CURRICULUM

(Scheme & Syllabi 1st to 4th year)

for

UNDERGRADUATE DEGREE COURSE

IN

Mechanical

ENGINEERING

[w.e.f. 2018-19]

DEENBANDHU CHHOTU RAM UNIVERSITY OF SCIENCE AND TECHONOLOGY
(Established Under Haryana Legislature Act NO. 29 of 2006)
Murthal-131039, Sonipat (Haryana)
www.dcrust.ac.in

Syllabi of MC101C Induction Programme (effective from Academic Session 2019-20) and Branch Code 102C In-House Practical Training (Level-I) (effective from academic Session 2018-19) are approved in the 14th meeting of Academic Council held on 11.06.2019.

Deenbandhu Chhotu Ram University of Science & Technology, Murthal (Sonepat)

B.Tech. 1ST YEAR (SEMESTER – I) (Common for all branches)
Choice Based Credit System (Scheme Of Studies & Examinations w.e.f. 2018-19)

S. No.	Course Code	Course Title	Teaching Schedule			Marks of Class work	Examination Marks		TotalMarks	Credits	Duration of Exam
			L	T	P		Theory	Practical			
1	HUM101C	ENGLISH LANGUAGE SKILLS **(Gr.-A)**	2	0	0	25	75	0	100	2	3
2		MATHEMATICS-I	3	1		25	75	0	100	4	3
3	CH101C	PHYSICS **(Gr.-A)** **OR** CHEMISTRY **(Gr.-B)**	3	1		25	75	0	100	4	3
4	EE101C EE103C CSE101C	BASIC ELECTRICAL ENGINEERING **(Gr.-A)** **OR** ELECTRICAL AND ELECTRONICS ENGG (For CHE only) **OR** PROGRAMMING FOR PROBLEM SOLVING (**Gr.-B)**	3 3	1 0		25 25	75 75	0 0	100 100	4 3	3
5	ME101C ME103C	ENGINEERING GRAPHICS & DESIGN **(Gr.-A)** OR WORKSHOP/ MANUFACTURING PRACTICES (**Gr.-B)**	1	0	4	25	0	75	100	3	3
6	HUM103C	ENGLISH LANGUAGE LAB (**Gr.-A)**	0	0	2	25	0	75	100	1	3
7	CH103C	PHYSICS LAB **(Gr.-A)** **OR** CHEMISTRY LAB **(Gr.-B)**	0	0	2	25		75	100	1	3
8	EE181C EE183C CSE103C	BASIC ELECTRICAL ENGINEERING LAB**(Gr.-A)**/ ELECTRICAL AND ELECTRONICS ENGG .LAB (For CHE only) **OR** PROGRAMMING FOR PROBLEM SOLVING LAB (**Gr.-B)**	0 0	0 0	2 4	25 25		75 75	100 100	1 2	3
9	MC101C	INDUCTION PROGRAM*	6	0	0	25	75	00	100	0	1.5
		Total Gr.-A	**18**	**3**	**10**	**225**	**375**	**300**	**900**	**20**	
		Gr.-B	**16**	**2**	**10**	**175**	**300**	**225**	**700**	**17**	

MATHEMATICS AND PHYSICS COURSES FOR DIFFERENT BRANCHES

COURSE CODE	COURSE TITLE
MATHEMATICS –I	
MATHS101C	MATHEMATICS –I (For computer Science &Engg)
MATHS103C	MATHEMATICS –I (For Bio-technology)
MATHS105C	MATHEMATICS –I (common for all branches except CSE & BT)
PHYSICS and PHYSICS LAB (Any One Combination)	
PHY101C PHY111C	INTRODUCTION TO ELECTROMAGNETIC THEORY IEMT LAB (For ME, AE, Aero & ECE)
PHY103C PHY113C	MECHANICS MECHANICS LAB (For CE)
PHY105C PHY115C	OPTICS, FIBRE OPTICS, MAGNETISM AND QUANTUM MECHANICS OFMQ LAB (For CHE, BT &BME)
PHY107C PHY117C	WAVES, OPTICS AND QUANTUM MECHANICS WAVES, OPTICS AND QUANTUM MECHANICS LAB (For EE)
PHY1O9C PHY119C	SEMICONDUCTOR PHYSICS SEMICONDUCTOR PHYSICS LAB (For CSE)

Note:

1 *Effective from the Academic Session 2019-20. Every student has to participate in the MANDATORY INDUCTION PROGRAM OF 07 working day DURATION at the start of regular teaching of first semester. It comprises physical activity, creative Arts, Universal Human Values, Literary, Proficiency Modules, Lectures by Eminent People, Visits to local Areas, Familiarization to Dept/ Branch &

Syllabi of MC101C Induction Programme (effective from Academic Session 2019-20) and Branch Code 102C In-House Practical Training (Level-I) (effective from academic Session 2018-19) are approved in the 14th meeting of Academic Council held on 11.06.2019.

Innovations. The remaining equivalent of two weeks (14 days) will be covered during first semester and there will be an examination at semester end.

2 All the branches are to be divided into groups 'A' and 'B' as per the suitability of the institute/college, so that there is an equitable distribution of teaching load in odd and even semesters.

For DCRUST Murthal: GROUP A: BME, BT, CSE, ECE. GROUP B: CE, CHE, EE, ME.

3. Induction Program Chief coordinator/ coordinators/Mentors shall be assigned a load of 2 hours per week.

4. For student admitted in B. Tech. 1st Semester (C-Scheme) in 2019 and all trailing students, Examinations and evaluation of students shall be conducted as per guidelines AICTE Examinations Reforms covering the entire syllabus. The students shall be made aware about the reforms.

Deenbandhu Chhotu Ram University of Science & Technology, Murthal (Sonepat)

B.Tech. 1ST YEAR (SEMESTER – II) (Common for all branches)
Choice Based Credit System (Scheme Of Studies & Examinations w.e.f. 2018-19)

S. No.	Course Code	Course Title	Teaching Schedule			Marks of Class work	Examination Marks		Total Marks	Credits	Duration of Exam
			L	T	P		Theory	Practical			
1	HUM101C	ENGLISH LANGUAGE SKILLS **(Gr.-B)**	2	0	0	25	75	0	100	2	3
2		MATHEMATICS-II	3	1		25	75	0	100	4	3
3	CH101C	PHYSICS **(Gr.-B)** **OR** CHEMISTRY **(Gr.-A)**	3	1		25	75	0	100	4	3
4	EE101C EE103C CSE101C	BASIC ELECTRICAL ENGINEERING **(Gr.-B)** **OR** ELECTRICAL AND ELECTRONICS ENGG (For CHE only) **OR** PROGRAMMING FOR PROBLEM SOLVING (**Gr.-A)**	3 3	1 0		25 25	75 75	0 0	100 100	4 3	3
5	ME101C ME103C	ENGINEERING GRAPHICS & DESIGN **(Gr.-B)** OR WORKSHOP/ MANUFACTURING PRACTICES (**Gr.-A)**	1	0	4	25	0	75	100	3	3
6	HUM103C	ENGLISH LANGUAGE LAB (**Gr.-B)**	0	0	2	25	0	75	100	1	3
7	CH103C	PHYSICS LAB **(Gr.-B)** **OR** CHEMISTRY LAB **(Gr.-A)**	0	0	2	25		75	100	1	3
8	EE105C/ EE107C CSE103C	BASIC ELECTRICAL ENGINEERING LAB/ ELECTRICAL AND ELECTRONICS ENGG. LAB (For CHE only)**(Gr.-B)** **OR** PROGRAMMING FOR PROBLEM SOLVING LAB (**Gr.-A)**	0 0	0 0	2 4	25 25		75 75	100 100	1 2	3
9	*Branch Code 102C	IN-HOUSE PRACTICAL TRAINING (level-1)*				100				1	
Total		**Gr.-B** **Gr.-A**	**12** **10**	**3** **2**	**10** **10**	**300** **250**	**300** **225**	**300** **225**	**800** **600**	**21** **18**	

MATHEMATICS AND PHYSICS COURSES FOR DIFFERENT BRANCHES

COURSE CODE	COURSE TITLE
MATHEMATICS –II	
MATHS102C	MATHEMATICS –II (For computer Science &Engg)
MATHS104C	MATHEMATICS –II (For Bio-technology)
MATHS106C	MATHEMATICS –II (common for all branches except CSE & BT)

Syllabi of MC101C Induction Programme (effective from Academic Session 2019-20) and Branch Code 102C In-House Practical Training (Level-I) (effective from academic Session 2018-19) are approved in the 14th meeting of Academic Council held on 11.06.2019.

PHYSICS and PHYSICS LAB (Any One Combination)	
PHY101C PHY111C	INTRODUCTION TO ELECTROMAGNETIC THEORY IEMT LAB (For ME, AE, Aero & ECE)
PHY103C PHY113C	MECHANICS MECHANICS LAB (For CE)
PHY105C PHY115C	OPTICS, FIBRE OPTICS, MAGNETISM AND QUANTUM MECHANICS OFMQ LAB (For CHE, BT &BME)
PHY107C PHY117C	WAVES, OPTICS AND QUANTUM MECHANICS WAVES ,OPTICS AND QUANTUM MECHANICS LAB (For EE)
PHY1O9C PHY119C	SEMICONDUCTOR PHYSICS SEMICONDUCTOR PHYSICS LAB (For CSE)

Note:

1. All the branches are to be divided into groups 'A' and 'B' as per the suitability of the institute/college, so that there is an equitable distribution of teaching load in odd and even semesters.

2. For DCRUST Murthal: GROUP A: BME, BT, CSE, ECE. GROUP B: CE, CHE, EE, ME.

3. *Effective from Academic Session 2018-19. Each student has to participate in the mandatory Course IN-HOUSE TRAINING (LEVEL-1) of 40 to 50 hours duration spread over 6 to 10 working days.

4. For student admitted in B. Tech. 1st Semester (C-Scheme) in 2019 and all trailing students, Examinations and evaluation of students shall be conducted as per guidelines AICTE Examinations Reforms covering the entire syllabus. The students shall be made aware about the reforms.

MC101C **INDUCTION PROGRAM**

B.TECH. (All ENGINEERING DISCIPLINES/ BRANCHES)

SEMESTER-I

Credits	Class-work Marks	: 25
0	Exam. Marks	: 75
	Total Marks	: 100
	Duration of Objective Type Examination	: 1.5 Hrs.

Course Outcomes:

At the end of this course, students will demonstrate the ability to:

1. Understand self.
2. Inculcate Human Values.
3. Feel inspired for intensive & extensive studies, co-curriculars, career, & life.
4. Nurture a hobby.
5. Dismantle upsets quickly& move forward in life.

Course Curriculum:

1. Each student has to participate in the mandatory Audit (Non-credit) Course INDUCTION PROGRAM of 21 days.
2. Out of these 21 days, initial 07 working days duration shall be dedicated solely to the Induction Program before the start of regular teaching of first semester.
3. The remaining two weeks (14 working days) will be spread over the rest of first semester by allotting 6 periods per week (preferably 2 periods each on Tues., Wed. & Thurs.), however, these periods shall necessarily be in the same slots for all engineering disciplines / branches so that if a common activity is to be planned, the same may be effected / actualized at the Univ. / Institute level.
4. Induction Program comprises of:
   a) Physical Activities,
   b) Creative Arts,
   c) Mentoring And Universal Human Values (UHVs),
   d) Literary Activities,
   e) Proficiency Modules,
   f) Lectures And Workshops by Eminent People,
   g) Visits to local Areas,
   h) Familiarization With Respective Dept./ Branch & Institute,
   i) Co-Curricular Activities in Univ. / College.
5. Each student will maintain a Diary to jot down salient points & scribble associated points lest these may wither & wane away from memory, because each student has to clear an Objective Type Test at the end of this Audit Course.
6. Also, students may keep recording their feedback / rating, on a scale of 1 to 10, of each speaker/ session/ activity in their diary, to reproduce the same in feedback session. The Mentors of resp. groups & Activity In-charges shall from time to time sign on these diaries to monitor progress & attendance.
7. It is expected that students, while coming on to sports arenas, will come in proper sports attire (sports shoes, etc.). They may also carry, in a bag/ carry-bag, their formal dress for subsequent sessions.
8. Each ***Universal Human Values (U.H.V.) Discussion Group*** shall consist of 20 Students + 2 Senior Student Guides + 1 Faculty Mentor.
9. **Venue & Schedule:** For cost-effectiveness, the Venue for the Lectures, Proficiency Modules, & common activities, etc. may be kept as Convention Centre/ Auditorium of the Univ./ resp. Institute. The venue for dept.-specific activities may be decided by Chairpersons of resp. Depts. offering these modules.

10. Wake-up call for hostellers shall be from 6:30 a.m.-7:00 a.m. and they shall perform Physical Activities from 7:00 a.m. to 8:00 a.m. in the morning and also for 1 hour in the evening on each working day. If the schedule of Physical Activities for hostelers cannot be followed with rigor by all day-scholars, then a separate schedule for the same may be suitably worked out by the Univ. / resp. Institute.
11. **Evaluation Scheme:**
    a) The Internal Assessment / Sessional / Class-work Marks shall be awarded for 25 marks by the mentor (for each group of about 20 students of respective branch/ discipline) based on candidate's regularity, attendance, diary work, assignments & enthusiastic participation in various activities of the Induction Program. These marks shall be collected (from each of the mentors of a group of about 20 students of resp. branch) by the senior-most mentor (or by the Class In-charge of 1st Year of the concerned branch/ discipline, as decided by Univ./ concerned Institute) who may upload the Sessional / Internal Assessment / Class-work Marks on the Univ. portal.
    b) There will be an end-semester examination of 75 marks based on selected chapters of the Text Books / References, and the B.Tech. Ordinance of the Univ., and on the life and achievements of State & National Heroes.
    c) Any student failing in the Sessional / Class-work / Internal Assessment and / or in the end-semester examination of Induction Program shall have to reappear and pass as per provisions of the B.Tech. Ordinance.
12. Any student failing of the Induction Program shall have to Preparing for the Conduct of the Program:
    a) Univ. / Each Institute may appoint a Faculty in-charge called Chief Coordinator, Induction Program, who shall prepare the Schedule of 1st Week & shall be responsible, along with his team (which shall necessarily include Faculty Mentors defined in this paragraph, besides other members), for its execution. Further, each Dept. may appoint one Faculty Mentor for each group of 20 first year students of each branch. The senior-most amongst such Faculty Mentors of a Dept. / branch (or the Class In-charge of 1st year of respective branch) shall, in association with other mentor(s), if any, of respective branch shall prepare, within the overall mandate of the Induction Program, the Schedule for the rest of the Semester & shall be responsible for its execution & also for Internal Assessment/ Class-work Marks award and upload. The Chief Coordinator may hold meetings of mentors periodically.
    b) Training program(s) for Chief Coordinator & faculty mentors may be conducted by Univ./ resp. Institute on how to mentor students based on universal human values, & imparting holistic education & larger vision of life.

Text Books / References:

1. Dr. J.S. Saini, "A Pithy Guide for Induction Program", Internal Report, DCRUST, Murthal, Sonipat (Haryana), 2019.
2. Rajeev Sangal, Gautam Biswas, Timothy Gonsalves, Pushpak Bhattacharya, "Motivating UG Students Towards Studies", IIT Director's Secretariat, IIT, Delhi, 2016.
3. "A Guide to Induction Program", Model Curriculum for Undergraduate Degree Courses in Engineering & Technology, vol.-1, Jan. 2018.
4. "A Detailed Guide on Student Induction Program', AICTE, Vasant Kunj, New Delhi, July 30, 2018.
5. R.R. Gaur, R. Sangal, G.P. Bagaria, "A Foundation Course in Human Values & Professional Ethics", Pub.: Excel Books.
6. Chapters 1, 2, 3 & 17 of Joseph Murphy, "The Power of Your Sub-Conscious Mind", Samaira Book Publishers, Ghaziabad, U.P. India (also available at www.ichoosetoheal.com).
7. Dr. Spencer Johnson, "Who Moved My Cheese", Vermillion Press.
8. Dr. Birender Hooda, "General Warm Up Exercise Structure And Cardiovascular Fitness Threshold of Training & Target Zones for Aerobic Exercise", Internal Report, DCRUST, Murthal, 2018.
9. Dr. J.S. Saini, "Reading the Mind and Jogging the Brain (A Compilation)", Internal Report, DCR Univ. of Sci. & Tech., 2019.
10. Dr. J.S. Saini, "Health System", Internal Report, DCR Univ. of Sci. & Tech., 2019.

NOTES:

1. For the semester examination, 75 Objective Type Questions are to be set by the examiner, to be answered in 1.5 hours by the examinees. Each question shall carry 1 mark; there shall be no negative marking. The questions shall be set based on the clause 11(b).
2. The students will be allowed to use non-programmable scientific calculator. However, programmable calculators, mobile phones or other electrical/ electronic items, and sharing / exchange of calculators are prohibited in the examination.

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BRANCH CODE102C **IN-HOUSE TRAINING (LEVEL-1)**

B.TECH. (All ENGINEERING DISCIPLINES/ BRANCHES)

SEMESTER-I

Credits	Class-work Marks: 100
1	Duration of Training: 40-50 Hrs.
	Total Marks: 100

Course Outcomes:

At the end of this course, students will demonstrate the ability to:

1. Compose, edit, analyse various documents and presentations on a computer.
2. Get started with simulation of engineering systems via softwares, such as MATLAB, Labview, etc.
3. Understand basics of domestic and industrial electrical wiring, protective gears and safety measures.
4. Present PPT on a topic related to contemporary technology.

Course Curriculum:

1. Each student has to participate in the mandatory Course IN-HOUSE TRAINING (LEVEL-1) of 40 to 50 hours duration spread over 6 to 10 working days.
2. Each student will maintain a Diary to jot down salient points & scribble associated points lest these may wither & wane away from memory, because each student has to get the Diary regularly signed by the Training Coordinator.
3. Chairperson of each Department may design the syllabus as per the need of students. Syllabi may be different for every Academic Year.
4. A sample of the syllabi designed by Electrical Engg. Deptt. and Electronics & Communication Engg. is given below:

EE102C **IN-HOUSE TRAINING (LEVEL-1)**

B.TECH. (All ENGINEERING DISCIPLINES/ BRANCHES)

SEMESTER-I

Credits	Class-work Marks: 100
1	Duration of Training: 40-50 Hrs.
	Total Marks: 100

UNIT-I

Basics of Electrical Wiring & Safety Measures

1. To visualise and understand functions of basic electrical components / gadgets/ protective gear/ relays, etc.
2. To have hands-on experience of different electrical wiring schemes.

UNIT-II

Basic Computer Skills

1. To know and operate MS office, etc.

2. To prepare a report in MS word on a topic related to contemporary technology and submit a bound report theron.
3. To prepare a Power Point presentation on the above topic and present the same.

UNIT-III
Computer Simulations

1. To get conversant with 'Getting Started Manual of MATLAB' and to carry out some mathematical problem solving.
2. To know Simulink of MATLAB and design some simple system(s) in SIMULINK.
3. To have a basic idea of LABVIEW and its functionality.

UNIT-IV
Instrumentation Circuit Making

1. To get conversant with basic measuring instruments.
2. To make a small PCB-based circuit.

Evaluation Scheme:

d) The Internal Assessment / Sessional / Class-work Marks shall be awarded for 100 marks by the Training Coordinator for respective branch/ discipline) based on candidate's regularity, attendance, diary work, assignments & enthusiastic participation in various activities of the Training. These marks shall be collected (from each of the mentors of a group of about 20 students of resp. branch) by the senior-most mentor (or by the Class In-charge of 1st Year of the concerned branch/ discipline, as decided by Univ./ concerned Institute) who may upload the Sessional / Internal Assessment / Class-work Marks on the Univ. portal.

e) Any student failing in the Sessional / Class-work / Internal Assessment of Training shall have to reappear and pass as per provisions of the B.Tech. Ordinance.

ECE101C Practical Training (In-house)

B.Tech. 1st YEAR (SEMESTER –II)
Electronics & Communication Engineering

L	T	P	Credits		
0	0	0	1	Class Work	: 100
				Examination	: -
				Total	: 100
				Duration of course	: 50 hrs.

Unit 1 (3 Days or 12-15 Hrs.)

Learning of Measuring Instruments:

(a) Study of electronics components and measuring instruments.
(b) Components testing using measuring instruments.
(c) Inter conversion of measuring instruments.

Unit 2 (3 Days or 12-15 Hrs.)

PCB Designing:

(a) Study of soldering methods.
(b) Study of steps involved in PCB making.
(c) Design and construct a simple PCB circuit.
(d) Component mounting on PCB.

Unit 3 (2 Days or 8-12 Hrs.)

Computer Skill Development:

(a) M/S word
(b) M/S excel
(c) M/S power point

Unit 4 (2 Days or 8-12 Hrs.)

MATLAB:

(a) Basic introduction to MATLAB.
(b) Introduction to various commands of MATLAB and introduction to simple programme writing.

Course Outcomes: At the end of the course:

1. Students will be beforehand ready for the upcoming challenges in their advance syllabus.
2. With the practical exposure, students will be handling real world problems with more ease.
3. Being equipped with computer skills, will provide them with an additional edge.
4. Students will be aware of basics of MATLAB for future use.

Vision:

Mission:

Program Educational Objectives:

1. To develop a strong foundation in mechanical engineering with hands-on laboratory experiences that illuminates theories and enhance practical skills.
2. To develop the ability to learn self learning modern engineering tools, techniques and communication skills necessary for higher studies and multidisciplinary projects.
3. To develop the ability to conceive, analyze, design, and solve mechanical engineering problems/projects to become effective collaborators / innovators in efforts to address social, technical and engineering challenges.
4. To develop awareness of professionalism, ethical attitude, team spirit and environmental implications of work in a global context.

Programme Outcomes

1. Apply knowledge of mathematics, science and engineering fundamentals in the field of mechanical engineering.
2. Review literature, identify, analyze, formulate and solve mechanical engineering problems using basic Sciences and engineering skills.
3. Design/development of mechanical systems, components, or processes to meet desired needs within realistic constraints such as economic, environmental, social, safety, and sustainability.
4. Design and conduct of experiments using domain knowledge and to carry out evaluation and analysis of data to achieve valid conclusions.
5. Apply appropriate modern engineering and IT tools, techniques and resources for the solution/development of mechanical engineering problems/systems.
6. Apply the contextual knowledge for assessing global, economical, environmental, social and cultural issues in engineering practices.
7. Understand the impact of mechanical engineering solutions in social and environmental context and to demonstrate knowledge of, and need for sustainable development.
8. Exhibit responsibility in professional, ethical, legal and social issues.
9. Participate effectively as an individual, as a member or leader in diverse and multidisciplinary teams to accomplish common goals.
10. Engage on diverse techno-managerial issues effectively through oral communication, presentation and reports.
11. Demonstrate and apply engineering and management principles to manage mechanical engineering projects in a multidisciplinary environment.
12. Pursue life long learning adopting technological changes for a successful professional career.

Programme Specific Outcomes

1. An ability to find out, articulate the local industrial problems and solve with the use of mechanical engineering tools for realistic outcomes.
2. An ability of collaborative and life-long learning through self-study, continuing education and project work.

Deenbandhu Chhotu Ram University of Science & Technology, Murthal (Sonepat)
Scheme of Studies & Examinations under Choice Based Credit System
Programme: B. Tech. in Mechanical Engineering; Year - 2nd (Semester – III); Session: 2019-20

S. No.	Course Code	Course Title	Teaching Schedule			Marks of Class Work	Examination Marks		Total	Credit	Duration of Exam
			L	T	P		Theory	Practical			
1	MGT 201C	Engineering Economics (common with ECE, Auto & CSE)	3	0	0	25	75	-	100	3	3
2	MATHS 201C	Mathematics-III (common with Auto & Aero)	3	1	0	25	75	-	100	4	3
3	BT 221C	Biology for Engineers (common with BT, Auto, Aero and CE)	3	0	0	25	75	-	100	3	3
4	ECE 211C	Basic Electronics Engineering	3	1	0	25	75	-	100	4	3
5	ME 201C	Engineering Mechanics (common with EE, EEE & Auto)	3	1	0	25	75	-	100	4	3
6	ME 203C	Thermodynamics	3	1	0	25	75	-	100	4	3
7	MC 203C / MC 201C	Constitution of India (Group A) / Environmental Studies (Group B)	3	0	0	25	75	-	100	0	3
Total			**21**	**4**	**0**	**175**	**525**		**700**	**22**	

Programme: B. Tech. in Mechanical Engineering; Year - 2nd (Semester – IV); Session: 2019-20

S. No.	Course Code	Course Title	Teaching Schedule			Marks of Class Work	Examination Marks		Total	Credit	Duration of Exam
			L	T	P		Theory	Practical			
1	ME 202C	Applied Thermodynamics	3	1	0	25	75	-	100	4	3
2	ME 204C	Fluid Mechanics & Fluid Machines	3	1	0	25	75	-	100	4	3
3	ME 206C	Strength of Materials	3	1	0	25	75	-	100	4	3
4	ME 208C	Materials Engineering	3	0	0	25	75	-	100	3	3
5	ME 210C	Instrumentation & Control	3	1	0	25	75	-	100	4	3
6	ME 212C	Laboratory - I (Thermal)	0	0	2	25	-	75	100	1	3
7	MC 203C / MC 201C	Constitution of India (Group B) / Environmental Studies (Group A)	3	0	0	25	75	-	100	0	3
Total			**18**	**4**	**2**	**175**	**450**	**75**	**700**	**20**	

Note:

1. *At the end of 4th Semester,the students have to undergo Professional Training (level-2) of atleast 4-weeks from Industry/Institute/Research Lab/Training Centre during summer vacation and its evaluation shall be carried out in the 5th semester.*

2. *For student admitted in B. Tech. 1st Semester (C-Scheme) in 2019 and all trailing students, Examinations and evaluation of students shall be conducted as per guidelines AICTE Examinations Reforms covering the entire syllabus. The students shall be made aware about the reforms.*

BT 221C BIOLOGY FOR ENGINEERS

B. Tech. Semester – III (Mechanical Engineering)

L	T	P	Credits			
3	-	-	3	**Class Work**	**:**	**25 Marks**
				Examination	**:**	**75 Marks**
				Total	**:**	**100 Marks**
				Duration of Examination	**:**	**3 Hours**

UNIT - I

Introduction: Significance of biology; Why study biology; Biological observations in history that led to the discovery of some major engineering basics (brownian motion & origin of thermodynamics); **F**undamental similarities and differences between science and engineering- humans as the best machines, comparison between eye and camera, flying of a bird and aircraft etc.

Classification: Classification based on (a) Cellularity- unicellular or multicellular (b) Ultrastructure- prokaryotes or eukaryotes (c) Energy and carbon utilization- autotrophs, heterotrophs and lithotrophs (d) Ammonia excretion- aminotelic, uricotelic, or ureotelic (e) Habitat- aquatic or terrestrial; Molecular taxonomy- three major kingdoms of life.

Single-celled organisms – Microorganisms and Microbiology: Concept of- single-celled organisms**,** species & strains; Identification and classification of microorganisms; Ecological aspects of single-celled organisms; Microscopy.

UNIT – II

Biomolecules: Molecules of Life- Monomeric units and polymeric structures- sugars, starch and cellulose; Amino acids and proteins; Nucleotides and DNA/ RNA; Two carbon units and lipids.

Proteins and Enzymes: Proteins- structure and function; Hierarchy in protein structure- primary, secondary, tertiary and quarternary structure; Proteins as enzymes, transporters, receptors and structural elements; Enzymes: classification and mechanism of action; Enzyme catalyzed reactions; Enzyme kinetics and kinetic parameters; RNA catalysis.

UNIT - III

Genetics: Genetics is to biology what Newton's laws are to physics; Mendel's laws of genetics; Concept of- allele, recessiveness and dominance, segregation and independent assortment; Genetic material passes from parent to offspring; Epistasis; Mapping of phenotype to genes, gene/ linkage mapping; Single gene disorders in humans; Meiosis and mitosis.

Genes, Chromosomes and Information transfer: DNA as genetic material; Hierarchy of DNA structure- single stranded to double stranded to nucleosomes to chromosomes; Molecular basis of information transfer; Concept of genetic code; Universality and degeneracy of genetic code.

UNIT - IV

Metabolism: Similarities between fundamental principles of energy transactions in physical and biological world; Thermodynamics as applied to biological systems; Exothermic and endothermic versus endergonic and exergonic reactions; Concept of K_{eq} and its relation to standard free energy; Spontaneity; ATP as an energy currency; Glycolysis and Krebs cycle (breakdown of glucose to CO_2 to H_2O); Photosynthesis (synthesis of glucose from CO_2 and H_2O); Energy yielding and energy consuming reactions; Concept of energy change

TEXT BOOK:

1. Biology: A global approach: Campbell, N.A.; Reece, J.B.; Urry, Lisa; Cain. M.L.; Wasserman, S.A.; Minorsky, P.V.; Jackson, R.B. Pearson Education Ltd.
2. Outlines of Biochemistry, Conn, E.E.; Stumpf, P.K.; Bruening, G.; Doi, R.H.; John Wiley and Sons.

REFERENCE BOOKS:

1. Principles of Biochemistry (V Edition), By Nelson, D.L.; and Cox, M.M.W.H. Freeman and Company.
2. Molecular Genetics (Second edition), Stent, G.S.; and Calender, R.W.H. Freeman and Company. Distributed by Satish Kumar Jain for CBS Publisher.
3. Microbiology, Prescott, L.M.J.P.; Harley and C.A. Klein. 1995. 2nd edition W.M.C. Brown Publishers.

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For student admitted in B. Tech. 1st Year (C-Scheme) in 2019 and all trailing students.

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1. .

ME 201C ENGINEERING MECHANICS

B. Tech. Semester – III (Mechanical Engineering)

L	T	P	Credits			
3	1	-	4	**Class Work**	**:**	**25 Marks**
				Examination	**:**	**75 Marks**
				Total	**:**	**100 Marks**
				Duration of Examination	**:**	**3 Hours**

UNIT- I

Review Of Basic Force Systems: Dimensions and units of mechanics, idealization of mechanics, laws of mechanics, vector algebra review, moment of a force about a point and axis, the couple and couple moment, addition and subtraction of couples, moment of a couple about a line, translation of a force to a parallel position, resultant of a force system, equivalent force, friction – static and dynamic, Problems.

Equilibrium: Introduction, free body diagram, control volumes, general equations of equilibrium, two point equivalent loading, static in-determinancy, simple truss, method of joints, method of sections, Problems.

UNIT-II

Properties Of Surfaces, Moments And Products Of Inertia : First moment of an area and the centroid, principal axes, formal definition of inertia quantities, relation between mass-inertia terms and area-inertia terms, translation of coordinate axes, transportation properties of the inertia terms, a brief introduction to tensors, the inertia of ellipsoid and principal moments of inertia, Problems.

UNIT-III

Kinematics Of Particles And Rigid Bodies: Velocity and acceleration in path and cylindrical coordinates, motion of a particle relative to a pair of translating axes, inertial and non-inertial frame of reference, centripetal and coriolis acceleration, definition and motion of a rigid body in the plane, translation and rotation in the plane, Chasles theorem, kinematics in a coordinate system rotating and translating in the plane, angular momentum about a point of a rigid body in planar motion; Euler's laws of motion. Problems.

UNIT-IV

Particle Dynamics, Energy & Momentum Methods: Newton's law for rectangular coordinates & cylindrical coordinates, Newton's law for path variables, work energy equations, work energy equations for a systems of particles, linear and angular momentum equations for a systems of particles, conservation of angular momentum, Problems.

TEXT BOOK:

1. Engineering Mechanics- Statics and Dynamics by R. C. Hibler, Pearson
2. Engineering Mechanics - Statics & Dynamics by I.H. Shames, PHI, New Delhi.
3. Engineering Mechanics – Timoschenko.

REFERENCE BOOKS:

1. Statics & Dynamics by J.L. Meriam, JohnWiley & Sons (P) Ltd. New York.
2. Statics & Dynamics by Beer & Johnson, MGH, New Delhi.

