining and other manufacturing processes.  
 21MZC25.CO5: Understand advancement in hydraulics and pneumatics systems.

Course Outcomes	Program Outcomes												PSOs		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
21MZC25.CO1	X	-	-	-	X	X	X	-	-	-	-	X	X	-	-
21MZC25.CO2	X	-	-	X	X	-	X	-	-	-	-	X	X	X	X
21MZC25.CO3	X	-	-	X	X	-	X	-	-	-	-	X	X	X	X
21MZC25.CO4	X	-	-	X	X	-	X	-	-	-	-	X	X	-	-
21MZC25.CO5	X	-	-	X	X	-	X	-	-	-	-	X	X	-	-

**UNIT I: FUNDAMENTAL CONCEPTS OF INDUSTRIAL AUTOMATION**

9

Fundamental concepts in manufacturing and automation, definition of automation, reasons for automating. Types of production and types of automation, automation strategies, levels of automation.

**UNIT II: TRANSFER LINES AND AUTOMATED ASSEMBLY**

10

General terminology and analysis, analysis of transfer lines without storage, partial automation. Automated flow lines with storage buffers. Automated assembly-design for automated assembly, types of automated assembly systems, part feeding devices, analysis of multi-station assembly machines. AS/RS, RFID system, AGVs, modular fixturing. Flow line balancing.

**UNIT III: DESIGN OF MECHATRONIC SYSTEMS**

8

Stages in design, traditional and mechatronic design, possible design solutions. Case studies-pick and place robot, engine management system.

**UNIT IV: PROGRAMMABLE AUTOMATION**

9

Special design features of CNC systems and features for lathes and machining centers. Drive system for CNC machine tools. Introduction to CIM; condition monitoring of manufacturing systems.

**UNIT V: DESIGN FOR HIGH SPEED AUTOMATIC ASSEMBLY**

9

Introduction, Design of parts for high speed feeding and orienting, high speed automatic insertion. Analysis of an assembly. General rules for product design for automation.

**TOTAL: L: 45: = 45**

**TEXT BOOKS:**

Sl. No.	Author(s)	Title of the Book	Publisher	Year of Publication
1	Mikell P Groover	Automation Production Systems and Computer- Integrated Manufacturing	Pearson Education, New Delhi	2001
2	Bolton W	Mechatronics	Pearson Education	1999



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**REFERENCES:**

Sl. No.	Author(s)	Title of the Book	Publisher	Year of Publication
1	Mikell P Groover	Industrial Robots – Technology Programmes and Applications	McGraw Hill, New York, USA	2000
2	Steve F Krar	Computer Numerical Control Simplified	Industrial Press	2001
3	Joffrey Boothroyd, Peter Dewhurst and Winston A. Knight	Product Design for manufacture and Assembly	CRC Press	2011

  
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**21MZC26**

**MICROCONTROLLER LABORATORY**

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

**COURSE OBJECTIVES**

- To provide knowledge Microcontroller Kits.
- To provide knowledge on interfacing the stepper and D.C motors.
- To provide knowledge on interface the microcomputer port
- To provide knowledge to control the speeds.
- To provide hands-on PLC systems

**COURSE OUTCOMES**

21MZC26.CO1: Use Microcontroller Kits.

21MZC26.CO2: Interface the stepper and D.C motors.

21MZC26.CO3: Interface the microcomputer port lines, LED relays and LCD displays

21MZC26.CO4: Control the speed using Hydraulic actuators.

21MZC26.CO5: Control the various devices using PLC.

