COURSE TEACHING PLAN

Course No **ME-103 E**

Course Title **Manufacturing Processes**

Name of Teacher Dr. Rajender Singh (Professor. Mech. Engg.)

Scope and Objective of the Course:

It covers the study of plant layout, basic tools and machinery used in industrial environment, industrial safety, different engineering materials, various manufacturing process namely casting processes, mechanical working processes (cold and hot metal work), joining processes (welding, brazing and soldering). The main objective of this course is to create an ideal reference for under graduate engineers to make them understand the deep insight of the manufacturing industrial environment. This study will help to develop the skill in engineers for understanding the comprehensive manufacturing knowledge, design parameters and production criteria for the development of useful products.

Lecture-wise Teaching Program

Unit -I
Introduction: Introduction to Manufacturing Processes and their Classification. Industrial Safety; Introduction, Types of Accidents, Causes and Common Sources of Accidents, Methods of Safety, First Aid.

(6)

Unit-II
Engineering Materials: General Properties and Applications of Engineering Materials, Mild Steel, Medium Carbon Steel, High Carbon Steel, High Speed Steel and Cast Iron.

(**6)**

Unit-III
Foundry: Introduction to Casting Processes, Basic Steps in Casting Process, Pattern, Types of Patterns, Pattern Allowances, Risers, Runners, Gates, Molding Sand and its composition, Sand Preparation, Molding Methods, Core Sands and Core Making, Core Assembly, Mold Assembly, Melting (Cupola) and Pouring, Fettling, Casting Defects and Remedies.

(6)

Unit-IV Cold Working (Sheet Metal Work): Sheet Metal Operations, Measuring, Layout Marking, Shearing, Punching, Blanking, Piercing, Forming, Bending and Joining Advantages and Limitations. Hot Working Processes: Introduction to Hot Working, Principles of Hot Working Processes, Forging, Rolling, Extrusion, Wire Drawing.

(6)

Unit - V
Introduction to Machine Tools: Specifications and Uses of commonly used Machine Tools in a Workshop such as Lathe, Shaper, Planer, Milling, Drilling, Slotter, Introduction to Metal Cutting. Nomenclature of a Single Points Cutting Tool and Tool Wear. Mechanics of Chips Formations, Type of Chips, Use of Coolants in Machining.

(6)

Unit-VI

Welding: Introduction to Welding, Classification of Welding Processes, Gas Welding: Oxy-Acetylene Welding, Resistance Welding; Spot and Seam Welding, Arc Welding: Metal Arc, TIG & MIG Welding, Welding Defects and Remedies, Soldering & Brazing.

(6)

Unit-VII

Plant Layout, Objectives of Layout, Types of Plant Layout and their Advantages.

(4)

Text Books :

1 Workshop Technology Vol. I & II - Hazra & Chaudhary, Asian Book Comp., New Delhi.
2 Process and Materials of Manufacture- - Lindberg, R.A. Prentice Hall of India, New Delhi.
3 Principles of Manufacturing Materials and Processes - Campbell, J.S.- McGraw- Hill.

Reference Books:

1 Manufacturing Science - Amitabha Ghosh & Ashok Kumar Malik, - East-West Press.
2 Manufacturing Process and Systems - Ostwald, Munoz , John Wiley
3 Workshop Technology, Vol. 1, 2 & 3 – Chapman, WAJ, Edward Arnold.

Note: Eight questions will be set by the examiner, taking at least one question from each unit. Students will be required to attempt five questions.

Home Assignments At least one from each topic

Evaluation Procedure

Duration of Univ. Exam. : 3 Hrs.
Total Marks : 100 Marks
University Examination : 75 Marks

Class Work : 25 Marks

30% based upon Minor tests I
30% based upon Minor tests II
20% based upon 3 assignments consisting of one from two units of syllabus
20% tutorial tests

1.Students are advised to solve the question at the end of each chapter
2.Students are advised to solve the question at the end of each chapter
3.Students are advised to come with reading in advance
4.Students are advised to solve the old question papers of sessional and university examinations
5.Reading lists will be supplied from times to times

Rajender Singh

ME-105B ELEMENTS OF MECHANICAL ENGINEERING ME-105B

B. Tech. Semester 2nd common to all branches

L T P Credits
3 1 0 4

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

➢ ***Objectives:***

- The purpose of this course to understand the basics concepts of Strength of Material, Theory of Machine and Fluid Machines which will be applied in our daily life.
- To familiarize the students with the basic principal of thermodynamics and thermodynamics relations, ideal thermodynamics cycles like Petrol, Diesel, Brayton Cycles, fire and water tube boilers and their comparison.
- To emphasize on the utilization of all kind of fuels and their combustions and the application of the combustible gases for producing mechanical power which can further be utilized for Industrial Engineering, Manufacturing engineering, Production engineering and in the last not the least in the electric power generation.
- To familiarize the refrigeration and air conditioning cycles and their applications in our day today life.
- To familiarize with the steam turbines, steam nozzles, condensers, and steam thermal power plants, and their applications in the generation of electrical energy from mechanical energy.
- To familiarize the hydraulic machines like turbines and pumps, simple lifting machines, power transmission devices, positives and non positive drives, simple stresses and strain, stress strain diagram, Hook's law, concept of Shear Force and Bending Moment diagram.

➢ ***Course Outcomes (COs):***

- After finishing the above course, the undergraduate students will be able to acquire the knowledge of the knowledge of boilers, steam nozzles, condenser, thermal power plant turbines, pumps, hydraulics machines, stress and strains and utilization of energy during the EC chain process.
- The above cited contents will be helpful to understand the others subjects in engineering.
- To study the power generating cycles and power absorbing cycles of and their applications in our daily use.
- This course helps the students to understand their core subjects of Mechanical, Civil, Electrical, Production etc.
- This course is very much helpful to understand the working of all modern petrol, diesel vehicles lighter airplanes, trainer airplanes, VIP airplanes etc.
- This course is helpful to understand the concept of refrigeration and air-conditioning used in our day to day life.

BOOKS:

1. Elements of Mechanical Engineering by D. S Kumar
2. Elements of Mechanical Engineering by Dr. R K Rajput
3. Hydraulic and Fluid Mechanics – Modi and Seth, Pub. – Standard Book House, New Delhi
4. Engineering Thermodynamics – C.P. Arora, Pub. - TMH, New Delhi
5. Thermal Engineering – A.S. Sarad, Pub. - Satya Prakashan, New Delhi.
6. Strength of Materials – Popov, Pub. - PHI, New Delhi
7. Hydraulic Machines – Jagdish Lal, Pub.- Metropolitan, Allahbad.
8. Thermal Science and Engineering – D.S. Kumar, Pub. – Kateria & Sons, New Delhi

The course structure and teaching plan is given below:

Lecture wise programme: (08.01.2018 to 27.04.2018)

UNIT-I (08.01.2018 to 29.01.2018)	**THERMODYNAMICS:** Elementary definitions in thermodynamics, fundamentals of first and 2nd law of thermodynamic- concept of internal energy, enthalpy and entropy, heat p u m p and refrigerator, elementary numerical problems.	3 Lectures
	PROPERTIES OF STEAM & BOILERS: properties of steam , use of steam tables and Mollier diagram ,measurement of dryness fraction of steam , Carnot and Rankin cycle, elementary numerical problems. Classification of boilers, Comparison of water and fire tube boilers mounting and accessories with their functions, Constructional and operational details of Cochran and Babcock and Wilcox boilers, elementary numerical problems.	4 Lectures
	STEAM TURBINES AND CONDENSERS: Classification of turbines and their working principles, Types of condensers and their uses.	3 Lectures

UNIT-II (30.01.2018 to 26.02.2018)	**I.C. ENGINES AND GAS TURBINES:** Introduction, Classification, Constructional details and working of two-stroke and four-stroke diesel and petrol engines, Efficiency of Otto & Diesel cycles, Working principle of gas turbine, elementary numerical problems. **REFRIGERATION AND AIR CONDITIONING-** rating of refrigeration machine, coefficient of performance, simple vapour compression cycle, fundamentals of air conditioning, use of Psychometric charts.	5 Lectures 5 Lectures
UNIT-III (28.02.2018 to 22.03.2018)	**WATER TURBINES AND PUMPS:** Introduction, Classification, Construction details and working principle of Pelton, Francis and Kaplan turbines, Classification of water pumps and construction detail & working principle of centrifugal pump. **SIMPLE LIFTING MACHINES:** Definition of machine, Velocity ratio, Mechanical Advantage, Efficiency, Laws of machines, Reversibility of machine, Wheel and axle, Differential pulley block, Single, double and triple start worm and worm wheel, Single and double purchase winch crabs, Simple and compound screw jacks, elementary numerical problems.	5 Lectures 5 Lectures
UNIT-IV (26.03.2018 to 27.04.2018)	**INTRODUCTION TO POWER TRANSMISSION AND DEVICES:** Belt drive, Rope drive, Chain drive, Types of gear and Gear train, Types and function of clutches, Types and function of brakes. **STRESSES AN D STRAIN S:** Introduction, Concept & types of Stresses and strains, Poison's ratio, stresses and strains in simple and compound bars under axial loading, Stress-strain diagram s, Hooks law , Elastic constants & their relationships. Concept of shear force and bending moments in beams, elementary numerical problems.	5 Lectures 5 Lectures

Note:

- The first question is compulsory. All questions carry equal marks.
- In the semester examination, the examiner will set two questions from each unit, covering the entire syllabus. The students will be required to attempt only four questions selecting at least one question from each unit.
- Total number of questions to be attempted is five
- The use of scientific calculator will be allowed in the examination. However, programmable calculator and cellular phone will not be allowed.
- The use of properties (water, air, steam etc) tables, heat transfer tables, charts is permitted

Home Assignments: 4 –5 assignments are given during the semester.