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ME 203C THERMODYNAMICS

B. Tech. Semester – III (Mechanical Engineering)

L	T	P	Credits			
3	1	-	4	Class Work	:	25 Marks
				Examination	:	75 Marks
				Total	:	100 Marks
				Duration of Examination	:	3 Hours

UNIT - I

Basic Concepts: Thermodynamic system and control volume, properties, state & Process, cycle, thermodynamic equilibrium; Zeroth law and temperature scales; Thermodynamic concept of energy; displacement work, Definition of heat; examples of heat/work interaction in systems

First Law of Thermodynamics: First law for cyclic & con-cyclic processes; concept of total energy; energy as a property; different forms of stored energy, Internal energy and Enthalpy; free expansion process. First Law for Flow Processes - general energy equation for a control volume; Steady state steady flow processes including throttling; Examples of steady flow devices; Unsteady processes; examples of steady and unsteady I law applications for system and control volume.

UNIT - II

Pure Substance and Phase: Phase Transformation, Solid-Liquid-Vapour Equilibrium, Throttling and Measurement of Dryness Fraction of Steam, Idea of a generalized chart and the law of corresponding states; Concept of ideal gases and their equations of state. Problems.

Second Law of Thermodynamics: Definitions of direct and reverse heat engines; Definitions of thermal efficiency and COP; The directional constraints on natural processes; Kelvin- Planck and Clausius Statements and their Equivalence; Concept of reversibility; Carnot principle; Absolute thermodynamic temperature scale; Clausius Inequality, entropy, change in entropy in various thermodynamic processes, T-dS relations, entropy balance for closed and open systems, Principle of increase-in-Entropy, entropy generation, Third Law of Thermodynamics. Problems

UNIT - III

Exergy: Concept of reversible work and irreversibility; Second law efficiency; Exergy change of a system: closed and open systems, exergy transfer by heat, work and mass, exergy destruction, exergy balance in closed and open systems. Problems

Introduction to Properties of Mixtures and Phases: Dalton's model, Equation of state, properties of ideal gas mixtures, Change in entropy on mixing; Law of corresponding states and introduction to real-gas mixtures; Gibbs phase rule; Air/Water Mixtures, Psychrometrics. Problems

UNIT - IV

Thermodynamic Property Relations: Maxwell relations; Clausius - Clapeyron equation; Difference in heat capacities; Ratio of heat capacities; Joule-Thompson coefficient and inversion curve.

Thermodynamics of Reactive Systems: Stoichiometry of combustion, First law analysis; Internal energy and enthalpy of reaction; Enthalpy of formation; Second law analysis; chemical equilibrium; equilibrium constant for ideal-gas mixtures and its variation with temperature. Problems

TEXT BOOK:

1. Engineering Thermodynamics – P K Nag, Tata McGraw Hill
2. Engineering Thermodynamics – Jones and Dugan, PHI, New Delhi.

REFERENCE BOOKS:

1. Dhar, P.L., Engineering Thermodynamics - a generalized approach Elsevier, New Delhi.
2. Moran M.J. and Shapiro H.N., Engineering Thermodynamics, IV Edition, John Wiley & Sons, Singapore.
3. Çengel Y.A. and Boles, M.A., Thermodynamics: An Engineering Approach, 4th Ed., TMG Hill, New Delhi.
4. Sonntag, Borgnakke and Van Wylen, Fundamentals of Thermodynamics, 5th Ed., JW Sons, Singapore.

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ME 202C APPLIED THERMODYNAMICS

B. Tech. Semester – IV (Mechanical Engineering)

L	T	P	Credits			
3	1	-	4	**Class Work**	**:**	**25 Marks**
				Examination	**:**	**75 Marks**
				Total	**:**	**100 Marks**
				Duration of Examination	**:**	**3 Hours**

UNIT I

Introduction to solid, liquid and gaseous fuels– Stoichiometry, exhaust gas analysis- First law analysis of combustion reactions- Heat calculations using enthalpy tables, Adiabatic flame temperature- Chemical equilibrium and equilibrium composition calculations using free energy.
Gas power cycles, Air standard Otto, Diesel and Dual cycles

UNIT II

Vapor power cycles Rankine cycle with superheat, reheat and regeneration; exergy analysis; Super-critical and ultra super-critical Rankine cycle; Analysis of steam turbines, velocity and pressure compounding of steam turbines.
Air standard Brayton cycle, effect of reheat, regeneration and intercooling; Combined gas and vapor power cycles.

UNIT III

Vapor compression refrigeration cycles; refrigerants and their properties, Properties of dry and wet air; use of psychometric chart, processes involving heating / cooling and humidification/ dehumidification, dew point.

UNIT IV

Basics of compressible flow, Stagnation properties, Isentropic flow of a perfect gas through a nozzle, choked flow, subsonic and supersonic flows- normal shocks- use of ideal gas tables for isentropic flow and normal shock flow- Flow of steam and refrigerant through nozzle, super-saturation - compressible flow in diffusers, efficiency of nozzle and diffuser.
Reciprocating compressors, staging of reciprocating compressors, optimal stage pressure ratio, effect of intercooling, minimum work for multistage reciprocating compressors

TEXT BOOKS:

1. Sonntag, R. E, Borgnakke, C. and Van Wylen, G. J., 2003, 6th Edition, Fundamentals of Thermodynamics, John Wiley and Sons.
2. Jones, J. B. and Duggan, R. E., 1996, Engineering Thermodynamics, Prentice-Hall of India

REFERENCES BOOKS:

1. Moran, M. J. and Shapiro, H. N., 1999, Fundamentals of Engineering Thermodynamics, John Wiley and Sons.
2. Nag, P.K, 1995, Engineering Thermodynamics, Tata McGraw-Hill Publishing Co. Ltd

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ME 204C FLUID MECHANICS AND FLUID MACHINES

B. Tech. Semester – IV (Mechanical & Aeronautical Engineering)

L	T	P	Credits			
3	1	-	4	**Class Work**	**:**	**25 Marks**
				Examination	**:**	**75 Marks**
				Total	**:**	**100 Marks**
				Duration of Examination	**:**	**3 Hours**

UNIT I

Fluid Properties And Fluid Statics: Concept of fluid and flow, Ideal and real fluids, Properties of fluids, Newtonian and non-Newtonian fluids. Pascal's law, Hydrostatic equation, Hydrostatic forces on submerged plane and curved surfaces, Stability of floating bodies, problems

Fluid Kinematics: Stream, streak and path lines, Types of flows, Differential (3-D) continuity equation, rotation, Vorticity and circulation, Stream and potential functions, Flow net, problems.

Fluid Dynamics: Euler's equation, Bernoulli's equation and its applications, Impulse momentum relationship and its applications, problems.

UNIT II

Viscous Flow: Uni-directional flow between stationary parallel plates, parallel plates having relative motion, Problems.

Flow Through Pipes: Major head loss in pipes and minor losses in pipes, bends and fittings. Hagen-Poiseuille law, Series and parallel connection of pipes, Branched pipes, Equivalent pipe, Elementary turbulent flow, Problems.

Boundary Layer Flow: Boundary layer concept, Displacement, Momentum and energy thickness, Laminar and turbulent boundary layer flows: Boundary layer thickness, Skin friction coefficient, Drag on a flat plate, Problems.

UNIT III

Impulse Turbines: Classification – impulse and reaction turbines, Component parts, Construction, operation and governing mechanism of Pelton wheel, Velocity diagrams, Work done and efficiency of a Pelton wheel, Problems

Reaction Turbines: Francis and Kaplan Turbines: Component parts, Construction and operation, Velocity diagrams ,Work done and efficiency, Draft tube - its function and different forms, Introduction to new types of turbine, Deriaz (Diagonal), Bulb, Tubular turbines, Problems.

UNIT IV

Centrifugal Pumps: Classification, Construction and operational details, Velocity diagrams, Work done, Manometric efficiency, Pressure rise in impeller, Minimum starting speed, Multi-stage pumps.specific speed, Net positive suction head, Cavitation and maximum suction lift, problems.

Reciprocating Pumps: Construction and operational details, slip, work and power input, Effect of acceleration and friction on indicator diagram, Separation, Problems.

Dimensional Analysis And Model Similitude: Rayleigh's method and Buckingham's π-theorem, model studies and similitude, dimensionless numbers and their significance. Unit quantities, Specific speed and model relationships for turbines, Problems

TEXT BOOKS:

1. Hydraulics & Fluid Mechanics – Modi & Seth, Pub. - Standard Book House, N.Delhi
2. Hydraulic Machines – Jagdish Lal, Metropolitan

REFERENCES BOOKS:

1. Introduction to Fluid Mechanics and Fluid Machines – S.K. Som and G. Biswas, TMH
2. Fluid Mechanics and Fluid Power Engineering – D.S. Kumar, S.K. Kataria and Sons
3. Fluid Mechanics– John F Douglas, Janusz M. Gasiorek, John A, Swaffield, Peason Education
4. Fluid Mechanics and Hydraulic Machines – S S Rattan, Khanna Publishers

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ME 206C STRENGTH OF MATERIALS

B. Tech. Semester – IV (Mechanical Engineering)

L	T	P	Credits			
3	1	-	4	**Class Work**	**:**	**25 Marks**
				Examination	**:**	**75 Marks**
				Total	**:**	**100 Marks**
				Duration of Examination	**:**	**3 Hours**

UNIT I

Simple Stresses & Strains: Concept & types of Stresses and strains, Poison's ratio, stresses and strain in simple and compound bars under axial loading, stress strain diagrams, Hooks law, elastic constants & their relationships, temperature stress & strain in simple & compound bars under axial loading, Numerical.

Compound Stresses & Strains: Concept of surface and volumetric strains, two dimensional stress system, conjugate shear stress at a point on a plane, principal stresses & strains and principal- planes, Mohr's circle of stresses, Numerical

UNIT II

Shear Force & Bending Moments: Definitions, SF & BM diagrams for cantilevers, simply supported beams with or without over-hang and calculation of maximum BM & SF and the point of contra-flexure under (i) concentrated loads, (ii) uniformly distributed loads over whole span or a part of it, (iii) combination of concentrated loads and uniformly distributed loads, (iv) uniformly varying loads and (v) application of moments, relation between the rate of loading, the shear force and the bending moments, Problems.

Bending & Shear Stresses In Beams: Bending stresses in beams with derivation & application to beams of circular, rectangular, I,T and channel sections, composite beams, shear stresses in beams with combined bending, torsion & axial loading of beams. Numericals.

Slope & Deflection: Relationship between bending moment, slope & deflection, Mohr's theorem, moment area method, method of integration, Macaulay's method, calculations for slope and deflection of (i) cantilevers and (ii) simply supported beams with or without overhang under concentrated load, Uniformly distributed loads or combination of concentrated and uniformly distributed loads, Numericals

UNIT III

Torsion of Circular Members: Torsion of thin circular tube, Solid and hollow circular shafts, tapered shaft, stepped shaft & composite circular shafts, combined bending and torsion, equivalent torque, effect of end thrust. Numericals.

Columns & Struts: Column under axial load, concept of instability and buckling, slenderness ratio, derivation of Euler's formulae for the elastic buckling load, Eulers, Rankine, Gordon's formulae Johnson's empirical formula for axial loading columns and their applications, eccentric compression of a short strut of rectangular & circular sections, Numericals.

UNIT IV

Theories Of Elastic Failure: Various theories of elastic failures with derivations and graphical representations, applications to problems of 2-dimensional stress system with combined direct loading and bending, and combined torsional and direct loading, Numericals.

Thin and thick walled Pressure Vessels: Stresses in cylindrical and spherical vessels subjected to internal fluid pressure only.

TEXT BOOKS:

1. Strength of Materials – G. H. Ryder - Macmillan, India
2. Strength of Materials– Andrew Pytel and Fredinand L. Singer, Addison – Wesley

REFERENCE BOOKS:

1. Strength of Materials – Popov, PHI, New Delhi.
2. Strength of Materials - A Rudimentary Approach – M.A. Jayaram, Sapna Book House, Bangalore
3. Mechanics of Materials - Timoshenko, S.P., and Gere, J.M., 2nd Ed., CBS Publishers 2002
4. An Introduction to the Mechanics of Solids - Crandall, S.H., Dahl, N.C., and Lardner, T.J., Tata McGraw-Hill 1999.

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ME 208C MATERIALS ENGINEERING

B. Tech. Semester – IV (Mechanical Engineering)

L	T	P	Credits			
3	-	-	3	**Class Work**	**:**	**25 Marks**
				Examination	**:**	**75 Marks**
				Total	**:**	**100 Marks**
				Duration of Examination	**:**	**3 Hours**

UNIT I

Crystal Structure: Unit cells, Metallic crystal structures, Ceramics. Imperfection in solids: Point, line, interfacial and volume defects; dislocation strengthening mechanisms and slip systems, critically resolved shear stress.

Mechanical Property measurement: Tensile, compression and torsion tests; Young's modulus, relations between true and engineering stress-strain curves, generalized Hooke's law, yielding and yield strength, ductility, resilience, toughness and elastic recovery; Hardness: Rockwell, Brinell and Vickers and their relation to strength.

UNIT II

Fracture mechanics: Ductile and brittle failure mechanisms, introduction to Stress-intensity factor approach and Griffith criterion.

Fatigue failure: High cycle fatigue, Stress-life approach, SN curve, endurance and fatigue limits, effects of mean stress using the Modified Goodman diagram; Fracture with fatigue, Introduction to nondestructive testing (NDT), Introduction to corrosion and its prevention

UNIT III

Alloys: Substitutional and interstitial solid solutions, introduction to diffusion process

Phase diagrams: Interpretation of binary phase diagrams and microstructure development; eutectic, peritectic, peritectoid and monotectic reactions. Iron Iron-carbide phase diagram and microstrctural aspects of ledeburite, austenite, ferrite and cementite, cast iron.

Heat treatment of Steel: Annealing, tempering, normalising and spheroidising, isothermal Transformation diagrams for Fe-C alloys and microstructure development. Continuous cooling curves and interpretation of final microstructures and properties- austempering, martempering, case hardening, carburizing, nitriding, cyaniding, carbo-nitriding, flame and induction hardening, vacuum and plasma hardening

UNIT IV

Steels : Alloying of steel, properties of stainless steel and tool steels, maraging steels

Cast irons: grey, white, malleable and spheroidal cast irons- copper and copper alloys; brass, bronze and cupro-nickel Aluminium and Al-Cu – Mg alloys- Nickel based super alloys and Titanium alloys

.TEXT BOOKS:

1. W. D. Callister, "Materials Science and Engineering-An Introduction", 6th Edition,Wiley India.
2. Kenneth G. Budinski and Michael K. Budinski, "Engineering Materials", Prentice Hall of India Private Limited,

REFERENCE BOOKS:

1. V. Raghavan, "Material Science and Engineering', Prentice Hall of India Private Limited,
2. William F. Smith ,Javad Hashemi ,Ravi Prakash "Material Science and Engineering" ,TMH publications
3. Gupta .K.M, "Material Science, Metallurgy and Engineering Materials "Umesh Publication, New Delhi

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ME 210C INSTRUMENTATION AND CONTROL

B. Tech. Semester – IV (Mechanical Engineering)

L	T	P	Credits			
3	1	-	4	**Class Work**	:	**25 Marks**
				Examination	:	**75 Marks**
				Total	:	**100 Marks**
				Duration of Examination	:	**3 Hours**

UNIT- I

Introduction: Measurement Systems and Instruments, Typical Applications of Instrument Systems, Functional Elements of a Measurement System, Classification of Instruments.

Static And Dynamic Characteristics Of Instruments: Introduction, Accuracy, Precision, Resolution, Threshold, Sensitivity, Linearity, Hysteresis, Dead Band, Backlash, Drift, Formulation of Differential Equations for Dynamic Performance- Zero Order, First Order and Second Order Systems, Response of First and Second Order Systems to Step, Ramp, Impulse And Harmonic Functions.

UNIT-II

Transducer, Intermediate And Recording Elements: Introduction, Types and Classification of Transducers, Selection of Transducers, Strain Gauges and Rosettes, Linear Variable Differential Transformer, Rotary Variable Differential Transformer; Peizo-Electric Transducers, Optical Transducers and Opto-Electric Transducers, Mechanical, Hydraulic and Pneumatic Amplifying Elements, Compensators, Data Transmission Elements, Data Acquisition Systems, Data Display and Storage, Signal Processing and Conditioning.

UNIT-III

Control System: Types of control systems ; Typical Block Diagram : Performance Analysis; Representation of Processes & Control Elements – Mathematical Modeling. Block Diagram Representation, Representation of Systems or Processes, Comparison Elements; Representation of Feedback Control systems – Block Diagram & Transfer Function Representation.

Types of Controllers: Types of Control Action; Proportional Controller, Integral Controller, Derivative Controller, On-off controller, PD, PID Controller, Hydraulic Controllers; Electronic Controllers; Pneumatic Controllers; Problems

UNIT-IV

Frequency Response Analysis: Introduction; Closed and Open Loop Transfer Function; Bode Diagram; Polar Plots; Rectangular Plots; Nichols Plots.

Stability Of Control Systems: Characteristic Equation; Routh's Criterion; Nyquists Criterion, Problems.

TEXT BOOKS:

1. Instrumentation and control systems by W. Bolton, 2nd edition, Newnes, 200
2. Measurement systems Application and Design. Ernest O. Doebelin, Tata McGraw Hill Edition (Fourth Edition) 2002.

REFERENCE BOOKS:

1. Measurement and Instrumentation in Engineering, Francis S. Tse and Ivan E. Morse, Marcel Dekker.
2. Theory & Applications of Automatic Controls by B.C. Nakra, Published by New Age International Pvt. Ltd., New Delhi.
3. Modern Control Engg. By Katsuhiko Ogata, Prentice Hall of India, New Delhi.
4. Principles of Measurement and Instrumentation – Alan S. Morris Prentice Hall of India.
5. Mechanical Measurements: T.G. Beckwith, W.L. Buck and R.D. Marangoni Addison Wesley.
6. Instrumentation, Measurement and Analysis – B.C. Nakra and K.K. Chaudhary, TMH.
7. Mechanical Measurements by D. S. Kumar, Kataria & Sons.
8. Automatic Control Systems by Kuo' Published by Prentice Hall of India, New Delhi.
9. Control System Engineering, I. J. Nagrath and M. Gopal, New Age, New Delhi.

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ME 212C LABORATORY-I THERMAL

B. Tech. Semester – IV (Mechanical Engineering)

L	T	P	Credits			
0	0	2	1	Class Work	:	25 Marks
				Examination	:	75 Marks
				Total	:	100 Marks
				Duration of Examination	:	3 Hours

List of Experiments:

1. To compare and determine the coefficient of discharge of an orifice meter, venturimeter and V/rectangular notch.
2. To determine the coefficient of discharge, contraction and velocity of an orifice.
3. To determine the loss coefficient for minor losses (sudden enlargement, sudden contraction, valves and bends, etc.) and coefficient of friction for pipes.
4. To determine the Meta-centric height of a floating body.
5. To verify the Bernoullis Theorem and to plot hydraulic gradient line and total energy line.
6. To draw and analyze the performance characteristics (constant head, constant speed and constant efficiency) of Pelton, Francis and Kaplan turbines.
7. To draw and analyze the characteristic curves of Centrifugal Pump and Reciprocating Pump.
8. To determine the Coefficient of Performance (COP) of a Vapour Compression Refrigeration (VCR) System and to draw its cycle on PH and TS diagrams.
9. To determine the By-pass factor of cooling and heating coils and to plot them on Psychrometric charts for different inlet conditions.
10. To prepare the heat balance sheet for a boiler.
11. To find the dryness fraction of steam by separating and throttling calorimeter.
12. To find the condenser efficiencies.
13. To determine the volumetric efficiency of a reciprocating air compressor.

MC203C Constitution of India

B.Tech. 2nd YEAR (SEMESTER –III/IV)
Common for all branches

L	T	P	Credits		
3	-	-	-	Class Work	: 25
				Examination	: 75
				Total	: 100
				Duration of Exam	: 3 Hours

Unit 1 (10 Lectures)

Philosophy of Indian Constitution: Ideological Basis and Salient Features of Indian Constitution, Fundamental Rights & Duties of the Citizens**,** Directive Principles of State Policy

Unit 2 (12 Lectures)

Nature and Dynamics of Indian Federalism: Federalism: Theory and Practice in India, Federal Features of the Indian Constitution**,**Legislative, Administrative and Financial Relations between the Union and the States.

Unit 3 (12 Lectures)

Union and State Legislature: Parliament: Composition, Functions and Working of the Parliamentary system **,**State Legislature: Composition and Functions of Vidhan Sabha/ Vidhan Parishad

Unit 4 (11 Lectures)

Centre and State: Executive and Judiciary: President, Prime Minister and Council of Ministers **,**Governor, Chief Minister and Council of Ministers**,**Judiciary: Supreme Court; High Court

Text Books:

1. Austin G., *The Indian Constitution: Corner Stone of a Nation*, New Delhi: Oxford University Press, 196
2. Basu D.D., *An Introduction to the Constitution of India*, New Delhi: Prentice Hall, 1994
3. Kothari R., *Politics in India*, New Delhi: Orient Language, 1970
4. Siwach J.R., *Dynamics of Indian Government and Politics*, New Delhi: Sterling Publishers, 1985
5. Bhambhri C.P., *The Indian State--Fifty Years*, New Delhi: Shipra, 1997
6. Ghai U.R., *Indian Political System*, Jalandhar: New Academic Publishing Company, 2010

Course Outcomes: Upon successful completion of this course,students will be able:

1. To understand basic features of the constitution and rights and duties of Indian citizens
2. To understand the basic structure of Centre and State Government
3. To get acquainted with the nature of parliamentary form of Government
4. To have knowledge of the executive and judiciary powers in Indian democratic set-up

Scheme of End Semester Examinations (Major Test):

1. The duration of examinations will be three hours.
2. Nine questions of 15 marks each will be set out of which the students will have to attempt five questions in all.
3. First question of 15 marks will be compulsory. It will cover all the four units of the syllabus. The nature of the questions in each unit will depend upon the nature of content therein. The questions may have sub-parts with marks assigned against each.
4. Question No 02 to 09 of 15 marks each will be set from the four units of the syllabus --- two from each unit.
5. In addition to first compulsory question the students will have to attempt four more questions, selecting one from each unit.

Note:

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MC 201C Environmental Studies

B. Tech. Semester – III/IV (Mechanical Engineering)

L	T	P	Credits			
3	-	-	-	Class (Field) Work	:	25 Marks
				Examination	:	75 Marks
				Total	:	100 Marks
				Duration of Examination	:	3 Hours

UNIT - I

The Multidisciplinary Nature of Environmental Studies, .Introduction to Environment: Definition, Scope, and importance of environmental studies; need for public awareness.

Environmental Pollution: Definition, Cause and effects of: Air pollution, Water pollution, Soil pollution, Marine pollution, Noise pollution, Role of an individual in prevention of pollution, Pollution case studies

UNIT - II

Natural Resources: Water resources: over-utilization, floods, drought, dams-benefits and problems; Mineral resources: Use and exploitation, environmental effects; Food resources: changes caused by modern agriculture, fertilizer-pesticide problems, water logging, Energy resources: Growing energy needs, renewable and non renewable energy sources; Land resources: Land as a resource, land degradation, man induced landslides, soil erosion and desertification.

UNIT - III

Ecosystems and Biodiversity: Concept of an ecosystem, Structure and function, Energy flow, Ecological succession, ecological pyramids. Concept of Biodiversity, definition and types, Hot-spots of biodiversity; threats to biodiversity, Endangered and endemic species of India, Conservation of biodiversity.

UNIT - IV

Social Issues and Environment: Water conservation, rain water harvesting, Environmental ethics: Issues and possible solutions. Climate change, global warming, acid rain, ozone layer depletion, Public awareness. Population growth, variation among nations, Family Welfare Programme. Human Population and the Environment - Population growth, Population explosion, Women and Child Welfare.

Field Work - Visit to a local area to document environmental assets—river/forest/grassland/hill/ mountain. Visit to a local polluted site—Urban/Rural/Industrial/Agricultural. Study of common plants, insects, birds. Study of simple ecosystems—pond, river, hill slopes, etc

REFERNCE BOOKS:

1. A Textbook of Environmental Studies by Asthana D.K. and Asthana Meera
2. Fundamental Concepts in Environmental Studies by Mishra D.D.
3. Environmental Studies by S.C Sharma M.P Poonia
4. Textbook of Environmental Studies for Undergraduate by Erach Bharucha
5. Environmental Studies: Third Edition by R. Rajagopalan

Note:

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MGT 201C Engineering Economics

B. Tech. Semester – III (Mechanical Engineering)

L	T	P	Credits			
3	-	-	3	**Class Work**	**:**	**25 Marks**
				Examination	**:**	**75 Marks**
				Total	**:**	**100 Marks**
				Duration of Examination	**:**	**3 Hours**

UNIT – I

Concept of Economics- various definitions, nature of Economic problem, Micro and macro economics- their features and scope, production possibility curve, Relationship between Science, Engineering Technology and Economics. Utility: Concept and measurement of utility, Law of Diminishing Marginal Utility, Law of equi-marginal utility – its importance and practical applications.

UNIT - II

Demand: Concept, Individual and Market demand schedule, Law of demand, shape of demand curve. Elasticity of demand: Concept, measurement of elasticity of demand, factors affecting elasticity of demand, practical application of elasticity of demand. Various concepts of cost-Fixed cost, variable cost, average cost, marginal cost, money cost, real cost, opportunity cost.

UNIT - III

Meaning of production and factors of production; Law of variable proportions, Law of Return to Scale, Internet and External economics and diseconomies of scale. Meaning of Market, Type of Marker– perfect Competition, Monopoly, Oligopoly, Monopolistic competition (Main features of these markers).

UNIT - IV

Supply and Law of Supply, Role of Demand & Supply in Price Determination and effect of changes in demand and supply on price. Nature and characteristics of Indian economy, privatization – meaning, merits and demerits. Globalisation – meaning, merits and demerits.

TEXT BOOKS:

1. Ahuja H.L"Micro Ecomomic Theory" S. Chand Publication, New Delhi
2. Dewett K.K "Modern Ecomomic Theory" S. Chand Publication, New Delhi
3. Jain T.R, Grover M.L, Ohri V.K Khanna O.P,"Economics for engineers" V.K .Publication ,New Delhi
4. Dr. R.K. Agarwal & Rashmi Agarwal, " Principles and Applications of Economic", Pragati Prakashan.

REFERNCE BOOKS:

1. Jhingan 1. Jhingan M.L"Micro Ecomomic Theory" S.Chand Publication ,New Delhi
2. Chopra P.N "Principle of Economics" Kalyani Publishers, Delhi
3. Mishra S.K "Modern Micro Economics" Pragati Publication Mumbai. 44
4. Dwivedi D.N "Micro Economics " Pearson Education, New Delhi.

Note:

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   For student admitted in B. Tech. 1st Year (C-Scheme) in 2019 and all trailing students.

   Examinations and evaluation of students shall be conducted as per guidelines AICTE Examinations Reforms covering the entire syllabus. The students shall be made aware about the reforms.

MATHS 201C Mathematics – III (PDE, Probability & Statistics)

B. Tech. Semester – III (Mechanical Engineering)

L	T	P	Credits			
3	1	-	4	**Class Work**	**:**	**25 Marks**
				Examination	**:**	**75 Marks**
				Total	**:**	**100 Marks**
				Duration of Examination	**:**	**3 Hours**

UNIT- I

First order Partial Differential Equations, Solutions of First order Linear and Non-Linear PDEs. Solution to Homogenous and Non-Homogenous Linear Partial Differential Equations of second and higher order by complimentary function and particular integral method.

UNIT-II

Flows, Vibrations and Diffusions, Second-order Linear equations and their classification, Initial and, Boundary conditions (with an informal description of well-posed problems), D'Alembert's solution of the Wave equation; Duhamel's principle for One Dimensional Wave Equation. Separation of variables, Method to Simple Problems in Cartesian coordinates.

UNIT-III

Basic Statistics, Measures of Central Tendency: Moments, Skewness and Kurtosis, Probability distributions: Binomial, Poisson and Normal, Evaluation of Statistical Parameters for these three distributions, Correlation and Regression, Rank Correlation. Curve fitting by the Method of Least Squares, Fitting of Straight Lines, Second Degree Parabolas and more general curves.

UNIT-IV

Probability spaces, Conditional Probability, Independence; Discrete random variables, Independent random variables, the Multinomial Distribution, Poisson Approximation to the Binomial Distribution, Infinite sequences of Bernoulli Trials, Sums of independent random variables; Expectation of Discrete Random Variables, Moments, Variance of a sum, Correlation coefficient, Chebyshev's Inequality.

REFERENCE BOOKS:

1. S. J. Farlow, Partial Differential Equations for Scientists and Engineers, Dover Publications, 1993.
2. R. Haberman; Elementary Applied Partial Differential equations with Fourier Series And Boundary Value Problem, 4th Ed., Prentice Hall, 1998.
3. I*an* Sneddon, Elements of Partial Deferential Equation, McGraw Hill, 1964.
4. S.S. Sastry, Engineering Mathematics, PHI, Vol. I & II.

Note:

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ECE 211C Basic Electronics Engineering

B. Tech. Semester – III (Mechanical Engineering)

L	T	P	Credits			
3	1	-	4	**Class Work**	**:**	**25 Marks**
				Examination	**:**	**75 Marks**
				Total	**:**	**100 Marks**
				Duration of Examination	**:**	**3 Hours**

UNIT- I

Semiconductor Devices and Applications: Introduction to P-N junction Diode and V-I characteristics, Half wave and Full-wave rectifiers, capacitor filter. Zener diode and its characteristics, Zener diode as voltage regulator. Regulated power supply IC based on 78XX and 79XX series.
Introduction to BJT, its input-output and transfer characteristics, BJT as a single stage CE amplifier, frequency response and bandwidth.

UNIT-II

Operational amplifier and its applications: Introduction to operational amplifiers, Op-amp input modes and parameters, Op-amp in open loop configuration, op-amp with negative feedback, study of practical op-amp IC 741, inverting and non-inverting amplifier applications: summing and difference amplifier, unity gain buffer, comparator, integrator and differentiator.

Timing Circuits and Oscillators: RC-timing circuits, IC 555 and its applications as astable and monostable multi-vibrators, positive feedback, Barkhausen's criteria for oscillation, R-C phase shift and Wein bridge oscillator.

UNIT-III

Digital Electronics Fundamentals: Difference between analog and digital signals, Boolean algebra, Basic and Universal Gates, Symbols, Truth tables, logic expressions, Logic simplification using K- map, Half and full adder/subtractor, multiplexers, demultiplexers, flip-flops, shift registers, counters. Block diagram of microprocessor 8085, Instruction set, Interrupt structure, Addressing modes, Simple programs.

UNIT-IV

Electronic Communication Systems: The elements of communication system, Classification of signals, Analog and Digital Communication, need of modulation, AM and FM (modulation and demodulation) schemes, modulation index. Mobile communication systems: wired and wireless, cellular concept and block diagram of GSM system..

TEXT/REFERENCE BOOKS:

1. Floyd ," Electronic Devices" Pearson Education 9th edition, 2012.
2. R.P. Jain , "Modern Digital Electronics", Tata Mc Graw Hill, 3rd Edition, 2007.
3. Manoj Duhan, "Communication Systems", I.K International, 2nd Edition, 2012.
4. Ramesh Gaonkar, "Microprocessor Architecture, Programming and Applications with the 8085", 6/e October 2013
5. Ramakant A. Gayakwad, "Op-Amps and Linear Integrated Circuit", PHI, 1993.

Note:

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2. The use of scientific calculator will be allowed in the examination. However, programmable calculator and cellular phone will not be allowed.

For student admitted in B. Tech. 1st Year (C-Scheme) in 2019 and all trailing students.

Examinations and evaluation of students shall be conducted as per guidelines AICTE Examinations Reforms covering the entire syllabus. The students shall be made aware about the reforms.