Course Outcomes	Program Outcomes												PSOs		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
21MZC27.CO1	X	-	-	X	X	-	-	-	-	-	-	X	X	-	-
21MZC27.CO2	X	-	-	X	X	-	-	-	-	-	-	X	X	X	X
21MZC27.CO3	X	-	-	X	X	-	-	-	-	-	-	X	X	X	X
21MZC27.CO4	X	-	-	X	X	-	-	-	-	-	-	X	X	X	X
21MZC27.CO5	X	-	-	X	X	-	-	-	-	-	-	X	X	-	-

**LIST OF EXPERIMENTS**

1. Study of Microcontroller Kits.
2. 8051/ 8031 Programming Exercises.
3. Stepper Motor interface.
4. D.C. motor controller interface.
5. Study of interrupt structure of 8051.
6. Interfacing high power devices to microcomputer port lines, LED relays and LCD displays.
7. Linear actuation of hydraulic cylinder with counter and speed control.
8. Hydraulic rotation with timer and speed control.
9. Sequential operation of pneumatic cylinders.
10. Traffic light controller.
11. Speed control of DC motor using PLC.
12. Testing of Relays using PLC.

**TOTAL: P: 30: = 30**



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**21MZC27 SENSORS AND SIGNAL PROCESSING LABORATORY**

**L T P C**  
**00 21**

**COURSE OBJECTIVES**

- To provide knowledge of thermal and displacement sensors.
- To provide knowledge of Torque and strain sensors.
- To provide knowledge of Servomotor position control and wave Shaping sensors.
- To provide knowledge of comparators and controllers.
- To provide hands-on experience on encoders and data acquisition system.

**COURSE OUTCOMES**

- 21MZC27.CO1: Use thermal and displacement sensors.  
 21MZC27.CO2: Measure Torque and strain using sensors.  
 21MZC27.CO3: Use Servomotor position control and wave Shaping sensors.  
 21MZC27.CO4: Use comparators and controllers.  
 21MZC27.CO5: Operate encoders and data acquisition system.

Course Outcomes	Program Outcomes												PSOs		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
21MZC27.CO1	X	-	-	X	X	X	-	-	-	-	-	X	X	X	-
21MZC27.CO2	X	-	-	X	X	-	-	-	-	-	-	X	X	X	-
21MZC27.CO3	X	-	-	X	X	-	-	-	-	-	-	X	X	X	X
21MZC27.CO4	X	-	-	X	X	-	-	-	-	-	-	X	X	X	X
21MZC27.CO5	X	-	-	X	X	-	-	-	-	-	-	X	X	-	-

**LIST OF EXPERIMENTS**

1. Measurement of temperature using thermocouple, thermistor and RTD
2. Measurement of displacement using POT, LVDT & Capacitive transducer
3. Torque measurement using torque measuring devices
4. Strain Measurement using strain gauge
5. Servomotor position control using photoelectric pickup
6. Wave Shaping circuit
7. Analog to Digital Converters
8. Digital Comparator
9. Voltage to frequency converter
10. Frequency to Voltage Converter
11. Position and velocity measurement using encoders
12. Study on the application of data acquisition system for industrial purposes.

**TOTAL: P: 30; = 30**



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**21MZC28FIELD AND SERVICE ROBOTICS**

**L T P C**  
**3 0 0 3**

**COURSE OBJECTIVES**

- To study the various parts of robots and fields of robotics.
- To study the various kinematics and inverse kinematics of robots.
- To study about the localization, planning and navigation.
- To study the control of robots for some specific applications.
- To study about the humanoid robots.

**COURSE OUTCOMES**

- 21MZC28.CO1: Explain the basic concepts of working of robot  
 21MZC28.CO2: Analyze the function of sensors in the robot  
 21MZC28.CO3: Write program to use a robot for a typical application  
 21MZC28.CO4: Use Robots in different applications  
 21MZC28.CO5: Know about the humanoid robots.

Course Outcomes	Program Outcomes												PSOs		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
21MZC28.CO1	-	-	-	X	-	-	X	-	-	-	-	X	X	X	X
21MZC28.CO2	-	-	-	X	-	-	X	-	-	-	-	X	X	X	X
21MZC28.CO3	-	-	-	X	-	-	X	-	-	-	-	X	X	X	X
21MZC28.CO4	-	-	-	X	-	-	X	-	-	-	-	X	X	X	X
21MZC28.CO5	-	-	-	X	-	-	X	-	-	-	-	X	X	X	X

**UNIT I: INTRODUCTION**

9

History of service robotics – Present status and future trends – Need for service robots – applications examples and Specifications of service and field Robots. Non conventional Industrial robots.