Evaluation Procedure

1.	Surprise Quiz/ Tutorial Test	5 Marks
2.	Assignment / Project / Performance in the Class	5 Marks
3.	Minor Tests (Two tests having equal weightage) Minor Test I : 14-16 Feb, 2018 Minor Test II : 4 -6 April, 2018	15 Marks
4.	Major test (University Examination)	75 Marks

Award of Grades Based on Absolute Marks: The University is following the system of grading based on absolute marks (after applying moderation if any). Following grading will be done based on the % of marks obtained in all the components of evaluation part of the subject. A+ (90% - 100 %), A (80% - 89%), B+ (70% - 79%) , B(62% - 69%), C+ (55% - 61%),C (46% - 54%), D (40% - 45), F (Less than 40 %)

For F grade, a candidate shall be required to appear in the major test of concerned course only in the subsequent examination(s) to obtain the requisite marks/grade.

Attendance Record – Candidate should attend at least75% attendance of the total classes held of the subject

Chamber consultation hour: Any vacant period.

Note:

- In the semester examination, the examiner will set two questions from each u nit (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.
- The u se of scientific calculator will be allowed in the examination. However, programmable calculator and cellular phone will not be allowed.
- The use of properties (water, air, steam etc) tables, heat transfer tables, charts is permitted

Dr.S.K.Jarial

COURSE TEACHING PLAN

Course No **ME-202B**

B. Tech. Semester – IV (Mechanical Engineering)

Course Title **MANUFACTURING TECHNOLOGY**

Name of Teacher Dr. Rajender Singh (Professor. Mech. Engg.)

Scope and Objective of the Course:

It covers the study of foundry namely casting processes, melting, cleaning and testing of casting, process, special casting processes, powder metallurgy, theory of mechanical working processes (cold and hot metal work), sheet metal forming processes- welding processes, joining processes (welding, brazing and soldering) and plastic processing-. The main objective of this course is to introduce the terminology elements of manufacturing technology to under graduate engineers for creating an ideal reference for making them understand the deep insight of the manufacturing industrial environment. This study will help to develop the skill in engineers for understanding the comprehensive manufacturing knowledge, design parameters and production criteria for the development of useful products.

Lecture-Wise Teaching Program

UNIT I

INTRODUCTION TO FOUNDRY - Steps involved in casting, advantages, limitations and applications of casting process, molding methods, molding materials and properties, Design considerations in casting, gating system design and Riser design, directional solidification in castings, problems.

(4)

MELTING, CLEANING AND TESTING OF CASTING PROCESS- Melting practice: Cupola, charge calculations, cleaning of casting, Fettling, defects in castings and their remedies, methods of testing of castings for their soundness, problems.

(4)

SPECIAL CASTING PROCESSES: Shell molding, precision investment casting, permanent mold casting, die casting, centrifugal casting, and continuous casting.

(4)

UNIT II

THEORY OF METAL FORMING -Classification of metal forming processes, Nature of plastic deformation, hot working and cold working, yield criteria and their significance, Principles of rolling roll passes roll pass sequences. Forging: process and defects, Extrusion and other processes: Extrusion principle, wire drawing, swaging, tube making.

(6)

POWDER METALLURGY- Introduction ,Production of Metallic Powder, Processing methods, Design consideration for powder metallurgy.

UNIT III

INTRODUCTION TO WELDING-Classification of welding process, Selection of a welding process, Effect of welding parameters, Selection of electrodes and fluxes, Metal transfer & its importance in arc welding, Power sources for arc welding, Inspections and defects of weldments, Gas welding, Arc welding, Resistance welding

(6)

OTHER WELDING PROCESSES: Introduction of thermit welding, electro slag welding, electron beam welding, forge welding, friction welding, diffusion welding, brazing and soldering.

(6)

UNIT IV

SHEET METAL FORMING PROCESSES- Classification of sheet metal processes, press tool operations, shearing action, Principle, process parameters, equipment and application of the following processes, piercing, blanking, deep drawing, spinning, stretch forming, embossing and coining, sheet metal die design, problems. (6)

PLASTIC PROCESSING- Introduction, plastic materials, extrusion of plastic, injection moulding, blow moulding.

(6)

Text Books:

1. Principles of Manufacturing Materials & Processes – Campbell J. S., Publisher – McGraw Hill.
2. Manufacturing Technology-Foundry, Forming and Welding - P.N. Rao, Tata McGraw Hill

Reference Books:

1. Foundry Technology - K.P. Sinha, D.B. Goel, Roorkee Publishing House.
2. Welding and Welding Technology, Richard L. Little Tata McGraw Hill Ltd.
3. Principle of Metal casting - Rosenthal, Tata McGraw Hill, New Delhi
4. Manufacturing Processes and Systems: Ostwald Phillip F., Munoz Jairo, John Wiley & Sons
5. Elements of Manufacturing Processes – B.S. NagendraParasher, RK Mittal, PHI N. Delhi

Note:

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

Evaluation Procedure

Total Marks	:	100 Marks
Duration of Univ. Exam.	:	3 Hrs.
University Examination	:	75 Marks

Note: Eight questions will be set by the examiner, taking at least one question from each unit. Students will be required to attempt five questions.

Class Work	:	25 Marks

30% based upon Minor tests I of one hour
30% based upon Minor tests II of one hour
20% based upon 4 home assignments consisting of two from each units of syllabus
20% tutorial tests

1 Students are advised to attempt the question at the end of each chapter
2 Students are advised to come in class with the reading of topic in advance which is to be covered in coming class
3 Students are also advised to solve the old question papers of sessional and university examinations
4 Reading lists will be supplied from times to times

Dr. Rajender Singh

ME- 204-B MATERIAL SCIENCE

B. Tech. Semester – IV (Mechanical Engineering)

L T P Credits
3 1 0 4

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

Scope and objective of the course:

The general objective of the Materials Science and Engineering undergraduate program is embedded in our mission statement - to provide to our students a well-rounded engineering education with specific emphasis on materials science and engineering that will meet the needs of industry, academia, and government. We will provide and maintain a curriculum that will prepare our recent graduates to accomplish the following Program Educational Objectives:

1. Provide science and engineering leadership in international industrial, governmental, and academic settings, while serving both their profession and the public.
2. Innovators in a wide variety of technical fields including, but not limited to, materials, energy, electronics, medicine, communications, transportation and recreation.
3. Excel in careers related to the entire life cycle of materials, from synthesis and processing, through design and development, to manufacturing, performance, reclamation and recycling.
4. Engage in lifelong learning activities which enhance their careers and provide flexibility to respond to changing professional and societal needs.

The course structure and teaching plan along with schedule are given below.

UNIT I	**ENGINEERING MATERIAL AND CRYSTALLOGRAPHY** **Engineering Materials**: Classification of engineering materials, Property spectrum of engineering materials **(10.01.2018)** **Crystal Geometry**:space lattice,unit cell, Bravais crystal system, atomic packing fraction, Miller indices, **(11.01.2018)** Interplaner spacing,linear density, planer density, Numerical problems **(12.01.2018)** **Crystal Imperfections**: Classification of Imperfections, line imperfection , Mixed dislocations, **(17.01.2018)** Characteristics of dislocation, sources of dislocation, their effects and remedies, phenomenon related to behaviour of dislocations, **(18.01.2018),** Surface imperfection, volume imperfection, whiskers. **(19.01.2018)**	06 lectures
UNIT II	**PHASES DIAGRAMS AND HEAT TREATMENT** Solid solution, types of solid solution, phases, Gibb's Phase rule,	4 lectures

	(24.01.2018) Phase diagrams, unary and binary phase diagrams, **(25.01.2018)** Eutectic and eutectoid phase diagrams, peritectic and peritectoid phase diagrams, **(31.01.2018)** Micro-structural changes, lever rule, Iron carbon system **(01.02.2018)**	
	PHASE TRANSFORMATIONS: terminology, Strengthening mechanism, cold and hot working, **(02.02.2018)** Precipitation hardening, dispersion hardening, solid solution hardening, Recovery, re-crystallization and grain growth. **(07.02.2018)** Diffusion process, types of diffusion, laws of diffusion- Fick's first law and Fick's second law of diffusion. **(08.02.2018)**	3 lectures
	HEAT TREATMENT: purpose of heat treatment, microstructure of steel and iron, Transformation in Steel and Critical cooling curve, **(09.02.2018)** Hardening, annealing, normalizing, stress relieving, **(21.02.2018)** tempering, carburizing, nitriding, cyaniding, flame and induction hardening., **(22.02.2018)**	3 lectures
UNIT III	**MATERIAL DEFORMATION AND FAILURE** Inelastic deformation, slip systems, critical resolved shear stress (crss) yielding, strain hardening, **(23.02.2018)- (28.02.2018)** Bauschinger effect, frank read source, Anelastic behaviour, Viscoelastic behaviour **(07.03.2018)**	3 lectures
	FRACTURE: Ductile fracture, brittle fracture, Griffith theory of crack propagation, cleavage fracture, method of protection against fracture ,Ductile to brittle transition **(08.03.2018)- (09.03.2018)**	2 lectures
	CORROSION AND OXIDATION: Corrosion, types of corrosion, laws of corrosion ,oxidation and its mechanism, passivity, special type of corrosion, protection against corrosion and oxidation. **(14.03.2018)- (15.03.2018)** Fatigue, mechanism of fatigue, improving fatigue life, Creep, factor affecting creep, mechanism of creep, creep resistant materials **(16.03.2018)- (21.03.2018)**	4 lectures
UNIT IV	**STEEL ALLOYS AND COMPOSITES** Plain carbon steel, cast iron, effects of alloying elements on steel, effects on alloying elements on non-ferrous metals, **(22.03.2018)** Ferrous alloys, non ferrous alloys, alloys in different applications, **(11.04.2018)**, Materials for special cases. **(12.04.2018)**	3 lectures

	Composite materials: introduction, laminates, reinforced composite materials and their classification ,particulate composites, flake composites, whisker reinforced composites, hybrid composites, **(13.04.2018)** Sandwitch composites, fibre reinforced glass and glass ceramic composites, MMC and wood composite, advantages and limitatation of composites, Application of composites materials**(19.04.2018)- (20.04.2018)**	3 lectures

TEXT BOOKS

1. Material Science, Metallurgy & Engineering materials-K.M.GUPTA, Umesh Publications

2 Material Science and Engineering-An Introduction - Callister; W.D., John Wiley & Sons., Delhi

REFERENCE BOOKS

1. Material Science & Engineering –V. Raghvan, Prentice Hall of India Pvt. Ltd, New Delhi

2. Elements of Material Science and Engineering: VanVlack, Wesley Pub. Comp

Note: 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.