Deenbandhu Chhotu Ram University of Science & Technology, Murthal (Sonepat)
Scheme of Studies & Examinations under Choice Based Credit System
Programme: B. Tech. in Mechanical Engineering; Year – 3rd (Semester – V); Session: 2020-21

S. No.	Course Code	Course Title	Teaching Schedule			Marks of Class Work	Examination Marks		Total	Credit	Duration of Exam
			L	T	P		Theory	Practical			
1	ME 301C	Heat Transfer	3	1	0	25	75	-	100	4	3
2	ME 303C	Solid Mechanics	3	1	0	25	75	-	100	4	3
3	ME 305C	Manufacturing Processes	3	0	0	25	75	-	100	3	3
4	ME 307C	Theory of Machines	3	1	0	25	75	-	100	4	3
5	ME 309C	Total Quality Management	3	0	0	25	75	-	100	3	3
6	ME 311C	Laboratory - II (Thermal)	0	0	2	25	-	75	100	1	3
7	ME 313C	Laboratory - III (Design)	0	0	2	25	-	75	100	1	3
8	ME 315C	Professional Training (Level II)	0	0	2	100	-	-	100	1	
9	HUM 301C	Essence of Indian Traditional Knowledge	3	0	0	25	75	-	100	0	3
Total			**18**	**3**	**6**	**300**	**450**	**150**	**900**	**21**	

Deenbandhu Chhotu Ram University of Science & Technology, Murthal (Sonepat)
Scheme of Studies & Examinations under Choice Based Credit System
Programme: B. Tech. in Mechanical Engineering; Year – 3rd (Semester – VI); Session: 2020-21

S. No.	Course Code	Course Title	Teaching Schedule			Marks of Class Work	Examination Marks		Total	Credit	Duration of Exam
			L	T	P		Theory	Practical			
1	ME 302C	Manufacturing Technology and Management	4	0	0	25	75	-	100	4	3
2	ME 304C	Design of Machine Elements	3	1	0	25	75	-	100	4	3
3		Professional Elective-I	4	0	0	25	75	-	100	4	3
4		Professional Elective-II	4	0	0	25	75	-	100	4	3
5		Open Elective-I	3	0	0	25	75	-	100	3	3
6	ME 306C	Laboratory - IV (Design)	0	0	2	25	-	75	100	1	3
7	ME 308C	In-house Project	0	0	6	100	-	-	100	3	
Total			**18**	**1**	**8**	**250**	**375**	**75**	**700**	**23**	

List of Professional Elective- I & II Courses		
S. No.	**Course Code**	**Course Title**
1	ME 322C	Robotics and Automation
2	ME 324C	Composite Materials
3	ME 326C	Modern Manufacturing Processes
4	ME 328C	Internal Combustion Engines
5	ME 330C	Gas Dynamics and Jet Propulsion

List of Open Elective-I Courses (Any One)		
S. No.	**Course Code**	**Course Title**
1	HUM350C	Communication Skills for Professionals (Except BME & BTE)
2	HUM352C	Soft Skills and Inter-personal Communication
3	MGT402C	Human Values, Ethics And IPR
4	MGT404C	Human Resource Management
5	HUM354C	Introduction to French language
6	HUM356C	Introduction to German Language

NOTE: *For students admitted in B.Tech. 1st Year (C-Scheme) in 2019 & onwards and all trailing students: Examinations and evaluations of students shall be conducted, covering the entire syllabus, as per guidelines "AICTE Examination Reforms". Students shall be informed about these reforms.*

DEENBANDHU CHHOTU RAM UNIVERSITY OF SCIENCE & TECHNOLOGY, MURTHAL (SONEPAT)

MECHANICAL ENGINEERING DEPARTMENT

SCHEME OF STUDIES & EXAMINATIONS OF B. TECH. (HONS./MINOR DEGREE) WITH SPECIALIZATION (W.E.F. 2020-21)

ROBOTICS (Jointly offered with ECE Department; Hons. Degree for students of ECE & ME, Minor Degree for other students)

S. No.	Semester	Course Code	Course Title	Teaching Schedule			Marks of Class work	Examination Marks		Total	Credit	Duration of Exam
				L	T	P		Theory	Practical			
1	5	SPME301C	Robotics and Applications	4	0	0	25	75	-	100	4	3
2	5	SPEC381C	Robotics Lab	0	0	2	25	-	75	100	1	3
3	6	SPEC302C	Python Programming	4	0	0	25	75	-	100	4	3
4	6	SPEC308C	Embedded Robotics	4	0	0	25	75	-	100	4	3
5	6	SPEC388C	Embedded Robotics Lab	0	0	2	25	-	75	100	1	3
6	7	SPME401C	Mechanics and Control in Robotics	4	0	0	25	75	-	100	4	3
Total				**16**	**0**	**4**	**150**	**300**	**150**	**600**	**18**	

Note:

1. **The ordinance of B. Tech. Programme of the University shall be applicable to this scheme as well.**
2. **Student can undertake 20% of the courses of this scheme (Hons./Minor Degree with Specialization in the above listed emerging areas) through online platforms SWAYAM/MOOCS/NPTEL etc. with due permission of the chairperson.**
3. **Any students of the B. Tech. of the University can opt for this scheme (Hons./Minor Degree with Specialization in the above listed emerging areas), however, minimum 10 students are required for running a particular specialization.**
4. **The choice of the students shall be sought through the respective chairpersons at the end of the 4th Semester.**
5. **If any of the course in the any of the above scheme opted by a student exist in the list of the electives of the normal B. Tech. Scheme of the stream of that student as well then the student has to opt for some other elective.**

ME 301C HEAT TRANSFER

B. Tech. Semester – V (Mechanical Engineering)

L T P Credits Class Work : 25 Marks

3	**1**	**--**	**4**	**Examination**	**:**	**75Marks**
				Total	**:**	**100 Marks**
				Duration of Examination	**:**	**3 Hours**

UNIT I

Basics concepts: Thermodynamics Vs Heat transfer, basic modes of heat transfer, thermal conductivity Vs diffusivity, combined heat transfer.

Steady State Heat Conduction: Introduction, I-D heat conduction through a plane wall, long hollow cylinder, hollow sphere, Conduction equation in cartesian, polar and spherical co-ordinate systems, concept of conduction and film resistances, critical insulation thickness, Numericals.

UNIT II

Steady State Conduction with Heat Generation: 1-D heat conduction with heat sources, extended surfaces (fins), Fin effectiveness, Biot number, heat transfer through fins, Numericals

Transient Heat Conduction: Lumped capacitance, semi-infinite and infinite solid conduction modes for walls, cylinders, spheres; Chart solution(Heissler), Relaxation Method, Numericals.

UNIT III

Convection: Heat convection, basic equations, boundary layers- Forced convection, external and internal flows- Natural convective heat transfer- Dimensionless parameters for forced and free convection heat transfer- Correlations for forced and free convection- Approximate solutions to laminar boundary layer equations (momentum and energy) for both internal and external flow- Estimating heat transfer rates in laminar and turbulent flow situations using appropriate correlations for free and forced convection, Numericals.

Thermal Radiation: Interaction of radiation with materials, definitions of radiative properties, Stefan Boltzmann's law, black and gray body radiation, Calculation of radiation heat transfer between surfaces using radiative properties, view factors and the radiosity method. Radiation shields, applications to two and three surface enclosures, introduction to participating media, Numericals.

UNIT IV

Heat Exchangers: Types of heat exchanges, Performance variables, Analysis and design of heat exchangers using both LMTD and ε-NTU methods, pressure drop, Numericals.

Heat Transfer with phase change: Laminar film condensation on a vertical plate, Drop-wise condensation, Pool boiling regimes, Nucleate boiling and critical heat flux, film boiling and minimum heat flux, Flow boiling.

Introduction to Mass transfer.

Text Books :

1. Heat Transfer – J.P. Holman, John Wiley & Sons, New York.
2. Fundamentals of Heat & Mass Transfer–Incropera, F.P. & Dewill, D.P –John Willey New York.
3. Heat transfer –P.K. Nag, McGraw Hill

Reference Books :

1. Heat Transfer – A. Bejan, John Wiley & Sons, Inc.
2. Conduction of Heat in Solids – Carslow, H.S. and J.C. Jaeger – Oxford Univ. Press.
3. Conduction Heat Transfer – Arpasi, V.S. – Addison – Wesley.
4. Compact Heat Exchangers – W.M. Keys & A.L. Landon, Mc. Graw Hill.
5. Thermal Radiation Heat Transfer – Siegel, R. and J.R. Howell, Mc. Graw Hill.

NOTES:

1. *In the semester examination, the examiner will set two questions from each unit (total 08 questions in all), covering the entire syllabus. The students will be required to attempt only 5 questions selecting at least one question from each unit.*
2. *The use of scientific calculator will be allowed in the examination. However, programmable calculator and cellular phone will not be allowed.*
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ME 303C SOLID MECHANICS
B. Tech. Semester – V (Mechanical Engineering)

L	T	P	Credits			
3	1	-	4	**Class Work**	**:**	**25 Marks**
				Examination	**:**	**75 Marks**
				Total	**:**	**100 Marks**
				Duration of Examination	**:**	**3 Hours**

UNIT I

Introduction to Cartesian tensors, Strains: Concept of strain, derivation of small strain tensor and compatibility, Stress: Derivation of Cauchy relations and equilibrium and symmetry equations, principal stresses and directions

UNIT II

Constitutive equations: Generalized Hooke's law, Linear elasticity, Material symmetry; Boundary Value Problems: concepts of uniqueness and superposition.

UNIT III

Plane stress and plane strain problems, introduction to governing equations in cylindrical and spherical coordinates, axisymmetric problems.

UNIT IV

Application to thick cylinders, rotating discs, torsion of non-circular cross-sections, stress concentration problems, thermo-elasticity, 2-d contact problems.

TEXT BOOKS:

1. Strength of Materials – G. H. Ryder - Macmillan, India
2. Strength of Materials– Andrew Pytel and Fredinand L. Singer, Addison – Wesley
3. Continuum Mechanics for Engineers - G. T. Mase, R. E. Smelser and G. E. Mase, , Third Edition, CRC Press, 2004.
4. Foundations of Solid Mechanics - Y. C. Fung, , Prentice Hall International, 1965.

REFERENCE BOOKS:

1. Strength of Materials – Popov, PHI, New Delhi.
2. Mechanics of Materials - Timoshenko, S.P., and Gere, J.M., 2nd Ed., CBS Publishers 2002
3. An Introduction to the Mechanics of Solids - Crandall, S.H., Dahl, N.C., and Lardner, T.J., Tata McGraw-Hill 1999.

NOTES:

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ME 305C MANUFACTURING PROCESSES
B. Tech. Semester – V (Mechanical Engineering)

L	T	P	Credits			
3	-	-	3	Class Work	:	25 Marks
				Examination	:	75 Marks
				Total	:	100 Marks
				Duration of Examination	:	3 Hours

UNIT – I

Conventional Manufacturing Processes: Casting and molding, Metal casting processes and equipment, design of patterns, moulds and cores; Heat transfer and solidification, shrinkage, riser and gating system design, casting defects and residual stresses.

Introduction to Bulk and Sheet Metal Forming: Plastic deformation and yield criteria, fundamentals of hot and cold working processes, load estimation for bulk forming (forging, rolling, extrusion, drawing) and sheet forming (shearing, deep drawing, bending) principles of powder metallurgy

UNIT – II

Metal Cutting: Single and multi-point cutting, orthogonal cutting, various force components, chip formation, tool wear and tool life, surface finish and integrity, machinability, cutting tool materials and tool geometry, coating, cutting fluids.

Process description of turning, drilling, milling and finishing processes, economics of machining, additive manufacturing, brief description of rapid prototyping and rapid tooling.

UNIT – III

Joining/Fastening Processes: Solid and liquid state joining processes; physics of welding, brazing and soldering; design considerations in welding, welding defects and testing, adhesive bonding.

Unconventional Machining Processes: Principles, process parameters, Applications and Limitations for the following Unconventional Machining Processes: Abrasive Jet Machining, Water Jet Machining, Abrasive Water Jet Machining, Ultrasonic Machining.

UNIT – IV

Electrical discharge machining(EDM), Principle and processes parameters, MRR, surface finish, tool wear, dielectric, power and control circuits, Wire EDM; electron Beam Machining (EBM).

Electro Chemical Machining (ECM), Principle and process parameters, Etchant & Maskant, MRR and surface finish, Laser Beam Machining (LBM), Plasma Arc Machining (PAM).

TEXT BOOK:

1. Kalpakjian and Schmid, Manufacturing processes for engineering materials (5th Edition)-Pearson India
2. Mikell P. Groover, Fundamentals of Modern Manufacturing: Materials, Processes, and Systems
3. P.N. Rao, Manufacturing Technology, Mc Graw Hill Education
4. Manufacturing Science, Amitabh Ghosh and Ashok Kumar Malik, EWP

REFERENCE BOOKS:

1. Schey J, Introduction to Manufacturing Processes, Mc Graw Hill Education
2. DeGarmo E. P., Black J. T. and Kohser R.A, Materials and Processes in Manufacturing, John Wiley & Sons
3. BL Juneja, GS Sekhon, Fundamental of Metal Cutting and Machine Tools, New Age international publishers.

NOTES:

1. *In the semester examination, the examiner will set two questions from each unit (total 08 questions in all), covering the entire syllabus. The students will be required to attempt only 5 questions selecting at least one question from each unit.*
2. *The use of scientific calculator will be allowed in the examination. However, programmable calculator and cellular phone will not be allowed.*
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ME 307C THEORY OF MACHINES (COMMON WITH AERONAUTICAL ENGG.)
B. Tech. Semester – V (Mechanical Engineering)

L	T	P	Credits			
3	1	-	4	**Class Work**	**:**	**25 Marks**
				Examination	**:**	**75 Marks**
				Total	**:**	**100 Marks**
				Duration of Examination	**:**	**3 Hours**

UNIT I

Introduction: Links-types, Kinematics pairs-classification, Constraints-types, Kinematic chains, Mechanism and machines, Degree of freedom, mobility- Grashof's law, Kinematic inversions of four bar chain and slider crank chains, Limit positions of four-bar mechanism, Transmission angle in four bar mechanism and slider crank mechanism, Synthesis for motion and path generation.

Velocity and Acceleration in Mechanism: Velocity and acceleration analysis of simple mechanisms, graphical velocity analysis using instantaneous centers, Coriolis component of acceleration,

UNIT II

Cams and Followers: Classification of cams and followers, Terminology, Cam profile by graphical methods with knife edge and radial roller follower for Uniform velocity, Parabolic, Simple harmonic and Cycloidal motions,

Gears and Gear Trains: Classification & Terminology, Law of gearing, Tooth Profile, Length of path of contact, Contact ratio, Interference & Under cutting in Involute gear teeth, Gear Trains- Synthesis of simple, Compound and Epicyclic gear train

UNIT III

Balancing of Rotating Components: Balancing of rotating masses, Graphical and analytical methods

Balancing of Reciprocating Parts: Primary and secondary forces and couples, Partial balancing, Effects of partial balancing, Balancing of single cylinder, multi cylinder; inline and radial engines

UNIT IV

Gyroscopes – Gyroscopic couple and their effects on Aircrafts and Ship during steering, rolling and pitching, Stability of two wheel and four wheel vehicles is moving on curved paths, Problems

Governors: Terminology, Centrifugal governors-Watt, Porter, Proell and Hartnell governor, Controlling force diagrams

TEXT BOOKS:

1. Theory of Machines - Thomas Bevan, CBS Publishers & Distributors
2. Mechanisms of Machines - CleghornW.L., Oxford University Press
3. Kinematics and Dynamics of Machinery, Robert L. Norton, Tata McGrawHill

REFERENCE BOOKS:

1. Theory of Mechanisms and Machines- Ghosh A. and Mallick A.K., Affiliated East- West Pvt. Ltd, New Delhi,
2. Mechanism and Machine Theory: J.S. Rao and R.V. Dukkipati Second Edition New age International
3. Theory of Machines and Mechanisms: Joseph Edward Shigley and John Joseph Uicker, Jr. Second Edition, MGH, New York
4. Theory and Machines: S.S. Rattan, Tata McGraw Hill.
5. Kinematics of Machines-Dr. Sadhu Singh, Pearson Education

NOTES:

1. *In the semester examination, the examiner will set two questions from each unit (total 08 questions in all), covering the entire syllabus. The students will be required to attempt only 5 questions selecting at least one question from each unit.*
2. *The use of scientific calculator will be allowed in the examination. However, programmable calculator and cellular phone will not be allowed.*
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ME 309C TOTAL QUALITY MANAGEMENT
B. Tech. Semester – V (Mechanical Engineering)

L	T	P	Credits			
3	-	-	3	**Class Work**	**:**	**25 Marks**
				Examination	**:**	**75 Marks**
				Total	**:**	**100 Marks**
				Duration of Examination	**:**	**3 Hours**

UNIT – I Philosophies and fundamentals

Evolution of quality management philosophy, Definitions of quality and importance in industry, concept and scope of total quality control, product quality and service quality.

Contributions of Deming, Juran and Crosby; Quality statements, customer focus, customer orientation & satisfaction, customer complaints, customer retention, Quality costs and economics of quality, Quality assurance and ISO 9000 quality system standards, quality systems-elements, documentation, quality auditing, ISO 14000-concepts, requirements and benefits

UNIT- II Tools and Methods of quality improvement

Tools for quality: Introduction, fundamental seven tools for quality - histogram, Pareto chart, cause and effect diagram, stratification analysis, check sheet, control charts etc., introduction to new management tools of quality.

Total Quality Management (TQM): basic concepts, TQM frame work, TQM principles/elements like leadership, strategic quality planning, employee involvement, motivation, empowerment, team work, quality circles, recognition and reward, performance appraisal, continuous improvement, PDCE cycle, 5S, supplier partnership, supplier rating and selection etc. Benefits, implementation aspects and barriers to TQM.

UNIT – II Statistical Quality Control

Descriptive statistics/basic statistical concepts: Data collection and presentation, measures of central tendency like mean, standard deviation etc., probability distributions- types, characteristics and applications in quality, Introduction to inferential statistics.

Statistical Process Control- concept of variation, control charts-philosophy, types; process capability- brief of six sigma and taguchi method.

Acceptance sampling- concept, advantages, Operating characteristic (OC) curve and its use.

UNIT – IV Advancements in Quality management

Quality function deployment (QFD), Role of Total Productive Maintenance (TPM), Just in Time (JIT) and lean manufacturing, Bench marking, Failure mode and effect analysis (FMEA) etc. in quality improvement

Quality in service sector- Introduction, growing role of service industries in economy, service industries and their characteristics, comparison with manufacturing , a conceptual model for service quality, TQM implementation in manufacturing and service sectors.

TEXT BOOKS:-

1) Fundamentals of quality control and improvement by A Mitra, Mcmillan Pub Company
2) Managing for Total Quality: N. Logothetis PHI

REFERENCE BOOKS: -

1. Quality Planning and Analysis by J M Juran and Frank M Gryna TMH
2. Besterfield D.H. et al., Total quality Management, 3rd ed., Pearson Education Asia, 2006.
3. Evans J.R. and Lindsay W.M., The management and Control of Quality, 8th ed., first Indian edition, Cengage Learning, 2012.

NOTES:

1. *In the semester examination, the examiner will set two questions from each unit (total 08 questions in all), covering the entire syllabus. The students will be required to attempt only 5 questions selecting at least one question from each unit.*
2. *The use of scientific calculator will be allowed in the examination. However, programmable calculator and cellular phone will not be allowed.*
3. *For students admitted in B.Tech. 1st Year (C-Scheme) in 2019 & onwards and all trailing students: Examinations and evaluations of students shall be conducted, covering the entire syllabus, as per guidelines "AICTE Examination Reforms". Students shall be informed about these reforms.*

ME 311C Laboratory-II (Thermal)
B. Tech. Semester – V (Mechanical & Aeronautical Engineering)

L	T	P	Credits			
--	--	2	1	**Class Work**	**:**	**25 Marks**
				Examination	**:**	**75 Marks**
				Total	**:**	**100 Marks**
				Duration of Examination	**:**	**3 Hours**

LIST OF EXPERIMENTS:

Unit-I

1. To determine the thermal conductivity of an insulating powder.
2. To find the effectiveness of a pin fin and plot temperature distribution along its length in a rectangular duct under natural and forced convective condition.
3. To determine the surface heat transfer coefficient for a heated vertical tube under natural convection and plot the variation of local heat transfer coefficient along the length of the tube. Also compare the results with those of the correlation.
4. To measure the emissivity of the gray body (plate) at different temperature and plot the variation of emissivity with surface temperature.
5. To find overall heat transfer coefficient and effectiveness of a heat exchange under parallel and counter flow conditions. Also plot the temperature distribution in both the cases along the length of heat of heat exchanger.
6. To verify the Stefan-Boltzmann constant for thermal radiation.
7. To determine the critical heat flux using two phase heat transfer apparatus.

Unit-II

8. To study the constructional details & working principles of two-stroke & four stroke petrol and diesel engine.
9. To prepare heat balance sheet on multi-cylinder diesel engine and petrol engine.
10. To prepare variable speed performance test of a multi-cylinder/single cylinder petrol engine and diesel engine and prepare the curves (i) BHP, IHP, FHP, vs Speed (ii) Volumetric efficiency & indicated specific fuel consumption vs speed.
11. To find FHP of a multi-cylinder diesel engine/petrol engine by Willian'sline method & by motoring method.
12. To perform constant speed performance test on a single cylinder/multi-cylinder diesel engine & draw curves of (i) BHP vs fuel rate, air rate and A/F ratio and (ii) BHP vs mep, Mech efficiency & SFC.

Unit-III

13. To study the Mechanical compression cycle based heat pump and determine its Carnot, theoretical and actual C.O.P. Draw the cycle on P-H and T-S diagrams.
14. To study the various air conditioning psychrometric processes like cooling, heating, cooling and dehumidification, heating and humidification etc using AC tutor and plot them on Psychrometric chart.
15. To study the aqua- ammonia absorption system and find its COP

Note:

1. **At least Ten experiments are to be performed in the Semester selecting atleast 4 from Unit I; 3 from Unit II; and 2 from Unit III**

ME 313C Laboratory- III (Design)
B. Tech. Semester – V (Mechanical Engineering)

L	T	P	Credits			
-	-	2	1	**Class Work**	**:**	**25 Marks**
				Examination	**:**	**75 Marks**
				Total	**:**	**100 Marks**
				Duration of Examination	**:**	**3 Hours**

LIST OF EXPERIMENTS:

1. To study various types of Kinematic links, pairs, chains and Mechanisms.
2. To study inversions of 4 Bar Mechanisms, Single and Double slider crank mechanisms.
3. To study various type of cam and follower arrangements.
4. To study various types of gears: Spur, Helical, Double helical, Spiral, Bevel gear, Hypoid
5. To study various types of gear trains: Simple, Compound and Epicyclic
6. To perform experiment on Watt Governors to prepare performance characteristic curves.
7. To perform experiment on Porter Governors to prepare performance characteristic curves.
8. To perform experiment on Proell Governor to prepare performance characteristic curves.
9. To perform experiment on Hartnell Governor to prepare performance characteristic curves.
10. To find experimentally the Gyroscopic couple on motorized gyroscope and compare with applied couple.
11. To perform the experiment for static balancing on Static Balancing Machine.
12. To perform the experiment for dynamic balancing on Dynamic Balancing machine.

Note:

1. Total Ten experiments are to be performed in the Semester.
2. At least eight experiments should be performed from the above list. Remaining two experiments may either be performed from the above list or designed & set by the concerned institute as per the scope of the syllabus.

ME 315C Professional Training (Level – II)

B. Tech. Semester – V (Mechanical Engineering)

Duration of Training	**Credits**	**Class Work**	**:**	**100 Marks**
4-6 weeks	1	**Total**	**:**	**100 Marks**

Professional Training is aimed to provide practical experience to the interns in his/her field or discipline to achieve the following objectives:

- To expose Technical students to the industrial environment, which cannot be simulated in the classroom and hence, creating competent professionals in the industry.
- To Provide possible opportunities to learn, understand and sharpen the real time technical / managerial skills required in the job.
- To gain experience in writing Technical reports/projects.
- To expose students to the engineer's responsibilities and ethics.
- To familiarize with various materials, processes, products and their applications along with the relevant aspects of quality control.
- To promote academic, professional and/or personal development.
- To expose the students to future employers.
- To understand the social, economic and administrative considerations that influence the working environment of industrial organizations
- To understand the psychology of the workers and their habits, attitudes and approach to problem solving.

At the end of 4th semester each student would undergo four to six weeks Professional Training in an Industry/ Institute/ Professional / Organization/ Research Laboratory etc. with the prior approval of the Training and Placement Officer of the University and submit in the department a typed report along with a certificate from the organization.

Every student is required to submit a typed report in a prescribed format. The report should contain the activities done by him. The report should also contain the student's Diary / Daily log. The students should record day-to-day account of the observations, impressions, information gathered and suggestions given, if any in the training diary. It should contain the sketches & drawings related to the observations made by the students. The diary should also be shown to the Faculty Mentor visiting the industry from time to time.

The evaluation of Professional Training/Project will be done by a departmental committee in the 5th semester as per time table allocated by the department. The evaluation committee will consist of teachers from different specialization to be constituted by the Chairperson of the department. The student will interact with the committee through presentation to demonstrate his/ her learning. Evaluation will be done on the basis of the following criteria/weightage:

- Regularity in maintenance of the diary (20%)
- Adequacy and quality of report (40%)
- Presentation (Quality of content /Effectiveness of presentation/Communication skill) 40%

HUM 301 C Essence of Indian Traditional Knowledge

B.Tech. V Semester(Common for All Branches)

Mandatory Course

L	T	P	External Assessment: 75 Marks
3	0	0	Internal Assessment: 25 Marks
			Total : 100 Marks
			Duration of Exam: 3 hrs

COURSE OBJECTIVE

- To introduce students to the basics of Indian knowledge traditions and forms
- To impart basic principles of thought process, reasoning and inferencing

UNIT I

Indian Knowledge Traditions and Processes: An Overview

Vedic Tradition, Epical Tradition, Sutra Tradition, Scholastic Tradition

UNIT II

Vedic and Upnishadic Traditions

Vedic Mantras: Hymn of Creation, To Vāk

Upnishadic Narraatives: The Story of Nachiketa

UNIT III

Epical Insights

Gyanmarg (The Yoga of Wisdom)

UNIT IV

Folk Wisdom

(A) Folk Tales as knowledge: "The Blind Man and an Elephant"#
"The Goat who saved the Priest", " Buried Treasure" , " Little Prince, No Father", " Demons in the Desert"##

"The Story of Meddlesome Monkey" , " The Story of the Lion and the Rabbit" "The Story of Three Fishes""The Story of Dharmabudhi amnd Papabuddhi"###

(B) Haryanvi Ragini as Moral lesson: Raja Harishchandra

Note: Different signs such as # etc. indicate source of the primary texts enlisted in the 'RECOMMENDED READING'

COURSE LEARNING OUTCOMES

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

- Understand, appreciate and explain Indian traditional knowledge systems
- Relate life and learning with traditional knowledge in present times

PEDAGOGY

Through lectures, self study, group discussion, Projects and seminar

RECOMMENDED READING

1. Mitchell, Stephen. *The Bhagavad Gita*. Harmony Books, 2007 (Ch.4 for UNIT III).
2. Radhakrishnan, S. & Charles A. Moore. eds. *A Source Book in Indian Philosophy*. Princeton UP, 1957 ("General Introduction: History of Indian Thought" for UNIT I, Ch.1-2 for UNIT II))
3. ###Sharma, Vishnu. *Panchatantra*. Translated by Rohini Chowdhury. Puffin Books.
4. Sharma, Puran Chand. *Pundit Lakhmi Chand Granthavali*. Haryana Sahitya Akademi, 2010.
5. # https://www.peacecorps.gov/educators/resources/story-blind-men-and-elephant/
6. ## www. buddhanet.net

SCHEME OF END SEMESTER THEORY EXAMINATION

1. The duration of the exam will be 3 hours.
2. The Question Paper shall have nine questions.
3. Each question will be of 15 marks.
4. The student is required to attempt five questions in all.
5. Questions no. 1 to 8 will be set in such manners that two questions are set from each unit of the syllabus. A student will have to attempt four questions selecting one question from each unit. Each question will have minimum 2 and maximum 4 parts.
6. Question no. 9 will be compulsory covering the entire syllabus and it will be in the form of short-answer type questions. Compulsory question will have minimum 5 and maximum 8 parts with minimum 1 part from each unit of the syllabus.
7. Marks and Bloom's Level (BL) of each part of the question will be there against each part/question, Following are Bloom's Level:- Bloom's Taxonomy Levels (1-Remembering, 2-Understanding, 3-Applying, 4- Analysing, 5-Evaluating, 6-Creating)

ME 302C MANUFACTURING TECHNOLOGY AND MANAGEMENT
B. Tech. Semester – VI (Mechanical Engineering)

L	T	P	Credits			
4	-	-	4	**Class Work**	**:**	**25 Marks**
				Examination	**:**	**75 Marks**
				Total	**:**	**100 Marks**
				Duration of Examination	**:**	**3 Hours**

UNIT – I

Tooling for Conventional and Non-Conventional Machining Processes: Principles of Mould & die design, Press tools Cutting tools; and Holding tools: Jigs and fixtures, principles, applications and design. Brief review of Press Tools: Configuration, design of die and punch, principles of forging die design

Metrology: Dimensions, forms and surface measurements, Limits, fits and tolerances, linear and angular measurements, comparators, gauge design, interferometry; Metrology in tool wear and part quality including surface integrity.

.UNIT – II

Alignment and Testing Methods: Tolerance analysis in manufacturing and assembly, Process metrology for emerging machining processes such as micro scale machining, Inspection and work-piece quality. Assembly Practices: Manufacturing and assembly, process planning, selective assembly, Material handling and devices.

Facility Models and selection of equipments: Principle and Models for Facility Location, Layout Design and selection of Equipments, Simple queuing theory models.

UNIT – III

Linear Programming: Objective function and constraints, graphical method, Simplex and duplex algorithms, transportation assignment, Traveling Salesman problem

Network Models: Shortest route, minimal spanning tree, maximum flow model- Project networks: CPM and PERT, critical path scheduling

UNIT – IV

Production Planning & Control: Forecasting Models, Aggregate production planning, Materials Requirement Planning.

Inventory models: Economic Order Quantity, Quantity Discount Models, Stochastic Inventory Models, Practical Inventory Control models, JIT.