**UNIT II: LOCALIZATION**

9

Introduction-Challenges of Localization- Map Representation- Probabilistic Map based Localization Monte carlo localization- Landmark based navigation-Globally unique localization- Positioning beacon systems- Route based localization.

**UNIT III : PLANNING AND NAVIGATION**

9

Introduction-Path planning overview- Road map path planning- Cell decomposition path planning Potential field path planning-Obstacle avoidance - Case studies: tiered robot architectures.

**UNIT IV:FIELD ROBOTS**

9

Ariel robots- Collision avoidance-Robots for agriculture, mining, exploration, underwater, civilian and military applications, nuclear applications, Space applications.

**UNIT V: HUMANOIDS**

9

Wheeled and legged, Legged locomotion and balance, Arm movement, Gaze and auditory orientation control, Facial expression, Hands and manipulation, Sound and speech generation, Motion capture/Learning from demonstration, Human activity recognition using vision, touch, sound, Vision, Tactile Sensing, Models of emotion and motivation. Performance, Interaction, Safety and robustness, Applications, Case studies.

**TOTAL: L: 45: = 45**

**TEXT BOOKS:**

Sl. No.	Author(s)	Title of the Book	Publisher	Year of Publication
1	Roland Siegwart, Illah Reza Nourbakhsh, Davide Scaramuzza	Introduction to Autonomous Mobile Robots	Bradford Company Scituate, USA	2004
2	RiadhSiaer	The future of Humanoid Robots- Research and applications	Intech Publications	2012



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REFERENCES:

Sl. No.	Author(s)	Title of the Book	Publisher	Year of Publication
1	Richard D Klafter, Thomas A, Chmielewski, Michael Negin	Robotics Engineering – An Integrated Approach	Eastern Economy Edition, Prentice Hall of India P Ltd	2006
2	Kelly, Alonzo; Iagnemma, Karl Howard, Andrew	Field and Service Robotics	Springer,	2011

  
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# **Employability Enhancement Courses (EEC)**

**For**

**Mechatronics**

Programme Code & Name: MZ & B.E-Mechatronics Engineering

21MZS01PROJECT WORK PHASE -I

L T P C  
0 0 6 3

### COURSE OBJECTIVES

- To achieve integrated mechanical design of a product through parts design, assembly and preparation of manufacturing drawings

### COURSE OUTCOMES

- 21MZS01.CO1: Choose an engineering problem in a current industrial scenario.
- 21MZS01.CO2: Do related literature review
- 21MZS01.CO3: Do intensive literature review
- 21MZS01.CO4: Decide the working methodology of the project
- 21MZS01.CO5: Make an analysis and produce a report over it

Students are asked to form a team which consists of 4 members, maximum. Each team has to work under a project supervisor. Based on the current industrial scenario, any relevant problem should be selected for the project with the consultation of the supervisor. Literature review should be done related to the problem considered. The working methodology of the project work for the phase II should be decided. These activities should be registered in a report and submitted by the student 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.

TOTAL: P: 90 = 90



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21MZS02

**PROJECT WORK PHASE -II**

**L T P C**  
**0 0 20 10**

**COURSE 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.

**COURSE OUTCOMES**

- 21MZS02.CO1: Apply knowledge and demonstrate to manage project in multi-disciplinary.
- 21MZS02.CO2: Design and conduct experiments to interpret data pertaining to engineering problems
- 21MZS02.CO3: Apply contextual knowledge to assess social, health and cultural issues and endue to professional engineering practice.
- 21MZS02.CO4: Prepare documentation and presentation for engineering activities for society
- 21MZS02.CO5: Perform effectively as leader in multi-disciplinary terms.

Based on the work methodology decided in the Phase I, the project is further developed. Necessary modeling and analysis is done using required software. The project is fabricated. The analytical results and the experimental results are validated. Three reviews will be conducted periodically by a committee constituted by the Head of the Department. A project report to be prepared by the students along with which the project has to be submitted for the final viva voce examination

**TOTAL: P: 300 = 300**

  
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**COURSE OBJECTIVES**

- To provide students an understanding of the expectations of industry.
- To improve employability skills
- To bridge the skill gaps and make students industry ready.
- To provide an opportunity to develop inter-disciplinary skills.

