SHIVAJI UNIVERSITY, KOLHAPUR

REVISED STRUCTURE AND SYLLABUS

SECOND YEAR (B. Tech) CBCS

MECHANICAL ENGINEERING

To be introduced from the academic year 2019-20

(i.e. from June 2019) onwards

SECOND YEAR MECHANICAL ENGINEERING– CBCS PATTERN

SEMESTER - III																									
Sr. No	Course (Subject Title)	TEACHING SCHEME									EXAMINATION SCHEME														
		THEORY			TUTORIAL			PRACTICAL			THEORY					PRACTICAL			TERM WORK					
		Credits	No. of Lecture	Hours	Credits	No. of Lecture	Hours	Credits	No. of Lecture	Hours	Hours	Mode	Marks	Total Marks	Min	Hours	Max	Min	Hours	Max	Min			
1	BSC-ME201	3	3	3	1	1	1	-	-	-		CIE	30	100	40	As per BOS Guidelines	-	-	2	25	10			
												ESE	70											
2	BSC-ME202	3	3	3	-	-	-	1	2#	2#		CIE	30	100	40				2	25	10			
												ESE	70											
3	PCC-ME203	3	3	3	-	-	-	1	2	2		CIE	30	100	40		25	10	2	25	10			
												ESE	70											
4	PCC-ME204	3	3	3	-	-	-	1	2	2		CIE	30	100	40		25	10	2	25	10			
												ESE	70											
5	PCC-ME205	3	3	3	-	-	-	1	2	2		CIE	30	100	40		25	10	2	25	10			
												ESE	70											
6	PCC-ME206		-	-	-	-	-	1	2	2		-	-	-	-		-	-	2	25	10			
7	PCC-ME207		-	-	-	-	-	1	2	2		-	-	-	-		-	-	-	25	10			
8	PCC-ME208		-	-	-	-	-	1	2#	2#		-	-	-	-		-	-	-	25	10			
9	MC-ME209	3	3	3	-	-	-	-	-	-		CIE	30	100	40		-	-	-	-	-			
												ESE	70											
	TOTAL	**18**	**18**	**18**	**1**	**1**	**1**	**7**	**12**	**12**				**600**			**75**			**200**				
SEMESTER –IV																									
1	PCC-	3	3	3		-	-	-		1	2	2			CIE	30	100	40	As per BOS Guidelines	-	-	2	25	10

	ME210												ESE	70								
2	PCC-ME211	3	3	3	-	-	-	1	2	2			CIE	30	100	40		-	-	2	25	10
													ESE	70								
3	PCC-ME212	3	3	3	-	-	-	1	2	2			CIE	30	100	40		25	10	2	25	10
													ESE	70								
4	PCC-ME213	3	3	3	-	-	-	1	2	2			CIE	30	100	40		-	-	2	25	10
													ESE	70								
5	PCC-ME214	4	4	4	-	-	-	-	-	-			CIE	30	100	40		-	-	-	-	-
													ESE	70								
6	PCC-ME215	-	-	-	-	-	-	1	2	2			-	-	-	-		25	10	2	25	10
7	PCC-ME216	-	-	-	-	-	-	1	2	2			-	-	-	-		-	-	2	25	10
8	PCC-ME217	-	-	-	-	-	-	1	2	2			-	-	-	-		-	-	2	25	10
9	PCC-ME218	-	-	-	-	-	-	1	2	2						-	-	25	10	2	25	10
	TOTAL	**16**	**16**	**16**	-	-	-	**8**	**16**	**16**					**500**			**75**			**200**	
	TOTAL	**34**	**34**	**34**	**1**	**1**	**1**	**16**	**28**	**28**					**1100**			**150**			**400**	

CIE- Continuous Internal Evaluation
ESE – End Semester Examination

• Candidate contact hours per week : 30 Hours (Minimum)	• Total Marks for S.E. Sem III & IV: **1650**
• Theory/Tutorial Duration : 60 Minutes and Practical Duration : 120 Minutes	• Total Credits for S.E. Sem III & IV : **50**
• In theory examination there will be a passing based on separate head of passing for examination of CIE and ESE.	
• There shall be separate passing for theory and practical (term work) courses.	

Note :

1. Basic Science Courses -Mechanical Engineering(BSC-ME) are compulsory.
2. Professional Core Course-MechanicalEngineering (PCC-ME) are compulsory.
3. Mandatory Course (MC-ME)Environmental Studies which is compulsory for theory 70 marks and project work 30 marks.

COURSE CODE AND DEFINITION

Semester III

Sr. No	Code No.	Subject	Credits
1.	BSC-ME201	Engineering Mathematics - III	4
2.	PCC-ME202	*Electrical Technology	4
3.	PCC-ME203	Applied Thermodynamics	4
4.	PCC-ME204	Metallurgy	4
5.	PCC-ME205	Fluid Mechanics	4
6.	PCC-ME206	Machine Drawing	1
7.	PCC-ME207	*Computer Programming Using C++	1
8.	PCC-ME208	Workshop Practice – III	1
9.	MC-ME209	Environmental studies	3
		Total	26

Semester IV

Sr. No	Code No.	Subject	Credits
1.	BSC-ME210	Applied Numerical Methods	4
2.	PCC-ME211	Analysis of Mechanical Elements	4
3.	PCC-ME212	Fluid and Turbo Machinery	4
4.	PCC-ME213	Theory of Machines – I @	4
5.	PCC-ME214	Machine Tools and Processes	4
6.	PCC-ME215	Testing and Measurement	1
7.	PCC-ME216	Computer Aided Drafting	1
8.	PCC-ME217	Computer Graphics	1
9.	PCC-ME218	Workshop Practice – IV	1
		Total	24

S.Y.B. Tech. (MECHANICAL ENGINEERING)- Semester – III

ENGINEERING MATHEMATICS-III BSC-ME201

Teaching Scheme	**Examination Scheme**
Lectures : 3 hours/week	**ESE : 70 marks**
Tutorial : 1 hour/week	**CIE : 30 marks**
Credits : 4	**Term Work : 25 marks**

Course Objectives:

1)To develop mathematical skills and enhance thinking power of students.

2)To give the knowledge to the students of Statistics, Linear Differential Equations ,Vector Differential Calculus ,Laplace transforms ,Fourier series with an emphasis on the application of solving engineering problems

3)To prepare students to formulate a mathematical model using engineering skills & interpret the solution in real world.

Course Outcomes:

Upon successful completion of this course, the student will be able to:

1) SolveLinear Differential Equations with constant coefficients.
2) Describe the statistical data numerically by using Lines of regression and Curve fittings.
3) Find Laplace transforms of given functions and use it to solve linear differential equations.
4) Applyknowledge of vector differentiation to find directional derivatives, curl and divergence of vector fields.

5) Develop Fourier series expansion of a function over the given interval.

6) Make use ofPartial Differential Equation to solve the Mechanical Engineering problems.

SECTION – I

Unit 1. Linear Differential Equations: **07**

1.1 Linear Differential equations with constant coefficients.
1.2 Rules to find complementary function.
1.3 Methods to find particular Integral (e^{ax}, sinax or cosax, $x^m, e^{ax}x^m, e^{ax}sinax$ or $e^{ax}cosax$)
1.4 Cauchy's homogeneous linear differential equations.

Unit 2. Correlation, Regression & Curve Fitting: 07

2.1 Introduction.
2.2 Karl Pearson's Coefficient of Correlation.
2.3 Lines of regression of bivariate data.
2.4 Fitting of Curves by method of Least-squares:
  2.4.1 Fitting of Straight lines.
  2.4.2 Fitting of exponential curves.
  2.4.3 Fitting of second degree Parabolic curves.

Unit 3. Laplace Transform and its Applications: 07

3.1 Laplace transform of elementary functions.
  3.2 Properties of Laplace transforms(First Shifting , Change of scale property , Multiplication & Division by t).
3.3 Laplace transforms of derivatives and integral.
3.4 Inverse Laplace transforms by partial fractions & convolution theorem.
3.5 Solution of Linear differential equation with constant coefficients using Laplace transform.

SECTION – II

Unit 4. Vector Differential Calculus: 06

4.1 Differentiation of vectors.
4.2 Gradient of scalar point function.
4.3 Directional derivative.
4.4 Divergence of vector point function.
4.5 Curl of a vector point function.
4.6 Irrotational, Solenoidal and Scalar potential function of a vector field.

Unit 5. Fourier Series: **06**

5.1 Introduction
5.2 Definition, Euler's formulae.
5.3 Dirichlet's conditions.
5.4 Change of interval.
5.5 Expansions of odd and even functions.
5.6 Half range series.

Unit 6 Partial Differential Equations and Applications: 09

6.1 Formation of partial differential equation
6.2 Method of separation of variables.

6.3 Wave Equation and its solution
6.4 One dimensional heat flow equation
6.5 Solutions of Laplace equations by the Gauss – Seidel iterative method

Reference Books:

1) Advance Engineering Mathematics by Erwin Kreyszig (Wiley India.)
2) Mathematical Methods of Science and Engineering, by Kanti B. Datta (Cengage Learning.)
3) Advanced Engineering Mathematics, 3e, by Jack Goldberg (Oxford University Press.)
4) Engineering Mathematics by V. Sundaram (Vikas Publication.)
5) Higher Engineering Mathematics, by B. S. Grewal (Khanna Publication Delhi.)
6) Higher Engineering Mathematics, by B. V. Ramana (Tata McGraw-Hill)
7) Advanced Engineering Mathematics, by H. K. Das (S. Chand Publication.)
8) Applied Mathematics by Navneet D. Sangle (Cengage Publication)

General Instructions:

1) For the term work of 25 marks, batch wise tutorials are to be conducted. The number of students per batch per tutorial should be as per University rules.
2) Number of assignments should be at least six (All units should be covered).