TEXT BOOK:

1. Pandey and Singh, Production engineering sciences,7e, standard publisher and distributer
2. Buffa and Sarin, Modern Production/Operations Management, 8th Ed, Willey pub

REFERENCE BOOKS:

1. Kalpakjian and Schmid, Manufacturing processes for engineering materials (5th Edition)-Pearson India
2. Modern Machining Processes, PC Pandey, HS Shan, Mc Graw Hill Education
3. Shenoy G.V. and Shrivastava U.K., Operations Research for Management, Wiley Eastern
4. Taha H. A., Operations Research, 6th Edition, Prentice Hall of India

NOTES:

1. *In the semester examination, the examiner will set two questions from each unit (total 08 questions in all), covering the entire syllabus. The students will be required to attempt only 5 questions selecting at least one question from each unit.*
2. *The use of scientific calculator will be allowed in the examination. However, programmable calculator and cellular phone will not be allowed.*
3. *For students admitted in B.Tech. 1st Year (C-Scheme) in 2019 & onwards and all trailing students: Examinations and evaluations of students shall be conducted, covering the entire syllabus, as per guidelines "AICTE Examination Reforms". Students shall be informed about these reforms.*

ME 304C DESIGN OF MACHINE ELEMENTS
B. Tech. Semester – VI (Mechanical Engineering)

L	T	P	Credits			
3	1	-	4	Class Work	:	25 Marks
				Examination	:	75 Marks
				Total	:	100 Marks
				Duration of Examination	:	3 Hours

UNIT – I

Chapter 1: Design considerations - limits, fits and standardization, Stress concentration, Review of failure theories for static and dynamic loading (including fatigue failure)

Chapter 2: Design of shafts under static and fatigue loadings

.UNIT – II

Chapter 3: Design of joints: Riveted joint for structures, threaded fasteners, pre-loaded bolts and welded joints, analysis and applications of power screws

Chapter 4: Keys and Couplings: various types of keys and design of keys; muff, split muff, flange, bush-pin flexible flange coupling; flywheels

UNIT – III

Chapter 5: Design of transmission elements: belt and chain drives; analysis of clutches and brakes

Chapter 6: Design of transmission elements: spur, helical, bevel and worm gears

UNIT – IV

Chapter 7: Design of springs: helical compression, tension, torsional and leaf springs

Chapter 8: Analysis and design of hydrodynamic journal bearing, sliding and rolling contact bearings

TEXT BOOK:

1. Mechanical Engineering Design, Fifth Edition, Shigley, J.E. and Mischke, C.R., McGraw-Hill International
2. Machine Design Theory and Practice, Deutschman, D., Michels, W.J. and Wilson, C.E. Macmillan
3. Fundamentals of Machine Component Design, Juvinal, R.C., John Wiley
4. Machine Design Data Book, 2nd edition, Jadon V K, Verma S.I. K. International publication, New Delh, Distributed by Wiley
5. Design Data: Data Book of Engineers, By PSG College-Kalaikathir Achchagam – Coimbatore PSG College- Coimbatore

REFERENCE BOOKS:

1. Design of Machine elements, Spottes, M.F., Prentice-Hall India
2. Mechanical Design – An Integrated Approach, R. L. Norton, Prentice Hall,
3. Analysis and Design of Machine Elements, 2nd edition, Jadon V K, Verma S, I. K. International publication, New Delhi, Distributed by Wiley

NOTES:

1. *In the semester examination, the examiner will set two questions from each unit (total 08 questions in all), covering the entire syllabus. The students will be required to attempt only 5 questions selecting at least one question from each unit.*
2. *The use of scientific calculator will be allowed in the examination. However, programmable calculator and cellular phone will not be allowed.*
3. *The paper setter will be required to mention in the note in the question paper that use of only those Machine Design Data books which are mentioned in the syllabus are permitted in the examination.*
4. *For students admitted in B.Tech. 1st Year (C-Scheme) in 2019 & onwards and all trailing students: Examinations and evaluations of students shall be conducted, covering the entire syllabus, as per guidelines "AICTE Examination Reforms". Students shall be informed about these reforms.*

ME 306C Laboratory – IV (Design)
B. Tech. Semester – VI (Mechanical Engineering)

L	T	P	Credits			
-	-	2	1	**Class Work**	**:**	**25 Marks**
				Examination	**:**	**75 Marks**
				Total	**:**	**100 Marks**
				Duration of Examination	**:**	**3 Hours**

LIST OF EXPERIMENTS:

UNIT I - (STRENGTH OF MATERIALS)

1. To study the Hardness testing machine (s) and perform the Rockwell hardness / Brinell hardness / Vickers test.
2. To study the Impact testing machine and perform the Impact tests (Izod and Charpy).
3. To study the Universal Testing Machine and perform the tensile test /compression / bending /shear test tests on UTM.
4. To study the torsion testing machine and perform the torsion test.
5. To study the Erichsen sheet metal testing machine and perform the Erichsen sheet metal test.
6. To draw shear Force, Bending Moment Diagrams for a simply Supported Beam under Point and Distributed Loads.

UNIT II - (MATERIAL SCIENCE)

7. To study crystal structures and crystals imperfections with the help of ball model.
8. To study microstructures of metals/ alloys through microscopic observation.
9. To study hardening (by quenching) of steel specimen by Jominy Test.
10. To observe effect of tempering temperature on the property of given steel specimen.
11. To study the properties of various types of plastics.
12. To study Bravais lattices with the help of models.

Note:

1. Ten experiments are to be performed in the Semester.
2. At least eight experiments should be performed from the above lists, taking at least 04 experiments from each Unit. Remaining two experiments may either be performed from the above list or designed & set by the department as per the scope of the syllabus.

ME 308C INHOUSE PROJECT

B. Tech. Semester – VI (Mechanical Engineering)

L	T	P	Credits			
-	-	6	3	**Class Work**	**:**	**100 Marks**
				Examination	**:**	**--**
				Total	**:**	**100 Marks**
				Duration of Examination	**:**	**3 Hours**

In-house Project is a group activity with a batch size of 4-5 students. The expected outcome of this course is the development of capability to employ technical knowledge obtained in the field of Engineering & Technology for societal use through an in-house project work involving design/ analysis/fabrication/ testing/ computer simulation/ case studies etc, augmented with creativity, innovation and ingenuity. Students may also choose to work on innovation or entrepreneurial activities resulting in start-up. Each group will work under the guidance of a faculty adviser.

After completion of the Project, the each group should prepare a comprehensive report to indicate what they have observed and learnt in the training period. The format of the cover page and the organization of the body of the report should be circulated by In-house Project coordinator.

At the end of the semester, the project will be evaluated through a panel of examiners consisting of three members. The chairman may constitute stream specific committees for the evaluation of the project. Each committee shall consist of three members as given below:

1. A senior faculty member (Chairman of the committee)
2. In-house Project coordinator (Member Secretary)
3. Respective In-house faculty adviser

The evaluation process will be as given below:

- The group will be required to submit two copies of his/her project report to the department for record (one copy each for the department and participating teacher).
- Project coordinator will be assigned the project load of maximum of 2 hrs. per week including his own guiding load of one hr. However, each faculty adviser will be assigned maximum of one period of teaching load irrespective of number of students/groups under him/her.
- The evaluation of In-house Project will be carried out on the basis of the following criteria:
  - Originality and relevance of the Project (20%)
  - Adequacy and quality of report (40%)
  - Presentation of the Project report (Quality of content /Effectiveness of presentation/Communication skill) 40%

ME 322C ROBOTICS AND AUTOMATION (COMMON WITH AERONAUTICAL ENGG.)

B. Tech. Semester – VI (Mechanical Engineering)

L	T	P	Credits			
3	-	-	3	**Class Work**	**:**	**25 Marks**
				Examination	**:**	**75 Marks**
				Total	**:**	**100 Marks**
				Duration of Examination	**:**	**3 Hours**

UNIT I

Introduction: Concept and scope of automation, Socio economic consideration, Low cost automation. Overview of Automation System - Architecture of Industrial Automation Systems, Different devices used in Automation Actuators, definition, types, selection.

Fluid Power Control: Fluid power control elements and standard graphical symbols, Construction and performance of fluid power generators, Hydraulic and pneumatic cylinders - construction, design and mounting; Hydraulic and pneumatic valves for pressure, flow and direction control: Servo valves and simple servo systems with mechanical feedback, governing differential equation and its solution for step position input, Basic hydraulic and pneumatic circuits.

UNIT II

Pneumatic Logic Circuits: Design of pneumatic logic circuits for a given time displacement diagram or sequence of operations.

Fluidics: Boolean algebra, Truth tables, Conda effect, Fluidic elements - their construction working and performance characteristics: Elementary fluidic circuits.

UNIT III

Transfer Devices and Feeders: Their Classification: Construction details and application of transfer devices and feeders

Electrical and Electronic Controls: Introduction to electrical and electronic controls such as electromagnetic controllers - transducers and sensors, microprocessors, programmable logic controllers (PLC), Integration of mechanical systems with electrical, electronic and computer systems.

UNIT IV

Robotics: Introduction, classification based on geometry, devices, control and path movement, End effectors - types and applications, Sensors - types and applications, Concept of Robotic/Machine vision, Teach pendent.

Industrial Applications of Robots: material transfer, machine loading / unloading, welding, assembly and spray painting operations.

TEXT BOOKS:

1. Anthony Esposito, Fluid Power with applications, Pearson.
2. S.R. Deb, Robotics and Flexible Automation, Tata mc Graw Hill
3. A.K Gupta, S.K. Arora, Industrial Automation and Robotics, Laxmi Pubilaction (P) Ltd.
4. Mikell and Groover, Industrial Robotics – Technology, Programming and Applications, McGraw Hill, 2/e, 2012

REFERANCE BOOKS:

1. Ashitava Ghosal, Robotics, Fundamental concepts and analysis, OXFORD University Press, 2006
2. Robert J. Schilling, Fundamentals of Robotics: Analysis & Control, Pearson Education, 2000.
3. Mickell. P. Groover 'Automation, Production and computer integrated manufacturing' Prentice Hall of India, 1992.17. Mickell. P. Groover 'Automation, Production and computer integrated manufacturing' Prentice Hall of India, 1992.

NOTES:

1. *In the semester examination, the examiner will set two questions from each unit (total 08 questions in all), covering the entire syllabus. The students will be required to attempt only 5 questions selecting at least one question from each unit.*
2. *The use of scientific calculator will be allowed in the examination. However, programmable calculator and cellular phone will not be allowed.*
3. *For students admitted in B.Tech. 1st Year (C-Scheme) in 2019 & onwards and all trailing students: Examinations and evaluations of students shall be conducted, covering the entire syllabus, as per guidelines "AICTE Examination Reforms". Students shall be informed about these reforms.*

ME 324C COMPOSITE MATERIALS
B. Tech. Semester – VI (Mechanical Engineering)

L	T	P	Credits			
3	-	-	3	**Class Work**	**:**	**25 Marks**
				Examination	**:**	**75 Marks**
				Total	**:**	**100 Marks**
				Duration of Examination	**:**	**3 Hours**

UNIT I

Introduction : Definition and applications of composite materials, Fibers- glass, carbon, ceramic and aramid fibers; Matrices- polymer, graphite, ceramic and metal matrices; characteristics of fibers and matrices, Manufacturing of composite materials

UNIT II

Lamina: Introduction, Macro-mechanical behavior , stress-strain relations for anisotropic materials, orthotropic material, lamina of arbitrary orientation, invariant properties of an orthotropic lamina, strengths of an orthotropic lamina, biaxial strength criteria for an orthotropic lamina , Micromechanical behavior: Mechanics of materials approach to stiffness and strength , elasticity approach to stiffness

UNIT III

Laminate: classical lamination theory, special cases of laminate stiffness, theoretical versus measured laminate stiffness, strength of laminates, Inter laminar stresses

UNIT IV

Bending, buckling, and vibration of laminated plates: Governing equations for bending , buckling, and vibration of laminated plates, deflection of simply supported laminated plates under distributed transverse load, buckling of simply supported laminated plates under in-plane load, vibration of simply supported laminated plates, introduction to design of composite structures, materials and configuration selection

TEXT BOOKS:

1. Principles of Composite Material Mechanics - Gibson R.F, McGraw Hill
2. Stress Analysis of Fiber Reinforced Composite Materials - Hyer M.W., McGraw Hill
3. Mechanics of composite materials- Robert m. Jones, Taylor & Francis, Inc

NOTES:

1. *In the semester examination, the examiner will set two questions from each unit (total 08 questions in all), covering the entire syllabus. The students will be required to attempt only 5 questions selecting at least one question from each unit.*
2. *The use of scientific calculator will be allowed in the examination. However, programmable calculator and cellular phone will not be allowed.*
3. *For students admitted in B.Tech. 1st Year (C-Scheme) in 2019 & onwards and all trailing students: Examinations and evaluations of students shall be conducted, covering the entire syllabus, as per guidelines "AICTE Examination Reforms". Students shall be informed about these reforms.*

ME 326C MODERN MANUFACTURING PROCESSES
B. Tech. Semester – VI (Mechanical Engineering)

L	T	P	Credits			
3	-	-	3	Class Work	:	25 Marks
				Examination	:	75 Marks
				Total	:	100 Marks
				Duration of Examination	:	3 Hours

UNIT I

Limitations of conventional manufacturing processes, Need of unconventional manufacturing processes, Classification of Modern Manufacturing Processes and its future possibilities.

ULTRASONIC MACHINING- Introduction, Basic Principle of USM, Elements of Process, tool feed mechanism, cutting tool system design, effect of parameters on MRR, economic considerations, applications, limitations of the process, advantages and disadvantages.

ABRASIVE JET MACHINING- Process description, features of AJM, Parameters in AJM, metal removal rate (MRR) in AJM. Advantages, limitations and Practical applications of AJM, Water Jet Machining- Jet cutting equipments, process details

UNIT II

CHEMICAL MACHINING: Basic technique of chemical machining, Mechanism of metal removal, process variables, advantages and applications .Electrochemical machining, principle of ECM process, ECM process detail, chemical reactions in ECM, tool work gap, process variables and characteristics in ECM, advantages, disadvantages and application of ECM ,Electrochemical Grinding - Material removal, surface finish, accuracy, advantages, applications.

UNIT III

THERMAL SPARK EROSION PROCESSES: Electric Discharge Machining (EDM) or spark erosion machining processes, practical aspects of spark erosion machining, mechanism of metal removal, spark erosion generators, electrode feed control, dielectric fluids, flushing, electrodes for spark erosion, selection of electrode material, tool electrode design, surface finish, machining accuracy, machine tool selection, applications. Wire cut EDM. Advantages and disadvantages of spark erosion machining.

LASER BEAM MACHINING (LBM)- Introduction, lasing process, Laser machining system, Thermal effect on workpiece, calculation of MRR, description of laser drilling machine, cutting speed and accuracy of cut, advantages and limitations.

UNIT IV

PLASMA ARC MACHINING (PAM): Introduction, non thermal generation of plasma types of plasma arc , the stabilized arc, mechanism of plasma torch, , mechanism of metal removal, PAM parameters, equipments for D.C. plasma torch unit, safety precautions, economics, other applications of plasma jets.

ELECTRON BEAM MACHINING (EBM) – Description of the process, need for high vacuum in EBM, process parameters in EBM. Advantages and disadvantages of EBM, Electron beam welding.

Text Books:

1. Advanced Machining Processes by V.K. Jain. Allied Publishers Pvt Ltd
2. Modern Machining Methods by M. Adithan, Khanna Publishers
3. Modern Machining Processes by P.C. Pandey and H.S. Shan. Tata McGraw- Hill
4. Advanced Methods of Machining by J. A. Mcgeough, Springer
5. Non-Traditional Manufacturing Process by Benedict, CRC pub.
6. Unconventional Manufacturing Process by M K Singh, New Age Publishers
7. Nonconventional manufacturing by P. K. Mishra, Narosa Publishers

NOTES:

1. *In the semester examination, the examiner will set two questions from each unit (total 08 questions in all), covering the entire syllabus. The students will be required to attempt only 5 questions selecting at least one question from each unit.*
2. *The use of scientific calculator will be allowed in the examination. However, programmable calculator and cellular phone will not be allowed.*
3. *For students admitted in B.Tech. 1st Year (C-Scheme) in 2019 & onwards and all trailing students: Examinations and evaluations of students shall be conducted, covering the entire syllabus, as per guidelines "AICTE Examination Reforms". Students shall be informed about these reforms.*

ME 328C INTERNAL COMBUSTION ENGINES
B. Tech. Semester – VI (Mechanical Engineering)

L	T	P	Credits			
3	-	-	3	**Class Work**	**:**	**25 Marks**
				Examination	**:**	**75 Marks**
				Total	**:**	**100 Marks**
				Duration of Examination	**:**	**3 Hours**

UNIT I

AIR STANDARD CYCLES: Internal and external combustion engines; classification of I.C. Engines, Brief review of air standard cycles; Deviation of actual engine cycle from ideal cycle. Problems.

CARBURETION, FUEL INJECTION AND IGNITION SYSTEMS: Mixture requirements for various operating conditions in S.I. Engines; Elementary carburetor, Requirements of a diesel injection system; types of injection systems; petrol injection, Requirements of ignition system; Types of ignition systems ignition timing; spark plugs. Problems.

UNIT II

COMBUSTION IN I.C. ENGINES : S.I. engines; Ignition limits; stages of combustion in S.I. Engines; Ignition lag; Velocity of flame propagation; detonation; Effects of engine variables on detonation; theories of detonation; octane rating of fuels; pre-ignition; S.I. engine combustion chambers,

Stages of combustion in C.I. Engines; delay period; variables affecting delay period; Knock in C.I. engines, Cetane rating; C.I. engine combustion chambers.

LUBRICATION AND COOLING SYSTEMS: Functions of a lubricating system, Types of lubrication system; Mist, Wet sump and Dry sump systems; Properties of lubricating oil; SAE rating of lubricants, engine performance and lubrication, Necessity of engine cooling; disadvantages of overcooling; Cooling systems; Air-cooling, Water cooling; Radiators.

UNIT–III

ENGINE TESTING AND PERFORMANCE: Performance parameters: BHP, IHP, Mechanical efficiency, Brake mean effective pressure and indicative mean effective pressure, Torque, Volumetric efficiency; specific fuel consumption (BSFC, ISFC), Thermal efficiency; Heat balance; Basic engine measurements; fuel and air consumption, Brake power, Indicated power and friction power, Heat lost to coolant and exhaust gases; Performance curves. Problems.

AIR POLLUTION FROM I.C. ENGINES AND ITS REMEDIES: Pollutants from S.I. and C.I. Engines, Methods of emission control; alternative fuels for I.C. Engines; the current scenario on the pollution front.

UNIT–IV

ROTARY COMPRESSORS: Root and vane blowers; Static and total head values; Centrifugal compressors-Velocity diagrams, slip factor, ratio of compression, pressure coefficient, pre-whirl; Axial flow compressor-Degree of reaction, polytropic efficiency, surging, choking and stalling, performance characteristics, Problems.

GAS TURBINES: Components of a gas turbine plant; open and closed types of gas turbine plants; Optimum pressure ratio; Improvements of the basic gas turbine cycle; multi stage compression with inter-cooling; multi stage expansion with reheating between stages; exhaust gas heat exchanger, Applications of gas turbines. Problems.

TEXT BOOKS:

1. Internal Combustion Engines –V. Ganesan, Pub.-Tata McGraw-Hill.
2. Gas Turbines - V. Ganesan, Pub.- Tata McGraw Hill.
3. Engineering fundamental of the I. C. Engines – Willard W. Pulkrabek Pub.-PHI,India

REFERENCE BOOKS:

1. Internal Combustion Engines & Air pollution- Obert E.F, Pub.-Hopper & Row Pub., New York
2. Internal Combustion Engines Fundamentals- John B. Heywood, Pub.-McGraw Hill, New York

NOTES:

1. *In the semester examination, the examiner will set two questions from each unit (total 08 questions in all), covering the entire syllabus. The students will be required to attempt only 5 questions selecting at least one question from each unit.*
2. *The use of scientific calculator will be allowed in the examination. However, programmable calculator and cellular phone will not be allowed.*
3. *For students admitted in B.Tech. 1st Year (C-Scheme) in 2019 & onwards and all trailing students: Examinations and evaluations of students shall be conducted, covering the entire syllabus, as per guidelines "AICTE Examination Reforms". Students shall be informed about these reforms.*

ME 330C GAS DYNAMICS AND JET PROPULSION
B. Tech. Semester – VI (Mechanical Engineering)

L	T	P	Credits			
3	-	-	3	**Class Work**	**:**	**25 Marks**
				Examination	**:**	**75 Marks**
				Total	**:**	**100 Marks**
				Duration of Examination	**:**	**3 Hours**

UNIT I

Compressible flow, definition, Mach waves and Mach cone, stagnation states, Mass, momentum and energy equations of one-dimensional flow, Isentropic flow through variable area ducts, nozzle s and diffusers, subsonic and supersonic flow I variable area ducts, choked flow, Area-Mach number relations for isentropic flow

UNIT II

Non-isentropic flow in constant area ducts, Rayleigh and Fanno flows, Normal shock relations, oblique shock relations, isentropic and shock tables

UNIT III

Theory of jet propulsion, thrust equation, thrust power and propulsive efficiency, Operating principle and cycle analysis of ramjet, turbojet, turbofan and turboprop engines.

UNIT IV

Types of rocket engines, propellants & feeding systems, ignition and combustion, theory of rocket propulsion, performance study, staging, terminal and characteristic velocity, space flights

TEXT BOOKS:

1. Ahmed F. El-Sayed, Aircraft Propulsion and Gas Turbine Engines, CRC Press, 2008
2. H.S. Mukunda, "Understanding Aerospace Chemical Propulsion", Interline Publishing, 2004
3. Hill P. and Peterson C., Mechanics & Thermodynamics of Propulsion, Addison Wesley, 1992

TEXT BOOKS:

1. Zucrow N. J., Aircraft and Missile Propulsion, Vol.I& II, John Wiley, 1975
2. Sutton G.P., Rocket Propulsion Elements, John Wiley, New York, 1986

NOTES:

1. *In the semester examination, the examiner will set two questions from each unit (total 08 questions in all), covering the entire syllabus. The students will be required to attempt only 5 questions selecting at least one question from each unit.*
2. *The use of scientific calculator will be allowed in the examination. However, programmable calculator and cellular phone will not be allowed.*
3. *For students admitted in B.Tech. 1st Year (C-Scheme) in 2019 & onwards and all trailing students: Examinations and evaluations of students shall be conducted, covering the entire syllabus, as per guidelines "AICTE Examination Reforms". Students shall be informed about these reforms.*

HUM350C Communication Skills for Professionals (Except BME & BTE)

B.Tech. 3rd YEAR (SEMESTER –VI)

L	T	P	Credits		
3	0	0	3	Class Work	: 25
				Examination	: 75
				Total	: 100
				Duration of Exam	: 3 Hours

Unit 1 (8 Lectures)

Mechanics of Report Writing: Objectives of Report Writing; Types of Reports on the basis of forms and content. Introduction to Formats of Reports; Structure of Reports:Front Matter, Main Body, Back Matter.

Unit 2 (10 Lectures)

Writing Business and Technical Report: Preliminary Strategies for Report Writing: Data Collection, Report Planning,Use of Illustrations, Point Formation, Preparing Notes/Drafts. Using Appropriate Formats: Memo Format, Letter Format,Manuscript Format, Printed Forms

Unit 3 (10 Lectures)

Oral Communication and Soft Skills : Group Discussions; Interviews for jobs: preparation and facing them.Professional Presentations: Power Point Presentation, Oral Presentation. Role of Kinesics (Body Language) in Communication.General Etiquettes in Office areas, corporate lunch and dinner. Handling Telephone calls.

Unit 4 (8 Lectures)

Resumes and Job application: Writing of Resume--Chronological Resume and Functional Resume.Request for Reference/Recommendation .Writing Application Letters for Job; Writing Covering letter.

Text/ Reference Books:

1. Sharma,Sangeeta, and Binod Mishra. *Communication Skills for Engineers and Scientists.* PHI,2009.
2. Tyagi,Kavita, and Padma Mishra. *Advanced Technical Communication.* PHI, 2011.
3. Rizvi, M. Ashraf. *Effective Technical Communication*. McGraw Hill Education, 2014.
4. Kumar, Sanjay, and PushpLata. *Communication Skills*. OUP, 2011.
5. Raman, Meenakshi and SangeetaSharma.*Communication* Skills. OUP,2011.
6. *Bhatnagar, Nitin, and MamtaBhatnagar. *Communicative English for Engineers and Professionals*. Pearson Education, 2013. (The soft copy of the book is available in the university library)
7. Mitra,Barun K. *Personality Development and Soft Skills*. OUP,2011.
8. Kaul, Asha. *Business Communication*. PHI, 2nd Edition.
9. Namee, Patrick Mc. *Success in Interviews: How to Succeed in any Job Interview*, Ist Edition.
10. Argenti, Paul. *Corporate Communication*.6th Edition. McGraw Hill Education, 2012.

Course Outcomes: At the end of the course, students will demonstrate the ability to:

1. Get acquainted with multiple forms and formats of various technical and business reports
2. Develop competence for report writing with a focus on its complex writing techniques and procedures.
3. Develop their speaking skills with professional proficiency.
4. Equip themselves for Letter Writing Skills.

Note:

1. In Semester Examinations, the paper setter will set two questions from each unit (total 8 questions in all), covering the entire syllabus. Students will be required to attempt only five questions, selecting atleast one question from each unit.

2. The use of scientific calculator will be allowed in the examination. However, programmable calculator, mobile phones or other electrical/ electronic items will not be allowed in the examination.

3. For students admitted in B.Tech. 1st Year (C-Scheme) in 2019 & onwards and all trailing students:

Examinations and evaluations of students shall be conducted, covering the entire syllabus, as per guidelines "AICTE Examination Reforms". Students shall be informed about these reforms.

HUM352C Soft Skills And Interpersonal Communication

B.Tech. 3rd YEAR (SEMESTER –VI)

L	T	P	Credits		
3	0	0	3	Class Work	: 25
				Examination	: 75
				Total	: 100
				Duration of Exam	: 3 Hours

Unit 1 (8 Lectures)

Soft Skills: Introduction to Soft Skills & their classification.Importance of Soft Skills: Writing Resume/CV, Engaging in Group discussion, Appearing for Job interviews.

Unit 2 (10 Lectures)

Interpersonal Skills, Behaviour, Relationships and Communication: Development and Role of Effective Interpersonal Skills.Development of Effective Speaking and Listening Skills.

Unit 3 (10 Lectures)

Non-Verbal Elements in Interpersonal Communication : Role of Body Language, Paralinguistic Features, Proxemics/Space Distance and Haptics in Interpersonal Communication.

Unit 4 (8 Lectures)

Personality Development for Personal and Professional Growth: Desirable Personality Attributes, Personality Types, Analysis of Personality Development (Freudian and Swami Vivekananda's Concept), Grooming Personality for Personal and Professional Life.

Text/ Reference Books:

1. Mitra, Barun K. *Personality Development and Soft Skills*. Delhi: OUP, 2nd Edition, 2016.
2. Butterfield, Jeff.*Soft Skills for Everyone.* Cengage Learning, 2017.
3. Raman, Meenakshi and Sangeeta Sharma. *Communication Skills.* OUP, 2011.
4. Ramesh, Gopalaswamy and Mahadevan Ramesh. *The ACE of Soft Skills*, Pearson India,2010.
5. Ribbons, Geoff and Richard Thompson.*Body Language*.Hodder& Stoughton, 2007.
6. Sharma, Sangeeta and Binod Mishra.*Communication Skills for Engineers and Scientists.* PHI, 2017.

Course Outcomes: At the end of the course, students will demonstrate the ability to:

1. Know now how soft skills complement hard skills for career growth.
2. Enhance communicative competence for professional enhancement.
3. Learn desirable body language and other non-verbal elements in interpersonal communication.
4. Groom personality for handling effectively various situations of personal and professional life.

Note:

1. In Semester Examinations, the paper setter will set two questions from each unit (total 8 questions in all), covering the entire syllabus. Students will be required to attempt only five questions, selecting atleast one question from each unit.

2. The use of scientific calculator will be allowed in the examination. However, programmable calculator, mobile phones or other electrical/ electronic items will not be allowed in the examination.

3. For students admitted in B.Tech. 1st Year (C-Scheme) in 2019 & onwards and all trailing students:

Examinations and evaluations of students shall be conducted, covering the entire syllabus, as per guidelines "AICTE Examination Reforms". Students shall be informed about these reforms.

MGT402C Human Values, Ethics and IPR

B.Tech. 3rd YEAR (SEMESTER –VI)

L	T	P	Credits		
3	0	0	3	Class Work	: 25
				Examination	: 75
				Total	: 100
				Duration of Exam	: 3 Hours

Unit 1 (10 Lectures)

Human Values: Understanding the need, basic guidelines, Self Exploration - its content and process; 'Natural Acceptance' and Experiential Validation, Continuous Happiness and Prosperity- Human Aspirations, Right understanding, Relationship and Physical Facilities, Understanding Happiness and Prosperity correctly.

Unit 2 (12 Lectures)

Different kinds of value: Understanding human being as a co-existence of the sentient 'I' and the material 'Body' Understanding the needs of Self ('I') and 'Body' - Sukh and Suvidha. Understanding the harmony of I with the Body: Sanyam and Swasthya; correct appraisal of Physical needs, meaning of Prosperity in detail, Programs to ensure Sanyam and Swasthya.

Unit 3 (10 Lectures)

Modern approach to the study of values: Understanding Harmony in the Family and Society- Harmony in Human-Human Relationship Understanding harmony in the Family, Understanding values in human-human relationship; meaning of Nyaya and program for its fulfillment to ensure Ubhay-tripti; Trust (Vishwas) and Respect (Samman).

Unit 4 (10 Lectures)

Professional Ethics & IPR: Values in Work-life, Professional Ethics and Ethos, Code of conduct, Whistle Blowing, Corporate Social Responsibility.IPR: meaning, nature, scope and relevance of IPR. Kinds of IPR: Copyright, Patents, Trademark, Geographical Indication, Industrial design, Plant Variety. Benefits, Emerging dimensions and Rational for protection of IPR.

Suggested Readings:

1. R. R. Gaur, R Sangal, G P Bagaria, 2009, A Foundation Course in Human Values and Professional Ethics, Excel Books, New Delhi
2. A.N. Tripathy, 2003, Human Values, New Age International Publishers.
3. E G Seebauer& Robert L.Berry, 2000, Fundamentals of Ethics for Scientists & Engineers, Oxford University Press.
4. M Govindrajan, S Natrajan& V. S Senthil Kumar, Engineering Ethics (including Human Values), Eastern Economy Edition, Prentice Hall of India Ltd.
5. S. B. Gogate, Human Values & Professional Ethics, Vikas Publishing House Pvt. Ltd., Noida.

Reference Books:

1. A Nagraj, 1998 JeevanVidyaekParichay, Divya Path Sansthan, Amarkantak.
2. P. L. Dhar, R. R. Gaur, 1990, Science and Humanism, Commonwealth Publishers.
3. Prof. A.R.Aryasri, DharanikotaSuyodhana, Professional Ethics and Moral, Maruthi Publications.
4. A. Alavudeen, R.Kalil Rahman and M. Jayakumaran, Professional Ethics and Human Values, University Science Press.
5. Prof.D.R.Kiran, 2013, Professional Ethics and Human Values, Tata McGraw-Hill
6. Jayshree Suresh and B. S. Raghavan, Human Values And Professional Ethics, S.Chand Publications

Course Outcomes: At the end of the course, students will demonstrate the ability to:

1. Students will be able to understand the significance of value inputs in a classroom and start applying them in their life and profession
2. Understand and can distinguish between values and skills, happiness and accumulation of physical facilities, the Self and the Body, Intention and Competence of an individual, etc.
3. Understand the role of a human being in ensuring harmony in society and nature.
4. Students will be aware of the significance of Intellectual Property as a very important driver of growth and development in today's world and to be able to statutorily acquire and use different types of intellectual property in their professional life.

Note:

1. In Semester Examinations, the paper setter will set two questions from each unit (total 8 questions in all), covering the entire syllabus. Students will be required to attempt only five questions, selecting atleast one question from each unit.

2. The use of scientific calculator will be allowed in the examination. However, programmable calculator, mobile phones or other electrical/ electronic items will not be allowed in the examination.

3. For students admitted in B.Tech. 1st Year (C-Scheme) in 2019 & onwards and all trailing students:

Examinations and evaluations of students shall be conducted, covering the entire syllabus, as per guidelines "AICTE Examination Reforms". Students shall be informed about these reforms.

MGT404C Human Resource Management

B.Tech. 3rd YEAR (SEMESTER –VI)

L	T	P	Credits		
3	0	0	3	Class Work	: 25
				Examination	: 75
				Total	: 100
				Duration of Exam	: 3 Hours

Unit 1 (10 Lectures)

Introduction: Nature and scope of human resource management, HRM objectives and functions, HRM policies, HRM in globally competitive environment; strategic human resource management.

Unit 2 (12 Lectures)

Acquiring human resources: Man power planning, Job evaluation, job analysis and job design. Recruitment: Sources, Methods, constraints & challenges, selection: objectives and process, placement and induction.

Unit 3 (10 Lectures)

Developing human resources: Training: types, methods, training vs. development and evaluation of a training programme and training need assessment, career planning and development.

Unit 4 (10 Lectures)

Performance appraisal: Methods, process and challenges of performance appraisal, performance appraisal vs. potential appraisal, Compensation: wages & salaries administration and factors influencing compensation levels.