**COURSE OUTCOMES**

- 21MZS03.CO1: Understand the expectations of industry.  
21MZS03.CO2: To apply employability skills.  
21MZS03.CO3: To apply the skill industry ready.  
21MZS03.CO4: To use inter-disciplinary skills.

**Value Added Courses**

- Fusion 360
- Modeling Software
- Analysis Software
- GRE/ GATE
- DFMA
- 3D Printing
- PLC
- Optimization

**Internship Training**

- Inplant Training in Industry.
- Training from Industry.
- Solve the Problems from Industry.
- Do the Project in Industry.



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Programme Code & Name: MZ & B.E-Mechatronics Engineering

21MZS04 INTERDISCIPLINARYPROJECT

L T P C  
0 0 3 1

### **COURSE OBJECTIVE**

To help the students look into the functioning of simple to complex devices and systems

- To enable the students to design and build simple systems on their own
- To help experiment with innovative ideas in design and team work
- To create an engaging and challenging environment in the engineering lab

The course will offer the students with an opportunity to gain a basic understanding of electronic devices and apply the concepts to design and build simple to complex devices. As a practical project-based course, the students will be taught the concepts in theory. While the course will start with formal instruction on hardware, programming and applications, the major portion of the course will provide the students with ample opportunity to be innovative in designing and building a range of products from Agriculture, medical and defense and etc. Students will focus primarily on-IOT using Arduino and Raspberry pi-based controllers with Python programming.

**TOTAL: T: 45 = 45**



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**21MZS05 CONSTITUTION OF INDIA AND PROFESSIONAL ETHICS**

**L T P C**  
**0 0 3 0**

**COURSE OBJECTIVES**

- To create an awareness on Engineering Ethics and Human Values.
- To instill Moral and Social Values and Loyalty.
- To create awareness among engineers about their social responsibilities
- To Appreciate the Ethical issues
- To Know the Human rights and concept of women empowerment
- To know features of our constitution.

**COURSE OUTCOMES**

21MZS05.CO1: Practice the moral values that ought to guide the Engineering profession.

21MZS04.CO2: Discover of the set of justified moral principles of obligation, ideals that ought to be endorsed by the engineers and apply them to concrete situations

21MZS04.CO3: Know the definitions of risk and safety also discover different factors that affect the perception of risk

21MZS04.CO4: Appreciate the Ethical issues and Know the code of ethics adopted in various professional body's and industries

21MZS04.CO5: Justify the need for protection of human rights and to know about concept of women empowerment and know the successful functioning of democracy in India.

**UNIT I: HUMAN VALUES**

9

Professional Ethics-Objectives of study of professional ethics-Human values- Definition of Morals and Ethics-Difference between Morality and Ethics-Values-Definition-Types of values Definition of Integrity- Concept of Work Ethic- Service Learning- Definition Virtues-Definition Civic Virtue-Duties and Rights - Respect for Others – Attitude and values, opinions-changing attitude-beliefs-Reliability-Living Peacefully-Means to be adopted for leaving peacefully-Caring Sharing-Honesty-Valuing Time- Co-operation- Commitment- Empathy- Self-Confidence Spirituality.

**UNIT II: ENGINEERING ETHICS**

8

Engineering ethics-Definition-Approach-Senses of Engineering Ethics-variety of moral issues-Inquiry-Types-Moral Dilemmas-Steps to solve dilemma-Moral autonomy –Definition-consensus & controversy –Profession-Definition– Ethical Theories-Theories about right action Personality– Self-control- Self-interest –Self-respect.

**UNIT III: SAFETY, RESPONSIBILITIES OF ENGINEERS**

6

Safety and risk-definition- - assessment of safety and risk - risk benefit analysis and reducing risk –Personal Risk-Public Risk-Reducing Risk-Voluntary Risk-Collegiality and loyalty– Authority Types- collective bargaining -occupational crime –Responsibility of engineers – Types – Social responsibility- Professional responsibility-confidentiality-conflicts of interest-liability.