S.Y. B. Tech (MECHANICAL ENGINEERING) Semester:III

2.ELECTRICAL TECHNOLOGY

Subject Code:BSC-ME202

TeachingScheme:	**Examination Scheme:**
Lectures: 3 Hrs.perweek	**ESE: 70Marks**
Practical: 2 Hrs. per alternate week	**CIE: 30Marks**
Credit: 04	**TERM WORK:25 Marks**

Pre-requisites: Basic Electrical Engineering

Course Objectives:

1) To understand Essential concepts & applications of Electric motors
2) To Select suitable drives for different mechanical systems.

3) To understand concept of electrical heating.

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

1) Deals the principles of Electrical Engineering
2) Understands the theoretical and practical's concepts of Electric motors
3) Apply Electrical heating methods for Industrial furnaces.
4) Identify and select suitable types of motors and drives
5) Decide complete Electrical drive system for Industrial applications.
6) Design various speed control techniques for Electric motors.

Unit No. 01 : DC motors **[7]**

Construction, Working, Types, Back emf, Speed equation, Torque equation, Speed torque characteristics, Power losses in d.c. Motors. Need of starter, 3 point starter, 4 point starter. Speed control of D.C. Shunt and series motor (numerical treatment on speed control methods). Reversal rotation of D.C motor

Unit No. 02 : Three Phase Induction Motor: **[6]**

Construction, Types, Working, Speed equation, Torque equation, Starting torque, full load torque, Torque speed characteristics, Power stages in motor, Advantages of 3- Phase Induction motor. (Numerical treatment on power stages)

Unit No. 03 : Three Phase Induction Motor Control **[6]**

Need of starter, Star delta starter, DOL starter, Autotransformer starter, Rotor resistance starter. Speed control methods- Pole changing, Voltage control, frequency control, Block diagram of VFD control, Reversal rotation 3- Phase Induction motor.

Unit No. 04 : Fractional Horse Power Motors **[6]**

Construction, Working, characteristics and Applications of Single phase permanent capacitor type Induction motor, AC servo motor, DC servo motor, Stepper motor (VR type and PM type).

Unit No. 05 : Electrical Drives [6]

Advantages of electrical drives, Types – Individual & Group drive, Nature of Mechanical loads With respect to speed–torque variation, 4 quadrant operation of DC motor. Criteria for selection of motors for applications like lathe, Traction, pumps, Conveyors, Lift, etc.

Unit No. 06 : Electric Heating [7]

Construction and Working of - Direct & Indirect resistance Heating, Direct arc furnace, Indirect arc furnace, Horizontal Core type induction furnace, Coreless induction furnace. (Numerical treatment on Electrical to Thermal energy conversion)

TERM WORK/ LIST OF EXPERIMENTS

Minimum six experiments from the following list should be performed.

1. Speed control of d.c. shunt motor by flux control method.
2. Speed control of d.c. shunt motor by armature voltage control.
3. Reversal of rotation of d.c. motor.
4. Load test on d.c. shunt motor.
5. Study of d.c. motor starters.
6. Speed control of 3 phase induction motor
7. Load test on 3 phase induction motor.
8. Reversal of rotation of 3 phase induction motor
9. Study of 3 phase induction motor starter
10. Load test on Single phase Induction motor
11. Study of Servomotors

TEXT BOOKS

1. “Text book of Electrical Technology”, Vol-II ,B. L. Theraja, S. Chand publication, 1st Edition.

REFERANCE BOOKS

1. “Electrical Power”,S. L. Uppal, DBS Publ.
2. “Utilization of Electric Power”, R. K. Rajput, Laxmi publication (p) Ltd., 4th Edition, 2007.

3. “Electrical Technology”, U. A. Bakshi , Technical Publication Pune,4th Edition , 2009.

S.Y. B. Tech (MECHANICAL ENGINEERING) Semester: III

3. APPLIED THERMODYNAMICS

SUBJECT CODE: PCC-ME-203

TeachingScheme:	**Examination Scheme:**
Lectures: 3 Hrs.perweek	**ESE: 70Marks**
Practical: 2 Hrs.perweek	**CIE: 30Marks**
Credit: 04	**Term Work: 25 Marks**
	Practical: 25 Marks

Pre-requisites: Applied Physics, Applied Chemistry

Course Objectives:

1. To introduce student about basic physics and chemistry behind thermodynamics.
2. To study basic concepts of thermodynamics and its applications.

3. To study physical significance of entropy term and its application.
4. To study application of first and second law of thermodynamics to various thermodynamic devices like Steam generator, Condenser, Nozzles andTurbines.
5. To study different types of turbines and corresponding velocity diagrams.

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

1. Remember the fundamental laws of thermodynamics
2. Understand and Solve the introductory problems on Rankine cycle.
3. Classify steam generators and condensers and Steam turbines.
4. Design the steam nozzle.
5. Understand and Solve problems on Steam turbines.
6. Understand the property of lubricants and selection of lubricants.

Unit No. 01 : Review of Laws of Thermodynamics: [08]

Zeroth law, first law and Second law of thermodynamics, Statement of third law of thermodynamics. Corollaries of Second Law, Equivalence of Second law Simple Numerical treatment second law of Thermodynamics (Heat engine, Refrigerator and Heat Pump), Entropy, Clausius theorem, Clausius inequality, Entropy as a property of system, Entropy change in a reversible and irreversible processes, Increase of entropy principle, Calculation of entropy changes of gases,(numerical treatment should be based on single Thermodynamic process),Introduction to Avialablity Definition-Available Energy, Unavilable Energy, Dead State)

Unit No. 02: Properties of Pure Substances and Vapour Power Cycles [06]

Properties of steam, Use of steam table and Mollier chart, Temperature Entropy Diagram Carnot cycle using steam, Limitations of Carnot cycle Rankine cycle, Representation on P-v, T-s and h-s planes, Thermal efficiency, Specific steam consumption. Work ratio, Effect of steam supply pressure and temperature, Condenser pressure on the performance. (Numerical Treatment), Reheat and regenerative steam power cycles.

Unit No. 03: Steam Condensers [06]

Steam Condenser, Functions, Elements of condensing plant, Types of steam condensers, surface and jet condensers, Comparison, Vacuum efficiency, Condenser efficiency, Sources of air leakages, Methods of leak detection, Edward Air Extraction Pump Estimation of cooling water required (Numerical Treatment on Steam Condensers)

Unit No. 04 : Steam Nozzles [06]

Functions, Shapes, Critical pressure ratio, Maximum discharge condition, Effect of faction, Design of throat and exit areas, Nozzle efficiency, Velocity coefficient, Coefficient of discharge, Supersaturated flow, Degree of under-cooling and degree of super saturation, Effects of super saturation(Numerical Treatment on nozzle without friction)

Unit No. 05 : Impulse Turbines [07]

Principles of operation, Classification, Impulse and reaction steam turbine, compounding of steam turbines. Flow through impulse turbine blades, Velocity diagrams, Work done, Efficiencies, End thrust, Blade friction, condition curve and reheat factors.(Numerical Treatment on Single stage impulse turbine)

Unit No 06: Reaction Turbines [07]

Comparison between impulse and reaction, Flow through impulse reaction blades, turbine Velocity diagram, and degree of reaction, Parson's reaction turbine, Governing of steam turbines. Losses in steam turbines, Performance of steam turbines. Function of diaphragm, Glands, Turbine troubles like Erosion, Corrosion, Vibration, Fouling etc. (Numerical Treatment on Single stage impulse reaction turbine)

TERM WORK

1. Study and Demonstration of water tube and fire tube boilers.
2. Study and Demonstration of boiler mountings,Accessories and steam calorimeters
3. Study and Demonstration of condenser and study of cooling towers
4. Significance and relevance of lubrication properties and systems
5. Test on Grease penetrometer and dropping point apparatus
6. Test on Carbon residue, Cloud and Pour point apparatus.

7. Test on Red wood viscometer and Aniline point apparatus.
8. Determination of flash and fire point of a lubricating oil
9. Study / Trial on steam power plant
10. Report on industrial visit to a steam power plant

Instructions for practical examination

1. Four to five experiments shall be selected for practical examination.
2. The number of students for each practical set up would not be more than four students.

TEXT BOOKS:

1. "Thermal Engineering", Kumar and Vasandani,D. S . Publisher Metropolitan Book Co, Delhi, 3rd Edition.
2. "Thermal Engineering", Mathur and Mehta, Jain Bros. Publishers,Delhi,3rd Edition.
3. "Thermal Engineering", BallaneyP.L, Khanna Publishers, New Delhi, 27th Edition.
4. "Engineering Thermodynamics",P.K. Nag., Tata McGraw Hill, New Delhi, 4th Edition.
5. "Engineering Thermodynamics", D.P.Mishra, Cengage learning, 1st Edition
6. "Principles of Engineering Thermodynamics", Moran,Shapiro,Boetnner, Wiley, 8thEdition
7. "Engineering Thermodynamics", Gupta andPrakash, Nemichandand Sons, 2nd edition.
8. "Thermal Engineering",R. K. Rajput, Laxmi Publications, 3rd Edition.
9. "Steam and Gas Turbines",R. Yadav, CPH Allahabad, 2nd Edition , 2005.
10. "Thermal Engineering", M.MRathod, Tata McGraw Hill Education Pvt.Ltd, 1stEdition , 2010

REFERENCE BOOKS:

1. "Fundamentals of Thermodynamics", Claus Borgnakke, Sonntag R. E., John Wiley and Sons.
2. "Thermodynamics",Holman, , McGraw Hill, London.
3. "Principles of Engineering Thermodynamics", Moran,Shapiro,Boetnner, Wiley, 8th Edition.
4. "Thermodynamics: an Engineering Approach",Cengel and Boles, Tata McGraw-Hill, New Delhi ,3rd Edition,.
5. "Applied Themodynamics", Estop Mcconkey ,Pearson Education, 5th Edition
6. "Engineering Thermodynamics" G.Rogers Yon Mayhew, Pearson Education, 4th Edition.