Suggested Readings:

1. Jyothi, Human Resource Management, Oxford University Press
2. Bohlander George and Scott Snell, Management Human Resources, Cengage, Mumbai
3. Bhattacharyya, Dipak Kumar, Human Resource Management, Excel Books, NewDelhi
4. Cascio Wayne F., Managing Human Resources, TMH, New Delhi
5. DeCenzo, David A, and Stephan P. Robbins, Fundamentals of Human Resource Management, Wiley India, New Delhi
6. Denisi, Angelo S, and Ricky W Griffin, Human Resource Management, Biztantra, New Delhi

Course Outcomes: At the end of the course, students will demonstrate the ability to:

1. To have an understanding of the basic concepts, functions and processes of human resource management
2. To be aware of the role, functions and functioning of human resource department of the organizations.
3. To Design and formulate various HRM processes such as Recruitment, Selection, Training, Development, Performance appraisals and Reward Systems, Compensation Plans and Ethical Behavior.
4. Develop ways in which human resources management might diagnose a business strategy and then facilitate the internal change necessary to accomplish the strategy.

Note:

1. In Semester Examinations, the paper setter will set two questions from each unit (total 8 questions in all), covering the entire syllabus. Students will be required to attempt only five questions, selecting atleast one question from each unit.

2. The use of scientific calculator will be allowed in the examination. However, programmable calculator, mobile phones or other electrical/ electronic items will not be allowed in the examination.

3. For students admitted in B.Tech. 1st Year (C-Scheme) in 2019 & onwards and all trailing students:

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HUM354C Introduction To French Language

B.Tech. 3rd YEAR (SEMESTER –VI)

L	T	P	Credits		
3	0	0	3	Class Work	: 25
				Examination	: 75
				Total	: 100
				Duration of Exam	: 3 Hours

Unit 1 (10 Lectures)

VOCABULAIRE
Les Salutations
Les jours de la semaine, Les moins de l'année, Les couleurs, Les professions
Les nombrescardinaux
Les lieux de la ville, Les nationalites
Personnesetobjetscaractéristiques d'un pays
Civilisation: France,de la sociétéfrancaise, les monuments, les fêtes

Unit 2 (10 Lectures)

GRAMMAIRE
Conjugation des verbeetre, avoir, aller; Conjugation des verbe –er, -ir, -re
Masculin/feminine,Singulier/ pluriel
Accord des nomset des adjectives
Articles indéfinisetdéfines
Négation simple
Interrogation
Futurproche
On= Nous
Articles partitifsetcontractes
La date etl'heure

Unit 3 (8 Lectures)

ECRITURE (comprehension des écrits, Production écrite)
Presentez- vous, Mon meuillierami, Ma famille
Carteset messages d'invitation, d'acceptationou de refus
Ecrives des scenes

Unit 4 (8 Lectures)

COMPREHENSION (écouter, production orale)
Se presenter à ungroupe
Parlez/ écoutezdevotreville
Parlez/écoutezdesesactivités de loisirs
Parlez /écoutez de vosgo*ûts*
Demander/ donnerun explication
Identifier unepersonneouun objet
Demander/dire cequ'ona fait

Text/ Reference Books:

1. Echo – A1 Methode de Francais, CLE International (Distributed in India by W. R. Goyal Publishers & Distributors, Delhi).
2. Connexions, niveau 1, Yves Loiseau and R_gineM_rieux(Goyal Publishers).
3. Alter Ego-1, Hachette (Distributed in India by W. R. Goyal Publishers & Distributors, Delhi).
4. Forum- Methode de Francais 1, Hachette (Distributed in India by W. R. Goyal Publishers & Distributors, Delhi).
5. 450 Exercises de Grammaire, CLE International (Distributed in India by W. R. Goyal Publishers & Distributors, Delhi).
6. Audio- Video study material.
7. Supplementary handouts

Course Outcomes: At the end of the course, students will demonstrate the ability to:

1. Familiarize with the basics of French language.
2. Understand and express vocabulary and grammar through writing.
3. Demonstrate understanding through simple dialogues in French.

Note:

1. In Semester Examinations, the paper setter will set two questions from each unit (total 8 questions in all), covering the entire syllabus. Students will be required to attempt only five questions, selecting atleast one question from each unit.

2. The use of scientific calculator will be allowed in the examination. However, programmable calculator, mobile phones or other electrical/ electronic items will not be allowed in the examination.

3. For students admitted in B.Tech. 1st Year (C-Scheme) in 2019 & onwards and all trailing students:

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HUM356C Introduction To German Language

B.Tech. 3rd YEAR (SEMESTER –VI)

L	T	P	Credits		
3	0	0	3	Class Work	: 25
				Examination	: 75
				Total	: 100
				Duration of Exam	: 3 Hours

Unit 1 (10 Lectures)

Introduction to German alphabets
Numbers 0- 100 (basic algebraic expressions)
Vocabulary of days and months
Adverbs of time
Ordinal numbers in German
Phonetics and pronunciation

Unit 2 (10 Lectures)

Introduction to the simple possessive pronouns
Sentence: statement, question, (question for completion and decision) command
Coordination of clauses
Placing of the verb in the sentence: first, second and last place
Word order in main clause
Details of time, manner and place (casual)

Unit 3 (8 Lectures)

Verb: infinitive, imperative, indicative – Präsens, Perfekt, Präteritum of auxiliary and modal verbs, modal verbs (meaning, indicative Präsens&Präteritum, möchten)
Verbs with prefixes – separable and inseparable
Nouns: Gender, plural, Nominative, Accusative, Dative
Articles: Definite and Indefinite
Adjectives: predicative use

Unit 4 (8 Lectures)

Day-to-day conversation in German: Introducing oneself and other, greeting and taking leave, Meeting people, Time and date, months and weekdays
Inquire and name the country of origin, languages
Introduce family members and friends

Text/ Reference Books:

1. Tangram AktuellNiveau A1, Max HeuberVertag, Ismaning, 2005 (Published and distributed in India by German Book Depot, Delhi).
2. Netzwerk A1, KlettVerlag, Muenchen, 2013 (Published and distributed in India by German Book Centre, Delhi 2015).
3. *Sprachkurs Deutsch I &2*. Diesterweg (Moritz) Verlag, Frankfurt am Main, 1989, (Published and distributed in India by Goyal Saab Publishers & Distributors, New Delhi).
4. *Schuelerduden Grammatik*, BibliographischesInstitutand F.ABrockhaus, 2000.
5. *ThemenAktuell 1, Kursbuch*, Max HeuberVerlag, Ismaning, Deutschland, 2003 (Published and distributed in India by German Book Centre, Delhi, 2010).
6. Audio-video Study Material.
7. Supplementary Handouts.

Course Outcomes: At the end of the course, students will demonstrate the ability to:

1. Familiarize with the basics of German language.
2. Understand and express vocabulary and grammar through writing.
3. Demonstrate understanding through simple dialogues in German.

Note:

1. In Semester Examinations, the paper setter will set two questions from each unit (total 8 questions in all), covering the entire syllabus. Students will be required to attempt only five questions, selecting atleast one question from each unit.

2. The use of scientific calculator will be allowed in the examination. However, programmable calculator, mobile phones or other electrical/ electronic items will not be allowed in the examination.

3. For students admitted in B.Tech. 1st Year (C-Scheme) in 2019 & onwards and all trailing students:

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SPME301C Robotics and Applications

B. Tech. (Hons./Minor degree) with Specialization in Robotics
3rd YEAR (SEMESTER –V)

L	T	P	Credits		
4	0	0	4	Class Work	: 25
				Examination	: 75
				Total	: 100
				Duration of Exam	: 3 Hours

Unit 1 (14 Lectures)

Introduction to Robotics: History, evolution of Robots and Robotics, Laws of Robotics, Progressive advancement in Robots- first, second, third and fourth generations; Robot autonomy-links, joints notations scheme, degrees of freedom in a manipulator, arm configuration, wrist configuration, End-effector.
Human arm characteristics, Components of Robotics-mechanics, trajectory generation and motion planning, control system, Sensors and vision, AI in robotics, Robot programming -teach method, off-line programming, Robot programming languages; future prospects-bio robotics and humanoid Robotics.

Unit 2 (15 Lectures)

Robotic Sensors: Human sensing, problem of Robot sensing; Sensors in Robots-status sensors, environmental sensors, quality control sensors, safety sensors, workcell control sensors, classification of Robotic sensors.
Types of sensors used in Robotics: Optical, pneumatic sensors; tactile, acoustic, force, torque; Optical encoders, selecting right sensor.

Unit 3 (15 Lectures)

Robotic Vision: Introduction, industrial application of vision-controlled Robotic systems - presence, object location, pick and place, object identification, visual inspection, visual guidance;
Image acquiring and processing: Processing of imaging, architecture of Robotic vision system, Image acquisition, description of components of vision system, image representation, introduction to image processing.

Unit 4 (16 Lectures)

Robot applications: Industrial applications, Material handling- material transfer, loading and unloading; Processing applications- arc welding, spray painting; Assembly applications- assembly task, peg-in-hole assembly, steps in assembly, providing compliance; Inspection application: sensors and vision based inspection and testing.
Principles for Robot application and application planning, quantitative and qualitative justification of Robots, Robot safety, Non-industrial applications;

Text/ Reference Books:

1. R.K. Mittal and I. J. Nagrath, " Robotics and control", McGraw Hill,2003.
2. K. R. Guruprasad, " Robotics: Mechanics and control", PHI, 2019.
3. John J. Craig, " Introduction to Robotics: Mechanics and control",3rd Edition, Pearson, 2005.
4. Ashitava Ghosal, " Robotics: fundamental concepts and analysis", Oxford Pub, 2006.
5. Saeed B. Niku, " Introduction to Robotics: Analysis, control, applications", 2nd Edition, Wiley, 2010.
6. King-Sun Fu, C.S. George Lee and Ralph Gonzalez, "Robotics: control, sensing, vision and intelligence", 3rd Edition, McGraw Hill, 2004.

Course Outcomes: At the end of the course, students will demonstrate the ability to:

1. Explain the characteristics, architecture and applications of Robotic systems.
2. Identify and describe different types of end effectors and sensors required for specific applications.
3. Apply the basic concepts of robotic vision and image processing for robotic systems.
4. Analyze the applications of robots in various industrial applications and select a robotic system for given application.

Note:

1. In Semester Examinations, the paper setter will set two questions from each unit (total 8 questions in all), covering the entire syllabus. Students will be required to attempt only five questions, selecting atleast one question from each unit.

2. The use of scientific calculator will be allowed in the examination. However, programmable calculator, mobile phones or other electrical/ electronic items will not be allowed in the examination.

3. For students admitted in B.Tech. 1st Year (C-Scheme) in 2019 & onwards and all trailing students:

Examinations and evaluations of students shall be conducted, covering the entire syllabus, as per guidelines "AICTE Examination Reforms". Students shall be informed about these reforms.

SPEC302C Python Programming

B. Tech. (Hons./Minor degree) with Specialization in Artificial Intelligence & Machine Learning/Internet of Things/Robotics

3rd YEAR (SEMESTER –VI)

L	T	P	Credits		
4	0	0	4	Class Work	: 25
				Examination	: 75
				Total	: 100
				Duration of Exam	: 3 Hours

Unit 1 (15 Lectures)

Introduction and Overview: Introduction to Python, Origin, Comparison, Comments, Operators, Variables and Assignment, Numbers, Strings, Lists and Tuples, Dictionaries, if Statement, while Loop, for Loop and the range(), Built-in Function, Files, Errors and Exceptions, Functions, Classes, Modules Syntax and Style Statements and Syntax, Variable Assignment, Identifiers, Memory Management, Python Applications.

Unit 2 (15 Lectures)

Numbers and Strings: Introduction to Numbers, Integers, Floating Point Real Numbers, Complex Numbers, Operators, Built-in Functions. Sequences: Strings, Lists, and Tuples, Sequences, Strings, Strings and Operators, String-only Operators, Built-in Functions, String Built-in Methods, Special Features of Strings.

Lists and Dictionaries: Operators, Built-in Functions, List Type Built-in Methods, Special Features of Lists, Tuples, Tuple Operators and Built-in Functions, Special Features of Tuples, Introduction to Dictionaries, Operators, Built-in Functions, Built-in Methods, Dictionary Keys.

Unit 3 (15 Lectures)

Functions: Functions, Calling Functions, Creating Functions, Formal Arguments, Positional Arguments, Default Arguments, Default Function Object Argument Example, Variable-length Arguments, Non-keyword Variable Arguments (Tuple), Keyword Variable Arguments (Dictionary).

Classes: Problems in Procedure Oriented Approach, Features of Object Oriented Programming System (OOPS), Classes and objects, Encapsulation, Abstraction, Inheritance, Polymorphism.

Unit 4 (15 Lectures)

Files and Input/output: File Objects, File Built-in Function, File Built-in Methods, File Built-in Attributes, Standard Files, Command-line Arguments, File System, File Execution, Persistent Storage Modules, Using context managers with files.

Errors and Exceptions : Introduction to Exceptions, Exceptions in Python, Detecting and Handling Exceptions, Exceptions as Strings, Raising Exceptions, Assertions, Standard Exceptions, Regular Expressions, Special Symbols and Characters for Regular expressions.

Text/Reference Books:

1. Wesley J. Chun, "Core Python Programming", 2nd Edition, Pearson, 2007 (Reprint 2010).
2. Paul Barry, "Head First Python", 2nd Edition, O Rielly, 2010.
3. Mark Lutz, "Learning Python", 4th Edition, O Rielly, 2009.

Course Outcomes: At the end of the course, students will demonstrate the ability to:

1. Explain the various concept of Python Programming.
2. Apply the basic concepts of Python Programming for writing simpler programs in Python.
3. Apply the advance concepts of Python Programming for writing advance programs in Python.
4. Develop applications in Python.

Note:

1. In Semester Examinations, the paper setter will set two questions from each unit (total 8 questions in all), covering the entire syllabus. Students will be required to attempt only five questions, selecting atleast one question from each unit.

2. The use of scientific calculator will be allowed in the examination. However, programmable calculator, mobile phones or other electrical/ electronic items will not be allowed in the examination.

3. For students admitted in B.Tech. 1st Year (C-Scheme) in 2019 & onwards and all trailing students:

Examinations and evaluations of students shall be conducted, covering the entire syllabus, as per guidelines "AICTE Examination Reforms". Students shall be informed about these reforms.

SPEC381C Robotics Lab

B. Tech. (Hons./Minor degree) with Specialization in Robotics
3rd YEAR (SEMESTER –V)

L	T	P	Credits		
0	0	2	1	Class Work	: 25
				Examination	: 75
				Total	: 100
				Duration of Exam	: 3 Hours

List of Experiments:

1. Study of Robotic Arm.
2. Write a Programming to demonstrate working of Robotic Arm.
3. Study of Fire bird –V Robotic Platform.
4. Write a Programming to demonstrate working of Fire bird-V Robotic Platform.
5. Study of Hexpod Robotic Platform.
6. Write a Programming to demonstrate working of Hexpod Robotic Platform.
7. Study and working of Quad-copter.
8. Study and working of Scorbot-ER4u (A five degrees of freedom) robot along with its on hardware & software:
   a) Construction (Sketch) & its specifications.
   b) Components & their functions.
   c) Operating instructions.
   d) Safety instructions.
   e) Teach Pendant.
9. Programming of Scorbot-ER4u for loading and unloading a job along with its simulation.
10. Make a program for Scorbot-ER4u to weld (spot and seam welding) a job and simulate the code.

Text/ Reference Books:

1. R.K. Mittal and I. J. Nagrath, " Robotics and control", McGraw Hill,2003.
2. K. R. Guruprasad, " Robotics: Mechanics and control", PHI, 2019.
3. John J. Craig, " Introduction to Robotics: Mechanics and control",3rd Edition, Pearson, 2005.
4. Ashitava Ghosal, " Robotics: fundamental concepts and analysis", Oxford Pub, 2006.
5. Saeed B. Niku, " Introduction to Robotics: Analysis, control, applications", 2nd Edition, Wiley, 2010.
6. King-Sun Fu, C.S. George Lee and Ralph Gonzalez, "Robotics: control, sensing, vision and intelligence", 3rd Edition, McGraw Hill, 2004.

Course Outcomes: At the end of the course, students will demonstrate the ability to:

1. Analyze various Robotic Platforms.
2. Work on various Robotic Platforms.
3. Write basic programs for running various Robotic Platforms.
4. Perform small jobs with various Robotic Platforms.

Note:

1. Each laboratory class/section shall not be more than about 20 students.
2. To allow fair opportunity of practical hands on experience to each student, each experiment may be either done by each student individually or in group of not more than 3-4 students. Larger groups be strictly discouraged/disallowed.
3. Ten experiments are to be performed out of which at least seven experiments should be performed from the above list. Remaining three experiments should be performed from the above list or designed and set by the concerned department as per the scope of the syllabus.
4. Pre-experimental & post experimental quiz / questions may be offered for each lab experiment to reinforce & aid comprehension of the experiment.

SPEC308C Embedded Robotics

B. Tech. (Hons./Minor degree) with Specialization in Robotics
3rd YEAR (SEMESTER –VI)

L	T	P	Credits		
4	0	0	4	Class Work	: 25
				Examination	: 75
				Total	: 100
				Duration of Exam	: 3 Hours

Unit 1 (14 Lectures)

Introduction to Embedded Robotics: Introduction to Embedded System Design, Categories of ES, Overview of Embedded System Architecture, Recent Trends in Embedded Systems, Hardware Architecture of Embedded System, Real-time Embedded Systems and Robots, Robots and Robotics, Microprocessors and Microcontrollers, Microcontroller or Embedded Controller.

Unit 2 (16 Lectures)

AVR Microcontroller: Introduction to AVR microcontroller, features of AVR family microcontrollers, different types of AVR microcontroller, architecture, memory access and instruction execution, pipelining, program memory considerations, addressing modes, CPU registers, Instruction set, and simple operations.

Unit 3 (14 Lectures)

Features & Programming of AVR Microcontroller: Timer: Control Word, mode of timers, simple programming, generation of square wave, Interrupts: Introduction, Control word Simple Programming, generation of waveforms using interrupt, Serial interface using interrupt, Watch-dog timer, Power-down modes of AVR microcontroller, UART, SRAM, Programming of AVR microcontroller.

Unit 4 (16 Lectures)

Robotic Platforms & Applications: Introduction to Robotic Platforms such as Robotic Arm, Fire-fird, Hexpod, Quad-copter etc., Robotic Applications such as Motion Control, Line follower, Serial Communication, Zig-bee Communication, Automatic Cruise Control, Drone etc.

Text/ Reference Books:

1. S.K. Saha, "Introduction to Robotics", 2nd Edition, McGraw-Hill Higher Education, New Delhi, 2014.
2. Ashitava Ghosal, "Robotics- Fundamental Concepts and Analysis", Oxford, New Delhi, 2006.
3. Dhananjay V. Gadre, " Programming and customizing the AVR Microcontroller", McGraw-Hill, 2011.
4. Thomas Grace , " Programming and Interfacing Atmel AVR Microcontrollers", Cengage Learning PTR,2015.

Course Outcomes: At the end of the course, students will demonstrate the ability to:

1. Analyze basics concepts of embedded Robotics.
2. Write Program using AVR Microcontroller.
3. Work on various Robotic Platforms.
4. Develop applications based on these platforms.

Note:

1. In Semester Examinations, the paper setter will set two questions from each unit (total 8 questions in all), covering the entire syllabus. Students will be required to attempt only five questions, selecting atleast one question from each unit.

2. The use of scientific calculator will be allowed in the examination. However, programmable calculator, mobile phones or other electrical/ electronic items will not be allowed in the examination.

3. For students admitted in B.Tech. 1st Year (C-Scheme) in 2019 & onwards and all trailing students:

Examinations and evaluations of students shall be conducted, covering the entire syllabus, as per guidelines "AICTE Examination Reforms". Students shall be informed about these reforms.

SPEC388C Embedded Robotics Lab

B. Tech. (Hons./Minor degree) with Specialization in Robotics
3rd YEAR (SEMESTER –VI)

L	T	P	Credits		
0	0	2	1	Class Work	: 25
				Examination	: 75
				Total	: 100
				Duration of Exam	: 3 Hours

List of Experiments:

1. To study the Robotic Platforms (Fire Bird V).
2. Write a Program to demonstrate operation of Buzzer Beep using Fire Bird V Robotics Platform.
3. Design a Program to demonstrate I/O interfacing using Fire Bird V Robotics Platform.
4. Write a Program to demonstrate motion control using Fire Bird V Robotics Platform.
5. Write a Program to demonstrate position control using Fire Bird V Robotics Platform.
6. Design a Program to demonstrate velocity control using Fire Bird V Robotics Platform.
7. Write a Program to LCD interfacing using Fire Bird V Robotics Platform.
8. Write a Program to Serial Communication using Fire Bird V Robotics Platform.
9. Design a Program to demonstrate operation of white line follower using Fire Bird V Robotics Platform.
10. Write a Program to demonstrate operation of Adaptive Cruise control using Fire Bird V Robotics Platform.
11. Write a Program to Serial Communication via Zig Bee using Fire Bird V Robotics Platform.
12. Design a Program to demonstrate operation of Robotic Arm.
13. Write a Program to demonstrate operation of Hexapod.

Text/ Reference Books:

1. S.K. Saha, “Introduction to Robotics”, 2nd Edition, McGraw-Hill Higher Education, New Delhi, 2014.
2. Ashitava Ghosal, “Robotics- Fundamental Concepts and Analysis”, Oxford, New Delhi, 2006.
3. Dhananjay V. Gadre, “ Programming and customizing the AVR Microcontroller”, McGraw-Hill, 2011.
4. Thomas Grace, “ Programming and Interfacing Atmel AVR Microcontrollers”, Cengage Learning PTR,2015.

Course Outcomes: At the end of the course, students will demonstrate the ability to:

1. Write Program using AVR microcontroller.
2. Write interfacing programs using AVR microcontroller.
3. Develop robotics applications using AVR microcontroller.
4. Develop robotics applications using Robotic Platforms.

Note:

1. Each laboratory class/section shall not be more than about 20 students.
2. To allow fair opportunity of practical hands on experience to each student, each experiment may be either done by each student individually or in group of not more than 3-4 students. Larger groups be strictly discouraged/disallowed.
3. Ten experiments are to be performed out of which at least seven experiments should be performed from the above list. Remaining three experiments should be performed from the above list or designed and set by the concerned department as per the scope of the syllabus.

SPME401C Mechanics and Control in Robotics

B. Tech. (Hons./Minor degree) with Specialization in Robotics

4th YEAR (SEMESTER –VII)

L	T	P	Credits		
4	0	0	4	Class Work	: 25
				Examination	: 75

Total : 100
Duration of Exam : 3 Hours

Unit 1 (16 Lectures)

Introduction to Robotics, Coordinate frames, mapping and Transforms – coordinate frames, description of objects in space, transformation of vectors, inverting a homogeneous transform, fundamental rotation matrices, exercises.
Forward kinematics: mechanical structure and notations, description of links and joints, kinematic modelling of manipulator, Denavit-Hartenberg notation, kinematic relationship between adjacent links, manipulator transformation matrix.

Unit 2 (15 Lectures)

Inverse kinematics: Manipulator workspace, solvability of inverse kinematic model, solution techniques, closed form solution.
Manipulator differential motion and statics: relationship between transformation matrix and angular velocity, mapping velocity vector, velocity propagation along links, Manipulator Jacobian and its inverse, Jacobian singularities, exercises.

Unit 3 (15 Lectures)

Robot Dynamics: Lagrange mechanics, dynamic model of two degree of freedom manipulator, Lagrange-Euler formulation, Newton-Euler formulation; Inverse dynamics.
Trajectory planning: definition and planning tasks, steps in trajectory planning, joint space technique, Cartesian space techniques.

Unit 4 (14 Lectures)

Control of manipulators: Open and closed loop control, manipulator control problem, linear control schemes, characteristics of second-order linear system.
Joint Actuators – model of a DC motor; Partitioned PD control scheme, PID control scheme.

Text/ Reference Books:

1. R.K. Mittal and I. J. Nagrath, " Robotics and control", McGraw Hill,2003.
2. K. R. Guruprasad, " Robotics: Mechanics and control", PHI, 2019.
3. John J. Craig, " Introduction to Robotics: Mechanics and control",3rd Edition, Pearson, 2005.
4. Ashitava Ghosal, "Robotics- Fundamental Concepts and Analysis", Oxford, New Delhi, 2006.
5. Saeed B. Niku, " Introduction to Robotics: Analysis, control, applications", 2nd Edition, Wiley, 2010.
6. King-Sun Fu, C.S. George Lee and Ralph Gonzalez, "Robotics: control, sensing, vision and intelligence", 3rd Edition, McGraw Hill, 2004.

Course Outcomes: At the end of the course, students will demonstrate the ability to:

1. Analyze a manipulator through evaluation of forward kinematics, inverse kinematics and Jacobian singularities.
2. Formulate and evaluate the dynamics of robot.
3. Describe the trajectory planning techniques for robotic manipulators.
4. Analyze the control problems and apply the control schemes for manipulators and actuators.

Note:

1. In Semester Examinations, the paper setter will set two questions from each unit (total 8 questions in all), covering the entire syllabus. Students will be required to attempt only five questions, selecting atleast one question from each unit.

2. The use of scientific calculator will be allowed in the examination. However, programmable calculator, mobile phones or other electrical/ electronic items will not be allowed in the examination.

3. For students admitted in B.Tech. 1st Year (C-Scheme) in 2019 & onwards and all trailing students:

Examinations and evaluations of students shall be conducted, covering the entire syllabus, as per guidelines "AICTE Examination Reforms". Students shall be informed about these reforms.

Deenbandhu Chhotu Ram University of Science & Technology, Murthal (Sonepat)
Scheme of Studies & Examinations under Choice Based Credit System
Programme: B. Tech. in Mechanical Engineering; Year – 4th (Semester – VII); w.e.f. Session: 2021-22

S. No.	Course Code	Course Title	Teaching Schedule			Marks of Class Work	Examination Marks		Total	Credit	Duration of Exam
			L	T	P		Theory	Practical			
1	ME 401C	Automation in Manufacturing	3	0	0	25	75	-	100	3	3
2	ME 403C	Refrigeration and Air Conditioning	3	0	0	25	75	-	100	3	3
3		Professional Elective – III	3	0	0	25	75	-	100	3	3
4		Open Elective-II	3	0	0	25	75	-	100	3	3
5	ME 405C	Laboratory – V (Manufacturing)	0	0	2	25	-	75	100	1	3
6	ME 407C	Professional Training (Level III)	0	0	2	100	-	-	100	2	3
7	ME 409C	Minor Project	0	0	10	100	-	-	100	5	3
Total			12	0	14	325	300	75	700	20	

List of OPEN ELECTIVE-II courses (A Student has to select any one)

S. No.	Course Code	Course Title
1	CSE305C	Computer Network
2	CSE431C	Cyber Security
3	CHE457C	Industrial Safety
4	CE406C	Disaster Management
5	ECE327C	Consumer Electronics

List of Professional Electives – III Courses (A Student has to select any one)

S. No.	Course Code	Course Title
1	ME 421C	Power Plant Engineering
2	ME 423C	Mechanical Vibration
3	ME 425C	Supply Chain Management
4	ME 427C	Mechatronic Systems

Deenbandhu Chhotu Ram University of Science & Technology, Murthal (Sonepat)
Scheme of Studies & Examinations under Choice Based Credit System
Programme: B. Tech. in Mechanical Engineering; Year – 4th (Semester – VIII); w.e.f. Session: 2021-22

A student can opt either Alternative-A or Alternative-B of the VIIIth semester scheme. In Alternative-A, students will undergo regular course work. Alternative-B includes one semester (minimum 16 weeks) internship/industrial training course. Students can opt Alternative-B only if he/she fulfills the pre-requisites as per guidelines given below the scheme.

Alternative - A

S. No.	Course Code	Course Title	Teaching Schedule			Marks of Class Work	Examination Marks		Total	Credit	Duration of Exam
			L	T	P		Theory	Practical			
1		**Professional Elective-IV**	3	0	0	25	75	-	100	3	3
2		**Professional Elective -V**	3	0	0	25	75	-	100	3	3
3		**Professional Elective -VI**	3	0	0	25	75	-	100	3	3
4		Open Elective-III	3	0	0	25	75	-	100	3	3
5	ME 402C	Major Project	0	0	16	25	-	75	100	8	3
	ME 406C	General Fitness for the Profession	-	-	-			100	100	-	-
Total			**12**	**0**	**16**	**125**	**300**	**175**	**600**	**20**	

Professional Elective – IV Courses (A Student has to select any one)			**Professional Elective – V Courses (A Student has to select any one)**		
S. No.	**Course Code**	**Course Title**	**S. No.**	**Course Code**	**Course Title**
1	ME 422C	Industrial Engineering and Management	1	ME 432C	Computing Techniques
2	ME 424C	Energy Conservation and Management	2	ME 434C	Finite Element Analysis
3	ME 426C	Machine Tool Design	3	ME 436C	Modern Manufacturing and Materials

Professional Elective – VI Courses (A Student has to select any one)		
1	ME 442C	Automobile Engineering
2	ME 444C	Design of Transmission Systems
3	ME 446C	Principles of Management
4	ME448C	Process Planning and Cost Estimation

List of Open Elective-III (A Student has to select any one)					
S. No.	Course Code	Course Title	S. No.	Course Code	Course Title
1	CSE340C	Artificial Intelligence & Expert Systems	4	ME452C	Fundamentals of Sustainable Manufacturing
2	EE452C	Electrical and Hybrid Vehicles	5	CHE459C	Nano-Science and Nano-Technology
3	MGT401C	Entrepreneurship	6	EE454C	Smart Grid

Alternative – B

S. No.	Course Code	Course Title	Teaching Schedule			Marks of Class Work	Examination Marks		Total	Credit	Duration of Exam
			L	T	P		Theory	Practical			
1	ME 404C	Internship	-	-	-	250	-	250	500	20	3
2	ME 406C	General Fitness for the Profession	-	-	-			100	100	-	-
Total			**-**	**-**	**-**	**250**	**-**	**350**	**600**	**20**	

A) Guidelines for Internship

A student can opt for Internship (minimum 16 weeks) in 8th semester, in lieu of course work of 8th semester, in joint supervision of internal supervisor (allotted by the Department) and the supervisor/official of the organization under whom the candidate is associated for internship. A student can arrange the internship at his/her own and arranging internship for a student by the Department is never his/her right.

Pre-requisite conditions:

The student has got selected through on-campus/off-campus placement and the same employer is willing to take that student for the Internship.

The student has got offer of pursuing Internship from Government research organization/govt. sponsored projects IIT'S/IIIT'S/IIMs/CDAC.

The student has got offer of pursuing Internship from reputed private organization.

For pursuing Internship, student will require the prior approval of the Director/Principal of the institute or Chairperson of the University Department. While allowing Internship, the institute/department concerned must insure that the proposed Internship schedule does not disturb the academic calendar in force. The candidate should submit a synopsis of the proposed work to be done during Internship. This synopsis should be submitted to the Department before the start of the internship semester. The synopsis received will be examined/evaluated by the Departmental committee. The student will be allowed for internship only after approval of synopsis by the Departmental committee.

Intimation of commencement of internship shall be submitted to the Chairperson concerned before the commencement of the ongoing semester.

They will have to further deposit the 8th Semester fee. The internship will not be permitted through online mode

If a student feels that the internship work is not of high quality/not-related to their field of interest, then he/ she should submit the application to the Department within two weeks and can re-join the institute to carry out the course work of 8th Semester.

The internal supervisor will monitor the student specific progress of the internship. The overall monitoring of industrial training has to be done by a Departmental Faculty Co-coordinator for Internship.

The Departmental Faculty Co-coordinator will be allotted total weekly teaching load of 2 periods, while each internal supervisor will be allotted total weekly teaching load of 1 period (supervising upto 4 students), and 2 periods , if supervising more than 4 students.