Home Assignments :4 –5 assignments are given during the semester.

Evaluation Procedure

1.	Surprise Quiz/ Tutorial Test	5 Marks
2.	Assignment / Project / Performance in the Class	5 Marks
3.	Minor Tests (Two tests having equal weightage) Minor Test I : 14-16 Feb, 2018 Minor Test II : 4 -6 April, 2018	15 Marks
4.	Major test (University Examination)	75 Marks

Award of Grades Based on Absolute Marks: The University is following the system of grading based on absolute marks (after applying moderation if any). Following grading will be done based on the % of marks obtained in all the components of evaluation part of the subject.

A+ (90% - 100 %), A (80% - 89%), B+ (70% - 79%) , B(62% - 69%), C+ (55% - 61%),C (46% - 54%), D (40% - 45), F (Less than 40 %)

For F grade, a candidate shall be required to appear in the major test of concerned course only in the subsequent examination(s) to obtain the requisite marks/grade.

Attendance Record – Candidate should attend at least75% attendance of the total classes held of the subject

Chamber consultation hour: Any vacant period.

Course Coordinator: Rajneesh Kumar

ME 206B STRENGTH OF MATERIALS –II

L	T	P	Credits		
3	1	-	04	Sessional Marks: 25	
				Theory Marks:	75
				Duration of Exams:	3 Hours

OBJECTIVES:

1. To review the basic concept of stress and strain in thin walled Vessels and develop an understanding of thick cylinders & Spheres.
2. To develop an understanding of strain energy and to analyze various theories of elastic failures with derivations and graphical representations, applications
3. To solve 2-dimensional stress system with combined direct loading and bending, and combined torsional and direct loading problems and to visualize the development of various stresses due to rotation
4. To develop an intuitive understanding of unsymmetrical bending in I-section and channel section
5. To analyze curved beams like stresses in beam of initial large radius of curvature, position of neutral axis for rectangular, circular and trapezoidal sections
6. To study the stresses in crane hooks, stresses in circular rings subjected to tension or compression and
7. To analyze Stresses in open coiled helical spring subjected to axial loads, axial couples and combined action of axial loads and axial couples and to study the importance of leaf springs, and flat spiral springs and to study the energy methods in determining spring deflection.

OUTCOME:

1. Identify the basics concepts of strain energy and various theories of failures and solve the problems
2. Differentiate different types of stresses induced in thin pressure vessel and solve the problems. Use of Lame's equation to calculate the stresses induced in thick pressure vessel.
3. Able to compute stresses in ring, disk and cylinder due to rotation. Classify the different types of spring and analyze the stresses produced due to loading
4. Determine the stresses in crane hook, rings, chain link for different cross section and also the deflection of curved bars and rings. Analyze the stresses due to unsymmetrical bending and determine the position of shear centre of different section.

Books:

Text Books:

1. Strength of Materials – Sadhu Singh, Khanna Publications.
2. Strength of Materials – R.K. Bansal, Laxmi Publications.
3. Strength of Materials – R.K. Rajput, Dhanpat Rai & Sons.
4.

Reference Books:

1. Strength of Materials – Popov, PHI, New Delhi.
2. Strength of Materials – Robert l. Mott, Pearson, New Delhi

3. Strength of Material – Shaums Outline Series – McGraw Hill
4. Strength of Material – Rider – ELBS

LECTUREWISE PROGRAMME:

Introduction of the subject	1
UNIT- I	
THIN WALLED VESSELS (5 lectures)	
Reviews of basic concept of stresses & strains	1
Hoop & Longitudinal stresses & strains in cylindrical vessels & their derivations under internal pressure, volumetric strain	2
Hoop & Longitudinal stresses & strains in spherical vessels & their derivations under internal pressure, volumetric strain	2
THICK CYLINDERS & SPHERES: (5 lectures)	
Derivation of Lame's equations	1
Variation of Radial & hoop stresses and strains in thick and compound cylinders	3
Spherical shells subjected to internal fluid pressure& Numerical	1
UNIT- II	
STRAIN ENERGY:(6 lectures)	
Definitions, expressions for strain energy stored in a body when load is gradually, suddenly and with impact, strain energy of beams due to: bending, pure shear, Horizontal shear and torsion, beam deflections, Castigliano's theorems, Numerical	
THEORIES OF ELASTIC FAILURE: (06 lectures)	
Various theories of elastic failures with derivations and graphical representations,	2
Applications to problems of 2-dimensional stress system with combined direct loading and bending,	1
2-dimensional stress system with combined torsional and direct loading,	1
Numerical	2
UNIT – III	
STRESSES DUE TO ROTATION(8 lectures)	
Stresses in Rotating Ring, and Disc, hollow disc and solids disc,	2
Stresses in rotating cylinders, hollow cylinders	2
Solids cylinder, rotating discs of uniform strength	2
Numerical	2
UNSYMMETRICAL BENDING(7 lectures)	
Properties of beam cross section, product of inertia, ellipse of inertia,	2
Slope of the neutral axis, stresses & deflections,	1
Shear center and the flexural axis for I-section and channel section,	2
Numerical	2
UNIT – IV	
CURVED BEAMS (7 lectures)	
Stresses in beam of initial large radius of curvature,	1
position of neutral axis for rectangular, circular and trapezoidal sections,	1
Stresses in crane hooks,	1
Stresses in circular rings subjected to tension,	1
Stresses in circular rings subjected to compression, Numerical.	1
Numerical	2
SPRINGS (6 lectures)	
Stresses in open coiled helical spring subjected to axial loads,	1

Axial couples and combined action of axial loads and axial couples,	1
Leaf springs, and flat spiral springs,	1
Energy methods in determining spring deflection	1
Numerical	2

Home Assignments: 4 –5 assignments will be given during the semester.

Evaluation Procedure

1.	Surprise Quiz/ Tutorial Test	5 Marks
2.	Assignment / Project / Performance in the Class	5 Marks
3.	Minor Tests (Two tests having equal weightage) Minor Test I : 14-16 Feb, 2018 Minor Test II : 4 -6 April, 2018	15 Marks
4.	Major test (University Examination)	75 Marks

Award of Grades Based on Absolute Marks:

The University is following the system of grading based on absolute marks (after applying moderation if any). Following grading will be done based on the % of marks obtained in all the components of evaluation part of the subject.
A+ (90% - 100 %), A (80% - 89%), B+ (70% - 79%),B (62% - 69%), C+ (55% - 61%),C (46% - 54%), D (40% - 45), F (Less than 40 %)

For F grade, a candidate shall be required to appear in the major test of concerned course only in the subsequent examination(s) to obtain the requisite marks/grade.

Attendance Record – Candidate should attend at least75% attendance of the total classes held of the subject

Chamber consultation hour: Any vacant period.

Note:

1. In the semester examination, the examiner will set 08 questions in all selecting two from each unit (1 & 2 from unit I, 3 & 4 from unit II, 5 &6 from unit III and 7 & 8 from unit IV). The students will be required to attempt only 5 questions selecting at least one question from each unit. All questions will carry equal marks.
2. The use of scientific calculator will be allowed in the examination. However, programmable calculator and cellular phone will not be allowed.

(Dr. M.S. Narwal)

ME 208B FLUID MACHINES (Common with AER)							
B. Tech. Semester – IVth (Mechanical Engineering)							
L	T	P	Credits		Class Work	:	25 Marks
3	1	--	4		Examination	:	75 Marks
					Total	:	100 Marks
					Duration of Examination	:	3 Hours

Course objective:

The complete course is divided into two parts. In the first part, students study the machines that run by water under some head. These machines are called power-generating machines (Turbines). These machines are used in hydro-electric power stations. In the second part students study the machines that lift the liquid to a higher level from a lower level. These machines are known as power using machines or pumps. These machines are commonly used in industries, for irrigation purpose etc.

Course aims at giving an overview of impact of jets and different types of hydraulic machinery used for energy transformation, such as Pelton , Francis , Kaplan turbines. Focus is on applications in power generation, design and construction parts etc. Pumps both centrifugal and reciprocating types used in different aspect of fluid power engineering is also dealt. Also dimensional analysis of flow in these macines.

Course Outcomes:

After completing the course the student will be able to:

Understand and apply concept of impact of jet.;

Recognize the working principle, typical designs of hydraulic machines like Pelton, Francis, Kaplan etc construction and governing mechanism ; investigate analytically

Determine the velocity triangles;

Able to understand various types of hydraulic systems ;

Understand the function and characteristics of centrifugal and reciprocating pumps

Able to do dimensional analysis

Text Books

1. Hydraulic & Fluid Mechanics (including hydraulic machines) by Modi & Seth. Pub. Standard Book House, New Delhi.
2. Fluid Mechanics and Hydraulic Machines – SS Rattan, Khanna Publishers
3. Hydraulic Machines by Jagdish Lal, Metropolitan
4. Hydraulic Machines Theory & Design by V.P. Vansandani
5. Introduction to Fluid Mechanics & Fluid Machines by S.K. Som and G Biswas, Tata McGraw Hill
6. Fluid Mechanics & Fluid Power Engineering Dr. D S Kumar , S K Kataria & Sons
7. Turbomachines – V Kadambi & Manohar Prasad

Lecture Plan

Unit 1

IMPACT OF FREE JETS: Impulse – momentum principle, jet impingement - on a stationary flat plate, inclined plate and a hinged plate, at the center of a stationary vane, on a moving flat plate, inclined plate, a moving vane and a series of vanes. Lecture 3

Jet striking tangentially at the tip of a stationary vane and moving vane(s);

jet propulsion of ships. Lecture 3

IMPULSE TURBINES: Classification – impulse and reaction turbines, water wheels, component parts, construction, operation and governing mechanism of a Pelton wheel Lecture 1

Work done, effective head, available head and efficiency of a Pelton wheel

Design aspects, speed ratio, flow ratio, jet ratio, number of jets, number of buckets and working proportions, Performance Characteristics, governing of impulse turbines. Lecture 3

Unit 2

FRANCIS TURBINES: Component parts, construction and operation of a Francis turbine,

Governing mechanism Lecture 2

Work done by the turbine runner, working proportions and design parameters, slow, medium and fast runners, degree of reaction, inward/outward flow reaction turbines, Performance Characteristics,