7. “Fundamentals of Thermodynamics”, R.E.Sonntag,C. Borgnakke, V. Wylen, Wiely India Pvt.Ltd, 6th Edition

S.Y. B. Tech (MECHANICAL ENGINEERING) Semester: III

4. METALLURGY

SUBJECT CODE: PCC-204

TeachingScheme:	**Examination Scheme:**
Lectures: 3 Hrs.perweek	**ESE: 70Marks**
Practical: 2 Hrs.perweek	**CIE: 30Marks**
Credit: 04	**Term Work: 25 Marks**
	Practical: 25 Marks

Pre-requisites: Applied Physics, Applied Chemistry, Fundamental knowledge of materials and their basic properties.

Course Objectives:

1. To acquaint students with the basic concepts of Metal Structure

2. To impart fundamental knowledge of Ferrous and Non Ferrous Metal Processing
3. To study applications of different Metals and Alloys
4. To Know Fundamentals of Metallography
5. To develop futuristic insight into Metals

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

1.Understand basic concept of metal structure.

2. Understand fundamental knowledge of Ferrous and Non Ferrous Metal.

3. Selection of Metals and Alloys for different application.

4. Understand need of Heat treatment and various heat treatment processes**.**

Unit No. 01 :Metals and Alloy Systems [07]

Introduction to Metallic and Non-metallic materials and its classification (metals/alloys, polymers and composites)

a) Metals, Metallic bonds, Crystal structure (SC, BCC, FCC, HCP), Imperfections in crystals

b) Alloy formation by crystallization, Nucleation and growth, Cooling curves, Dendritic structure and coring.

c) Solid solutions and intermediate phases

d) Phases and Gibbs phase rule

e) Construction of equilibrium diagrams from cooling curves, Isomorphous system (Solid Solution), Eutectic, Partial solubility Peritectic and Intermetallic Compounds Lever arm principles.

Unit No. 02 :Study of Phase Diagrams [11]

(With respect to typical compositions, Properties and Applications for the following alloys.)

a)Fe- Fe3C equilibrium diagram - Ferrous alloys (Plain carbon steels, cast iron)

b) Alloy steels- Free cutting steels, HSLA high carbon low alloy steels, maraging steels. creep resisting steels, Stainless steels- different types. Tool steels- types,

c) Selection of materials and Specifications based on -IS, BS, SAE, AISI,

d) Copper based alloys brasses Cu- Zn, Bronzes Cu- Sn, , Cu- Be, Cu-Ni.

e) Aluminum based alloys Al- Cu(Duralumin) - Al-Si (Modification),

f) Pb- Sn (Solders and fusible alloys)

Unit No. 03 :Principles of Mechanical Testing: [04]

a) Destructive Testing methods: Tensile, Compressive, Impact, Fatigue, Creep, Hardness (Rockwell, Brinell and Vickers)

b) Non- Destructive Testing: Dye Penetrant, Magnetic, Ultrasonic, Radiography, Eddy Current testing.

Unit No. 04 :Principles of Heat Treatment & heat treatment of Ferrous Alloys [06]

a) Transformation of Pearlite into austenite upon heating,

b) Transformation of austenite into Pearlite, Bainite and Martensite on cooling.

c) TTT –Diagram and CCT - Diagrams - significance, Effect of alloying elements on TTT diagram and its significance.

d) Heat treatment furnaces and equipments, controlled atmosphere

Unit No. 05 :Heat Treatment Processes: [08]

a) Heat Treatment of Steels

I. Annealing – Types-Full, Partial and Sub critical annealing (Various types) and purposes

II. Normalising- Purposes

III. Hardening (Hardening types), Purposes, Austempering and Martempering, Mechanism of quenching and Quenching media, Hardenability- Concept and methods of determination of hardenability- Grossmans critical diameter method and Jominy end quench test.

IV. Tempering Types, Structural transformations during tempering, purposes

sub zero treatment

V. Surface hardening - Flame and Induction

VI. Chemical heat treatments for case hardening - Carburising, Nitriding, Cyniding, Carbonitriding

VII. Annealing- Stress relief, Recrystallization and Process annealing

VIII. Precipitation hardening - Basic requirements, Stages, Common alloys, Variables,theories

IX. Heat treatment defects and remedies

Unit No. 06: Powder Metallurgy: [04]

a) Advantages, Limitations and Applications of Powder Metallurgy

b) Powder manufacturing types- Mechanical, Physical, Chemical and Electro- Chemical

c) Mixing/ Blending.

d) Compaction- types- Conventional, Isostatic, HERF, Powder rolling and extrussion

e) Sintering- Types liquid stage and solid stage sintering

f) Finishing operations: Sizing, Machining, Infiltration and Impregnation

g) Flowcharts for – Self-lubricating bearings.

TERM WORK/ LIST OF EXPERIMENTS

1) Tensile testing of M.S. and C.I.

2) Hardness testing (Rockwell and Brinell)

3) Impact testing (Izod and Charpy) of M.S, Brass and Al Alloy.

4) Demonstration of N.D.T. (Minimum two of different NDT tests)

5) Macroscopic Examinations Spark Test.

6) Examination of microstructure of steels and Cast Irons.

7) Examination of microstructure of Non ferrousalloys (Brass, Duralimin, Babbit)

8) Heat treatment of steels (Annealing, Normalizing, Hardening on medium/ high carbon steels

9) Jominy end - quench test for hardenability

10) Observation of various industrial heat treatments processes during industrial visits.

11) Any five assignments on above units are to be included in journal.

TEXT BOOKS

1. "Introduction to physical metallurgy", S.H.Avner, Mcgraw Hill Book Company Inc, Edition, 2nd , 1974.

2. "Physical metallurgy", Vijendrasingh, Standard Publishers delhi

3. "Material science and engineering",W.D Callister, Wiley India Pvt.Ltd., 5th Edition.

4. "Material science and metallurgy for engineers", V.D.Kodgire, Everest Publishers Pune,12th Edition.

5. "Heat Treatments Principles and Practices", T.V. Rajan / C.P. Sharma, Prentice Hall of India Pvt Ltd, New Delhi,

6. "Material Science and Engineering",VRaghwan., Prentice Hall of India Pvt. Ltd., New Delhi ,3rd Edition, 1995.

REFERANCE BOOKS

1. "Engineering Metallurgy", R.A. Higgins, Viva Books Pvt. Ltd., New Delhi, 1st Edition

,1998

2. “Physical Metallurgy for Engineers ”, D.S.Clark, W. R. Varney, AN East West Press Pvt. Ltd. , New Delhi, 2nd Edition,1962
3. “Heat Treatment of Metals”, J L Smith and SC Bhatia , CBS Publisheres and distibutors, New delhi, 1st edition, 2008.

S.Y. B. Tech (MECHANICAL ENGINEERING) Semester: III

5. FLUIDMECHANICS

SUBJECT CODE:PCC-ME205

TeachingScheme	**Examination Scheme**
Lectures: 3 Hrs.perweek	**ESE: 70Marks**
Practical: 2 Hrs.perweek	**CIE: 30Marks**
Credit: 04	**Term Work: 25 Marks**
	Practical: 25 Marks

Pre-requisites: AppliedPhysics, Applied Chemistry

Course Objectives:

1. To identify various properties of fluids and their SI units.
2. To state and illustrate fundamentals of Fluid Statics, Kinematics and Dynamics.
3. To study the use of Continuity Equation, Bernoulli's Equation and Momentum Equation for various applications.
4. To study the theory of laminar flow and application of Hagen Poiseuille's equation
5. To understand the physics of fluid flow through the pipe and its applications.

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

1. Understand properties of fluids and classification of fluid flows
2. Identify the fluid flow problem and explain the theoretical concepts of fluid statics, fluid kinematics and fluid dynamics
3. Apply fundamental equation of fluid mechanics i.e. Continuity equation, Bernoulli's Equation and momentum equation for different fluid flow applications
4. Make basic analysis of laminar flow to calculate resistance to it through circular pipe and parallel plates
5. Calculate different losses in fluid flow through different arrangements of pipes
6. Apply theory of boundary layer, Drag and lift forces in proper cases

Unit1 FluidPropertiesandFluidStatics: [7]

A) **FluidProperties:**Definitionoffluid,Propertiesoffluid

Mass Density, Weight Density, Specific Volume, Specific Gravity, Dynamic Viscosity, Kinematic Viscosity, Surface Tension, Capillarity and Compressibility,Typesoffluid

B) **FluidStatics:**Statement of Pascal'slaw,Hydrostaticlawofpressure,Definition of TotalPressure,Centreof Pressure,Buoyancy,Metacenter, ConditionofEquilibriumoffloatingandsubmerged bodies (No Numerical Treatment on fluid Statics)

Unit2 FluidKinematics [6]

EulerianandLangragianapproachoffluidflow,Flowvisualization,Typesofflow,Streamlines,Pathlines,streaklines,Stream tube,ContinuityEquationinCartesiancoordinatesinthreedimensional fluid flows.Velocity and Acceleration of fluid particles, Stream function and velocitypotential function.