Evaluation Process:

Each student will submit 3 copies of the detailed internship report to the Department in prescribed format at the conclusion of training.

Internal assessment/ Sessional of Internship will be made jointly by the Departmental Faculty Co-coordinator for Internship, the concerned organization training supervisor/official and internal supervisor.

Assessment by the External supervisor/Mentor = 40% of Internal Assessment Marks

Assessment by the internal supervisor and Departmental Faculty Co-coordinator for Internship = 60% of Internal Assessment Marks

Practical Examination Assessment of Internship will be made by the committee consisting of the Chairperson of the Department, Departmental Faculty Co-coordinator for Internship and one external examiner appointed by the University.

ME 401C Automation in Manufacturing
B. Tech. Semester – VII (Mechanical Engineering)

L	T	P	Credits			
3	0	0	3	Class Work	:	25 Marks
				Examination	:	75Marks
				Total	:	100 Marks
				Duration of Examination	:	3 Hours

Course Objectives: This course is intended to provide the knowledge of tools and technologies for automation of manufacturing processes and systems. This course gives students the knowledge of hardware tools that enable automation as well as the software tools and systems that help in the integration of different manufacturing resources and functions including FMS, Robots and CIMS.

Course Outcomes: At the end of the course, the student will be able to:

CO1: Underline the importance of automation for manufacturing industries.

CO2: Describe the elements and tools that facilitate manufacturing automation.

CO3: Illustrate the advantages of integration of different types on automation tools in NC based systems.

CO4: Describe the functional tools for CIMS: CAM, CAD, MRP, ERP, CAPP etc.

UNIT I

Automation Tools: Automation and types, reasons for automation, Automation, Manufacturing Flexibility and Competitiveness, Basic elements of an Automated System: Sensors, Actuators, Analog-to-Digital and Digital-to-Analog Converters, Input/ Output Devices for Discrete Data, PLC and Micro-controllers
Low Cost Automation: Mechanical & Electro-Mechanical Systems, Pneumatics and Hydraulics, Illustrative Examples and case studies

UNIT II

Computer Aided Design: Fundamentals of CAD -Hardware in CAD-Computer Graphics Software and Data Base, Geometric modeling for downstream applications and analysis methods

Numerical Control (NC): Fundamentals of NC Technology and advantages in Manufacturing, NC Machines and types, Computer Numerical Control, Distributed Numerical Control, Machining Centers, Brief introduction of NC Part Programming. Adaptive Control in CNC

UNIT III

Robotic Technology: Common robot configurations, types of robot control, accuracy and repeatability, interlocks, advantages and disadvantages. Brief review of Robot programming languages, Applications of Robots, AGV, AS/RS systems

Automated Flow Lines: methods of work part transport, Transfer Mechanisms, buffer storage, automation for machining operations, part feeding devices, Brief review of automated assembly systems and types

UNIT IV

Flexible Manufacturing Systems (FMS): Components of an FMS, FMS work stations. Material handling and storage systems for FMS, FMS layout configurations, Computer control system in FMS and its functions, Planning the FMS, FMS applications and benefits

Computer Integrated Manufacturing Systems (CIMS): Elements of CIMS, Brief Review of Computer aided process Planning, MRP, Capacity Planning, MRPII and ERP, Computer aided quality control, Brief review of Shop floor Control systems and Computer Process Monitoring

TEXT BOOKS:

1. Automation, Production Systems and Computer Integrated Manufacturing: Groover M.P, Prentice Hall of India.
2. CAD/CAM: Groover M.P, Zimmers E.W, Prentice Hall of India.

REFERENCE BOOKS:

1. Approach to Computer Integrated Design and Manufacturing: Nanua Singh, John Wiley and Sons, 1998.
2. Production Management Systems: A CIM Perspective: Browne J, Harhen J, Shivnan J, Addison Wesley, 2nd Ed. 1996.
3. Computer control of manufacturing system, Yoram Koren, 1st edition, McGraw Hill Education
4. CAD/CAM: Theory & Practice, Ibrahim Zeid , 2nd edition, McGraw Hill Education

ME 403C Refrigeration and Air Conditioning

B. Tech. Semester – VII (Mechanical Engineering)

L	T	P	Credits			
3	0	0	3	**Class Work**	**:**	**25 Marks**
				Examination	**:**	**75Marks**
				Total	**:**	**100 Marks**
				Duration of Examination	**:**	**3 Hours**

Course Objectives: A student who has done the course will have a good understanding of the working principles of refrigeration and air-conditioning systems.

Course Outcomes: At the end of the course, the student will be able to:

CO1: Explain the basic refrigeration processes, refrigerants and their environmental impacts.

CO2: Discuss the basics of psychrometry and the practices in applied psychrometrics.

CO3: Describe the uses of sorption technologies in refrigeration and Air-conditioning.

CO4: Model and analyze refrigeration cycles and design different refrigeration as well as air conditioning processes.

Unit I (10)

Chapter 1: Fundamentals of Refrigeration and Air-conditioning (A/C); unit of refrigeration; COP of refrigeration systems; Methods of refrigeration; Classification of refrigeration systems; Refrigerant's nomenclature and classification; refrigerants and their mixtures: properties and characteristics; Eco friendly refrigerants; Ozone depletion and global warming issues of refrigerants.

Chapter 2: Necessity of cooling the aeroplane; Reversed Brayton air refrigeration cycle; Different Air craft refrigeration systems- Simple cooling and Simple evaporative types, Boot strap and Boot strap evaporative types, Regenerative type and Reduced Ambient type system.

Unit II (11)

Chapter 3: Limitations and Modifications of Reversed Carnot cycle; Vapor compression refrigeration (VCR) cycle; analysis and effect of operating conditions on VCR cycle like subcooling, superheating, using Liquid vapor regenerative heat exchanger etc; actual VCR cycle; introduction to advanced vapour compression cycles.

Chapter 4: Multipressure systems- multistage, multi evaporator and cascade sysyem.VCR System components: Compressors, Condensers, Expansion devices and Evaporators; Performance matching of components of refrigeration systems.

Unit III (11)

Chapter 5: Review of Psychrometry and Air-conditioning: Psychrometric properties of moist air, Psychrometric chart, Bypass factor,efficiency of cooling coil, Various Air-conditioning processes; A/C load calculations ; and applied Psychrometrics; Comfort air conditioning, Indoor air quality.

Chapter 6: Heat and moisture transfer in A/C apparatus - Enthalpy potential; Air washers, Cooling towers, Evaporative condensers; Cooling and dehumidifying coils. Duct design.

Unit IV (10)

Chapter 7: Absorption Refrigeration Systems – COP of the System, Performance, Relative merits and demerits as compared to VCR system; Aqua ammonia based vapor absorption refrigeration (VAR) system and LiBr-H2O based VAR system and components like absorber, generator etc.

Chapter 8: Introduction to advanced Sorption refrigeration systems - absorption and adsorption type systems; Desiccant based refrigeration system and components. Applications of A/C systems in different industries like food processing and preservation etc.

Text Books:

1. Gosney, W.B, *Principles of Refrigeration*, Cambridge University Press,1982
2. Stoecker, W.F. and Jones, J.W., *Refrigeration and Air conditioning*, Tata McGraw Hill, 1986.
3. Arora, C.P., *Refrigeration and Air conditioning*, Tata McGraw Hill, 2nd Edition, 2000.
4. Kuehn, T.H., Ramsey, J.W. and Threlkeld, J.L., *Thermal Environmental Engineering*, 3rd Edition, Prentice Hall, 1998

Reference books:

1. R.C. Jordan and G.B. Priester ,*Refrigeration & Air conditioning*, Prentice Hall of India.
2. Arora & Domkundwar ,*A course in Refrigeration & Air Conditioning*, Dhanpat Rai & Sons,2018.
3. Manohar Prasad ,*Refrigeration & Air conditioning*, New Age International Publisher 2nd edition, 2003.

ME 405C Mechanical Engineering Laboratory III (Manufacturing)
B. Tech. Semester – VIII (Mechanical Engineering)

L	T	P	Credits			
0	0	2	1	Class Work	:	25 Marks
				Examination	:	75Marks
				Total	:	100 Marks
				Duration of Examination	:	3 Hours

Course objectives:

1. To understand and interpret drawings of machine components and assembly leading to preparation of production drawings manually and using CAD software (e.g. AutoCAD).
2. To get an idea of the dimensional & form accuracy of products
3. To provide an understanding of advanced manufacturing methods.

Course Outcomes: At the end of the course, the student will be able to:

CO1: Prepare part and assembly drawings manually and using any drafting software tool.

CO2: Draw and draft manuscript for production of jobs.

CO3: Apply appropriate limits and tolerances on parts and decide the type of fits on assemblies.

CO4: To perform different operations on conventional, NC machines, EDM and robots.

List of Experiments:

1) Draw and Draft the orthographic views of any two of the following components:
   a) Hexagonal Square bolt, nut and washer assembly.
   b) Collar Joint
   c) Knuckle Joint
   d) Flanged Coupling
2) Draw the orthographic views of any two of the following assemblies using drafting software.
   a) Universal Coupling
   b) Split Muff Coupling
   c) Oldham Coupling
   d) Tailstock of Lathe
   e) Tool-post of the Lathe
3) Prepare the Process plan and Fabricate/Manufacture one product, which has been drawn and drafted by the student from the list given at exp. No. 1.
4) Disassemble/assemble the product physically on shop floor for which the drawing has been prepared at exp. No. 2 as per appropriate disassembly/assembly plan.
5) Perform Taper turning and external thread cutting using lathe.
6) Perform Contour milling using vertical milling machine.
7) Develop part program for a sample part containing point-to-point and contouring tool movements.
8) Perform Drilling of a hole using EDM.
9) Perform robot programming and operation of a robot for pick & place operation.
10) Measure the dimension and surface finish of the product fabricated at experiment no. 3 / 4.

Books:

1. Machine Drawing with AutoCAD, by Gowtham Pohit and Goutam Ghosh, Pearson Education, Delhi
2. Fundamentals of machine drawing, by Sadhu Singh, PHI New Delhi
3. Machine drawing Includes AutoCAD supplements, by Basudeb Bhattacharyya, Oxford New Delhi, 2015
4. Textbook of machine drawing, by P S Gill, S K Kataria New Delhi, 2016
5. Machine drawing, by N.D Bhatt, India Charotar, 1987

ME 407C Professional Training (Level – III)

B. Tech. Semester – VII (Mechanical Engineering)

Duration of Training	**Credits**	**Class Work**	**:**	**100 Marks**
4-6 weeks	2	**Total**	**:**	**100 Marks**

Professional Training is aimed to provide practical experience to the interns in his/her field or discipline to achieve the following objectives:

- To expose Technical students to the industrial environment, which cannot be simulated in the classroom and hence, creating competent professionals in the industry.
- To Provide possible opportunities to learn, understand and sharpen the real time technical / managerial skills required in the job.
- To gain experience in writing Technical reports/projects.
- To expose students to the engineer's responsibilities and ethics.
- To familiarize with various materials, processes, products and their applications along with the relevant aspects of quality control.
- To promote academic, professional and/or personal development.
- To expose the students to future employers.
- To understand the social, economic and administrative considerations that influence the working environment of industrial organizations
- To understand the psychology of the workers and their habits, attitudes and approach to problem solving.

Course Outcomes:

CO1: Capability to execute and report industrial projects as a team with moral and ethical standard.

CO2: Ability to draft technical/ project reports.

CO3: Ability to use academic expertise in industrial/professional domain.

CO4: Communicate effectively on professional issues.

At the end of 6th semester each student would undergo four to six weeks Professional Training in an Industry/ Institute/ Professional / Organization/ Research Laboratory etc. with the prior approval of the Chairman of the department/Training and Placement Officer of the University and submit in the department a typed report along with a certificate from the organization.

Every student is required to submit a typed report in a prescribed format. The report should contain the activities done by him. The report should also contain the student's Diary / Daily log. The students should record day-to-day account of the observations, impressions, information gathered and suggestions given, if any in the training diary. It should contain the sketches & drawings related to the observations made by the students. The diary should also be shown to the Faculty Mentor visiting the industry from time to time.

The evaluation of Professional Training/Project will be done by a departmental committee in the 7th semester as per time table allocated by the department. The evaluation committee will consist of teachers from different specialization to be constituted by the Chairperson of the department. The student will interact with the committee through presentation to demonstrate his/ her learning. Evaluation will be done on the basis of the following criteria/weightage:

- Regularity in maintenance of the diary (20%)
- Quality of training report (40%)
- Presentation (Quality of content (20%)
- Effectiveness of presentation/Communication skill (20%)

ME 409C Minor Project

B. Tech. Semester – VII (Mechanical Engineering)

L	T	P	Credits			
0	0	10	5	**Class Work**	**:**	**100 Marks**
				Examination (Practical)	**:**	**0 Marks**
				Total	**:**	**100 Marks**
				Duration of Examination	**:**	**3 Hours**

This course is a group activity to be undertaken by a group of 4-5 students under the guidance of a faculty supervisor assigned by the department. The primary objective of this course is to develop in students the professional quality of synthesis employing technical knowledge obtained in the field of Engineering & Technology through a project work involving design, analysis augmented with creativity, innovation and ingenuity. Minor Project involving design/ fabrication/ testing/ computer simulation/ case studies etc. is to be undertaken in the VII Semester. In this semester the student is expected to complete the study/modeling/ design part of the project. The students, who opt to undertake course work during the VIIIth semester can extend the same project as Major Project in VIIIth Semester.

Course Outcomes: At the end of the course, the student will be able to:

CO1: Apply academic knowledge to complete technical project as a team.

CO2: Use professional capability towards Design, Innovation and creative solution.

CO3: Prepare project reports.

CO4: Effectively communicate on projects undertaken.

The assessment of the class work for Major Project will be evaluated through two presentations, with equal weightage, before the committee consisting of the following:

a. Chairman of the Department or his nominee
b. Major Project coordinator
c. The Project supervisor: Member

The student will be required to submit two copies of his/her project report to the department for record (one copy each for the department and participating teacher). The format of the cover page and the organization of the body of the report will be finalized and circulated by Project coordinator.

The Assessment will comprise of the following elements for evaluation:

- Quality of Modeling and Technical Detail: 40 Marks
- Adequacy and quality of Project: 20 Marks
- Quality of project reports: 20 Marks.
- Effectiveness of presentation/Communication skill and Team Work: 20 Marks

Project coordinator will be assigned the project load of maximum of 2 hours per week including his own guiding load of one hr. However, the guiding teacher will be assigned maximum of one period of teaching load irrespective of number of students/groups under him/her.

ME 421C Power Plant Engineering
B. Tech. Semester – VII (Mechanical Engineering)

L	T	P	Credits			
3	0	0	3	Class Work	:	25 Marks
				Examination	:	75Marks
				Total	:	100 Marks
				Duration of Examination	:	3 Hours

Course Outcomes: At the end of the course, the student will be able to:

CO1: Explain the basics of Power Plants and Power Plant Economics.
CO2: Analyze the thermodynamic cycles for power generation.
CO3: Describe power generation in different types of Power Plants by renewable and non-renewable energy resources.
CO4: Discuss the developments in Power Plants, their applications, Safety and Environmental issues.

UNIT-I

INTRODUCTION: Energy resources and their availability, types of power plants, selection of the plants, review of basic thermodynamic cycles like Rankine, Brayton, Binary vapor power cycle, Combined cycle etc used in power plants. Environmental aspects of power generation

POWER PLANT ECONOMICS: Load curve, different terms and definitions, principles of power plant design, location of power plant, layout and cost analysis

UNIT II

STEAM POWER PLANTS: Flow sheet and working of modern-thermal power plants, requirements of steam stations, site selection; Coal storage, Preparation, Coal handling systems, Feeding and burning of pulverized fuel, Ash handling systems, Dust collection system; electrostatic precipitator.

COMBINED STEAM AND GAS CYCLES: Constant pressure gas turbine power plants, Arrangements of combined plants, re-powering systems with gas production from coal, using PFBC systems; Integrated Gasification based Combined Cycle (IGCC) systems.

UNIT III

HYDRO ELECTRIC POWER PLANTS: Introduction: classification, typical layout and components, site selection, Advantages and disadvantages, Rainfall and run off Measurements, Hydrograph.

NUCLEAR POWER PLANTS: Principles of nuclear energy, basic components of nuclear reactors, site selection, nuclear reactors-PWR,BWR, CANDU, Fast breeder, gas cooled and liquid metal cooled reactors Advantages and limitations, safety measures for nuclear power plants.

UNIT IV

NON-CONVENTIONAL POWER GENERATION: Solar energy -Solar radiation estimation, solar energy collectors, low, medium & high temperature power plants; OTEC; Wind power plants; Tidal power plants and Geothermal power plants.

DIRECT ENERGY CONVERSION SYSTEMS: Fuel cell, MHD power generation-principle, open & closed cycle's systems; thermoelectric power generation; thermionic power generation.

TEXT BOOKS:

1. Power Plant Engineering : Manoj kumar Gupta, PHI learning ,First Edition 2012
2. Power Plant Engineering : R.K. Rajput, Laxmi Publication ,Fourth Edition 2008
3. Power station Engineering and Economy by Bernhardt G.A. Skrotzki and William A. Vopat – Tata McGraw Hill Publishing Campany Ltd., New Delhi .

REFERENCE BOOKS:

1. Power Plant Engg. : M.M. El-Wakil, McGraw Hill 1985.
2. Power Plant Engineering : P.K. Nag Tata McGraw Hill second Edition 2001

ME 423C Mechanical Vibrations

B. Tech. Semester – VII (Mechanical Engineering)

L	T	P	Credits			
3	0	0	3	Class Work	:	25 Marks
				Examination	:	75Marks
				Total	:	100 Marks
				Duration of Examination	:	3 Hours

Course Outcomes: At the end of the course, the student will be able to:

CO1: Analyze the vibration of mechanical systems with single degree of freedom system and the implications of vibration.

CO2: Calculate different vibration parameters under forced vibration.

CO3: Use numerical technique to analyze vibration in two & multi degree of freedom system.

CO4: Discuss different types of equipments and processes for vibration measurement and condition Monitoring.

UNIT I

Basic Concept & Single Degree Of Freedom System - Undamped and Damped

Classifications of Vibrations: Free and Forced, Undamped and Damped, Linear and Non-linear, Deterministic and Random Harmonic Motion, Vector and Complex Number Representations Single Degree of Freedom system

Governing equations using D'Alembert's Principal Determination of natural frequency of vibratory systems using Energy Method, Equivalent systems concept of viscous damping, response of Free Damped Vibrations (Under Damping, Critical and Over Damping), Logarithmic Decrement

UNIT II

Forced Vibrations

Governing equation under harmonic excitation and response using techniques of calculus and phasor diagram, Magnification factor, Active and passive vibration isolation, Forced and Motion Transmissibility, Rotating and Reciprocating unbalance, Critical Speeds and Whirling of Rotating Shafts, Vibration isolation materials, Transient Response Impulse Excitation, Response to Step Excitations

UNIT III

Multi Degree Freedom System and Numerical Techniques

Two Degrees of Freedom Systems, Normal Mode Vibrations, Coordinate Coupling, Principal Coordinates, Free Vibrations in Terms of Initial Conditions, Forced Harmonic Vibrations, Simple Vibration Absorber, Multi degrees of Freedom Systems, Eigen value problems-close coupled system and far coupled systems using influence coefficient, Natural Frequencies and Normal Modes, Orthogonality of Normal Modes

Method of Matrix Iteration, Introduction to vibration of continuous system with the help of lateral vibration of Beam, Dunkerley's method, Rayleigh's method

UNIT IV

Vibration Measurement and Condition Monitoring

Principle of seismometer and accelerometer, Basic Vibration measuring setups- amplitude and phase measurement; vibration pick-ups, Working principle of piezoelectric accelerometer, Eddy current based displacement probe, Bending critical speed of simple shaft, Fourier series and Fourier transform, Condition monitoring- its need and types; vibration signals in a rotating machines.

Books:

1. Theory of Vibrations with Applications W.T. Thomson, Prentice Hall of India.
2. Mechanical Vibration : G.K. Grover and S.P. Nigam, Nem Chand and Sons
3. Theory and Practice of Mechanical Vibrations J.S. Rao and K. Gupta, Wiley Eastern Ltd.
4. Mechanical Vibrations S.S. Rao, Addison – Wesely Publishing Company

ME425C Supply Chain Management

B. Tech. Semester – VII (Mechanical Engineering)

L	T	P	Credits			
3	0	0	3	**Class Work**	**:**	**25 Marks**
				Examination	**:**	**75 Marks**
				Total	**:**	**100 Marks**
				Duration of Examination	**:**	**3 Hours**

Course Outcomes: At the end of the course, the student will be able to:

CO1: Explore the processes, drivers, initiatives and tools for the management of Supply chain (SC) Systems.
CO2: Explore SC distribution network and methods for management of supply and Demand.
CO3: Model forecasting, Aggregate Planning and Inventory planning issues in SC.
CO4: Describe transportation and sourcing decisions and related performance improvement initiatives in SC.

Unit-I

Introduction: Supply Chain (SC), Objectives and Role of SC in competiveness of firms, SC processes, Decision Phases in SC and their Importance, Process Views of a Supply Chain, process of achieving Strategic Fitness, SC levers to manage uncertainty, Scope for strategic fitness in SC and its Challenges, Case examples of Supply Chains.

SC Drivers and Matrices: SC Performance Measures, Drivers of SC Performance: Facilities, Inventory, Transportation, Information, Sourcing, Pricing; their matrices, Framework for Structuring SC Drivers.

Unit-II

SC Distribution Networks: Role of Distribution, Factors affecting Distribution Network Design, Distribution Networks types and performance characteristics, brief review of online sales and the Distribution Network, Factors Influencing Network Design Decisions, Specific features of Global SC networks

Planning in SC:; Role and Characteristics Forecasting in SC, Forecast components, Forecasting methods and Error, Aggregate Planning (AGP); Role and Strategies, Linear Programming model for AGP, Management of supply through Capacity change, inventory control, subcontracting, risk pooling and backlogs, Management of demand through price discount and promotion, numerical problems.

Unit-III

SC Coordination: Importance of Coordination in SC, Bullwhip Effect and its impact on SC performance, Obstacles to Coordination in a Supply Chain, Managerial Decisions to Achieve Coordination, Continuous Replenishment, Vendor-Managed Inventories, Collaborative Planning, Forecasting, and Replenishment, Different IT initiatives for SCM

Inventory Management in SC: Role of Cycle and Safety Inventory and their models, Economies of Scale to Exploit Fixed Costs, Quantity Discounts, Short-Term Discounting, Trade Promotions, Managing Multi-echelon Cycle Inventory, Impacts of Supply Uncertainty, Aggregation and Replenishment Policies on Safety Inventory, Safety Inventory in a Multi-echelon Supply Chain, Postponement and its effects on SC performance.

Unit-IV

Transportation in SC: The Role of Transportation in a SC, Modes of Transportation and Their Performance Characteristics, Design Options and Trade-off in Transportation Network Design, Risk Management in Transportation, Closed-Loop Supply Chains.

Sourcing Decision in SC: The Role of Sourcing in a Supply Chain, In-House or Outsource decision, Third- and Fourth-Party Logistics Providers, Supplier Selection—Auctions and Negotiations, Contracts, Risk Sharing, and Supply Chain Performance. Risk Management in Sourcing.

TEXT BOOKS:

1. Supply Chain Management- Chopra S., Meindl P., and Kalra D.V., 7e, Pearson Education
2. Designing And Managing the Supply Chain: Concepts, Strategies and Case studies- Simchi Levi D., Simchi Levi E., Kaminsky P., and Shankar R., 3e, TMH

REFERENCES BOOKS:

1. Logistics & Supply Chain Management – Martin Christopher, 5e, FT Publishing

Note:

1. In Semester Examinations, the examiner will set two questions from each unit (total 8 questions in all) covering the entire syllabus. The students will be required to attend only five questions selecting atleast one question from each unit.
2. The use of scientific calculator will be allowed in the examination. However, programmable calculator and cellular phone will not be allowed.

For student admitted in B. Tech. 1st Year (C-Scheme) in 2019 and all trailing students.

ME427C Mechatronic Systems
B. Tech. Semester – VII (Mechanical Engineering)

L	T	P	Credits			
3	0	0	3	**Class Work**	**:**	**25 Marks**
				Examination	**:**	**75 Marks**
				Total	**:**	**100 Marks**
				Duration of Examination	**:**	**3 Hours**

Course Outcomes: At the end of the course, the student will be able to:

CO1: Describe the structure of microprocessors and their applications in mechanical devices
CO2: Explain the principle of automatic control and real time motion control systems, with the help of electrical drives and actuators
CO3: Discuss the types of drives & actuators and their applications in various fields
CO4: Explain the uses of smart materials, micro-sensors and microprocessors in medical and Industrial applications.

UNIT I

Introduction: Definition of Mechanical Systems, Philosophy and approach; Systems and Design: Mechatronic approach, Integrated Product Design, Modeling, Analysis and Simulation, Man-Machine Interface;

Sensors and transducers: classification, Development in Transducer technology, Optoelectronics- Shaft encoders, CD Sensors, Vision System, etc.

UNIT II

Drives and Actuators: Hydraulic and Pneumatic drives, Electrical Actuators such as servomotor and Stepper motor, Drive circuits, open and closed loop control; Embedded Systems:

Hardware Structure, Software Design and Communication, Programmable Logic Devices, Automatic Control and Real Time Control Systems;

UNIT III

Smart materials: Shape Memory Alloy, Piezoelectric and Magnetostrictive Actuators: Materials, Static and dynamic characteristics, illustrative examples for positioning, vibration isolation, etc.

Micromechatronic systems: Microsensors, Microactuators; Micro-fabrication techniques

UNIT IV

LIGA Process: Lithography, etching, Micro-joining etc. Application examples; Case studies, Examples of Mechatronic Systems from Robotics Manufacturing, Machine Diagnostics, Road vehicles and Medical Technology.

Text Books:

1) Mechatronics System Design, Devdas Shetty & Richard A. Kolk, PWS Publishing Company (Thomson Learning Inc.)
2) Mechatronics: A Multidisciplinary Approach, William Bolton, Pearson Education
3) A Textbook of Mechatronics ,R.K.Rajput, S. Chand & Company Private Limited
4) Mechatronics: Electronic Control Systems in Mechanical and Electrical Engineering, William Bolton, Prentice Hall

Open Elective II: CSE 305C Computer Networks
B. Tech. Semester – VII (Mechanical Engineering)

L	T	P	Credits
3	0	0	3

Class Work	**:**	**25 Marks**
Examination	**:**	**75 Marks**
Total	**:**	**100 Marks**
Duration of Examination	**:**	**3 Hours**

Unit 1 (10 Lectures)

OSI Reference Model and Network Architecture: Introduction to Computer Networks, Example Networks ARPANET, Internet, Private Networks, and Network Topologies: Bus, Star, Ring, Hybrid, Tree, Complete, Irregular –Topology; Types of Networks: Local Area Networks, Metropolitan Area Networks, Wide Area Networks; layering architecture of networks, OSI model, Functions of each layer, Services and Protocols of each layer.

Unit 2 (10 Lectures)

TCP/IP: Introduction, History of TCP/IP, Layers of TCP/IP, Protocols, Internet Protocol, TransmissionControl Protocol , User Datagram Protocol, IP Addressing, IP address classes, Subnet Addressing, Internet Control Protocols, ARP, RARP, ICMP, Application Layer, Domain Name System, Email – SMTP, POP,IMAP; FTP, NNTP, HTTP, Overview of IP version 6.

Unit 3 (10 Lectures)

Local Area Networks: Introduction to LANs, Features of LANs, Components of LANs, Usage of LANs, LAN Standards, IEEE 802 standards, Channel Access Methods, Aloha, CSMA, CSMA/CD, Token Passing, Ethernet, Layer 2 & 3 switching, Fast Ethernet and Gigabit Ethernet, Token Ring, LAN interconnecting devices: Hubs, Switches, Bridges, Routers, Gateways.

Unit 4 (10 Lectures)

Wide Area Networks: Introduction of WANs, Routing, Congestion Control, WAN Technologies, Distributed Queue Dual Bus (DQDB), Synchronous Digital Hierarchy (SDH)/ Synchronous Optical Network (SONET), Asynchronous Transfer Mode (ATM), Frame Relay, Wireless Links.
Introduction to Network Management: Management, Class of Service, Quality Firewalls, VLANs, Proxy Servers. Remote Monitoring Techniques: Polling, Traps, Performance of Service, Security management, Digital signatures, SSL.

Text/Reference Books:

1. Computer Networks (3rd edition), Tanenbaum Andrew S., International edition, 1996.
2. Data Communications, Computer Networks and Open Systems (4th edition), Halsall Fred, 2000, Addison Wesley, Low Price Edition.
3. Business Data Communications, Fitzgerald Jerry, Computer Networks – A System Approach, Larry L. Peterson & Bruce S. Davie, 2nd Edition.

Course Outcomes: After completing the course, student will demonstrate the ability to:

1. To understand the organization of computer networks, factors influencing computer network development and the reasons for having variety of different types of networks.
2. To apply knowledge of different techniques of error detection and correction to detect and solve error bit during data transmission.
3. To design a network routing for IP networks.
4. To demonstrate proper placement of different layers of ISO model and illuminate its function and determine proper usage of the IP address, subnet mask and default gateway in a routed network.

Note:

1. In Semester Examinations, the paper setter will set two questions from each unit (total 8 questions in all), covering the entire syllabus. Students will be required to attempt only five questions, selecting atleast one question from each unit.

2. The use of scientific calculator will be allowed in the examination. However, programmable calculator, mobile phones or other electrical/ electronic items will not be allowed in the examination.

3. For students admitted in B.Tech. 1st Year (C-Scheme) in 2019 & onwards and all trailing students:

Examinations and evaluations of students shall be conducted, covering the entire syllabus, as per guidelines "AICTE Examination Reforms". Students shall be informed about these reforms.

Open Elective II: CSE 431C Cyber Security
B. Tech. Semester – VII (Mechanical Engineering)

L	T	P	Credits
3	0	0	3

Class Work	**:**	**25 Marks**
Examination	**:**	**75 Marks**
Total	**:**	**100 Marks**
Duration of Examination	**:**	**3 Hours**

Unit 1 (10 Lectures)

Introduction To Cybercrime:- Cybercrime and Information Security, Classificationsof Cybercrimes, The need for Cyber laws, The Indian IT Act Challenges to Indian Law and Cybercrime Scenario in India, Weakness in Information Technology Act and it consequences, Digital Signatures and the Indian IT Act, Cybercrime and Punishment; Technology, Students and Cyber law; Survival tactics for the Netizens, Cyber-offenses: Cybers talking, Cyber cafe and Cyber crimes, Botnets, Attack Vector, Cloud Computing.

Unit 2 (10 Lectures)

Tools And Methods Used In Cybercrime:- Proxy Servers and Anonymizers, Phishingand identity theft, Password Cracking, Keyloggers and Spywares, Virus and Worms, Trojan Horses and Backdoors, Stenography, DoS and DDoS Attacks, SQL Injection, Buffer Overflow; Cybercrime: Mobile and Wireless Devices: Trends in Mobility, Attacks on Wireless Networks, Credit Card Frauds in Mobile and Wireless Computing Era, Security Challenges, Registry Settings for Mobile Devices, Authentication Service Security Attacks on Mobile/Cell Phones.

Unit 3 (10 Lectures)

Understanding Computer Forensics:- The Need for Computer Forensics, Cyberforensics and Digital Evidence, Forensics Analysis of E-Mail, Digital Forensics Life Cycle, Chain of Custody Concept, Network Forensics, Computer Forensics and Stenography, Relevance of the OSI 7 Layer Model to Computer Forensics, Forensics and Social Networking Sites: The Security/Privacy Threats, Challenges in Computer Forensics, Forensics Auditing, Anti forensics.

Unit 4 (10 Lectures)

Cyber security Organizational Implications:- Cost of Cybercrimes and IPR Issues,Web Threats for Organizations, Security and Privacy Implications from Cloud Computing, Social Media Marketing, Social Computing and the Associated Challenges for Organizations, Protecting People's Privacy in the Organization, Organizational Guidelines for Internet Usage, Safe Computing Guidelines and Computer Usage Policy, Incident Handling, Forensics Best Practices, Media and Asset Protection, Importance of Endpoint Security in Organizations.