Problems. Lecture 3

PROPELLER AND KAPLAN TURBINES: Component parts, construction and operation of a Propeller, Kaplan turbine, differences between the Francis and Kaplan turbines, draft tube - its function and different forms, Performance Characteristics, Lecture 3

Governing of reaction turbine, Introduction to new types of turbine, Deriaz (Diagonal), Bulb,

Tubular turbines. Lecture 2

Unit 3

DIMENSIONAL ANALYSIS AND MODEL SIMILITUDE: Dimensional homogeneity, Rayleigh's method and Buckingham's p-theorem, model studies and similitude, dimensionless numbers and their significance. Unit quantities, specific speed and model relationships for turbines, scale effect, cavitations – its causes, harmful effects and prevention, Thomas cavitation factor, permissible installation height, Problems. Lecture 5

HYDRAULIC SYSTEMS: Function, construction and operation of Hydraulic accumulator, hydraulic intensifier, hydraulic crane, hydraulic lift and hydraulic press, Fluid coupling and torque converter, Hydraulic ram,

Problems Lecture 3

Unit 4

CENTRIFUGAL PUMPS: Classification, velocity vector diagrams and work done, manometric efficiency, vane shape, head capacity relationship and pump losses, pressure rise in impeller, minimum starting speed, design considerations, multi-stage pumps. Lecture 3

Similarity relations and specific speed, net positive suction head, cavitation and maximum suction lift, performance characteristics. Brief introduction to axial flow, mixed flow and submersible pumps, Problems. Lecture 3

RECIPROCATING PUMPS: Construction and operational details, discharge coefficient, volumetric efficiency and slip, work and power input, effect of acceleration and friction on indicator diagram

(pressure – stroke length plot), Lecture 3

Air vessels and their utility, rate of flow into or from the air vessel, maximum speed of the rotating crank, characteristic curves, centrifugal vs reciprocating pumps, brief introduction to screw, gear, vane and radial piston pumps, Lecture 3

Evaluation Procedure:

Sessional Test : 60%; Assignment : 20%; Surprise Quiz : 20%

1.	Surprise Quiz/ Tutorial Test	5 Marks
2.	Assignment / Project / Performance in the Class	5 Marks
3.	Minor Tests (Two tests having equal weight age) Minor Test I : 14-16 Feb, 2018 Minor Test II : 4 -6 April, 2018	15 Marks
4.	Major test (University Examination)	75 Marks

Home Assignments :4 –5 assignments are given during the semester.

Award of Grades Based on Absolute Marks: The University is following the system of grading based on absolute marks (after applying moderation if any). Following grading will be done based on the % of marks obtained in all the components of evaluation part of the subject. A+ (90% - 100 %), A (80% - 89%), B+ (70% - 79%) , B(62% - 69%), C+ (55% - 61%), C (46% - 54%), D (40% - 45), F (Less than 40 %) For F grade, a candidate shallbe required to appear in the major test of concerned course only in the subsequent examination(s) to obtain the requisite marks/grade.

Attendance Record – Candidate should attend at least75% attendance of the total classes held of the subject

Chamber consultation hour: Any vacant period.

Note:

- In the semester examination, the examiner will set eight questions in all, covering the entire syllabus. The students will be required to attempt only five questions.
- The use of scientific calculator will be allowed in the examination. However, programmable calculator and cellular phone will not be allowed.

Course Coordinator
Dr Amit Sharma, Assistant professor
Mech. Engg Deptt., DCRUST Murthal

ME-210B ENERGY CONVERSION
B. Tech. Semester 4th (Mechanical Engineering)

L T P Credits
3 1 0 4

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

- ***Objectives:***

- . The purpose in this course to briefly review these basic thermodynamics laws & concepts.
- principal of thermodynamics and thermodynamics relations, ideal thermodynamics cycles like Carnot cycle, actual working cycle steam power plant Rankine cycles, Rankine cycle with superheat, binary vapor cycles and their applications in our daily use.
- To emphasize on the utilization of all kind of fuels and their combustions and the application of the combustible gases for producing mechanical power which can further be utilized for Industrial engineering, Manufacturing engineering, Production engineering and in the last not the least in the electric power generation.
- To familiarize with the steam turbines, steam nozzles, condensers, and steam thermal power plants, and their applications in the generation of electrical energy from mechanical energy and drawbacks of steam thermal power plants as compared to other thermal power plants/any other power plants.
- To emphasize the condenser, cooling tower in the steam thermal power plant.
- To emphasize the reciprocating compressor and its application in our day today life.

- ***Course Outcomes (COs):***

- After finishing the above course, the undergraduate students will be able to acquire the knowledge of the Energy Conversion Chain (EC chain) and utilization of energy during the EC chain process.
- To acquire with the steam turbines, steam nozzles, condensers, and steam thermal power plants, and their applications in the generation of electrical energy from mechanical energy and drawbacks of steam thermal power plants as compared to other thermal power plants/any other power plants.
- To study the power generating cycles and power absorbing cycles of and their applications in our daily use.
- To study the condenser, cooling tower in the steam thermal power plant.
- To study the reciprocating compressor and its application in our day today life.
- To study the concept and application of heat pump and refrigeration in our day to day life.
- To familiarize with the working of air compressor and their utilization in our daily life.
- To be able to understand various types of orsat apparatus and its applications in day to day life.

BOOKS:

1. Engineering Thermodynamics – P K Nag Tata Mc Graw Hill
2. Thermal Science & Engineering – D S Kumar, S K Kataria & Sons
3. Thermal Engineering – R K Rajput, S K Kataria & Sons
4. Applied Thermodynamics for Engineering Technologists – T D Eastop and A McConkey
5. Thermal Engineering – A S Sarao, Satya Prakashan
6. Thermodynamics and Heat Engines vol. II – R Yadav, Central Publishing House

Lecture wise programme: (from 08.01.2018 to 27.04.2018)

The course structure and teaching plan are given below:

UNIT-I (08.01.2018 to 25.01.2018)	**FUELS AND COMBUSTION:** Classification of fuels- solid, liquid & gaseous fuels, Combustion equations, Stochiometric air-fuel ratio, Excess air, Orsat apparatus for exhaust & flue gas. Enthalpy and internal energy of combustion, Enthalpy of formation, Adiabatic flame temperature, Calorific values of fuel, Problems. **STEAM BOILERS AND DRAFT:** Classification, comparison between fire and water tube boilers, Essentials of a good boiler, Constructional and operational details of Locomotive & Lancashire Boilers, High pressure boilers- Benson, Lamont, Loeffler and Velox boilers, Boiler mountings and accessories, Boiler performance, Natural& Artificial drafts, Chimney height, Maximum draft and chimney efficiency, Boiler heat balance sheet, Problems.	2 Lecture 7 Lectures

UNIT-II (29.01.2018 to 23.02.2018)	**VAPOUR POWER CYCLES:** Carnot and Rankine vapour cycles, effect of operating conditions on efficiency of Rankine cycle, Rankine cycle with superheat, reheat and regeneration, Binary vapour cycle, Problems. **FLOW THROUGH NOZZLES:** Velocity and heat drop, mass discharge through a nozzle, critical pressure ratio and its significance, effect of friction and nozzle efficiency, supersaturated flow, relationship between area, velocity & pressure in nozzle flow, Problems.	3 Lectures 6 Lectures
UNIT-III (26.02.2018 to 22.03.2018)	**STEAM TURBINES:** Classification, Impulse Turbine- Flow through blades, velocity diagram, power output and efficiency, maximum blade efficiency of single stage impulse turbine, blade friction, compounding of impulse turbine. Reaction Turbine-Flow through blades, degree of reaction, velocity diagram, power output, blade efficiency and blade height, comparison of impulse and impulse reaction turbines. Energy losses in steam turbines, stage efficiency, overall efficiency and reheat factor, condition for maximum blade efficiency for impulse and reaction turbine, governing of steam turbines, Problems.	12 Lectures
UNIT-IV (26.03.2018 to 27.04.2018)	**STEAM CONDENSERS:** Elements of a condensing plant, types of condensers, comparison of jet and surface condensers. Condenser vacuum , sources of air leakage & its disadvantages, vacuum efficiency and condenser efficiency, determination of mass of cooling water for jet and surface condensers, cooling ponds and cooling towers, Problems. **AIR COMPRESSORS:** Working of a single stage reciprocating air compressor; calculation of work input with and without clearance; Volumetric efficiency; Isotherm al efficiency; Ad vantages of multi stage compression; Multi - stage compressor with Inter-cooling; Perfect Inter cooling; Optimum intercooler pressure, Problems.	6 Lectures 6 Lectures

Home Assignments: 4 –5 assignments are given during the semester.

Evaluation Procedure

1.	Surprise Quiz/ Tutorial Test	5 Marks
2.	Assignment / Project / Performance in the Class	5 Marks
3.	Minor Tests (Two tests having equal weightage) Minor Test I : 14-16 Feb, 2018 Minor Test II : 4 -6 April, 2018	15 Marks
4.	Major test (University Examination)	75 Marks

Award of Grades Based on Absolute Marks: The University is following the system of grading based on absolute marks (after applying moderation if any). Following grading will be done based on the % of marks obtained in all the components of evaluation part of the subject. A+ (90% - 100 %), A (80% - 89%), B+ (70% - 79%) , B(62% - 69%), C+ (55% - 61%),C (46% - 54%), D (40% - 45), F (Less than 40 %)

For F grade, a candidate shall be required to appear in the major test of concerned course only in the subsequent examination(s) to obtain the requisite marks/grade.

Attendance Record – Candidate should attend at least75% attendance of the total classes held of the subject

Chamber consultation hour: Any vacant period.