Unit3 FluidDynamics [7]

Euler's Equationofmotion, IntegrationofEuler'sequationasenergyequation. Kinetic Energycorrection factor,Applications of Bernoulli's equation Venturimeter, orifice meter and Pitot tube,

Definition of Notch, classification and it Applications, Derivation of Flowover triangularandrectangularnotches only, Definition of Orifice, classification and it Applications, Hydraulic Coefficients C_d, C_c and C_v and C_r

Unit4 Momentum Equation and LaminarFlow [7]

A) Derivationofmomentumequation, Applications of momentum equation, momentum correction factor, Analysis of fluid flow through pipe bends.

B) **LaminarFlow**:Laminarflowthroughcircularpipes and derivation of Hagen Poiseuille's equation.Laminarflowthroughparallel plates,Introduction of CFD and its applications.

Unit5 Fluid Pipe through Flow [7]

Different energy losses in flow through pipe, Losses due to friction: Darcy's Weisbach equation and Chezy's equation, Minor Losses due to expansion, contraction, pipe fittings, at entrance, at exit, due to obstruction etc. Flow through Series pipe, Parallel

pipe, Siphon pipes, Branching pipes and equivalent pipes, Hydraulic Gradient line (HGL) and Total Energy Line (TEL).

Unit6 BoundaryLayerTheoryandForces on Immersed Body [6]

A) **Boundary Layer Theory:** Boundary layer thickness, its characteristics, laminar and turbulent boundary layers, Displacement thickness, Momentum thickness, Energy thickness, separation, boundary layer control

B) **Forces on Immersed Bodies:** Lift and Drag, Drag on a flat plate and on aerofoil, Types of drags, Development of lift. (Magnus effect) stalling condition of aerofoil.

TERM WORK

List of Assignments and Experiments

Theterm work shall consist of the report on following assignments and experiments

Assignments on

1. Study and demonstration of Pressure Measuring Devices (Compulsory)
2. Theoretical assignment of Dimensional analysis which may include procedure and Numerical on Rayleigh's method and Buckingham π theorem. (Compulsory)

Experiments List

3. Flow visualization by plotting of streamlines (Heleshaw's apparatus).
4. Reynolds experiment
5. Verification of Bernoulli's equation
6. Calibration of venturimeter
7. Calibration of notches
8. Calibration of orifice under steady and unsteady flow condition
9. Determination of minor losses in pips-fittings
10. Determination of coefficient of friction in pipes of different materials.

TEXTBOOKS:

1. "Fluid Mechanics", K.L.Kumar, S. Chand Publication. New Delhi,2nd Edition ,2000

2. “Theory and Applications of machines”,K.Subramanya,,Tata McGraw Hill, Publication,1993
3. “Fluid Mechanics”, R. K.Bansal,Laxmi publications. New Delhi, 1998.
4. “Fluid Mechanics and HydraulicMachines”, Ramamrutham
5. “Fluid mechanics and Hydraulic Machines”, Modiand Seth,.
6. “Fluid mechanics and Hydraulic Machinery”, R. KRajput,Laxmi publishers.

REFERENCEBOOKS:

1. “Fluid Mechanics”, V.L. Streeter and E.B. Wylie,Tata McGraw Hill PvtLtd., New Delhi,2nd Edition ,1997
2. “Mechanics of Fluid”, Merle C. Potter, Prentis HallofIndia, New Delhi ,2nd Edtion .
3. “Fluid Mechanics”, Foxand McDonald,John Wileyand Sons, New York,8th Edition.
4. “Fluid Mechanics –Fundamentals andApplication”, Y. A. Cengel, J. M. Cimbala, TMI,
5. “Fundamentals of FluidMechanics”,B.R. Munson, D.F. Young, T. H. OkiishiWileyIndia Pvt. Ltd.
6. “Fluid Mechanics and Machinery”, C.S. Ojha, ,Oxford UniversityPress.

S.Y. B. Tech (MECHANICAL ENGINEERING) Semester: III

6: MACHINE DRAWING

SUBJECT CODE: PCC-ME206

TeachingScheme: **Examination Scheme:**

Practical: 2 Hrs.perweek **Term Work: 25 Marks**

Credit: 02

Pre-requisites: Engineering Graphics

Course Objectives:

1. To study BIS conventions used in machine drawing.
2. To find the line/curve of intersection between two solids.
3. To study the function of various machine components.
4. To study the use of production drawings.
5. To study assembly and detail drawings.

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

1. Use BIS conventions in machine drawings.
2. Find line/curve of intersection between two solids.
3. Sketch the various machine components.
4. Read and interpret the given production drawings.
5. Understand significance of assembly and detail drawings.

Study of B.I.S. (Bureau of Indian Standards) Conventions:

Significance and importance of BIS Conventions, Drawings sheet sizes and layout recommended by BIS. Conventional representation of engineering materials, BIS conventions for sectioning, Types of threads profiles, Internal and external threads, Types of springs, Types gears and gearings, Conventional representation of common features (Splined shaft, Serrated shaft, Knurling, Bearings etc.). BIS methods of Linear-and angular dimensioning. Symbolic representation of welds as per BIS for representation of above conventions.

Interpenetration of Solids:

Introduction, interpenetration of Prism with Prism, Prism with cylinder, Prism with cone, prism with pyramid. (Prisms and Pyramids limited up to Rectangular base), Cylinder with Cylinder, Cone with Cylinder.

Sketching of Machine Component:

Importance of sketching and entering proportionate dimensions on sketches. Sketches of nut, Bolts square and Hexagonal Flanged nuts, Lock nuts, Dome nut, Capstan nut, Wing nut, Castle nut, Split pin, Square headed bolt, Cup headed bolt,T-headed bolt, Types of foundation bolts, Stud, Washer, Set screws, Cap screws. Various types of rivets and riveted joints,Various types of keys, Socket and spigot (Cotter joint) , Knuckle (pin) joint, Muff coupling, Protected and unprotected Flanged, Coupling, Universal coupling, solid and bush bearing. Plummer block (pedestal bearing), Foot step bearing. Flat and V-belt pulleys, Fast and loose pulleys, speed cone pulleys, Pipe joint for C.I. Flanged, socket and spigot type pipe joint. Union pipe joint and standard pipe-fittings. Students should know the applications of above machine components.

Auxiliary Projection:

Projection on auxiliary vertical and horizontal plane, Auxiliary nprojection of simple machine components.

Limits, Fits and Tolerances:

Significance of system of limits and fits. Definitions, Types, Recommendations and selections, Tolerances of form and position, surface finish symbols as per BIS, Selection and entering of all these symbols with reference to details and assembly drawings, Tolerancing an individual dimensions of details drawing.

Details and Assembly Drawing:

To prepare detail drawings from given assembly drawing. To prepare assembly drawing from given drawing of details. The number of parts is limited to ten to twelve. Preparation of detail and assembly drawing from the following details such as: - Machine tool parts: Tool post, Tailstock, Machine vice, Chucks etc.- Engine parts: Stuffing box, Crosshead assembly, Piston and connecting rod, etc. - Miscellaneous parts: Valve assembly, Screw jack, Jigs and fixtures, Pipe vice etc. Assembly selected should include different types of sections.

TERM WORK:

Sheet No. 1: Sheet Based on BIS conventions

Sheet No. 2: Sketching (Free hand drawing) of various machine components.

Sheet No. 3: Sheet Based on limits, Fits and tolerances (Production Drawing)

Sheet No. 4: To draw details and assembly drawing of machine component containing 10 to 12 parts.

Sheet No. 5: Sheet based on auxiliary projection **OR**

Sheet No. 5: Sheet based on interpenetration of solids.

TEXT BOOKS:

1. P.S. Gill, Machine Drawing. S. K. Kataria and Sons, Delhi, 7thEdition, 2008

2. N. D. Bhatt, Machine Drawing. Charotor Publication House, Bombay, 42th Edition, 2007

3. N. Sidheshwar . P. Kannaiah and V.V. S. Sastry. Machine Drawing, Tata McGraw Hill, New Delhi.

4. R.K. Dhavan, MachineDrawing, S. Chand and Company, 1stEdition, 1996.

5."Production Drawing", Narayana, Kannaiah and VenkataReddv,New Age International.2nd Edition, 2002.

6. "Machine Drawing", N.D.Junnarkar,Print Pearson Education, 1st Edition.

REFERENCE BOOKS:

1. IS: SP46-Engineering Drawing Practice for Schools and Colleges, B.I.S. Publications.

2. IS: 696-Code of Practice for General Engineering Drawings B.I.S. Publications.

3. IS: 2709-Guide for Selection of Fits, B.I.S. Publications.

4. IS: 919-Recommendation for Limits and Fits for Engineering, B.I.S. Publications

5. IS: 8000-Part I, II. III. TV, Geometrical Tolerencingof Technical Drawings --B.I.S. Publications.

6. “Engineering Drawing, with an Introduction to AutoCAD”, DhananjayA.Jolhe, Tata McGrawHill, 2010

S.Y. B. Tech (MECHANICAL ENGINEERING) Semester: III

8. Computer Programming Using C++

SUBJECT CODE –PCC- ME207

TeachingScheme:	**Examination Scheme:**
Practical: 2 Hrs.peralternate week	**Term Work: 25 Marks**
	Credit: 01

Pre-requisites: Computer Programming in C

Course Objectives:

1. To understand how C++ improves C with object-oriented features.

2. To introduce an object oriented programming language.

3. After the students have successfully completed the course, they shall have sufficient knowledge of the basic computer operations and various programming techniques especially in C++.