Text/Reference Books:

1. "Cyber Security Understanding Cyber Crimes, Computer Forensics and Legal Perspectives", Nina Godbole, Sunit Belapur, Wiley India Publications, April, 2011.

Course Outcomes: After completing the course, student will demonstrate the ability to:

1. Able to demonstrate cyber crime its laws and related terms.
2. Work with SQL injection, DOS attacks etc.
3. Explain computer forensic, Network forensic cyber forensic.
4. Understand safe computing guidelines, usage policies and incident handling.

Note:

1. In Semester Examinations, the paper setter will set two questions from each unit (total 8 questions in all), covering the entire syllabus. Students will be required to attempt only five questions, selecting atleast one question from each unit.

2. The use of scientific calculator will be allowed in the examination. However, programmable calculator, mobile phones or other electrical/ electronic items will not be allowed in the examination.

3. For students admitted in B.Tech. 1st Year (C-Scheme) in 2019 & onwards and all trailing students:

Examinations and evaluations of students shall be conducted, covering the entire syllabus, as per guidelines "AICTE Examination Reforms". Students shall be informed about these reforms.

Open Elective II: CHE457C Industrial Safety
B. Tech. Semester – VII (Mechanical Engineering)

L	T	P	Credits
3	0	0	3

Class Work	**:**	**25 Marks**
Examination	**:**	**75 Marks**
Total	**:**	**100 Marks**
Duration of Examination	**:**	**3 Hours**

Unit 1 (10 Lectures)

Introduction: Concept of loss prevention, origin of process hazards, types of process hazards, acceptable risks, accident and loss statics, nature of accident process, concepts of inherent safety in plants or Factories, dose Vs response curve, toxicants entry route, thresh limit values, safety regulations.

Unit 2 (10 Lectures)

Hazards: Fire, Chemical (industrial and laboratory scale), electrical, mechanical, biohazards (natural and anthropogenic), toxic materials, their types and preventive measures, Liquid and vapor phase hazardous methods, storage and handling, containment, precautions, Personal safety precautions.

Unit 3 (10 Lectures)

Risk management principles, risk analysis techniques, risk control, hazards operability studies, hazard analysis, Fault tree analysis, Consequences analysis, human error analysis, accidental error analysis, economics of risk management, check list, reliability theory, event tree, HAZOP, safety reviews, what if analysis.

Unit 4 (10 Lectures)

Safety audit, procedure for safety auditing, audit report, safety report, safety training, emergency planning and disaster management, introduction to security risk factors tables.

Text Books:

1. Chemical Hazards and safety, 2nd Edition, DawandeDenet& Co. , 2012
2. Loss preventions in process industries, Lees Butterworth-Heinemann, 1980.
3. Industrial safety Handbook, William and Handley, McGraw Hill.

Reference Books:

1. Safety and Hazard management in Chemical Industries, Vyas, Atlantic 2013.
2. Industrial safety, health environment & Security, Basudev Panda, Laxmi publication ISBN- 97893-81159-43-9.
3. Industrial Safety and Health Management, 4th Edition, C. Ray Asfahl, Prentice Hall International Series, 1984.
4. Industrial Accident Prevention : A Safety Management Approach, Herbert William Heinrich.

Course Outcomes: After completing the course, student will demonstrate the ability to:

1. Analyze the effect of release of toxic substances.
2. Understand the industrial laws, regulations and source models.
3. Understand the methods of hazard identification and preventive measures and develop safety programs to prevent the damage or loss.
4. Conduct safety audits and improve safety practices

Note:

1. In Semester Examinations, the paper setter will set two questions from each unit (total 8 questions in all), covering the entire syllabus. Students will be required to attempt only five questions, selecting atleast one question from each unit.

2. The use of scientific calculator will be allowed in the examination. However, programmable calculator, mobile phones or other electrical/ electronic items will not be allowed in the examination.

3. For students admitted in B.Tech. 1st Year (C-Scheme) in 2019 & onwards and all trailing students:

Examinations and evaluations of students shall be conducted, covering the entire syllabus, as per guidelines "AICTE Examination Reforms". Students shall be informed about these reforms.

Open Elective II: CE406C Disaster Management
B. Tech. Semester – VII (Mechanical Engineering)

L	T	P	Credits
3	0	0	3

Class Work	**:**	**25 Marks**
Examination	**:**	**75 Marks**
Total	**:**	**100 Marks**
Duration of Examination	**:**	**3 Hours**

Unit 1 (10 Lectures)

Introduction to Disaster Management: Disaster, Emergency, Hazard, Mitigation, Disaster Prevention, Preparedness and Rehabilitation, Risk and Vulnerability, Classification of Disaster, Natural and Man-made Disasters, International day and Decade of Disaster Reduction.

Risk and Vulnerability to disaster mitigation and management options: Warning and Forecasting.

Unit 2 (12 Lectures)

Hydro-meteorological based disasters I: Disaster Management Act 2005, Role of NDMA, NDRF, NIDM, Tropical Cyclones, Floods, droughts, mechanism, causes, role of Indian Metrological Department, Central Water Commission, structure and their impacts, classifications, vulnerability, Early Warning System, Forecasting, Flood Warning System, Drought Indicators, recurrence and declaration, Structural and Non-structural Measures.

Hydro-meteorological based disasters II: Desertification Zones, causes and impacts of desertification, Characteristics, Vulnerability to India and Steps taken to combat desertification, Forest Fires; Causes of Forest Fires; Impact of Forest Fires, Prevention.

Unit 3 (10 Lectures)

Geological based disasters: Earthquake, Reasons, Compression, Shear, Rayleigh and Love Waves; Magnitude and Intensity Scales, Direct and Indirect Impact of Earthquake; Seismic Zones in India, Factors, Indian Standards Guidelines for RCC and Masonry Structures, Prevention and Preparedness for Earthquake, Tsunamis, Landslides and avalanches: Definition, causes and structure; past lesson learnt and measures taken; their Characteristic features, Impact and prevention, Atlas (BMTRPC); structural and non-structural measures.

Unit 4 (10 Lectures)

Manmade Disasters I: Chemical Industrial hazards; causes and factors, pre- and post-disaster measures; control; Indian Standard Guidelines and Compliance;

Traffic accidents; classification and impact, Fire hazards; Classification as per Indian Standards;

Fire risk assessment; Escape routes; fire-fighting equipment; classification of buildings, fire zones, occupancy loads; capacity and arrangements of exits,

Use of remote sensing and GIS in disaster mitigation and management.

Text Books:

1. Thomas D. Schneid , Disaster Management and Preparedness, CRC Publication, USA, 2001.
2. Patrick Leon Abbott, Natural Disasters, Amazon Publications, 2002.
3. Ben Wisner., At Risk: Natural Hazards, People vulnerability and Disaster, Amazon Publications, 2001.
4. Oosterom, Petervan, Zlatanova, Siyka, Fendel, Elfriede M., "Geo-information for Disaster Management", Springer Publications, 2005.
5. Savindra Singh and Jeetendra Singh, Disaster Management, Pravalika Publications, Allahabad.
6. Nidhi Gauba Dhawan and Ambrina Sardar Khan, Disaster Management and Preparedness, CBS Publishers & Distribution.

Reference Books:

1. Selected Resources Published by the National Disaster Management Institute of Home Affairs, Govt. of India, New Delhi.

Course Outcomes: After completing the course, student will demonstrate the ability to:

1. Understand the significance of disaster management.
2. Analyze the occurrences, reasons and mechanism of various types of disaster.
3. Understand the preventive measures as Civil Engineer with latest codal provisions.
4. Apply the latest technology in mitigation of disasters.

Note:

1. In Semester Examinations, the paper setter will set two questions from each unit (total 8 questions in all), covering the entire syllabus. Students will be required to attempt only five questions, selecting atleast one question from each unit.

2. The use of scientific calculator will be allowed in the examination. However, programmable calculator, mobile phones or other electrical/ electronic items will not be allowed in the examination.

3. For students admitted in B.Tech. 1st Year (C-Scheme) in 2019 & onwards and all trailing students:

Examinations and evaluations of students shall be conducted, covering the entire syllabus, as per guidelines "AICTE Examination Reforms". Students shall be informed about these reforms.

ECE327C Consumer Electronics

B. Tech. Semester – VI (Computer Science and Engg.)

L	T	P	Credits			
3	0	0	3	Class Work	:	25 Marks
				Examination	:	75Marks
				Total	:	100 Marks
				Duration of Examination	:	3 Hours

Unit I (12 Lectures)

Monochrome TV (Introduction): Elements of a TV System, Picture transmission, Sound transmission, Picture reception, Sound reception, Synchronization, Receiver control, Image continuity, Scanning Process, Aspect Ratio, Flicker, Composite Video Signal, Picture Elements, Kell factor, Vertical Resolution, Horizontal Resolution, Video bandwidth, Interlacing, 625 Line System, Bandwidths for TV Transmission, Vertical and horizontal synch detail, Vestigial Side Band transmission(Advantages and Disadvantages)

Monochrome TV (Picture and Camera Tubes): Monochrome picture tube, beam reflection, Beam focusing, Screen Phosphor, Faceplate, Picture tube characteristics, picture tube circuit controls, Monochrome Camera Tubes: Basic principle, Image Orthicon, Vidicon, Plumbicon

Unit II (12 Lectures)

Colour TV Essentials: Compatibility , Colour perception, Three Colour theory, Luminance, Hue and Saturation, Dispersion and Recombination of light, Primary and secondary colours, luminance signal, Chrominance Signal, Colour picture tube, colour TV Camera, Colour TV display Tubes, colour Signal Transmission, Bandwidth for colour signal transmission, Colour TV controls. Cable TV, Block Diagram and principle of working of cable TV.

Plasma and LCD: Introduction, liquidcrystals, types of LCD's,TN, STN, TFT, Power requirements, LCD working, Principle of operation of TN display, Construction of TN display, Behaviour of TN liquid crystals, Viewing angle, colour balance, colour TN display, limitatons, advantages, disadvantages, applications.

Unit III (10 Lectures)

LED and DMD : Introduction to LED Television , comparison with LCD and Plasma TV's, schematic of DMD, introduction to Digital Micro Mirror device, Diagram of DMD, principle of working, emerging applications of DMD.

Microwave Ovens and Air Conditioners: Microwaves, Transit Time, Magnetron, Waveguides, Microwave Oven, Microwave Cooking. Air conditioning, Components of air conditioning systems, all water Air conditioning systems, all air conditioning Systems, Split air conditioner.

Unit IV (11 Lectures)

Microphones: Introduction, characteristics of microphones, types of microphone: carbon, movingcoil, wireless, crystal, introduction to tape recorder.

Loudspeaker: Introduction to ideal and basic loudspeaker, loudspeaker construction types of loudspeaker: Dynamic and permanent magnet, woofers, tweeters, brief introduction to baffles, equalisers.

Text Books :

1. **Consumer Electronics by S. P. Bali, Pearson Education.**
2. **Complete Satellite and Cable T.V by R.R Gulati, New Age International Publishers**

Reference Books:

1. Monochrome and ColourTelevision by R. R. Gulati, New Age International Publishers

Note:

In semester Examinations, the examiner will set two questions from each unit (total 8 questions in all) covering the entire syllabus. The students will be required to attempt only five questions selecting at least one question from each unit.

The use of scientific calculator will be allowed in the examination. However, programmable calculator, mobile phones or other electrical/ electronic items will not be allowed in the examination.

For students admitted in B Tech 1st year (C-Scheme) in 2019 and all training students:

Examination and evaluations of students shall be conducted as per guidelines *AICTE Examinations reforms* covering the entire syllabus. The students shall be made aware about the reforms.

Course outcomes: At the end of the course, students will demonstrate the ability to:

1. Identify and explain basic working of electronics products like TV, Microphone, loudspeaker, AC, Microwave ovens.
2. Learn various components of composite video signal and differentiate between line, brightness, saturation and to design the lower power consumption device, the primary challenge is how to minimize overall cost.
3. Acquire ability to design different display screen so that effect of radiations on eyes will be reduced.
4. Understand the general importance of product safety to consumers & producers will reduce the various adverse impacts of these devices on common man.

ME 402C Major Project

B. Tech. Semester – VIII (Mechanical Engineering)

L	T	P	Credits
0	0	16	8

Class Work	**:**	**25 Marks**
Examination (Practical)	**:**	**75 Marks**
Total	**:**	**100 Marks**
Duration of Examination	**:**	**3 Hours**

This course is a group activity to be undertaken by a group of 4-5 students under the guidance of a faculty supervisor assigned by the department. The primary objective of this course is to develop in students the professional quality of synthesis employing technical knowledge obtained in the field of Engineering & Technology through a project work involving design, analysis augmented with creativity, innovation and ingenuity. Minor Project involving design/ fabrication/ testing/ computer simulation/ case studies etc. is to be undertaken in the VII Semester. In this semester the student is expected to complete the study/modeling/ design part of the project.

Course Outcomes: At the end of the course, the student will be able to:

CO1: Apply academic knowledge to complete technical project as a team.

CO2: Design/Innovate/ creative product or solution using his/her professional capability.

CO3: Prepare project reports.

CO4: Effectively communicate details of the project undertaken.

The assessment of the class work for Major Project will be evaluated through two presentations, with equal weightage, before the committee consisting of the following:

a. Chairman of the Department or his nominee
b. Major Project coordinator
c. The Project supervisor: Member

The assessment of practical/Examination component for Major Project will be evaluated through a panel of examiners consisting of the following:

1. Chairman of Department: Chairperson
2. Major Project coordinator: Member Secretary
3. External Expert: To be appointed by the University

The student will be required to submit two copies of his/her project report to the department for record (one copy each for the department and participating teacher). The format of the cover page and the organization of the body of the report will be finalized and circulated by Project coordinator.

The Assessment will comprise of the following elements for evaluation:

- Quality of Modeling and Technical Detail: 40 Marks
- Adequacy and quality of Project: 20 Marks
- Quality of project reports: 20 Marks.
- Effectiveness of presentation/Communication skill and Team Work: 20 Marks

Project coordinator will be assigned the project load of maximum of 2 hours per week including his/her own guiding load of one hr. However, the guiding teacher will be assigned maximum of one period of teaching load irrespective of number of students/groups under him/her.

ME 406C General Fitness For the Profession

B. Tech. Semester – VIII (Mechanical Engineering)

L	T	P	Credits (Audit Pass)			
0	0	0	0	**Class Work**	**:**	**0 Marks**
				Practical	**:**	**100Marks**
				Total	**:**	**100 Marks**
				Duration of Examination	**:**	**3 Hours**

General Fitness for the Profession (ME 406C) is a compulsory & qualifying course (Audit Pass). The purpose of this course is to inculcate a sense of professionalism in a student along with personality development in terms of quality such as receiving, responding, temperament, attitude and outlook. The student efforts will be evaluated on the basis of his/ her performance / achievements in different walks of life.

Course Outcomes: This course is intended to evaluate the overall fitness of students as a result of 4 years of engagement in the degree course. At the end of the course, the student will be able to:

CO1: Attain quality in professional competence.

CO2: Compete in the professional field on the basis of temperament, attitude and outlook.

CO3: Participate on issues pertaining to society, community and nation at large.

CO4: Effectively communicate on technical and societal issues.

The evaluation for this course will assess the performance of student; at the end of 8th semester, in all types of programme activities like Academics, Cultural, Sports, NSS, organisation of camps, social activities etc., during the 8 semester period.

The student will submit a written report and present the same before the evaluation committee orally for assessment. The report and presentation should highlight the followings:

I. Academic Performance **(20 Marks)**
II. Extra-Curricular Activities / Community Service, Hostel Activities **(12 Marks)**
III. Technical Activities / Industrial, Educational tour **(12 Marks)**
IV. Sports/games **(16Marks)**
V. Written and oral communicative skill **(40 Marks)**

The evaluation of the General Fitness will be made by the committee of examiners constituted as under:

1. Chairperson of the Department : Chairperson
2. Final Year Coordinator of the Department : Member
3. External Examiner : Appointed by the University

ME 404C Internship

B. Tech. Semester – VIII (Mechanical Engineering)

L	T	P	Credits			
0	0	-	20	Class Work	:	250 Marks
				Examination (Practical)	:	250 Marks
				Total	:	500 Marks
				Duration of Examination	:	3 Hours

Course Objectives: This course is intended to provide students the practical exposure to industrial setup. This is also intended to provide him/her the platform to explore his professional engagement with the training organization. This course is further expected to increase the employability of the graduate trainee.

Course Outcomes:

CO1: Capability to execute and report industrial projects as a team with moral and ethical standard.

CO2: Ability to draft technical/ project reports.

CO3: Ability to use academic expertise in industrial/professional domain.

CO4: Communicate effectively on professional issues.

Each student will undergo industrial training/Internship (minimum 16 weeks) in joint supervision of internal supervisor (allotted by the Department) and the supervisor/official of the organization under whom the candidate is associated for training/internship. The internal supervisor will monitor the student specific progress of the internship. The overall monitoring of industrial training has to be done by a departmental faculty co-coordinator.

Evaluation Process:

Each student will submit 3 copies of the detailed internship report to the Department in prescribed format at the conclusion of training.

(A) Internal assessment/ Sessional of Internship will be made jointly by the Departmental Faculty Co-coordinator for Internship, the concerned organization training supervisor/official and internal supervisor.

Assessment by the External supervisor/Mentor = 40% of Internal Assessment Marks

Assessment by the internal supervisor and Departmental Faculty Co-coordinator for Internship = 60% of Internal Assessment Marks

(B) Practical Examination Assessment of Internship will be made by the committee consisting of the Chairperson of the Department, Departmental Faculty Co-coordinator for Internship and one external examiner appointed by the University.

The Following criteria are to be followed for evaluation in each of the Internal assessment/ Sessional as well as practical assessments:

- Detail of training undergone: 40%
- Adequacy and quality of report: 20%
- Quality of learning through Training Project: 20 Marks
- Effectiveness of presentation/Communication skill and Team Work: 20%

ME422C Industrial Engineering and Management
B. Tech. Semester – VIII (Mechanical Engineering)

L	T	P	Credits			
3	0	0	3	Class Work	:	25 Marks
				Examination	:	75 Marks
				Total	:	100 Marks
				Duration of Examination	:	3 Hours

Course Outcomes: At the end of the course, the student will be able to:

CO1: Describe the different types of production systems, the related decision variables, and methods for improving operations and worker safety.
CO2: Perform cost and breakeven analysis and appreciate the strategic role of materials management.
CO3: Explain the product design and development process and associate product design with process design and process selection.
CO4: Appreciate manufacturing strategy and Supply Chain as pathways for competitive advantages.

UNIT I

Introduction: Brief history and Definition of Industrial Engineering, Objectives, relevance of industrial engineering for achieving excellence in industry, types of decisions in industrial engineering.
Production System and Productivity: Value addition process, Production system, types of production system, conceptual model of a production system, Productivity-definition, measurement, factors effecting productivity, ways and strategies to improve productivity.
Work Study- Introduction, Method study- basic procedure of method study, recording techniques, various charts, therbligs etc. Work measurement- basic procedure, various techniques like time study, work sampling, PMTS etc.
Workforce management:- Introduction, recruitment, selection**,** employees empowerment, quality circles, team work etc., **Job design**- Job specialization, job enlargement, job rotation, job enrichment, training etc

UNIT II

Manufacturing cost analysis- fixed & variable cost, direct & indirect cost, Estimation of overheads, Break even analysis.
Materials management- strategic importance, need for integrated approach to materials management- role of value analysis and purchase price analysis, materials handling, inventory control, stores management, waste management. Relevant costs, Overview of inventory models and inventory control models, selective inventory control, JIT- materials management approach.

UNIT III

Product development and design: product development approaches, product development process, Product life cycle (PLC) concept. Product design**-** Various approaches: concurrent engineering, designing for customer-quality function deployment (QFD), design for manufacture and assembly (DFMA), rapid prototyping, design for environment, Role of 3S- standardization, simplification, specialization, role of ergonomics in product design, introduction to value engineering.
Process planning: Introduction, forms of transformation process**,** selection of process, use of break-even analysis.

UNIT IV

Manufacturing strategy and competitiveness
Brief review of manufacturing strategy, measures of manufacturing performance, internal and external aspects of performance measures, order wining and order qualifying criteria, SWOT analysis, five force model, linkage between manufacturing and corporate strategy.
Elements , benefits, and implementation aspects of various approaches: JIT, TQC, TPM
Management of Supply Chains and Service Systems
Overview of supply chain management, Introduction to simulation, Monte Carlo simulation, applications in IE. Management Information System: meaning, importance and role in decision making, Service processes: Introduction, difference between manufacturing and service operations, a conceptual model of service quality

Textbooks:-

1. Industrial engineering & Management by Dr. Ravi Shankar - Galgotia publication
2. Industrial engineering & Management by Dr. B. Kumar – Khanna publication
3. Industrial Engineering by A P Verma - S. K. Kataria and sons
4. Production and Operations Management by Charry- TMH publication

Reference books:-

1. Operations Management by Chase, Jacobs and Aquilano - TMH publication

ME424C Energy Conservation And Management
B. Tech. Semester – VIII (Mechanical Engineering)

L	T	P	Credits			
3	0	0	3	Class Work	:	25 Marks
				Examination	:	75 Marks
				Total	:	100 Marks
				Duration of Examination	:	3 Hours

Course Outcomes: At the end of the course, the student will be able to:

CO1: Explain the principles of energy conservation, Energy audit, Energy Management and related environmental issues.
CO2: Evaluate the energy saving & conservation in different utilities.
CO3: Explain Energy audit process and methods and the instruments for energy audit for thermal system.
CO4: Perform economic evaluation life cycle cost analysis of thermals systems.

UNIT I

Energy conservation: Introduction, Principles of energy conservation, Energy consumption pattern, Resource availability, Energy pricing, Energy Security, Estimation of energy use in a building. Heat gain and thermal performance of building envelope - Steady and non-steady heat transfer through the glazed window and the wall - Standards for thermal performance of building envelope, Evaluation of overall thermal transfer

UNIT II

Energy conservation in utilities: Energy efficiency in boilers, furnaces, steam systems, cogeneration utilities, waste heat recovery, compressed air systems, HVAC & R systems, I.C. Engine, fans and blowers, pumps, cooling tower, DG Sets. Energy conservation in electrical utilities: power factor improvement, electric motor, illumination, scope of energy conservation in lightening.

UNIT III

Energy Audit: Definition, objective and principles of Energy Management, Need of Energy Audit and Management, types of energy audit, audit process, Guidelines for writing energy audit report, data presentation in report, findings recommendations, impact of renewable energy on energy audit recommendations and energy audit report, energy audit of building system, lighting system, HVAC system, Water heating system, heat recovery opportunities during energy audit, Industrial audit opportunities, Instruments for Audit and Monitoring Energy and Energy Savings

UNIT IV

Energy Economics: Simple Payback Period, Time Value of Money, Internal Rate of Return, Net Present Value, Life Cycle Costing, Equivalent uniform annual cost (EUAC), Life cycle cost, Discounting factor, Capital recovery, Depreciation, taxes and tax credit, Impact of fuel inflation on life cycle cost, Cost of saved energy, cost of energy generated, Energy performance contracts and role of Energy Service Companies (ESCOs).
Energy Management and Environment: Importance and role of Energy management, Kyoto protocol, Clean development mechanism (CDM), Geopolitics of GHG control; Carbon Market

Textbooks:-

1. Energy Conservation Guidebook, Dale R Patrick, Stephen W Fardo, Latest Edition, CRC Press
2. Handbook of Energy Audits, Albert Thumann, Latest Edition, The Fairmont Press
3. Energy Management Handbook, W.C. Turner, John Wiley and Sons, A Wiley Interscience publication
4. Heating and Cooling of Buildings - Design for Efficiency, J. Krieder and A. Rabl, McGraw Hill Publication, latest edition.
5. Carbon Capture and Sequestration: Integrating Technology, Monitoring, and Regulation, E J Wilson and D Gerard, Blackwell Publishing

Reference books:-

1. Energy Management, Commonwealth Publication, New Delhi, P.R. Trivedi, K.R. Jolka, Latest Edition, CRC Press
2. Economics of Solar Energy and Conservation System by Kreith, Volume 3.
3. Bureau of Energy Efficiency Reference book: No.1, 2, 3 4

ME 426C Machine Tool Design

B. Tech. Semester – VIII (Mechanical Engineering)

L	T	P	Credits			
3	0	0	3	Class Work	:	25 Marks
				Examination	:	75Marks
				Total	:	100 Marks
				Duration of Examination	:	3 Hours

Course Outcomes: At the end of the course, the student will be able to:

CO1: Evaluate motion, forces and power and machining accuracy in different machine tools.
CO2: Design machine tool structures and drives.
CO3: Design speed and feed boxes of machine tool structures.
CO4: Design slide Ways, Guide Ways and Spindles of machine tools

UNIT-I

Analysis of Forces, Velocities and Power Requirements during metal cutting: Turning, Drilling, Milling, Grinding, Planning, Shaping and Broaching.

General Requirements of the Machine Tool: Accuracy of Shape, Dimensional accuracy and surface finish of the components produced. Productivity and Efficiency of Machine tools

UNIT-II

Design Principles: Stiffness and Rigidity of Constructional Elements and Machine Tools under Load, Static Rigidity, Dynamic Rigidity, Brief discussion of Natural frequencies, Damping, Mode of Vibration in Machine Tools.

Standardization of Spindle Speeds and Feed Rates: Layout of Speed Change Gears. Saw Diagrams of Mechanical Stepped Drives in Machine Tools for different series, Layout of the Intermediate Reduction Gears, Calculation of Transmission Ratios, Pulley Diameter, Gear Wheel Diameters and Number of Teeth, Ray Diagram, Speed Diagram.

UNIT-III

Electrical, Mechanical and Hydraulic Drives for the Operational Movements: Electric Drive and Control Equipment, Mechanical and Hydraulic Drives, Drives for Producing Rotational Movements, Stepped Drives, Step less Drives. Drives for Producing Rectilinear Movements, Backlash Eliminator in the Feed Drive Nut.

Design of Constructional Elements: Machine Tool Structures, Structural Elements Design for Centre Lathe, Drilling Machine, Knee Type Milling Machine, Planning Machine, Boring Machine, and Grinding Machines.

UNIT-IV

Design of Slide Ways: Design of Slide ways for Tables, Saddles and Cross-slides, Antifriction Bearings for slide ways, Hydrostatically Lubricated Slide ways.

Design of Spindles and Spindle Bearings: Design of Spindles for Strength and Stiffness, Design of Spindles for Balancing, General Layout and Design of the Driving Elements and the Spindle Bearings, Selection and General Layout of Ball and Roller Bearings for Supporting Spindles. Brief discussion on Design of Secondary Drives for Machine Tools

Text Books:

1. Machine Tool Design by N. K. Mehta, 3e, McGraw Hill Publishing
2. Machine tool design by Sen and Bhattacharya, CBS Publications Oxford and IBH Publishing

Reference Books:

1. Machine Tool Design by S.K, Basu, Design
2. Machine Tool Design by Acherkan, Mir publishing
3. Principles of Metal-Cutting Machine Tools by F. Koenigsberger

ME 432C Computing Techniques

B. Tech. Semester – VIII (Mechanical Engineering)

L	T	P	Credits			
3	0	0	3	**Class Work**	**:**	**25 Marks**
				Examination	**:**	**75Marks**
				Total	**:**	**100 Marks**
				Duration of Examination	**:**	**3 Hours**

Course Outcomes: At the end of the course, the student will be able to:

CO1: Understand and appreciate the importance of errors associated with scientific computing and accuracy requirements.
CO2: Understand the computing techniques and the inherent limitations of the techniques.
CO3: Understand the significance of computing methods, their strengths and application areas.
CO4: Perform the computations on various data using appropriate computation tools.
CO5: Understand and implement Discrete Fourier Transform, Fast Fourier Transform.

Unit-I

Chapter-1

Introduction to numerical computing: Numeric data, analog computing, digital computing, process of numerical computing and characteristics, Sources of Approximations, Data Error and Computational, Truncation Error and Rounding Error, Absolute Error and Relative Error, Sensitivity and Conditioning, Backward Error Analysis, Stability and Accuracy; Computer arithmetic -Floating Point Numbers, Normalization, Properties of Floating Point System, Rounding, Machine Precision, Error propagation, Minimizing the total error.

Chapter-2

System of liner equations: Linear Systems, Solving Linear Systems, Gaussian elimination, Pivoting, Gauss-Jordan, Norms and Condition Numbers, Iterative Methods for Linear Systems Linear least squares: Data Fitting, Linear Least Squares, Orthogonalization Methods, QR factorization, Gram-Schmidt Orthogonalization.

Unit-II

Chapter-3

Eigen values and singular values: Eigen values and Eigenvectors, Methods for Computing All Eigen values, Jacobi Method, Methods for Computing Selected Eigen values,

Chapter-4

Nonlinear equations: Fixed Point Iteration, Newton's Method, Inverse Interpolation Method Interpolation: Purpose for Interpolation, Choice of Interpolating, Function, Polynomial Interpolation, Piecewise Polynomial Interpolation

Unit-III

Chapter-5

Numerical Integration and Differentiation: Quadrature Rule, Newton-Cotes Rule, Gaussian Quadrature Rule, Finite Difference Approximation,

Chapter-6

Initial Value Problems for ODEs, Euler's Method, Taylor Series Method, Runga-Kutta Method, Extrapolation Methods, Boundary Value Problems for ODEs, Finite Difference Methods, introduction to Finite Element Method.

Unit-IV

Chapter-7

Partial Differential Equations, Time Dependent Problems, Time Independent Problems, Solution for Sparse Linear Systems, Iterative Methods,

Chapter-8

Continuous Fourier Series, Frequency and Time Domains, Fourier Integral and Transform, Discrete Fourier Transform (DFT),Fast Fourier Transform (FFT), The Power Spectrum, Introduction to Curve Fitting with Software Packages.

Text/ Reference Books:

1. Computational Methods in Engineering, S.P. Venkateshan and Prasanna Swaminathan, Ane Books Pvt. Ltd
2. Numerical Methods, E. Balagurusamy, Tata McGraw-Hill Education
3. Numerical Methods for Engineers, Steven C. Chapra Raymond P. Canale, McGraw Hills, 6th edition
4. Computational Science, Kiryanov D. and Kiryanova E., Infinity Science Press, 1st Ed., 2006
5. Scientific Computing With MATLAB and Octave, Quarteroni, Alfio, Saleri, Fausto, Gervasio and Paola, Springer, 3rd Ed., 2010

ME 434C Finite Element Analysis

B. Tech. Semester – VIII (Mechanical Engineering)

L	T	P	Credits			
3	0	0	3	Class Work	:	25 Marks
				Examination	:	75Marks
				Total	:	100 Marks
				Duration of Examination	:	3 Hours

Objectives:

1. To illustrate the principle of mathematical modeling of engineering problems
2. To introduce the basics and application of Finite Element Method

Course Outcomes: At the end of the course, the student will be able to:

CO1: Perform finite element formulations for simple engineering problems
CO2: Understand the concepts of discretization and various types of finite elements
CO3: Understand use of finite element in structural and thermal problems
CO4: Use commercial finite element software and understand its structure.
CO5: Write formal technical report based on the finite element analysis of engineering problem

Unit-I

Chapter-1

Historical Background, Mathematical modeling of field problems in engineering, governing equations, discrete and continuous models, boundary and initial value problems,

Chapter-2

Weighted Residual Methods, Variational formulation of boundary value problems, Ritz technique, Basic concept of Finite Element Method.

Unit-II

Chapter-3

One dimensional second order equation, discretization, linear and higher order elements, derivation of shape functions, Stiffness matrix and force vectors, assembly of elemental matrices, Solution of problems from solid mechanics and heat transfer,

Chapter-4

Solution of problems from longitudinal vibration and mode shapes, fourth order beam equation, transverse deflections and natural frequencies.