Note:

- 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.
- The use of scientific calculator will be allowed in the examination. However, programmable calculator and cellular phone will not be allowed.
- The use of properties (water, air, steam etc) tables, heat transfer tables, charts is permitted

Dr.S.K.Jarial

ME 302B DYNAMICS OF MACHINES

L	T	P	Credits		
3	1	-	04	Sessional Marks: 25	
				Theory Marks:	75
				Duration of Exams:	3 Hours

OBJECTIVES:

1. To review the basic concept of Dynamics of Machines.
2. To find theCombined static and dynamics force analysis in slider-crank mechanism
3. To analyze the turning moment diagrams-single cylinder double acting steam engine
4. To analyze the Turning moment diagrams four stroke IC engine and multi-cylinder steam engine
5. To balance the single cylinder engine
6. To balancing of multi cylinder; inline; radial engines
7. To study Terminology, Centrifugal governors-Watt governor and to study the Power of governor, Controlling force diagrams for Porter governor and Spring controlled governors
8. To understand the concpetofgyroscopic couple and their effects on aeroplane, ship during steering, rolling and pitching.
9. To analyze the stability of two wheel and four wheel vehicles moving on curved paths.
10. To study the importance of braking system and types of braking systems
11. To study the various types ofof dynamometers and their importance

OUTCOME:

1. To study the effect of static and dynamic forces on the components of mechanisms
2. To study the design and working of various gears and gear trains.
3. To study the various types of brakes and dynamometers.
4. To study the unbalanced forces and vibrations in various components of rotating and reciprocating machines.
5. To study the gyroscopic effect in aeroplanes, ships, two and four wheelers.

Books :

1. Theory of machines: S. S. Rattan, Tata McGraw Hill Publications.
2. Theory of Machines: V. P. Singh, Dhanpat Rai & Co. Pvt. Ltd.
3. Theory of machines: Kinematics and Dynamics by Sadhu Singh, Pearson Publications
4. Theory of Machines and Mechanisms.:Uicker, J.J., Pennock G.R and Shigley, J.E.,3rd Edition, Oxford University Press, 2009.
5. Mechanism synthesis and analysis: A.H. Soni, McGraw Hill Publications.
6. Mechanism: J.S. Beggs.
7. Mechanics of Machines: P.Black, Pergamon Press.
8. Theory of Machines: P.L.Ballaney, Khanna Publisher.

LECTUREWISE PROGRAMME : (from 08.01.18 to 27.04.18)

Introduction of the subject	1

UNIT- I

STATIC AND DYNAMIC FORCE ANALYSIS: **(5 lectures)**

Static force analysis in four-bar	1
mechanism and slider crank mechanism, Internal force analysis,	
Inertia force in four-bar mechanism,	1
Combined static and dynamics force analysis in slider-crank mechanism,	1
Problem	2

TURNING MOMENT AND FLYWHEEL **(6 lectures)**

Turning moment on crankshaft, 1
Turning moment diagrams-single cylinder double acting steam engine, 1
Turning moment diagramsfour stroke IC engine and multi-cylinder steam engine, 1
Fluctuation of energy, Flywheel, 1
Problems 2

UNIT- II

BALANCING OF ROTATING COMPONENTS (06 lectures)

Static balance, Dynamic balance, Balancing of rotating masses, Two plane balancing, Graphical and analytical methods, Balancing machines-static balancing and dynamic balancing machines, Field balancing, Problems. 3+3

BALANCING OF RECIPROCATING PARTS (06 lectures)

Primary and secondary forces and couples, 1
Partial balancing, Effects of partial balancing,. 1
Balancing of single cylinder engine, 1
balancing of multi cylinder; inline; radial engines, 1
firing order, Problems 2

UNIT – III

GOVERNORS **(7 lectures)**

Terminology, Centrifugal governors-Watt governor, Dead weight governors 2
Porter &Proell governor, Spring controlled governor-Hartnell governor, 2
Sensitivity, Stability, Hunting, Isochronism, 1
Effort and Power of governor, Controlling force diagrams for Porter governor and Spring controlled governors 2

GYROSCOPE**(4 lectures)**

Precession angular motion and gyroscopic couple and their effects on aeroplane, ship during steering, rolling and pitching, 2
Stability of two wheel and four wheel vehicles moving on curved paths, Problems. 2

UNIT – IV

BRAKE AND DYNAMOMETERS **(06 lectures)**

Types of brakes- external shoe brakes, band brakes, band and block brakes, 2
Braking of vehicle, Types of dynamometers-Prony brake, 1
rope brake dynamometers, Belt transmission dynamometer, 1
Torsion dynamometer, 1
Problems. 1

INERTIA FORCES IN RECIPROCATING PARTS (5 lectures)

Forces on reciprocating parts of an engine neglecting the weight of connecting rod, 1
Crankshaft torque, 1
Dynamically equivalent system-analytical 1
Dynamically equivalent system graphical method, Correction couple 1
Problems. 1

Home Assignments :4 –5 assignments will given during the semester.

Evaluation Procedure

1.	Surprise Quiz/ Tutorial Test	5 Marks
2.	Assignment / Project / Performance in the Class	5 Marks
3.	Minor Tests (Two tests having equal weightage) Minor Test I : 14-16 Feb, 2018 Minor Test II : 4 -6 April, 2018	15 Marks
4.	Major test (University Examination)	75 Marks

Award of Grades Based on Absolute Marks: The University is following the system of grading based on absolute marks (after applying moderation if any). Following grading will be done based on the % of marks obtained in all the components of evaluation part of the subject.
A+ (90% - 100 %), A (80% - 89%), B+ (70% - 79%) , B(62% - 69%), C+ (55% - 61%),C (46% - 54%), D (40% - 45), F (Less than 40 %)

For F grade, a candidate shallbe required to appear in the major test of concerned course only in the subsequent examination(s) to obtain the requisite marks/grade.

Attendance Record – Candidate should attend at least75% attendance of the total classes held of the subject

Chamber consultation hour: Any vacant period.

Note:

1. In the semester examination, the examiner will set 08 questions in all selecting two from each unit (1 & 2 from unit I, 3 & 4 from unit II, 5 &6 from unit III and 7 & 8 from unit IV). The students will be required to attempt only 5 questions selecting at least one question from each unit. All questions will carry equal marks.
2. The use of scientific calculator will be allowed in the examination. However, programmable calculator and cellular phone will not be allowed.

(Dr. M.S. Narwal)

ME-304B MACHINE DESIGN –II

B. Tech. Semester – VI (Mechanical Engineering)

L	T	P	Credits	
3	2	--	5	**Class Work : 25 Marks**
				Examination : 75 Marks
				Total :100 Marks
				Duration of Examination : 3 Hours

OBJECTIVES: Machine design occupies a prominent place in Mechanical Engineering and it‘s most indispensable tools are the information resources available in the form of standards, codes research results etc. to develop new or improved machines. This course is designed to fulfil this requirement.

In this course the students will be acquainted with standards, safety, reliability, ergonomic statistical considerations and manufacturing aspects in mechanical design. The topics dealt in the course and the pedagogy is aimed to prepare the graduates with the ability to analyse and design various machine elements to meet the needs with in realistic constraints.

The students will be able to apply fatigue failure criteria in the analysis and design of mechanical components. The students will be able to analyse and design power transmission shafts carrying various elements with geometrical features. At the end of this course, students will be able to analyse and design mechanical springs, rolling element bearings, hydrodynamic journal bearing, hydrostatic thrust bearing and selection of lubricants. The students will be able to analyse and design the spur, helical, bevel and worm gear. Through this course, students will also be able to improve their technical report writing skills.

OUTCOMES:

1. Acquaintance with Ergonomic and value engineering considerations in design. An nderstanding of the influence of manufacturing processes in the design of machine elements.
2. Knowledge of stress concentration due to geometric discontinuities present in machine elements.
3. Knowledge of various fatigue failure criteria, load-life relation and finite and infinite life of machine components. Ability to apply fatigue failure criteria in the design and analysis of machine components under various loading conditions.
4. Acquaintance with spring terminology and different types of springs. Ability to design and analyze coil springs (compression, tension, torsion) under various loads.
5. Knowledge of the function of bearing, types and load- life relationships. Ability to select the bearing from catalogue for a given application.
6. Knowledge of basic modes of lubrication in journal bearing. Ability to analyse and design hydrodynamic journal bearing based on temperature rise and other specific parameters.
7. Knowledge of types of gears and applications, force acting on gear tooth and common types of failure. Ability to analyse and design the gears based on beam strength, dynamic loading and wear.
8. Ability to justify a design project in a formal report. Ability to perform and present design calculations in a neat and organized manner.

(Dr SURESH VERMA)

LECTUREWISE PROGRAMME: (from **08.01.18** to **27.04.18**)

The course structure and teaching plan are given below.

	Introduction to the Subject / Curriculum of Machine Design-II	**08.01.18**	1 Lecture
UNIT I	**DESIGN ASPECTS**: Ergonomic and value engineering considerations in design, **(10.01.18)** design for manufacturability, assembly, interchangeability,(**11.01.18)** Statistical consideration in design, considerations for casting, forging and machining (**15.01.18)** **VARIABLE LOADING**: Different types of fluctuating/ variable stresses, (**17.01.18)** Fatigue strength considering stress concentration factor, surface factor, size factor, reliability factor etc., (**18.01.18 and 24.01.18)** Fatigue design for finite and infinite life (**25.01.18)** Goodman and Soderberg's Criterion, (**29.01.18)** Fatigue design using Miner's equation, Problems. (**01.02.18)**	**10.01.18 to 15.01.18** **17.01.18 to 01.02.18**	3 Lectures 6 Lectures
UNIT II	**SHAFTS**: Detailed design of shafts for static and dynamic loading, Rigidity and deflection consideration. (**05.02.18 07.02.18 and 08.02.18**) **SPRINGS** : Types of Springs, their uses, **(12.02.18)** Design for helical springs against tension and, (**19.02.18)** compression (**21.02.18)** and fluctuating loads, (**22.02.18)** Design of leaf springs, Surging in springs, Design Problem. (**26.02.18 and 28.02.18)**	**01.02.18 to 08.02.18** **12.02.18 to 28.02.18**	3 Lectures 6 Lectures
UNIT III	**BEARINGS:** Classification, (**01.03.18**) Design of pivot and collar bearing, (**05.03.18**) Selection of ball and roller bearing based on static and dynamic load carrying capacity, (**07.03.18**) load-life relationship, (**08.03.18)** Selection of Bearings from manufacturer's catalogue (**12.03.18)** Lubricants and their properties,(**14.03.18)** Selection of lubricants, (**15.03.18)** Types of lubrication–Boundary, mixed and hydrodynamic lubrication, (**19.03.18**) Design of journal bearings using Raimondi and Boyd's Charts, Design Problems. (**21.03.18 and 22.03.18)**	**01.03.18 to 12.03.18** **14.03.18 to 22.03.18**	5 Lectures 5 Lectures
UNIT IV	**GEARS:** Classification, Selection of gears, (**28.03.18)** Terminology of gears, (**02.04.18**) Force analysis, Selection of material for gears, (**09.04.18**) Beam & wear strength of gear tooth, Form or Lewis factor for gear tooth, (**11.04.18)** Dynamic load on gear teeth -Barth equation and Buckingham equation and their comparison, (**12.04.18)** Design of spur, helical, bevel & worm gear including the Consideration for maximum power transmitting capacity, Gear Lubrication, Design Problems. (**16.04.18, 19.04.18, 23.04.18,25.04.18 and 26.04.18**	**26.03.18 to 26.04.18**	10 Lectures