4. To develop and enhance the programming skills amongst the students in general aswell as application of it in the field of Mechanical Engineering.

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

1. Write, compile and debug programs in C++ language.
2. Design programs involving decision control statements, loop control statements and case control structures.
3. Develop algorithms for solving problems using object oriented language.
4. Apply their knowledge and programming skills to solve various computing problems in the field of Mechanical Engineering.

1. **Evolution of Programming methodologies,** Introduction to OOP and its basic features, Basic components of a C++, Program and program structure, Compiling and Executing C++ Program. Selection control statements in C++.

2. **Data types, Expression and control statements Iteration** statements in C++, Introduction to Arrays, Multidimensional Arrays, Strings and String related Library Functions.
3. **Functions,** Passing Data to Functions, Scope and Visibility of variables in Functions,
4. **Creating classes and Abstraction:** Classes objects, data members, member functions, this Pointer, Friends, Friend Functions, Friend Classes, Friend Scope, and Static Functions.Structures in C++. **Constructors and Destructors,** Static variables and Functions in class.
5. **Operator Overloading in C++,** Overloading Unary Operators, Overloading binary operators.
6. **Inheritance in C++,** Types of Inheritance, Pointers, Objects and Pointers, Multiple Inheritance.**Virtual Functions,** Polymorphism, Abstract classes.

TERM WORK/ LIST OF EXPERIMENTS

1. One assignment based on Object-Oriented programming: Introduction, Basic concepts, Benefits, Object-oriented languages, Applications.
2. Minimum 2 program on Data types, Expression and control statements Iteration statements in C++, Introduction to Arrays, Multidimensional Arrays, Strings and String related Library Functions.
3. Minimum 2 program on Functions, Passing Data to Functions, Scope and Visibility of variables in Functions, Structures in C++.
4. Minimum 2 program on Creating classes and Abstraction: Classes objects, data members, member functions, this Pointer, Friends, Friend Functions, Friend Classes, Friend Scope, and Static Functions. Constructors and Destructors, Static variables and Functions in class
5. Minimum 2 program on Operator Overloading in C++, Overloading Unary Operators, Overloading binary operators.
6. Minimum 2 program on Inheritance in C++, Types of Inheritance, Pointers, Objects and Pointers, Multiple Inheritance. Virtual Functions, Polymorphism, Abstract classes.

TEXT BOOKS

1. "Object Oriented Programming", E. Balguruswami, Tata McGraw Hill Publication.
2. "Let us C++" ,YashwantKanitkar ,BPB Publication.
3. "C++ Programming",AlstevanswielyIndia,7th Edition.
4. "Object oriented Programming with C++", Sourav Sahay, Oxford University Press.
5. "Object-Oriented Programming in C++", Rajesh K Shukla, Wiley India

REFERANCE BOOKS

1. "Professional C++", Solterwiely India
2. "The C++ Programming Language", Brian W. Kernighan, Dennis M. Ritchie, Prentice Hall
3. "C++: The Complete Reference", Schildt H., Tata Mcgraw Hill.

S.Y. B. Tech. (MECHANICAL ENGINEERING) Semester: III

9. WORKSHOP PRACTICE III

SUBJECT CODE PCC ME 208

TeachingScheme:	**Examination Scheme:**
Practical: 2 Hrs.perweek	**Term Work: 25 Marks**
	Credit: 01

Pre-requisites: Engineering Graphics, Basic Mechanical Engineering

Course Objectives:

1. To study Patterns, Core boxes, Preparation of Pattern for solid casting.
2. To study Sand testing, Size analysis, Moisture percentage, Permeability Test.
3. To study Gating system for metal casting with casting defects.

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

1. Understand types of Patterns, Core boxes and Preparation of Pattern for solid casting.
2. Understand properties of sand by permeability test, moisture percentage test, and green strength.
3. Understand gating system for metal casting with casting defects

Term Work:

1. Study of Patterns – Types, Materials used, Pattern Allowances, Construction and color code.
2. Study of Core boxes: Types, Allowances
3. Preparation of Pattern for solid casting
4. Sand testing for green sand and core sand (Any four)
    a. Preparation of standard specimen
    b. Preparation of green sand mould
    c. Size analysis. Grain fineness Number
    d. Moisture percentage
    e. Permeability Test
    f. Green Compressive strength
    g. Clay content
    h. Mould hardness
5. Foundry visit to study pattern shop, sand making and moulding.

NOTE:

1. The load of Workshop Practice III will be allotted to the Teaching Faculty.
2. Assessment of Journal based on above Term Work and Industrial Visit Report.
3. Term work will consist of Job on Pattern Making Carrying 15 Marks, Journal Assessment along with internal oral 10 marks.

S.Y. B. Tech. (MECHANICAL ENGINEERING) Semester: IV

09. ENVIRONMENTAL STUDIES

SUBJECT CODE: MC ME 209

TeachingScheme:	**Examination Scheme:**
Lectures: 3 Hrs.perweek	**ESE: 70Marks**
Credit: 03	**CIE: 30Marks**

S.Y. B. Tech (MECHANICAL ENGINEERING) **Semester IV**

01. APPLIED NUMERICAL METHODS

SUBJECT CODE: PCC-ME-210

Teaching Scheme:	**Examination Scheme:**
Lectures: 3 Hrs. per week	**ESE: 70 Marks**
Practical: 2 Hrs. per week	**CIE: 30 Marks**
Credit: 04	**Term Work: 25 Marks**

Pre-requisites: Engineering Mathematics-I, Engineering Mathematics-II, Engineering Mathematics-III and C++ Programming

Course Objectives:

1. To introduce numerical methods to solve different types of equations.
2. To introduce regression and interpolation techniques.
3. To know various methods of Differentiation & Integration.
4. To apply the knowledge of these methods to solve practical problems.
5. To transform various methods into Computer Programs.

Course Outcomes:

1. Understand and apply various methods to find roots of equations.
2. Learn and Implement different methods to solve simultaneous equations.
3. Understand and apply the methods of Regression and interpolation.
4. Implement various numerical methods for differentiation and Integration.
5. Apply various methods to solve engineering problems with Ordinary differential equations.
6. Understand the methods to solve Partial differential equations involved in Engineering Problems.

Unit 1 **[7]**

a. **Errors**: Introduction, Types of errors, Rules for estimate errors, Error propagation, Error in the approximation of function. **Only an Assignment is to be given on Errors. No weightage in theory examination**.

b. **Roots of Equation**:
    a. Bracketing Method: Bisection Method, False position method
    b. Open method: Newton-Raphson's method for Single root, multiple root, Iterative method for Non-linear equations
    c. Roots of polynomial: Muller's Method, limited to TWO Iterations. Initial guesses not to be given.

Unit 2 **[5]**

Linear Algebraic Equation:

a. Gauss Elimination Method. Pitfalls and improving techniques.
b. LU decomposition method, Gauss-Jacobi and Gauss-Seidel Iteration method

Unit 3 **[8]**

Curve Fitting & Interpolation:

a. Least Square Regression – Linear regression, Parabolic regression

b. Interpolation–Interpolating polynomial, Lagrange's interpolating polynomial, Divided Difference Formula

Unit 4 **[7]**

Numerical Differentiation and Integration

a. Newton-Cote's Integration of equation: Trapezoidal rule, Simpson's rules

b. Integration of Equation: Gauss Quadrature methods.

c. Numerical differentiation: For Equally spaced Data: Forward difference Formula, Central difference Formula, Backward difference Formula,

d. For unequally spaced Data: Divided difference Formula.

Unit 5 **[6]**

Ordinary Differential Equation:

a. Taylor's series method, Picard's Method, Euler's Method, Runge-Kutta 4^{th} Order method

b. Boundary value Problem: Finite Difference Method

c. Eigen value problem: Eigen value problem based on Power method.

Unit 6 **[7]**

Partial Differential Equation:

a. Finite Difference–Elliptical equation, Liebmann's method to Solve Laplace's and Poisson's Equations

b. Finite Difference- Parabolic Equation

c. Implicit Method- Crank-Nicolson method (Derivation Only)

TERM WORK:

Term work should contain **at least SIX assignments** based on SIX Units.

a. At least one problem should be solved based on each method from every Unit.

b. A computer program along with Flowchart on following methods using **C++/MATLAB/SCILAB**or any other suitable software**:**

- Method of false Position,
- Gauss elimination method & Gauss Jacobi method,
- Least Square method for Line fitting,

- Forward difference method for Num. Diff. & Trapezoidal method of Integration,
- Runge-Kutta method of 4^{th} Order,
- Liebmann's method to solve Elliptic equations.

TEXT BOOKS:

1. Higher Engineering Mathematics", Dr. B. S. Grewal, Khanna Publishers, New Delhi, 7th Edition, 2005.

2. "Numerical Methods", Dr. B.S. Grewal, Khanna Publishers, New Delhi, 7th Edition, 2005.

3. "Numerical Methods", E Balguruswamy Tata McGraw-Hill Publication Company Ltd. 8th Edition, 2002.

4. "Numerical Methods", S. Arumugam, A. Thangapandi Isaac and A.Somasundaram, SciTech Publications India Pvt. Ltd. Chennai, 2nd Edition, 2007.

5. "Numerical Methods", Dr. P. Kandasamy, Dr. K. Gunavathi, Dr. K. Thilagavathy. S Chand Publication, New Delhi, 2nd Edition, 2006

6. "Numerical Methods", G. Haribaskaran, Laxmi Publications Pvt. Ltd, New Delhi, 1st Edition, 2006.