Unit-III

Chapter-5

Two dimensional equations, variational formulation, finite element formulation, triangular elements- shape functions, elemental matrices and RHS vectors; Application to thermal problems,

Chapter-6

Application to torsion of non-circular shafts, quadrilateral and higher order elements; Plane stresses and plane strain problems, body forces and thermal loads, plate and shell elements.

Unit-IV

Chapter-7

Natural coordinate systems, isoparametric elements and shape functions, numerical integration and application to plane stress problems, matrix solution techniques,

Chapter-8

Solution of dynamic problems, introduction to FE software.

Text Books:

1. Reddy J.N., An Introduction to Finite Element Method, 3rd ed., Tata McGraw Hill, 2005.
2. Seshu P., Text Book of Finite Element Analysis, Prentice Hall, New Delhi, 2007.
3. Rao S.S., The Finite Element Method in Engineering, 3rd ed., Butterworth Heinemann,
4. Chandraputla & Belegundu, Introduction to Finite Elements in Engineering, Prentice Hall,

ME 436C Modern Manufacturing and Materials
B. Tech. Semester – VIII (Mechanical Engineering)

L	T	P	Credits			
3	0	0	3	Class Work	:	25 Marks
				Examination	:	75Marks
				Total	:	100 Marks
				Duration of Examination	:	3 Hours

Objectives:
1. To illustrate the principle of mathematical modeling of engineering problems
2. To introduce the basics and application of Finite Element Method

Course Outcomes: At the end of the course, the student will be able to:

CO1: Discuss Additive Manufacturing, Rapid prototyping and their applications .
CO2: Describe Micro-machining/Powder Metallurgy and Surface Treatment processes.
CO3: Illustrate the types and Applications of different ceramic and smart materials.
CO4: Describe the types and Applications of different composite materials.

UNIT - I

Additive Manufacturing (AM): Introduction and Classification of AM process, Need for Additive Manufacturing, Fundamentals of Additive Manufacturing and Prototyping, methods of Additive Manufacturing, Applications of AM in rapid prototyping, rapid manufacturing, rapid tooling, repairing and coating, Pre and post Processing in Additive Manufacturing

UNIT – II

Micromachining – definition - principle of mechanical micromachining - Classification of Micro-machining processes and methods

Powder Metallurgy: Introduction to Powder Metallurgy process, preparation of powders, types & function of binders, advantages disadvantages and application of powder metallurgy products

Surface Treatment: Scope, Cleaners, Methods of cleaning, Surface coating types, methods of coating, economics of coating. Electro forming, Chemical vapour deposition, thermal spraying.

UNIT III

Ceramic material: Structural ceramics, Applications, characteristics, classification ,properties, Processing of particulate ceramics, WC, TiC, TaC, Al2O3, SiC, Si3N4, CBN and diamond -properties, processing and application

Smart Material: Classification, types of smart material, carbon nanotechnology tubes and applications.

UNIT IV

Composite material: Definition- Rule of mixtures, methods of manufacturing, Matrix materials-polymers-metals-ceramics, Reinforcements: Particles, whiskers, inorganic fibres, metal filaments- ceramic fibres- natural composite, Advantages and drawbacks of composites over monolithic materials. Properties and applications of composites

Text Books:

1. M. P. Groover, "Principles of Modern Manufacturing," 5 th Edition, Wiley, India, 2014.
2. James A. Murphy- Surface Preparation and Finishes for Metal, McGraw-Hill, New York 1971
3. Manufacturing Engineering and Technology IKalpakijian / Adisson Wesley, 1995
4. Process and Materials of Manufacturing / R. A. Lindburg / 1th edition, PHI 1990.
5. Jain V. K. - 'Introduction to Micromachining' - Narosa Publishing House – 2010

Reference Book:

1. Madou M. J. - 'Fundamentals of Microfabrication' - CRC Press - 2009 - 2nd Edition
2. I. Gibson, D. W. Rosen, and B. Stucker, "Additive manufacturing technologies," New York: Springer. 2010
3. Andreas Gebhardt, Understanding additive manufacturing: rapid prototyping, rapid tooling, rapid manufacturing, Hanser Publishers, 2011

ME 442C Automobile Engineering

B. Tech. Semester – VIII (Mechanical Engineering)

L	T	P	Credits			
3	0	0	3	**Class Work**	**:**	**25 Marks**
				Examination	**:**	**75Marks**
				Total	**:**	**100 Marks**
				Duration of Examination	**:**	**3 Hours**

Course Objectives:

To understand the construction and working principle of various parts of an automobile

Course Outcomes: At the end of the course, the student will be able to:

CO1: Describe the details, constituents and technologies of Automobiles.
CO2: Discuss the details of the transmission system of an Automobile.
CO3: Explain the types and operation of Steering, suspension and braking system in Automobiles.
CO4: Discuss different alternative energy sources/ fuels in for Automobiles.

Unit-I

Types of automobiles, vehicle construction and layouts, chassis, frame and body, vehicle aerodynamics, IC engines-components, function and materials, variable valve timing (VVT), Engine auxiliary systems, electronic injection for SI and CI engines, unit injector system, rotary distributor type and common rail direct injection system, transistor based coil ignition & capacitive discharge ignition systems, turbo chargers (WGT, VGT), engine emission control by 3-way catalytic converter system, Emission norms (Euro & BS).

Unit-II

Transmission systems, clutch types & construction, gear boxes-manual and automatic gear shift mechanisms, Over drive, transfer box, flywheel, torque converter, propeller shaft, slip joints, universal joints, differential and rear axle, Hotchkiss drive and Torque tube drive.

Unit-III

Steering geometry and types of steering gear box, power steering, types of front axle, types of suspension systems, pneumatic and hydraulic braking systems, antilock braking system (ABS), electronic brake force distribution (EBD) and traction control.

Unit-IV

Alternative energy sources, natural gas, LPG, biodiesel, bio-ethanol, gasohol and hydrogen fuels in automobiles, modifications needed, performance, combustion & emission characteristics of alternative fuels in SI and CI engines, Electric and Hybrid vehicles, application of Fuel Cells

Text books:

1. Kirpal Singh, Automobile Engineering, 7th ed., Standard Publishers, New Delhi, 1997.
2. Jain K.K. and Asthana R.B., Automobile Engineering, Tata McGraw Hill, New Delhi, 2002.
3. Heitner J., Automotive Mechanics, 2nd ed., East-West Press, 1999.

Reference book:

1. Heisler H., Advanced Engine Technology, SAE International Publ., USA, 1998.

ME 444C Design of Transmission Systems

B. Tech. Semester – VIII (Mechanical Engineering)

L	T	P	Credits			
3	0	0	3	Class Work	:	25 Marks
				Examination	:	75Marks
				Total	:	100 Marks
				Duration of Examination	:	3 Hours

Objectives:

To learn about the design procedures for mechanical power transmission components

Course Outcomes: At the end of the course, the student will be able to:

CO1: Inculcate an ability to design belt drives and selection of belt, rope and chain drives.
CO2: Understand and apply principles of gear design to spur gears and spur gear boxes.
CO3: Become proficient in design of helical, bevel gear and worm gear box.
CO4: Learn a skill to design multi-speed gear box for various applications.
CO5: Inculcate an ability to design clutches brakes and cams.

Unit-I

Chapter-1

Flexible transmission elements- design of flat belts & pulleys, selection of V-belts and pulleys, selection of hoisting wire ropes and pulleys, design of chains and sprockets

Chapter-2

Gear transmission- speed ratios and number of teeth, force analysis, tooth stresses, dynamic effects, fatigue strength, factor safety, gear materials; Design of straight tooth spur gear and parallel axis helical gears based on strength and wear considerations, pressure angle in the normal and transverse plane; equivalent number of teeth and forces for helical gears.

Unit-II

Chapter-3

Straight bevel gear- tooth terminology, tooth forces and stresses, equivalent number of teeth. Estimating the dimensions of a pair of straight bevel gears;

Chapter-4

Worm gear, merits & demerits, terminology, thermal capacity, materials, forces & stresses, efficiency, estimating the size of worm gear pair. Cross helical gears, terminology, helix angles, sizing of a pair of helical gears.

Unit-III

Chapter-5

Gear box- geometric progression, standard step ratio; Ray diagram, kinematics layout; Design of sliding mesh gear box- Design of multi-seed gear box for machine tool applications; constant mesh gear box, speed reducer unit; problems,

Chapter-6

Variable speed gear box; Fluid couplings, Torque converters for automotive applications, problems,

Unit-IV

Chapter-7

Cam design, types: pressure angle and undercutting base circle determination, forces and surface stresses; Design of plate clutches, axial clutches, cone clutches, internal expanding rim clutches; Electromagnetic clutches;

Chapter-8

Band and Block brakes, external shoe brakes, internal expanding shoe brake, problems

Text Books:

1. Shigley J., Mischke C., Budynas R. and Nisbett K., Mechanical Engineering Design, 8th ed., Tata McGraw Hill, 2010.
2. Jindal U.C., Machine Design: Design of Transmission System, Dorling Kindersley, 2010.
3. Maitra G. and Prasad L., Handbook of Mechanical Design, 2nd ed., Tata McGraw Hill, 2001.

ME 446C Principles of Management

B. Tech. Semester – VIII (Mechanical Engineering)

L	T	P	Credits			
3	0	0	3	Class Work	:	25 Marks
				Examination	:	75Marks
				Total	:	100 Marks
				Duration of Examination	:	3 Hours

Objectives:

Broad objective of course is to understand the principles of management and their application to the functioning of an organization.

Course Outcomes: At the end of the course, the student will be able to:

CO1: Describe the types of business organization its management, roles of manager and entrepreneurs.

CO2: Distinguish between strategic, tactical, and operational planning and explain the benefits, tools and techniques of planning.

CO3: Understand organizational structure and describe the major considerations in organizing an enterprise's resources, including human resources, and role of IT systems in management.

CO4: Describe the effective management skills needed to maximize individual and organizational productivity related to the internal and external environment and issues of ethics and social responsibility.

UNIT I

Definition of management, science or art, manager vs. entrepreneur; Types of managers managerial roles and skills; Evolution of management- scientific, human relations, system and contingency approaches; Types of Business Organizations, sole proprietorship, partnership, company, public and private enterprises; Organization culture and environment; Current trends and issues in management

UNIT II

Nature and purpose of Planning, types of Planning, objectives, setting objectives, policies, Strategic Management, Planning Tools and Techniques, Decision making steps & processes

UNIT III

Nature and purpose of Organizing, formal and informal organization, organization structure, types, line and staff authority, departmentalization, delegation of authority, centralization and decentralization, job design, human resource management, HR planning, Recruitment selection, Training & Development, Performance Management, Career planning and Management.

UNIT IV

Directing, individual and group behavior, motivation, motivation theories, motivational techniques, job satisfaction, job enrichment, leadership, types & theories of leadership, effective communication. Controlling, system and process of controlling, budgetary and non-budgetary control techniques, use of computers and IT in management control, productivity problems and management, control and performance, direct and preventive control, reporting.

Text Books:

1. Robins S.P. and Couiter M., Management, Prentice Hall India, 10th ed., 2009.
2. Stoner JAF, Freeman RE and Gilbert DR, Management, 6th ed., Pearson Education, 2004.
3. Tripathy PC & Reddy PN, Principles of Management, Tata McGraw Hill, 1999

ME448C Process Planning and Cost Estimation

B. Tech. Semester – VIII (Mechanical Engineering)

L	T	P	Credits			
3	0	0	3	Class Work	:	25 Marks
				Examination	:	75Marks
				Total	:	100 Marks
				Duration of Examination	:	3 Hours

Objectives:

To introduce process planning concepts to make cost estimation for various products

Course Outcomes:

Upon completion of this course, the students will be able to use the concepts of process planning and cost estimation for various products

Course Outcomes: At the end of the course, the student will be able to:

CO1: Explain Process planning, select material, production machine, equipments and tools using parts drawing; and calculate process parameters for production activity.

CO2: Comprehend the different elements of cost in manufacturing and their estimation procedure.

CO3: Calculate process times for metal cutting jobs on different machines.

CO4: Estimate cost of Production for different jobs in forging, welding, foundry and machining.

UNIT I

Introduction of Process Planning- methods of process planning, drawing interpretation, material evaluation, steps in process selection, production equipment and tooling selection Process planning activities- process parameter calculation for various production processes,

Selection of jigs and fixtures, selection of quality assurance methods, documents for process planning, economics of process planning, case studies

UNIT II

Introduction to cost estimation- importance of costing and estimation, methods of costing, elements of cost estimation, types of estimates, estimating procedure, estimation of labor cost, material cost, allocation of overhead charges, calculation of depreciation cost

UNIT III

Machining time estimation- importance of machine time calculation, machining time for different lathe operations, drilling and boring time calculations, Machining time calculation for Milling, Shaping, Planning and Grinding

UNIT IV

Production costs- Different production processes for different jobs, estimation of forging cost, estimation of welding cost, estimation of foundry cost, estimation of machining cost

Text Books:

1. Peter Scallan, Process Planning, Design/ Manufacture Interface, Elsevier Sci.&Tech. 2002.
2. Ostwald P.F. and Munoz J., Manufacturing Processes and Systems, 9th ed., John Wiley, 1998.
3. Chitale A.V. and Gupta R.C., Product Design and Manufacturing, 2nd ed., Prentice Hall, 2002.

Open Elective –III: CSE340C Artificial Intelligence & Expert Systems
B. Tech. Semester – VIII (Mechanical Engineering)

L	T	P	Credits			
3	0	0	3	**Class Work**	**:**	**25 Marks**
				Examination	**:**	**75Marks**
				Total	**:**	**100 Marks**
				Duration of Examination	**:**	**3 Hours**

Unit 1(10 Lectures)

Introduction: The AI problems; what is an AI technique; Characteristics of AI applications Problem Solving, Search and Control Strategies General Problem solving; Production systems; Control strategies: forward and backward chaining Exhaustive searches: Depth first Breadth first search.

Unit 2(10 Lectures)

Heuristic Search Techniques: Hill climbing; Branch and Bound technique; Best first search and A* algorithm; AND/OR Graphs; Problem reduction and AO* algorithm; Constraint Satisfaction problems Game Playing Minmax search procedure; Alpha-Beta cutoffs; Additional Refinements.

Unit 3(12 Lectures)

Knowledge Representation & Reasoning:- Propositional logic, First order predicate logic, Inference in FOPL, Skolemnisation; Resolution Principle and Unification; Forward & Backward chaining, Inference Mechanisms Horn's Clauses; Semantic Networks; Frame Systems and Value Inheritance; Conceptual Dependency**.**

Learning Techniques: - Supervised and unsupervised learning, Decision trees, Statistical learning models, Reinforcement learning.
Expert Systems: Introduction to Expert Systems, Architecture of Expert Systems; Expert System Shells; Knowledge Acquisition; Case Studies: MYCIN, Learning, Rote Learning; Learning by Induction; Explanation based learning.

Text Books/Reference Books:

1. Elaine Rich and Kevin Knight: Artificial Intelligence- Tata McGraw Hill.
2. Dan W.Patterson, Introduction to Artificial Intelligence and Expert Systems- Prentice Hall of India.
3. Nils J.Nilsson: Principles of Artificial Intelligence- Narosa Publishing house.
4. Artificial Intelligence : A Modern Approach, Stuart Rusell, Peter Norvig, Pearson Education.
5. Artificial Intelligence, Winston, Patrick, Henry, Pearson Education.

Course Outcomes: At the end of the course, students will demonstrate the ability to:

1. Analyze and formalize problem and solve them using AI techniques
2. Use Heuristic search techniques for game playing and other problems
3. Represent diverse knowledge using AI and analyze
4. Understand and design an expert system

Note:

1. In Semester Examinations, the paper setter will set two questions from each unit (total 8 questions in all), covering the entire syllabus. Students will be required to attempt only five questions, selecting atleast one question from each unit.

2. The use of scientific calculator will be allowed in the examination. However, programmable calculator, mobile phones or other electrical/ electronic items will not be allowed in the examination.

3. For students admitted in B.Tech. 1st Year (C-Scheme) in 2019 & onwards and all trailing students:

Examinations and evaluations of students shall be conducted, covering the entire syllabus, as per guidelines "AICTE Examination Reforms". Students shall be informed about these reforms.

Open Elective –III: EE452C Electrical and Hybrid Vehicles
B. Tech. Semester – VIII (Mechanical Engineering)

L	T	P	Credits			
3	0	0	3	Class Work	:	25 Marks
				Examination	:	75Marks
				Total	:	100 Marks
				Duration of Examination	:	3 Hours

Unit 1(10 Lectures)

Introduction: History of hybrid and electric vehicles, social and environmental importance of hybrid and electric vehicles, impact of modern electric vehicles on energy supplies.
Electric Vehicle Composition and Configurations, Basic concept of hybrid Electric vehicle, HEV configuration types – series, parallel, series-parallel and complex hybrid, Power flow control.

Unit 2(10 Lectures)

Electric Propulsion: major requirements of EV motor drive, characteristics and control ofDC motor, Induction motor, Switched Reluctance motor and Permanent Magnet motor, power converters devices/topology, control hardware, software and strategy vehicle, power source characterization, transmission characteristics.

Unit 3(12 Lectures)

Energy Storage: Introduction to energy storage requirements in Hybrid and Electric Vehicles, Energy sources, Battery based energy storage and its analysis, Fuel fell based energy storage and its analysis, super capacitor based energy storage and its analysis, Flywheel based energy storage and its analysis.

Unit 4(12 Lectures)

Energy Management Strategies: Introduction to energy management strategies used in hybrid and electric vehicles, classification of different energy management strategies, comparison of different energy management strategies, implementation issues of energy management strategies. Plug-in electric vehicles, Vehicle to grid (V2G) and Grid to vehicle (G2V) fundamentals.

Text/ Reference Books:

1. C. Mi, M. A. Masrur and D. W. Gao, "Hybrid Electric Vehicles: Principles and Applications with Practical Perspectives", John Wiley & Sons, 2011.
2. S. Onori, L. Serrao and G. Rizzoni, "Hybrid Electric Vehicles: Energy Management Strategies", Springer, 2015.
3. M. Ehsani, Y. Gao, S. E. Gay and A. Emadi, "Modern Electric, Hybrid Electric, and Fuel Cell Vehicles: Fundamentals, Theory, and Design", CRC Press, 2004.
4. T. Denton, "Electric and Hybrid Vehicles", Routledge, 2016.

Course Outcomes: At the end of the course, students will demonstrate the ability to:

1. Understand the basic concept and history of EV and HEV.
2. Understand the models to describe hybrid vehicles and their performance.
3. Understand the different possible ways of energy storage.
4. Understand the different strategies related to energy management systems.

Note:

1. In Semester Examinations, the paper setter will set two questions from each unit (total 8 questions in all), covering the entire syllabus. Students will be required to attempt only five questions, selecting atleast one question from each unit.

2. The use of scientific calculator will be allowed in the examination. However, programmable calculator, mobile phones or other electrical/ electronic items will not be allowed in the examination.

3. For students admitted in B.Tech. 1st Year (C-Scheme) in 2019 & onwards and all trailing students:

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Open Elective –III: MGT401C Entrepreneurship
B. Tech. Semester – VIII (Mechanical Engineering)

L	T	P	Credits
3	0	0	3

Class Work	**:**	**25 Marks**
Examination	**:**	**75Marks**
Total	**:**	**100 Marks**
Duration of Examination	**:**	**3 Hours**

Unit 1 (9 Lectures)

Entrepreneurship: Concept and Definitions of Entrepreneur & Entrepreneurship; Classification and Types of Entrepreneurs; Traits/Qualities of an Entrepreneurs; Entrepreneurship's Challenges; Factor affecting Entrepreneurial Growth – Economic &Non-Economic Factors; Entrepreneur Vs. Intrapreneur .EDP Programmes.

Unit 2 (10 Lectures)

Innovation Technology Management: Entrepreneurial Opportunity Search and Identification; recognition of a good business opportunity; Conducting Feasibility Studies. Business Plan: Purpose of Business Plan; Contents of Business Plan; Presenting of Business Plan; Why Business plan Fails.

Unit 3 (10 Lectures)

Indian Models in Entrepreneurship: Social Entrepreneur: Introduction; Characteristics, Need, Types and Motivations of Social Entrepreneur. Women Entrepreneurship: Role & Importance, Profile of Women Entrepreneur, Problems of Women Entrepreneurs, Women Entrepreneurship Development in India.

Unit 4 (9 Lectures)

Developments of Entrepreneur: Micro, Small and Medium Enterprises: Concept & definitions; Role & Importance; MSMED Act 2006, Current Scheme of MSME- Technology Up-gradation Scheme ,Marketing Assistance Scheme ,Certification Scheme, Credit- rating scheme , Problems facing MSME.
Financing the venture: Introduction, features and process of Venture Capital, Funding from Banks.

Text Books:

1. Roy Rajeev, Entrepreneurship 2/e, Oxford University Press.
2. Charantimath, Poornima, "Entrepreneurship Development and Small Business Enterprises", Pearson Education, New Delhi.

Reference Books:

1. Roy Rajeev, Entrepreneurship 2/e, Oxford University Press.
2. Charantimath, Poornima, "Entrepreneurship Development and Small Business Enterprises", Pearson Education, New Delhi.
3. Norman M. Scarborough, "Essentials of Entrepreneurship & Small Business Management", PHI, New Delhi.
4. Vasant Desai, "Entrepreneurial Development and Management", Himalaya Publishing House, New Delhi.
5. Kumar Arya, "Entrepreneurship: creating and leading an entrepreneurial organization", Seventh Impression, Pearson Education.
6. Holt, "Entrepreneurship: New Venture Creation", Prentice Hall, New Delhi.
7. Hisrich, Robert D., Michael Peters and Dean Shephered, "Entrepreneurship", Tata McGraw Hill, New Delhi.
8. Bridge, S et al., "Understanding Enterprise: Entrepreneurship and Small Business", Palgrave Publication.
9. Donald F. Kuratko, "Entrepreneurship: Theory, Process, and Practice", South Western College Publications.

Course Outcomes: At the end of the course, students will demonstrate the ability to:

1. Understand the concept of entrepreneurship, traits required to become an entrepreneur.
2. Design and formulate the basic principles of business plans, they can choose and present their business plan.
3. Know about the different types of entrepreneurs.
4. Understand the role of MSME in the development of Small Scale industries.

Note:

1. In Semester Examinations, the paper setter will set two questions from each unit (total 8 questions in all), covering the entire syllabus. Students will be required to attempt only five questions, selecting atleast one question from each unit.

2. The use of scientific calculator will be allowed in the examination. However, programmable calculator, mobile phones or other electrical/ electronic items will not be allowed in the examination.

3. For students admitted in B.Tech. 1st Year (C-Scheme) in 2019 & onwards and all trailing students:

Examinations and evaluations of students shall be conducted, covering the entire syllabus, as per guidelines "AICTE Examination Reforms". Students shall be informed about these reforms.

Open Elective –III: ME452C Fundamentals Of Sustainable Manufacturing
B. Tech. Semester – VIII (Mechanical Engineering)

L	T	P	Credits			
3	0	0	3	Class Work	:	25 Marks
				Examination	:	75Marks
				Total	:	100 Marks
				Duration of Examination	:	3 Hours

Unit 1 (9 Lectures)

Introduction: Introduction to sustainability and drivers for sustainable development and Sustainable Manufacturing - Concept of Triple bottom line, Environmental, Economic and Social Dimensions of Sustainability, Sustainable Product Development – Various Phases.

Unit 2 (10 Lectures)

Tools and Techniques: Environmental Conscious Quality Function Deployment, Life cycle assessment, Design for Environment, R3 and R6 cycles, loop production systems, Reverse supply chain, product acquisition management Design for Disassembly.

Unit 3 (10 Lectures)

EIA Standards: CML, EI 95 and 99, ISO 14001 EMS and PAS 2050 standards, Environmental Impact parameters, Energy in manufacturing (assessment and minimization)

Design for recycling: Eco friendly product design methods – Methods to infuse sustainability in early product design phases

Unit 4 (9 Lectures)

Sustainability Assessment: Concept, Models and Various Approaches, Toxic substances in industry, Product Sustainability and Risk/Benefit assessment– Corporate Social Responsibility, Industry cooperation for reducing Carbon footprint

Green Manufacturing: Dry and near-dry machining, edible oil-based cutting fluids, cryogenic machining, improving work environment, of lean manufacturing, Lean techniques for green manufacturing and strategies for waste reduction in green manufacturing.

Text Books:

1. G. Atkinson, S. Dietz, E. Neumayer ―Handbook of Sustainable Manufacturing‖. Edward Elgar Publishing Limited, 2007.
2. D. Rodick, Industrial Development for the 21st Century: Sustainable Development Perspectives, UN New York, 2007.

Reference Books:

1. P. Lawn, Sustainable Development Indicators in Ecological Economics, Edward Elgar Publishing Limited.
2. S. Asefa, The Economics of Sustainable Development, W.E. Upjohn Institute for Employment Research, 2005.

Course Outcomes: At the end of the course, students will demonstrate the ability to:

1. Summarize sustainability issuesand drivers of sustainability.
2. Understand various standards for Environmental Impact Assessment.
3. Apply various tools and technique to access manufacturing sustainability.
4. Comprehend sustainability advantages associated with various manufacturing initiatives.

Note:

1. In Semester Examinations, the paper setter will set two questions from each unit (total 8 questions in all), covering the entire syllabus. Students will be required to attempt only five questions, selecting atleast one question from each unit.

2. The use of scientific calculator will be allowed in the examination. However, programmable calculator, mobile phones or other electrical/ electronic items will not be allowed in the examination.

3. For students admitted in B.Tech. 1st Year (C-Scheme) in 2019 & onwards and all trailing students:

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Open Elective –III: CHE459C Nanoscience and Nanotechnology
B. Tech. Semester – VIII (Mechanical Engineering)

L	T	P	Credits			
3	0	0	3	Class Work	:	25 Marks
				Examination	:	75Marks
				Total	:	100 Marks
				Duration of Examination	:	3 Hours

Unit 1 (9 Lectures)

Types of materials; bonding in materials; crystal structures and defects; amorphous materials; origins of properties of materials; Effect of nanostructures on properties of materials.
The science of materials – materials science; Historical use of nanoparticles; discovery of the carbon nanotubes; fullerenes; nanostructured materials.

Unit 2 (10 Lectures)

Particle-wave duality; de-Broglie waves; Schrodinger equation in 1-Dimension; Superposition; Energy eigenstates; Interpretation of wave function; Fermions and Bosons; Electron density of states; Energy bandgaps; Fermi energy; Excitons and Bohr radius.

Unit 3 (10 Lectures)

AFM; STM; Transport in nanostructures; 0,1 and 2 dimensional nanostructures; Bandgap engineering; Molecular motors; MEMS and NEMS devices. Biomaterials and nano-biotechnology.

Unit 4 (9 Lectures)

Synthesis of Nanomaterials – ZnO and Fe3O4. Characterization of phases and quantification of phases. Applications of Nanomaterials: In textile industry, in catalytic operations, in energy generation, in energy storage, in environmental remediation and in sensors and devices.

Text Books:

1. NANO:The Essentials Understanding Nanoscience and Nanotechnology, T. Pradeep, Tata McGraw Hill Publishing Company Limited, 2007, 0-07-154830-0.
2. Material Science and Engineering, 7th ed. , William D. Callister, Johan Wiley & Sons, Inc.
3. Nanostructured Materials and Nanotechnology, Hari Singh Nalwa, Academic Press, 2002.
4. Nanostructures and Nanomaterials, synthesis, properties and applications., Guozhong Cao, Imperial College Press, 2004.

Reference Books:

1. Introduction to Nanoscience, S.M. Lindsay, Oxford University Press, 2010, ISBN: 978–019–954421–9 (Pbk).
2. Nanoscience, Hans-Eckhardt Schaefer, Springer, 2010, ISBN 978-3-642-10558-6.
3. Chemistry of nanomaterials: Synthesis, Properties and applications. C.N.R. Rao, Achim Muller, A.K. Cheetham, Wiley-VCH, 2004.

Course Outcomes: At the end of the course, students will demonstrate the ability to:

1. Learn about the background on nanoscience and give a general introduction to different classes of nanomaterials.
2. Develop an understanding of the science behind the nanomaterial properties.
3. Apply their learned knowledge to study and characterize nanomaterials.
4. Familiarize themselves with the variety of nanotechnology applications, and know how to approach the synthesis of nanomaterials with a set of desirable properties.

Note:

1. In Semester Examinations, the paper setter will set two questions from each unit (total 8 questions in all), covering the entire syllabus. Students will be required to attempt only five questions, selecting atleast one question from each unit.

2. The use of scientific calculator will be allowed in the examination. However, programmable calculator, mobile phones or other electrical/ electronic items will not be allowed in the examination.

3. For students admitted in B.Tech. 1st Year (C-Scheme) in 2019 & onwards and all trailing students:

Examinations and evaluations of students shall be conducted, covering the entire syllabus, as per guidelines "AICTE Examination Reforms". Students shall be informed about these reforms.

Open Elective –III: EE454C Smart Grid
B. Tech. Semester – VIII (Mechanical Engineering)

L	T	P	Credits
3	0	0	3

Class Work	**:**	**25 Marks**
Examination	**:**	**75Marks**
Total	**:**	**100 Marks**
Duration of Examination	**:**	**3 Hours**

Unit 1(10 Lectures)

Introduction: Concept of smart grid, smart grid control, Communications and Sensing in a Smart Grid, Hardware Architecture, Software architecture, Protocol detail, application & benefits, PLCs Vs RTUs, IED's, RTU Block diagram, PMU communication interface.

Unit 2(10 Lectures)

Cyber Security of the Smart Grid: Smart Grid Threats, Vulnerabilities and Cyber Security Strategies, Cyber Security Environment, False Data Injection and Attacks in Electric Power Grids Cyber-Physical System Security.

Unit 3(12 Lectures)

Smart Grid Technologies: Energy Management System, Demand side management: peak clipping, valley filling, load shifting etc., state estimation, load forecasting. Time of the day pricing(TOD), Time of use pricing(TOU).

Unit 4(12 Lectures)

Distributed Generation & Control: Concept of distributed generation, Introduction of various distributed generation sources like wind, solar, fuel-cell, micro-hydro, PHEV's etc., Grid integration and control of distributed generation sources.

Text Books:

1. T. Gönen, Electric Power Distribution System Engineering, McGraw-Hill, 1986. ISBN: 0-8493- 5806-X.
2. Distribution System Protection Manual, McGraw-Edison Power Systems, 1990.
3. Westinghouse Electric Utility Ref. Book, Vol.3, Distribution Systems, 1965.
4. R. E. Brown, Electric Power Distribution Reliability, Marcel Dekker Inc., 2002.

Reference Books:

1. IEEE Power and Energy Magazine, July/August 2007 Issue
2. James Burke, Power Distribution Engineering, Mercel Dekker, 1994.
3. A.J. Pansini, Electrical Distribution Engineering McGrawHill, 1983.
4. E. Lakervi, E.J.Holmes, Electricity Distribution Network Design, IEE series, 1989.
5. J. Gers and E. J. Holmes Protection of Electricity Distribution Networks 2nd Edition.

Course Outcomes: At the end of the course, students will demonstrate the ability to:

1. Understand the features of Smart Grid.
2. Understand to make conventional grid more smart, reliable, and efficient.
3. Understand the technical expertise in the emerging area of smart grid.
4. Understand the concepts of distributed generation.

Note:

1. In Semester Examinations, the paper setter will set two questions from each unit (total 8 questions in all), covering the entire syllabus. Students will be required to attempt only five questions, selecting atleast one question from each unit.

2. The use of scientific calculator will be allowed in the examination. However, programmable calculator, mobile phones or other electrical/ electronic items will not be allowed in the examination.

3. For students admitted in B.Tech. 1st Year (C-Scheme) in 2019 & onwards and all trailing students:

Examinations and evaluations of students shall be conducted, covering the entire syllabus, as per guidelines "AICTE Examination Reforms". Students shall be informed about these reforms.