(Dr SURESH VERMA)

TEXT BOOKS :

1. Mechanical Engg. Design, Joseph Edward Shigley, McGraw Hill Book Co.
2. Design of Machine Elements, V.B. Bhandari ,Tata McGraw Hill, New Delhi.
3. Engineering design – George Dieter, McGraw Hill, New York.
4. Product Design and Manufacturing , A.K.Chitale and R.C.Gupta, PHI, New Delhi.
5. Machine Design An Integrated Approach: Robert L.Norton, Addison Wisley Longman
6. Analysis and Design of Machine Elements, V K Jadon, S Verma, I K International
7. Machine Design, S.G. Kulkarni, TMH , New Delhi.
8. Design of machine elements-C S Sharma, Kamlesh Purohit, PHI.
9. PSG design data book
10. Machine Design Data book , V K Jadon , S Verma, I K International Publication

NOTE:

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 the use of only PSG Design Data book / Machine Design Data book by I. K. International Publication, New Delhi is permitted.

HOME ASSIGNMENTS: 4 –5 assignments are given during the semester.

EVALUATION PROCEDURE:

1.	Surprise Quiz/ Tutorial Test	5 Marks	Internal 25 Marks
2.	Assignment / Project / Performance in the Class	5 Marks	
3.	Minor Tests (Two tests having equal weightage) Minor Test I : 14-16 Feb, 2018 Minor Test II : 4 -6 April, 2018	15 Marks	
4.	Major test (University Examination)	75 Marks	External 75 Marks

AWARD OF GRADES BASED ON ABSOLUTE MARKS:

The University is following the system of grading based on absolute marks (after applying moderation if any). Following grading will be done based on the % of marks obtained in all the components of evaluation part of the subject.

A+ (90% - 100 %), A (80% - 89%), B+ (70% - 79%) , B(62% - 69%), C+ (55% - 61%), C (46% - 54%), D (40% - 45), F (Less than 40 %)

For F grade, a candidate shall be required to appear in the major test of concerned course only in the subsequent examination(s) to obtain the requisite marks/grade.

ATTENDANCE RECORD:

Candidate should attend at least75% attendance of the total classes held of the subject

CHAMBER CONSULTATION HOUR:

Any vacant period as per time table

(Dr SURESH VERMA)

ME 306B HEAT TRANSFER

B. Tech. Semester – VI (Mechanical Engineering)#

L	T	P	Credits		
				Sessional Marks:	25
4	1	--	5	Theory Marks:	75
				Duration of Exams:	3 Hours

OBJECTIVES:

1. Heat transfer is a central discipline of thermal engineering to represent a rigorous and refreshing treatment of the energy transfer rates through conduction, convection and radiation mode.
2. The course is designed to impart the analytical and practical knowledge of the basic heat transfer principles among undergraduate in order to understand and to apply on the power producing, refrigeration and air conditioning systems.
3. It also relates to other disciplines, in particular, thermodynamics and fluid mechanics to study the steady state and transient behavior.
4. Number of representative problems is included to enhance problem solving ability.
5. The course stands at the crossroad of demanding needs of the immerging areas like thermal management in electronics, bio-technology and newer efforts for cleaner energy options.
6. Thus, the contents dealt in the course and the pedagogy is aimed to prepare the graduates towards a deeper research insight.

OUTCOME:

1. After finishing the above course, the graduates are expected to acquire knowledge of the heat transfer fundamentals and issues related to applications relevant to their professional excellence in area of power generation plants and industries.
2. It enables them to establish better control on steady state and transient behaviour of plants.
3. This course prepares students for research including the domain of newer microscale heat transfer technology for heat exchanger in single and two phase regime.

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

LECTUREWISE PROGRAMME: (from 08.01.18 to 27.04.18)

	L(T)
UNIT-I	
BASIC CONCEPTS (08.01.18 to 12.01.18)	
Heat transfer vs thermodynamics, Fourier's law	1
thermal conductivity Vs diffusivity	2
basic modes of heat transfer	1
Combined heat transfer.	1
STEADY STATE HEAT CONDUCTION(15.01.18 to 23.01.18)	
Introduction to steady state heat conduction, Conduction equation in Cartesian,	2
Conduction equation in polar co-ordinate,	1
Conduction equation spherical co-ordinate,	1
Conduction equation in Cartesian, polar and spherical co-ordinate systems	2
Numericals	(1)
UNIT-II	
STEADY STATE CONDUCTION WITH HEAT GENERATION(24.01.18 to 07.02.18)	
I-D heat conduction through a plane wall, long hollow cylinder, hollow sphere	3
Introduction to steady state conduction with heat generation	2
1-D heat conduction with heat sources,	2
Extended surfaces (fins) - Fins with uniform cross-sectional area	1
Fin effectiveness and efficiency	1
Brief introduction of 2-D heat conduction	1
Numericals	(2)
TRANSIENT HEAT CONDUCTION (1-D): (08.02.18 to 23.02.18)	
Introduction to 1-D transient heat conduction	1
Lumped capacitance	1
semi-infinite solid conduction mode	2
infinite solid conduction mode	2
Applications to walls, cylinders, spherical shape objects	2

Chart solution, Relaxation Method	1
Numericals	(2)

UNIT-III

CONVECTION: **(26.02.18 to 16.03.18)**	
Forced convection- Thermal and hydro-dynamic boundary layers	2
Equation of continuity, Momentum	2
Energy equations	2
Internal flow through circular tube	2
external flow over a flat plate	2
Colburn analogy	1
Free convection from a vertical flat plate,	2
Empirical relations for free convection from vertical/ horizontal planes/ cylinders,	1
Numericals	(2)
THERMAL RADIATION: **(19.03.18 to 02.04.18)**	
Introduction to radiation : Basic laws, Black body radiation,	2
Intensity and emissive power,	2
diffuse and gray surfaces, Shape factors and network analogy	2
Radiation shields, applications to two and three surface enclosures,	2
introduction to participating media	1
Numericals	(2)

UNIT-IV

EXCHANGERS: **(03.04.18 to 16.04.18)**	
Classification, Performance variables	1
Analysis of a parallel/counter flow heat exchanger,	2
Heat exchanger effectiveness	3
Pressure drop through heat exchangers	2
Numericals	(2)
HEAT TRANSFER WITH CHANGE OF PHASE(17.04.18 to 27.04.18)	
Laminar film condensation on a vertical plate	1
Drop-wise condensation,	1
Pool boiling regimes	1
Nucleate boiling and critical heat flux	2
film boiling, minimum heat flux	2
Flow boiling	1
Numericals	(1)

Home Assignments :4 –5 assignments are given during the semester.

Evaluation Procedure

1.	Surprise Quiz/ Tutorial Test	5 Marks
2.	Assignment / Project / Performance in the Class	5 Marks
3.	Minor Tests (Two tests having equal weightage) Minor Test I : 14-16 Feb, 2018 Minor Test II : 4 -6 April, 2018	15 Marks
4.	Major test (University Examination)	75 Marks

Award of Grades Based on Absolute Marks: The University is following the system of grading based on absolute marks (after applying moderation if any). Following grading will be done based on the % of marks obtained in all the components of evaluation part of the subject. A+ (90% - 100 %), A (80% - 89%), B+ (70% - 79%) , B(62% - 69%), C+ (55% - 61%), C (46% - 54%), D (40% - 45), F (Less than 40 %)

For F grade, a candidate shall be required to appear in the major test of concerned course only in the subsequent examination(s) to obtain the requisite marks/grade.

Attendance Record – Candidate should attend at least 75% attendance of the total classes held of the subject
Chamber consultation hour: Any vacant period.

Note:

1. In the semester examination, the examiner will set 08 questions in all selecting two from each unit (1 & 2 from unit I, 3 & 4 from unit II, 5 &6 from unit III and 7 & 8 from unit IV). The students will be required to attempt only 5 questions selecting at least one question from each unit. All questions will carry equal marks.
2. The use of scientific calculator will be allowed in the examination. However, programmable calculator and cellular phone will not be allowed.
3. The use of properties (water, air, steam etc) tables, heat transfer tables, charts is permitted

(Dr. Avdhesh Kr. Sharma)

ME 308B ATOMATIC CONTROL

L	T	P	Credits		
3	1	-	04	Sessional Marks:	25
				Theory Marks:	75
				Duration of Exams:	3 Hours

OBJECTIVES:

1. To understand basic elements of an automatic control system.
2. To understand different control logics on the basis of relation between controlled variable and error.
3. To be familiar with mathematical modeling and block diagram representation of a physical dynamic system.
4. To determine the transient state and steady state behavior of first and second order system to different inputs.
5. To evaluate the frequency response of a physical system that includes Bode diagram, Polar plot, Nicholas plot.
6. To check the stability of a system analytically using methods like Routh's stability criterion, Root locus method, Nyquist's criterion.
7. Introduction of mathematical modeling of dynamics of physical system in state space equations and solution to determine system behavior to various input.
8. To know applications of various control system in various governor systems and NC/CNC/DNC machine.

OUTCOME:

1. Able to understand working of an automatic control system, and various control strategies
2. Able to determine both transient and steady state response of a physical system to various inputs.
3. Able to understand the importance of stability of a dynamic system, and anticipate the response and stability of a physical system in advance, which is useful in design and synthesis of dynamic physical systems.
4. Able to design the control logic for controlling desired parameter(s) in any control system, and understand applications of a control system.