REFERENCE BOOKS:

1. "Applied Numerical Methods with MATLAB for Engineers and Scientists", S.C. Chapra, Tata McGraw Hill Education Pvt. Ltd. New Delhi, 3rd Edition, 2012.

2. "Numerical Analysis Theory and Applications", R. L. Burden and J. D. Faires, Cengage Learning India Pvt. Ltd. New Delhi, 1st Edition, 2005.

3. "Applied Numerical Methods Using MATLAB", W. Y. Yang, W. Cao and J. Morris, Wiley India Pvt. Ltd. New Delhi, 1st Edition, 2005.

4. "Numerical Mathematics and Computing", Ward Cheney, Cengage Learning India Pvt. Ltd. New Delhi, 7th Edition.

S.Y. B. Tech (MECHANICAL ENGINEERING) Semester**: IV**

02.ANALYSIS OF MECHANICAL ELEMENTS

SUBJECT CODE: PCC-ME211

TeachingScheme:	**Examination Scheme:**
Lectures: 3 Hrs.perweek	**ESE: 70Marks**
Practical: 2 Hrs.perweek	**CIE: 30Marks**
Credit: 04	**Term Work: 25 Marks**

Pre-requisites: Engineering Mechanics

Course Objectives:

1. To gain knowledge of different types of stresses, strains and deformation induced in mechanical components due to external loads.
2. To study shear force and bending moment distribution for different types of loads and support conditions.
3. To study the distribution of various stresses and deformation in mechanical elements.
4. To study the analytical and graphical method to solve the problems in principal planes and stresses.
5. To study the effect of component dimensions and shape on stresses and deformations.
6. To study the buckling, and strain energy effect in mechanical elements.

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

1. Apply concepts of analysis of mechanical elements to obtain solution to various types of loading and stresses induced in real time engineering problems.
2. Draw shear force and bending moment diagrams for simple beams subjected to various loads and support conditions.
3. Compute and analyze bending and shear stresses in mechanical components.
4. Determine plane stress, principal stress .maximum shear stress and their orientations using analytical method and Mohr's circle.
5. Analyze the effect of deflection in beams**.**
6. Evaluate buckling and strain energy in beams subject to various types of loading.

Unit No. 01 Stresses and Strains: [06]

Concept of Stress and Strain, (Linear, Lateral, Shear and Volumetric), Hooke's Law, Poisson's ratio, Modulus of Elasticity, Modulus of Rigidity, Stress-strain diagram for ductile and brittle material, Factor of safety, Working stress. Normal and shear stresses, Thermal Stresses, Bulk Modulus, Inter-relationship between elastic constants.

Unit No. 02 [08]

A. Torsion: Introduction to Torsion, Basic assumptions, Torsion formula, Hollow and solid circular shafts,Angular deflection.

B. Shear Force and Bending Moment: Concept and definition of shear force and bending moment in determinate beams (Simply supported, cantilever and overhanging) due to concentrated, UDL, UVL and Couple.

Unit No. 03 Stresses in Beams: [07]

A. Bending Stresses: Symmetric pure bending of beams, Flexure formula, moment ofresistance of cross-sections, Simple built-up section, Design of rectangular and circular(solid and hollow) sections; L, I and T sections

B. Shear Stresses: Distribution of shear stresses in beams of various commonly usedsections such as circular. I, T, and angles.

Unit No. 04 Principal Stresses and Strains: [08]

Normal and shear stresses on any oblique planes, Concept of Principal planes, Derivation of expression for Principal stresses and maximum shear stress, Positions of principal planes and planes of maximum shear, Graphical solutions using Mohr's circle of stresses, Combined effect of shear and bending in Beam.

Unit No. 05 Deflection of Beams: [06]

Strain curvature and moment curvature relation, Solution of beam deflection problem by Double integration method, Macaulay's method and Area moment method. (Simply Supported Beam and Cantilever.)

Unit No 06 [05]

A. Columns: Euler's formula for different end connections, Concept of equivalentlength, Eccentric loading, Rankine formula.

B. Energy Methods: Concept of strain energy, Resilience, Proof resilience, Modulus of resilience, derivation for deformation of axially loaded members under gradual, sudden and impact loads (including Numerical).

TERM WORK/ LIST OF EXPERIMENTS

A term work shall consist of report on the assignments given below.

1. Stresses and strains.
2. Torsion (Problems based on industrial applications)
3. Shear force diagram & bending moment diagram.
4. Bending stresses and shear stresses in beams.
5. Principal stresses (both analytical and graphical).
6. Deflection of beams.
7. Columns.
8. Strain Energy.

TEXTBOOKS:

1. "Strength of Materials", S. Ramamruthum, DhanpatRai and Sons, New Delhi.
2. "Strength of Materials", R. K. Bansal, Laxmi Publication, 4th Edition.
3. "Strength of Materials", Khurmi Gupta, S. Chand Publication.
4. "Strength of Materials", R.K. Rajput, S. Chad Publication.
5. "Mechanics of structure", S.BJunnerkar,Charotar Publication House.
6. "Strength of Materials", S. S. Bhavikatti, Vikas Publication House.
7. "Strength of Materials", Timoshenko and Young, CBS Publication.
8. "Mechanics of Materials", S. S. Ratan, Tata McGraw Hill Publication, 2009.
9. "Strength of Materials",B. K. Sarkar, McGraw Hill Publication, 2003
10. "Strength of Materials", L. S. Negi, McGraw Hill Publication, 2008.

REFERANCE BOOKS:

1. "Strength of Materials", Beer and Johnson, CBS Publication.
2. "Strength of Materials", G.H. Rider,Mac Millan India Ltd.
3. "Strength of Materials", Nag and Chanda, Willey India Publication.
4. "Advanced Mechanics of Materials", Boresi, Willey India Publication.
5. "Strength of Materials", Den Hartong, McGraw Hill Publication.
6. "Mechanical analysis and design", H. Burr and John Cheatam, PHI, New Delhi.

S.Y. B. Tech (MECHANICAL ENGINEERING) Semester**: IV**

03. FLUID AND TURBO MACHINERY

SUBJECT CODE- PCC-ME212

TeachingScheme:	**Examination Scheme:**
Lectures: 3 Hrs.perweek	**ESE: 70Marks**
Practical: 2 Hrs.perweek	**CIE: 30Marks**
Credit: 04	**Term Work:25 Marks**
	Practical: 25 Marks

Pre-requisites: Fluid Mechanics, Applied Thermodynamics

Course Objectives:

1. To learn the working principles of Impulse water turbines and also to study its velocity triangles .To study design parameters related to Turbines
2. To learn the working principles of Reaction water turbines and also to study its velocity trianglesstudy design parameters related to Turbines
3. To understand the concept of Centrifugal pumps and its construction. To understand NPSH terms related to centrifugal pumps
4. To illustrate the concept of Reciprocating Air Compressors. To understand various parameters related to Air Compressors.
5. To illustrate the concept of centrifugal compressor, Axial compressors. To understand variousparameters related to rotodynamic air compressors
6. To discuss the working of Gas Turbines, and Jet engine and know its various configurations. To determine the efficiencies of gas turbines

Course Outcomes: At the successful completion of this course, student will be able to,

1. Classify and understand working principle of rotodynamic machines and Reciprocating compressor.
2. Remember Euler's equation of rotodynamic machines
3. Remember Euler's equation of rotodynamic machines
4. Apply the theoretical knowledge to solve numerical problems, select the machinesfor particular application.
5. Analyze the machines to evaluate the performance.

Unit No. 01 Impulse Water Turbines: [07]

Eulers equation for work done in Rotodynamic Machines classification of water turbines ,Pelton wheel, its construction and working, velocity triangles, types. Pelton wheel design (bucket dimensions, Number of buckets, Jet diameter, Wheel diameter, Jet ratio, Speed ratio, Number of jets,) Calculation of efficiency, Power, Discharge etc. Governing of Pelton wheel.

Unit No. 02 Reaction Water Turbines: [07]

Principle of operation, Construction and working of Francis and Kaplan Turbine, Draft tube, Cavitation calculation of various efficiencies, Power, Discharge, Blade angles, Runner dimensions etc. Governing of Francis and Kaplan turbine. Draft tube-types and analysis.

Unit No. 03 Centrifugal Pumps: **[06]**

Working principles, Construction, Types, Various heads, Multistage pumps, Velocity triangles, Minimum starting speed, Cavitation, Net positive suction head (NPSH). efficiencies, Discharge, Blade angles, Head, Power required, Impeller dimensions etc.

Unit No. 04 Reciprocating Air Compressors: **[08]**

Application of compressed air, classification of compressor, Reciprocating compressors, construction , Work input, Necessity of cooling , Isothermal efficiency, Heat rejected, Effect of clearance volume, Volumetric efficiency, Necessity of multistaging, construction, Optimum intermediate pressure for minimum work required, After cooler.

Unit No. 05 Rotodyanamic Air Compressors: **[07]**

Centrifugal compressor, velocity diagram. Theory of operation, losses, Adiabatic efficiency, Effect of compressibility, Diffuser, Prewhirl, Pressure coefficient, Slip factor, performance., Surging, Chocking, Stalling, Performance, Comparison with centrifugal. Introduction to Axial flow compressors, Roots blower and vane blower (Descriptive treatment)

Unit No. 06 Gas Turbines: **[05]**

Working principles, Applications, Open, Closed cycle and their comparison. Cycle modified to Regeneration, Reheat, Intercooling performance. Calculation of gas turbine work ratio, Efficiency etc. Types of fuels for gas Turbine Introduction to Jet engine.