**UNIT IV: ETHICAL ISSUES IN ENGINEERING PRACTICE**

6

Ethical issues–Industrial standards-Environmental ethics –Plastic waste disposal-E-Waste Disposal-Semiconductor waste Disposal-Industrial waste disposal-Human centered environmental ethics- computer ethics –Types of issues-Computer as the Instrument and Object of Unethical Acts -Engineers as managers-Codes of ethics-Sample code of Ethics like - Institution of Engineers(India)-Institute of Electrical & Electronics engineers- Institute of Electronics & Telecommunication Engineers - Indian Institute of Materials Management.

**UNIT V: HUMAN RIGHTS**

8

Human Rights-Definition-constitutional provisions-right to life and liberty-Human Rights of Women-Discrimination against women- steps that are to be taken to eliminate discrimination against women in Education, employment, health care, Economic and social life, Women in rural areas- Status of Women in India - Constitutional Safeguards - Dowry Prohibition

  
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Programme Code & Name: MZ & B.E-Mechatronics Engineering

act 1961- Domestic violence act 2005- Sexual harassment at work place bill 2006-Human Rights of Children- Who is a child- list the Rights of the Child- Right to education--Protection of Children from Sexual Offences Act(POCSO)-2012- National Human Rights Commission- Constitution Powers and function of the Commission-Employee rights- Provisions made-Contractual-Non contractual employee rights-Whistle blowing-definition-Aspects-Intellectual Property Rights (IPR)-Meaning-Need for protection- Briefly description of concept of patents, Copy right, Trade mark.

**UNIT VI: INDIAN CONSTITUTION**

8

Introduction to constitution of India-Formation and Composition of the Constituent Assembly Salient features of the Constitution-Preamble to the Indian Constitution Fundamental Rights Fundamental Duties-Directive principles of state policy. Parliamentary system of governance- Structure of Parliament- Lokhasabha and Rajyasabha -Functions of parliament- Legislative, Executive, Financial Function, Powers of Loksabha and Rajya Sabha- Procedure followed in parliament in making law-Structure of union executive Power and position of President, Vice President, Prime minister and council of ministers. Structure of the judiciary: Jurisdiction and functions of Supreme Court, high court, and subordinate courts Federalism in the Indian constitution, Division of Powers- Union list, State list and concurrent list, Structure of state legislation, Legislative assembly and Legislative council, Functions of state legislature, Structure of state executive-Powers and positions of Governor, Speaker, Deputy Speaker, Chief Minister and council of minister. Local self-government-meaning-Three tier system-Village panchayath - Taluk panchayath Zilla panchayath – Local bodies –Municipalities and Corporations, Bruhath mahanagara Palike. Functions of Election commission, UPSC, KPSC.

**TOTAL: T: 45 = 45**



**Chairman  
Board of Studies**

**Department of Mechatronics Engineering  
Muthayammal Engineering College (Autonomous)  
Rasipuram, Namakkal Dist 637 408.**

Programme Code & Name: MZ & B.E-Mechatronics Engineering

21MZS06 ESSENCE OF INDIAN TRADITIONAL KNOWLEDGE

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**COURSE OBJECTIVES**

- The course aims at imparting basic principles of thought process, reasoning and inferencing.
- Sustainability is at the core of Indian Traditional Knowledge Systems connecting society and nature.
- Holistic life style of Yogic-science and wisdom capsules in Sanskrit literature are also important in modern society with rapid technological advancements and societal disruptions.
- The course focuses on introduction to Indian Knowledge System, Indian perspective of modern scientific world-view and basic principles of Yoga and holistic health care system.

**COURSE OUTCOMES**

21MZS06.CO1: To understand, connect up and explain basics of Indian Traditional knowledge modern scientific perspective.

**Syllabus**

Basic Structure of Indian Knowledge System - Modern Science and Indian Knowledge System - Yoga and Holistic Health care - Case Studies.

TOTAL: T: 45 = 45



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