Books :

1. Theory & Applications of Automatic Controls by B.C. Nakra, Published by New Age International Pvt. Ltd. Publishers, New Delhi.
2. Modern Control Engg. by Ugata, Prentice Hall of India, New Delhi.
3. Automatic Control Systems by Kuo' Published by Prentice Hall of India, New Delhi.
4. Control System Engineering, I. J. Nagrath and M. Gopal, New Age , New Delhi

LECTUREWISE PROGRAMME : (from 08.01.18 to 27.04.18)

Introduction of the subject (08.01.18)	1
UNIT- I	
INTRODUCTION (10.01.18- 25.01.18)	
Types of control systems,	1
Typical Block Diagram : Performance Analysis; Representation of Processes & Control Elements – Mathematical Modeling.	2
Block Diagram Representation, Representation of Systems or Processes, Comparison Elements	2
Representation of Feedback Control systems – Block Diagram & Transfer Function Representation, Representation of a Temperature, Control System	2
Signal Flow Graphs, Mason's Formula, Problems.	2
TYPES OF CONTROLLERS (01.02.18- 09.02.2018)	
Types of Control Action	1
Proportional Controller, Integral Controller, Derivative Controller, On-off controller, PD, PID Controller	1
Hydraulic Controllers; Electronic Controllers; Pneumatic Controllers; Problems	3
UNIT- II	
TRANSIENT AND STEADY STATE RESPONSE(15.02.18- 01.03.18)	
First order system; Unit Step, Unit Ramp and Unit Impulse Response of First Order system	2
Second Order System; Step Response of Second Order System	3
Delay Time, Rise Time, Peak Time, Settling Time.	2
FREQUENCY RESPONSE ANALYSIS (07.03.18- 15.03.18)	

Introduction; Closed and Open Loop Transfer Function	2
Bode Diagram; Polar Plots; Rectangular Plots; Nichols Plots	3

UNIT – III

STABILITY OF CONTROL SYSTEMS (16.03.18- 22.03.18)

Characteristic Equation; Routh's Criterion; Nyquists Criterion, Problems.	4

ROOT LOCUS METHOD(28.03.18- 06.04.18)

Introduction; Root Loci of a Second Order System; General Case; Rules for Drawing Forms of Root Loci;	2
Relation between Root Locus Locations and Transient Response; Parametric Variation; Problems.	2

UNIT – IV

STATE SPACE ANALYSIS OF CONTROL SYSTEMS(11.04.18-20.04.18)

Introduction; Generalized State Equation; Techniques for Deriving System State – Space Equations	2
Transfer Function from State Equations; Solution of State Vector Differential Equations; Discrete Systems; Problems	3

CONTROL APPLICATION (25.04.18- 27.04.18)

Machine Tool Control; Hydraulic Control, NC/ DNC/ CNC Control system	1
Engine Governing; Mechanical Governors, Hydraulic Governors, Pneumatic Governors, Electronic Governors, Diesel Fuel Ignition Control	2

Home Assignments :4 –5 assignments are given during the semester.

Evaluation Procedure

1.	Surprise Quiz/ Tutorial Test	5 Marks
2.	Assignment / Project / Performance in the Class	5 Marks
3.	Minor Tests (Two tests having equal weightage) Minor Test I : 14-16 Feb, 2018 Minor Test II : 4 -6 April, 2018	15 Marks
4.	Major test (University Examination)	75 Marks

Award of Grades Based on Absolute Marks: The University is following the system of grading based on absolute marks (after applying moderation if any). Following grading will be done based on the % of marks obtained in all the components of evaluation part of the subject. A+ (90% - 100 %), A (80% - 89%), B+ (70% - 79%) , B(62% - 69%), C+ (55% - 61%), C (46% - 54%), D (40% - 45), F (Less than 40 %)

For F grade, a candidate shallbe required to appear in the major test of concerned course only in the subsequent examination(s) to obtain the requisite marks/grade.

Attendance Record – Candidate should attend at least75% attendance of the total classes held of the subject

Chamber consultation hour: Any vacant period.

Note:

1. In the semester examination, the examiner will set 08 questions in all selecting two from each unit (1 & 2 from unit I, 3 & 4 from unit II, 5 &6 from unit III and 7 & 8 from unit IV). The students will be required to attempt only 5 questions selecting at least one question from each unit. All questions will carry equal marks.
2. The use of scientific calculator will be allowed in the examination. However, programmable calculator and cellular phone will not be allowed.
3. The use of properties (water, air, steam etc) tables, heat transfer tables, charts is permitted

(Dr. Anil Kumar Narwal)

ME- 312 B INDUSTRIAL ENGINEERING

L	T	P	Credits		
3	1	-	4	Sessional Marks:	25
				Theory Marks:	75
				Duration of Exams:	3 Hr

Objectives and outcome of course

To design, improve and install, an integrated system of men, materials and equipment. After studying the contents of this course, the students should be able to specify, predict and evaluate the results to be obtained from such systems.

This course used assigned readings, lectures, tutorials and homework to enable the students to learn the different topics in industrial engineering i.e. method study, work measurement, productivity and strategies for improving productivity, estimation of overheads and break even analysis in manufacturing cost analysis, strategic importance of materials, various inventory control models and introduction to JIT, Quality management tools and TQM, scheduling and sequencing, role of 3 S, value engineering in product design and development. After studying this course, the students are in position to solve the different types of industrial problems for managing operations of an industrial system in a better way.

Course Plan

S. No.	**Contents of course**	**Lecture**
UNIT 1	**Introduction** Definition of Industrial Engineering, Objectives, relevance and decisions in industrial engineering.	2
	Production System and Productivity: Value addition process, **Production** system, types of production system, conceptual model of a production system, Productivit**y**-definition, measurement, factors effecting productivity, ways and strategies to improve productivity.	4
	Workforce Management	2
	Work Study- Introduction, method study, work study	5
UNIT II	**Manufacturing cost analysis**- fixed & variable cost, direct & indirect cost, Estimation of overheads, Break even analysis	5
	Materials management- strategic importance, relevant costs, inventory control models, EOQ, EBQ, sensitivity analysis, inventory control models, selective inventory control	5
UNIT III	**Production Planning and control**- forecasting, objectives of PPC, aggregate planning, master production schedule, methods for line & intermittent production system, Gantt chart, sequencing-Johnson algorithm, means of measuring effectiveness of PPC, introduction to JIT	8
UNIT IV	Product Design and development- various approaches, PLC concept, 3 S's - standardization, simplification. and specialist ion, value engineering, role of ergonomics in product design.	2
	Manufacturing Strategies- Introduction to JIT, TQM, Kaizan, Supply Chain Management, Management Information System- meaning, importance and role in decision making etc.	5

Text Books

1. Production and Operations Management by S N Chary- TMH

2. Industrial Engineering and Management by O P Khana- Dhanpat Rai Publications

Reference Books:

1. Modern Production Management by S S Buffa John Wiley

2. Operations Management for competitive advantage by Chase, Jacob & Aquilino TMH

Home Assignments: 4 –5 assignments are given during the semester.

Evaluation Procedure

1.	Surprise Quiz/ Tutorial Test (at least 2+2)	05 Marks
2.	Assignment / Project / Performance in the Class	05 Marks
3.	Minor Tests (Two tests having equal weightage)	15 Marks
4.	Major test (University Examination)	75 Marks

Award of Grades Based on Absolute Marks: The University is following the system of grading based on absolute marks (after applying moderation if any). Following grading will be done based on the % of marks obtained in all the components of evaluation part of the subject.

A+ (90% - 100 %), A (80% - 89%), B+ (70% - 79%) , B(62% - 69%), C+ (55% - 61%),C (46% - 54%), D (40% - 45), F (Less than 40 %)

For F grade, a candidate shall be required to appear in the major test of concerned course only in the subsequent examination(s) to obtain the requisite marks/grade.

Attendance Record – Candidate should attend at least 75% attendance of the total classes held of the subject

Chamber consultation hour: Any vacant period.

Note:

- 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 five questions selecting at least one question from each unit.
- The use of scientific calculator will be allowed in the examination. However, programmable calculator and cellular phone will not be allowed.

Dr A. K. Gupta
Course Coordinator

ME-407-B Mechanical Vibration

B. Tech. Semester – VIII (Mechanical Engineering)

L T P Credits
3 1 0 4

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

Scope and objective of the course: The subject Mechanical Vibration has become one of the most important subjects that have to be clearly understood by the students graduating from universities. The understanding of vibration analysis assumes greater importance while designing the equipments and the structures such that these do not fail while operating in the field. The course covers fundamental concepts of mechanical vibration and divided in to seven units.
Students will be able to learn about:

1. The principle and working of Elements of a Vibrating system.
2. Formulation of Workable model of a Vibrating system.
3. Formulations and solution of equations of motion for various types of vibrating systems.
4. Methods to bring reduction in the levels of vibration in system to which they are harmful by learning to design vibration controlling Mechanical systems

The course structure and teaching plan along with schedule are given below

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 **(09.01.2018)** Harmonic Motion, Vector and Complex Number Representations Single Degree of Freedom system **(10.01.2018-11.01.2018)** Governing equations using D'Alemberts Principal **(16.01.2018)** Determination of natural frequency of vibratory systems using Energy Method, **(17.01.2018)** Equivalent systems concept of viscous damping, response of Free Damped Vibrations (Under Damping, Critical and Over Damping), **(18.01.2018), (23.01.2018)** Logarithmic Decrement, determination of Structural damping, **(24.01.2018)**	08