TERM WORK/ LIST OF EXPERIMENTS

1. Study and demonstration of Model & Testing, Unit quantities of turbine & pump.
2. Trial on Pelton wheel with characteristics curve.
3. Trial on Francis/ Kaplan turbine with characteristics curve.
4. Trial on Centrifugal pump with characteristics curve.
5. Trial on reciprocating compressor
6. Study & Trial on centrifugal blower
7. Study of hydraulic devices- Intensifier, Accumulator, Hydraulic jacks, Press, Crane. hydraulic

ram.

8. Study of other types of pumps- Reciprocating pump, Gear pump, Jet pump, Submersible pump, Air lift pump.
9. Industrial visit to Pump/Turbine Manufacturing Industry or Hydro Power Plant.

TEXT BOOKS:

1. "Hydraulic Machines", V.P. Vasantdani, Khanna Publishers, 1996.
2. "Fluid flow machines", N.S. Govindrao, Tata McGraw-Hill,1983.
3. "Steam and gas Turbines", R. Yadav, Central Publishing House, Allahabad, 6th Edition , 1997 4. "Gas Turbines", V. Ganeshan, Published by TMH Education Pvt. Ltd. ,3rdEdition.
5. "Thermal Engg.", Kumar vasantdani, Khanna publisher
6. "Thermal Engg.",P.L. Balleny, Khannapublisher. , 20th Edition
7. "Gas turbines and Compressor", Cohen and Rogers, Saravanamutto Publisher
8. "Thermodynamics and Heat Engines", R. Yadav, Vol-II, Central Publishing House.
9. "Fluid mechanics and hydraulic machines", Modi and Seth, Sstandard Book House, 2004
10. "Thermal Engineering", R K Rajput, Laxmi Publication.
11. "Fluid Mechanics and Hydraulic Machines", S.C. Gupta , Pearson Education, 1stEdition
12. "Fluid Mechanics and hydraulic machines",R. K. Rajput , S. Chand Publication.
13. "Fluid Mechanics and hydraulic machines",R. K. Bansal, L.P. Pub. House.
14. "Turbo machines", Pai, Willey India

REFERENCES BOOKS:

1. "Turbo machines", S.M. Yahya , Tata Mc Graw Hill , 2005
2. "Fans, compressor and turbine", S. M. Yahya,Tata Mc Graw Hill , 2005

S.Y. B. Tech (MECHANICAL ENGINEERING) Semester: IV

04. THEORY OF MACHINES-I (*)

SUBJECT CODE: PCC-ME-213

TeachingScheme:	**Examination Scheme:**
Lectures: 3 Hrs.perweek	**ESE: 70*Marks**
Practical: 2 Hrs.perweek	**CIE: 30Marks**
Credit: 04	**Term Work: 25 Marks**

Course Objectives:

1. To represent kinematic behavior of different machine elements and mechanisms.
2. To select various Power transmitting devices.

3. To explain types of Cam with followers and select according to their applications.
4. To compare types of Governing mechanisms.
5. To analyze effect of friction in Mechanisms and machines

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

1. Understand different types of mechanisms and their applications
2. Analyze kinematic theories of mechanism,
3. Design cam with follower for different applications
4. Select different power transmitting elements according to application
5. Select different governing mechanisms according to application.

Unit No. 01 Basic Concept of Mechanisms: [05]

Links, kinematic pair (lower and higher), Kinematic chain, Mechanism, inversion, Types of constraints, Grubbler□s criterion, Inversions of slider crank chain, Double slider crank chain, Four bar, Steering gear mechanisms, Hooke's joint (only theoretical treatment).

Unit No. 02 Velocity and Acceleration in Mechanisms: [10]

Graphical analysis of Velocity and acceleration for different mechanisms using relative velocity and acceleration method, Klein's construction for slider crank mechanism, Velocity analysis by Instantaneous center method.

Unit No. 03 Friction: [05]

Introduction to friction, Friction in pivot bearings, Inclined plane theory, Friction in screws

Unit No. 04 Cams: [08]

Types of cams and followers, Profiles of cams for specified motion of different followers, Spring load on the follower, Jumping of follower.

Unit No. 05 Belts and Dynamometers: [06]

Types of belt drives, Calculation of power transmitted, Belt tension ratio, Actual tension in a running belt, Centrifugal and initial tension in belt, Slip and creep of belt.

Unit No. 06 Governors: [06]

Types of governors, Porter and Hartnell governor, Controlling force and stability of governor, Hunting, Sensitivity, Isochronism, Governor effort and power, Insensitiveness of governors.

TERM WORK/ LIST OF EXPERIMENTS

1. Study of basic mechanisms. (Demonstration of models, Actual mechanisms, etc.)
2. One A3 size sheet of Velocity problems by relative velocity method. (Minimum 4 problems)
3. One A3 size sheet of Velocity problems by Klien's construction and Instantaneous center method. (Minimum 4 problems)
4. One A3 size sheet of Acceleration problems (including Coriolis component) by relative acceleration method. (Minimum 4 problems)
5. Verification of ratio of angular velocities of shafts connected by Hooks joint.
6. One A3 size sheet of Problems on cam profile. (Minimum 4 problems)
7. Experiment on Governor characteristics for Porter or Hartnell governor.
8. Experiment on Cam Profile
9. Experiment on belt drives.
10. Experiment on Dynamometer

Note: Minimum 8 experiment

TEXT BOOKS

1. "Theory of Machines", RatanS.S, Tata McGraw Hill New Delhi, 2nd Edition.
2. "Theory of Machines", P.L.Ballany, Khanna Publication, New Delhi, 2nd Edition.
3. "Theory of Machines", V.P. Singh, DhanpatRai and Sons.
4. "Theory of Machines", H.G.Phakatkar, Nirali Publication. Pune
5. "Theory of Machines", Dr. R.K.Bansal, Laxmi Publication.
6. "Theory of Machines", Thomas Bevan, CBS Publishers, New Delhi.
7. "Theory of Machines and Mechanism", G.S. Rao and R.V. Dukipatti, "New Age Int.Publications Ltd., New Delhi.
8. "Theory of Machines", Shah and Jadhawani, DhanpatRaiand Sons

REFERANCE BOOKS

1. “Theory of Machines and Mechanism”, Shigley, McGraw Hill, New York
2. “Theory of Machines”, Abdullah Shariff, McGraw Hill, New Delhi.

Note: (*) Indicates Theory Paper of Three Hours Duration.

S.Y. B. Tech (MECHANICAL ENGINEERING) Semester: IV

05.MACHINE TOOLS AND PROCESSES

Subject Code: PCC-ME214

TeachingScheme:	**Examination Scheme:**
Lectures: 4 Hrs.perweek	**ESE: 70Marks**
Credit: 03	**CIE: 30Marks**

Pre-requisites: Basic Mechanical Engineering

Course Objectives:

1. To introduce different methods of Molding and Casting.

2. To introduce forming and Plastic Shaping processes.

3. To study various Metal Removal Processes and Machine tools.

4. To study Nonconventional Machining.

5. To study gear manufacturing processes.

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

1. Identify various kinds of machine tools of previous and present era tools.

2. Describe construction and working of basic machine tools.

3. Demonstrate their understanding of plastic processing, injection moulding, extrusion and thermoforming.

4. Analyze the concept, mechanism of material removal with respect different processes.

5. In position to appreciate the merits of non-traditional machining and its applications in industries.

Unit No. 01 Casting Processes: **[11]**

Importance of casting as manufacturing process, advantages and limitations of casting processes, foundry layouts and mechanization, Moulding types such as Green sand moulding, Shell moulding, CO_2moulding, investment casting, Sand reclamation, Components of gating system, functions and importance of runners and risers, solidification control devices: chills, ceramics bricks, directional solidification, Introduction to permanent mould casting process such as continuous casting, Gravity die casting, pressure die casting, centrifugal casting, Melting practices and Metallurgical control in Cupola furnace, oil/gas fired furnaces, Induction and Arc Furnace, Solidification of castings, casting defects, metal pouring equipments, Cleaning-fettling and inspection of casting.

Unit No. 02 Forming Processes: [**11]**

a) **Rolling:** Introduction, Hot and cold rolling, Rolling Mill Classification, Defects in rolling.

b) **Forging:** Introduction, Forging Machines (board Hammer, Air and Steam, Hydraulic Hammer), Open and Closed die Forging, Defects in forging.

c) **Extrusion:** Introduction, Direct, Indirect, Tube, Impact and Hydraulic Extrusion, Defects in extrusion.

d) **Drawing:** Introduction and Types of Wire, rod and pipe drawing, defects in drawing.

Unit No. 03 Plastic Shaping: [**04]**

Thermosetting and thermoplastic materials, their properties and applications, Introduction to blow moulding, injection moulding, extrusion, calendaring and thermo forming.

Unit No. 04 Machine Tools for Metal Cutting I: [11]

a) **Lathe**: Introduction, Working principle, types, specifications, principle parts, accessories, attachments, and various lathe operations, Calculations of Change gears for thread cutting.

b) **Capstan, turret lathe**: Principle parts, Working, Turret indexing mechanism, bar feeding mechanism, Comparison with centre lathe.

c) **Drilling & Boring Machines:** Classification of drilling machines, Construction and working of radial drilling machine, Various accessories and various operations. Introduction to boring machines, Types of boring machine, different operations.