UNIT-II	**FORCED VIBRATIONS** Governing equation under harmonic excitation and response using techniques of calculus and phasor diagram **(25.01.2018)** Magnification factor, Active and passive vibration isolation, **(06.02.2018)** Forced and Motion Transmissibility **(07.02.2018)** Rotating and Reciprocating unbalance **(08.02.2018),** Critical Speeds and Whirling of Rotating Shafts **(13.02.2018)** Vibration isolation materials , Transient Response, **(20.02.2018)** Impulse Excitation, Response to Step Excitations **(21.02.2018)**	07
UNIT-III	**MULTI DEGREE FREEDOM SYSTEM AND NUMERICAL TECHNIQUES** Two Degrees of Freedom Systems, Normal Mode Vibrations, **(22.02.2018)** Coordinate Coupling, Principal Coordinates, **(27.02.2018)** Free Vibrations in Terms of Initial Conditions, Forced Harmonic Vibrations **(28.02.2018)** Simple Vibration Absorber ,Multi degrees of Freedom Systems **(06.03.2018)** Eigen value problems-close coupled system and far coupled systems using influence coefficient, **(07.03.2018)** Natural Frequencies and Normal Modes, Orthogonality of Normal Modes **(08.03.2018)** Method of Matrix Iteration, **(13.03.2018)** Introduction to vibration of continuous system with the help of lateral vibration of Beam **(14.03.2018) (15.03.2018)** Dunkerley's method**(20.03.2018)**, Rayleigh's method **(21.03.2018)**	11
UNIT-IV	**VIBERATION MEASEUREMENT AND CONDITION MONITERING** Principle of seismometer and accelerometer **(22.03.2018)** Basic Vibration measuring set ups- amplitude and phase measurement; vibration pick-ups, **(27.03.2018) (28.03.2018)** Working principle of piezoelectric accelerometer **(03.04.2018)** **E**ddy current based displacement probe **(10.04.2018)** Bending critical speed of simple shaft **(11.04.2018)**, Fourier series and Fourier transform **(12.04.2018) (17.04.2018)** Condition monitoring- its need and types; concept of 1X, 2X, 3X,- vibration signals in a rotating machines. **(19.04.2018) (24.04.2018)**	10

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

Home Assignments :4 –5 assignments are given during the semester.

Evaluation Procedure

1.	Surprise Quiz/ Tutorial Test	5 Marks
2.	Assignment / Project / Performance in the Class	5 Marks
3.	Minor Tests (Two tests having equal weightage) Minor Test I : 14-16 Feb, 2018 Minor Test II : 4 -6 April, 2018	15 Marks
4.	Major test (University Examination)	75 Marks

Award of Grades Based on Absolute Marks: The University is following the system of grading based on absolute marks (after applying moderation if any). Following grading will be done based on the % of marks obtained in all the components of evaluation part of the subject.

A+ (90% - 100 %), A (80% - 89%), B+ (70% - 79%) , B(62% - 69%), C+ (55% - 61%),C (46% - 54%), D (40% - 45), F (Less than 40 %)

For F grade, a candidate shall be required to appear in the major test of concerned course only in the subsequent examination(s) to obtain the requisite marks/grade.

Attendance Record – Candidate should attend at least75% attendance of the total classes held of the subject

Chamber consultation hour: Any vacant period.

(Rajneesh Kumar)

Course Handout: ME 438B FLEXIBLE MANUFACTURING SYSTEM				
B. Tech. Semester – VIII (Mechanical Engineering)				
L	**T**	**P**	**Credits**	**Class Work : 25 Marks**
4	**-**	**--**	**4**	**Examination : 75 Marks**
Scheme for Sessional Awards: As per UG acad. Ordinance				**Total : 100 Marks**
Duration of course: As per Univ. acad. Calendar				**Duration of Examination : 3 Hours**

Course objectives: Modern manufacturing industries utilize automation in their process and operations for superior manufacturing performance. Graduate engineers from the production industries thus require a sound technical know-how about manufacturing automation. This course is designed with a building block approach that starts with hardware tools of automation and culminates into NC technologies, robotics and Flexible manufacturing system. The course further aims to illustrate the integration of automated systems used for different business functions of manufacturing industry. The course aims to strengthen the professional excellence of students for a rewarding career in manufacturing industries. The course also prepares the graduates towards a deeper research insight.

Course Outcomes: After completing the course, the graduates acquire knowledge of automation tools and technologies relevant for professional excellence in present day global manufacturing industries. It enables them to devise automation systems that increase enterprise wide manufacturing performance. Students find research motivation in the domain of industrial automation especially machine tools, robotics and integrated manufacturing. These conceptual building blocks help candidates to use the course content towards research issues pertaining to digital manufacturing and internet-of-things.

The course structure and teaching plan are given below.

UNIT I	**AUTOMATION AND MANUFACTURING FLEXIBILITY:** Automation and types, reasons for automation, Basic elements of an Automated System: Sensors, Actuators, Analog-to-Digital and Digital-to-Analog Converters, Input/ Output Devices for Discrete Data, Definition of Manufacturing Flexibility, Need of Manufacturing flexibility, Types of Manufacturing Flexibilities, Classification of Manufacturing systems on Flexibility types, Resources and Processes to increase flexibility of manufacturing systems	5 lectures
	GROUP TECHNOLOGY (GT): GT and its benefits, Parts classification and coding systems, the composite part concept, GT based Machine cell design through Cluster Analysis and Hollier's Algorithm; Numerical problems	5 lectures
UNIT II	**NUMERICAL CONTROL (NC):** Fundamentals of NC Technology and advantages in Manufacturing, NC Machines and types, Computer Numerical Control, Distributed Numerical Control, brief introduction of NC Part Programming.	5 lectures
	FLEXIBLE MANUFACTURING SYSTEMS (FMS): Components of an FMS, FMS work stations. Material handling and storage system: Functions of material handling system, FMS layout configurations, Computer control system: Computer function, FMS data file, system reports. Planning the FMS, FMS applications and benefits	5 lectures
UNIT III	**ROBOTIC TECHNOLOGY:** Common robot configurations, Joints and links, work volume, types of robot control, accuracy and repeatability, interlocks, advantages and disadvantages. Brief review of Robot programming and languages: Motion programming, simulation and offline programming, work cell control. Applications of Robot: Material handling, processing operations, assembly and inspection	5 lectures
	MATERIALS HANDLING 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	5 lectures

UNIT IV	**COMPUTER INTEGRATED MANUFACTURING SYSTEMS (CIMS):** Elements of CIM, Brief Review of Computer aided process Planning, Computer Integrated Production Management Systems, MRP, Capacity Planning, MRPII, Shop floor Control systems, Computer Process Monitoring, Computer aided quality control, Adaptive Control of Manufacturing	10 lectures

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.

Note:

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.

Course Coordinator: Dr. M N Mishra	**Consultation Hours: Thursday, 2-4 PM**

ME-446B MODERN MANUFACTURING PROCESS

B.Tech. Semester-VIII (Mechanical Engineering)

Course Objectives and Outcomes

Course Objectives

- The course highlights the advances in non conventional manufacturing process over conventional processes. Further the course aims in identifying the classification of unconventional machining processes
- The course provides a perspective view with adequate depth to understand the unconventional machining processes and their relative advantages over conventional techniques
- To understand the principle, mechanism of metal removal of various unconventional machining processes.
- To study the various process parameters and their effect on the component machined on various unconventional machining processes.
- To understand the applications of different processes.
- Understand modern manufacturing operations, including their capabilities, limitations, and how to design for lowest cost.
- The objective of the course is to provide the students with the fundamental concepts, the necessary knowledge and the basic skills related to unconventional manufacturing process.
- Course imparts not only the unconventional machining process but working principles and design aspects but emphasizes the economical aspects of various manufacturing processes.

Course Outcomes

- The students are able to understand the need of unconventional machining process over conventional machining process.
- The students are able to understand the principle and mechanism of metal removal of various unconventional machining processes.
- The students are able to identify the process parameters, their effect and applications of different processes.
- The student are able to understand the effects of various process parameters on the component machined on various unconventional machining processes..
- Understand and apply particular method of manufacturing for a production system.

LECTURE PLAN

	COURSE CONTENTS	Lect. Hrs	Total Hrs
UNIT - I	**NON CONVENTIONAL MACHINING**		12
	Introduction: Need of unconventional manufacturing processes, Classification of Modern Manufacturing Processes and its future possibilities, Limitations of conventional manufacturing processes	2	
	Ultrasonic Machining- Introduction, Basic Principle of USM, Elements of Process, tool feed mechanism, cutting tool system design	3	
	Effect of parameters on MRR, economic considerations, applications, limitations of the process, advantages and disadvantages	2	
	Abrasive Jet Machining- Process description, features of AJM, Parameters in AJM, metal removal rate (MRR) in AJM	3	
	Advantages, limitations and Practical applications of AJM. Water Jet Machining- Jet cutting equipments, process details	2	
UNIT- II	**CHEMICAL MACHINING**		11
	Basic technique of chemical machining,	1	
	Mechanism of metal removal, process variables, advantages and applications	2	
	Electrochemical machining, principle of ECM process	1	
	ECM process detail, chemical reactions in ECM, tool work gap, process variables and characteristics in ECM, advantages, disadvantages and application of ECM	4	
	Electrochemical Grinding – Material removal, surface finish, accuracy, advantages, applications.	3	
UNIT-III	**THERMAL SPARK EROSION PROCESSES**		15
	Electric Discharge Machining (EDM) or spark erosion machining processes	1	
	Practical aspects of spark erosion machining, mechanism of metal removal,spark erosion generators, electrode feed control, dielectric fluids, flushing, electrodes for spark erosion	3	
	Selection of electrode material, tool electrode design, surface finish, machining accuracy	2	
	Machine tool selection, applications	1	
	Wire cut EDM. Advantages and disadvantages of spark erosion machining.	2	
	Laser Beam Machining (LBM)- Introduction, lasing process, Laser machining system	2	
	Thermal effect on workpiece, calculation of MRR	2	
	Description of laser drilling machine, cutting speed and accuracy of cut, advantages and limitations	2	
UNIT-IV	**PLASMA ARC MACHINING (PAM)**		12
	Introduction to Plasma Arc Machining	1	
	Non thermal generation of plasma types of plasma arc , the stabilized arc, mechanism of plasma torch, , mechanism of metal removal	3	
	PAM parameters, equipments for D.C. plasma torch unit, safety precautions, economics, other applications of plasma jets.	3	
	ELECTRON BEAM MACHINING (EBM) Introduction to EBM	1	
	Description of the process, need for high vacuum in EBM,	2	
	Process parameters in EBM. Advantages and disadvantages of EBM. Electron beam welding.	2	

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

Pardeep Kumar
Assistant Professor
Department of Mechanical Engineering.
DCRUST, Murthal