Unit No. 05 Machine Tools for Metal Cutting II: [11]

a) **Shaping & Planning Machine:** Construction & working of shaper and Planer machine, Comparison between planer and shaper machine.

b) **Milling Machine:** Types- Horizontal, Vertical milling machines, Milling cutters, construction and working of column and knee type, milling operations, simple and compound indexing.

c) **Gear Manufacturing processes:** Study of various processes like gear shaping, gear hobbing, Gear finishing processes –Gear shaving, Gear burnishing and gear rolling.

Unit No. 06 Nonconventional Machining: [04]

Fundamental principle, machining unit, tool material, advantages, limitations and applications of Abrasive Jet Machining, Electrical Discharge machining, Electro- Chemical machining, Laser beam machining, Ultrasonic machining, Water jet machining.

Note:

The Workshop practice IV should cover the practical based on this syllabus, the load of

which shall be allotted to teaching staff.

TEXT BOOKS:

1. "Manufacturing Technology- Foundry, Forming and Welding, Vol. I", P. N. Rao, Tata McGraw-Hill, New Delhi,3rd edition, 2009.
2. "Principles of Foundry Technology", P.L. Jain, Tata McGraw-Hill, NewDelhi, 2nd Edition.
3. "A Textbook of Production Technology (Manufacturing Processes)", P.C. Sharma, S. Chand and Company Pvt.Ltd, New Delhi.7thEdition,2010.
4. "Foundry technology", O. P. Khanna, Dhanapat Rai Publications Pvt.Ltd, New Delhi.17th Edition, 2013.
5. "Workshop Technology vol. II", B.S. Raghuvanshi, Dhanapat Rai Publications Pvt.Ltd, New Delhi.10th Edition, 2000.
6. "Workshop Technology vol. II", W. A. J. Chapman, Viva Books Pvt.Ltd,NewDelhi,1stEdition,2001.
7. "Elements of Workshop Technology vol. II", S.K.Hajra Choudhury and A.K. Hajra Choudhury , Media promoters and Publishers Pvt.Ltd,NewDelhi,13thEdition,2012.
8. "Production technology", R. K. Jain, Khanna Publishers, Delhi, 15th Edition,2000.
9. "A Textbook of Manufacturing Technology (Manufacturing Processes)", R.K. Rajput, Laxmi Publications Pvt.Ltd, New Delhi. Edition,2007

REFERANCE BOOKS:

1. "Principles of metal casting", Haineand Rosenthal, Tata McGraw-Hill Book, Company. New Delhi.
2. ASTM Volumes on Welding, casting, forming and material selection.
3. ASM Handbook," Volume- 15, 1988, Casting.
4. "Workshop Technology", W.A.J.Chapman, CBS Publishing and Distributors, N.DelhiVol.I [ISBN-13:9788123904016]2001, Vol.II [9788123904115] 2007 andVol.III [9788123904122] 1995.
5. "Machine Tools and Manufacturing Technology" , Steve F. Krar, Mario Rapisarda,Albert F. Check.

S.Y. B. Tech (MECHANICAL ENGINEERING) Semester: IV

06. Testing and Measurement

SUBJECT CODE: PCC-ME 215

TeachingScheme:	**Examination Scheme:**
Practical: 2 Hrs.perweek	**Term Work: 25 Marks**
Credit: 01	**Practical: 25Marks**

Pre-requisites: Applied Thermodynamics, Fluid Mechanics, Applied Physics

Course Objectives:

1. to gain knowledge of different types of measuring instruments for mechanical engineering

2. to study and calibration of various measuring instruments

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

1. Understand basic constriction of working of various instruments
2. Select the various of types of instruments for the measurement system

TERM WORK/ LIST OF EXPERIMENTS

1. Study and assignment on generalized measurement system and characteristics of instruments.
2. Study and assignment on sensing elements and transducers.
3. Testing of mechanical pressure gauge by using dead weight pressure gauge tester
4. Study and Measurement of fluid flow by using Rota meter/ Anemometer/ Turbine meter/ Target Meter.
5. Study and Measurement of Angular speed by using Magnetic Pickup and Photoelectric Pickup/ Stroboscope.
6. Study and Measurement of Temperature by using Thermocouple, RTD, Thermister/ Pyrometer.
7. Study and Measurement of Displacement by using LVDT.
8. Study and Measurement of Force and Torque by using Strain Gauges.
9. Study and Measurement of Vacumm by using Mc-lead guage/ Pirani gauge
10. Study of Vibrations testing by using Vibrometer.
11. Case study on measuring system for Pressure, flow, temperature etc.

TEXT BOOKS

1. “Mechanical Measurement”, Beckwith and Buck, Pearson Education Asia,5thEdition,2001.
2. “Mechanical Measurement and Control” D.S. Kumar, Metropolitan Book Co.Pvt.Ltd.,NewDelhi,4thEdition,2007.
3. “Mechanical Measurements”, Shirohi and Radha Krishnan H.C., New Age International, New Delhi, 3rd Edition,2007.
4. Engineering Practices Laboratory Kannaiah, Scitech Publication.

REFERANCE BOOKS

1. “Measurement Systems”, DoebelinEmesto, McGraw Hill International Publication Co. New York, 4th Edition, 1990
2. “Mechanical Measurement and Control” ,A.K. Sawhney and P. Sawhney, Dhanpat Rai and Company Pvt.Ltd.,New Delhi, 12th Edition,2010.
3. “Theory and design for mechanical measurements”, Richard S. Figliola, Donald E. Beasley, Wiley India Edition.

S.Y. B. Tech (MECHANICAL ENGINEERING) Semester : IV

07. COMPUTER AIDED DRAFTING

SUBJECT CODE: PCC-ME216

TeachingScheme:

Practical: 2 Hrs.perweek

Credit: 01

Examination Scheme:

Term Work: 25 Marks

Pre-requisites:

1. Fundamentals of Engineering Graphics
2. Fundamentals of Machine Drawing and Engineering Drawing

Course Objectives:

1. To understand importance of CAD tool
2. To Develop an ability to create 2-D drawings
3. To Create 3-D models of machine components
4. To Create assembly of simple machine components with industrial approach.

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

1. Draw 2D drawings and 3D models of simple components.
2. Analyze and interpret production Drawing
3. Use modern engineering techniques, tools and skills for engineering practice.
4. Develop the skills for drafting using CAD software and get the knowledge to enhance the CAD utilities.

1. Introduction to CAD: [03]

Basic commands to draw 2D objects like, point, line, circle, ellipse, polygon etc. Editing commands like, Erase, extension, break, trim, fillet, scale etc. Viewing commands like Zoom, pan, mirror, rotate, move, block, offsetting, Draw& Modify toolbars of any advance CAD Software.

2.Use of layers: [02]

Use of layers in 2D drawing, Annotation and Layers toolbars any advance CAD Software.

3.Geometric Dimensioning and Tolerancing: [02]

Geometric Dimensioning and Tolerancing For 2-D Objects: Straightness, Flatness, Perpendicularity, Angularity, Roundness, Concentricity, Cylindricity, Run out, Profile, Parallelism etc. Entering limits, fits, tolerances surface finish symbols and Machining Symbols on drawings.

4.Detail and Assembly Drawings: [02]

Preparing detail and assembly drawings in 2D. Preparing of bill of material (BOM). Maximum no. of parts to be limited to twelve only. Entering limits, fits, tolerances and surface finish symbols on detail and assembly drawings.

5.Production Drawing: [02]

Production drawing including production note, removed cross section, detail views, Cross sectional views, dimensions and tolerances etc.

6.Introduction 3D: [02]

Extrude, Cut, Revolve, Union, Rib, Fillet, Chamfer, UCS etc. using any advance CAD software.

TERM WORK/ LIST OF EXPERIMENTS:

1) Computer aided drafting of two simple components and print out of the same on A4 size sheet.
2) Drawing details and assembly with limit, fit, tolerances & Bill of material of assembly containing 6-8 major components .Print out of the same on A3 size sheet.
3) 3-D drawing of one simple components and plotting its 2-D views along with 3-D object drawing. Print out of the same on A4 size sheet.

Note: Latest drafting software like Auto cad and any advance 3-D modeling software are to be used.

TEXT BOOKS

1. Ajeet Sing, "Working with AutoCAD 2000", Tata McGraw Hill
2. "Machine drawing", N.D. Bhat and V.M. Panchal, Charotar Publication House, Anand, 42nd Edition,2007 .
3. "Machine drawing", Basudeb Bhattacharyya, Oxford university press.

REFERANCE BOOKS

1. "Auto cad 2014 for Engineers and Designers", Sham Tickoo, Dreamtech press, New Delhi,2014.
2. "Auto Cad 2014", Ellen Finkelsten, Wiley India Manuals and Tutorials of referred software"

S.Y. B. Tech (MECHANICAL ENGINEERING) Semester: III

7: Computer Graphics

SUBJECT CODE: PCC-ME 217

TeachingScheme:	**Examination Scheme:**
Practical: 2 Hrs.perweek	**Term Work: 25 Marks**
	Credit: 01

Course Objectives:

1) To introduce student about computer graphics leading to the ability to understand contemporary.
2) To study basic concepts of computer graphics techniques, focusing on 3D modeling, Image synthesis.
3) To study physical significance of Curves and Surfaces.

Course Learning Outcomes:

1) To acquire the knowledge of basics of computer graphics.
2) To Apply basic programming in C for line, rectangle, circle etc for different shapes.
3) To recognize the importance of using three dimensional transformations like translation, scaling and rotating.
4) To Analyzing the hidden unwanted parts in graphics and do the program on animation
5) To choose the different of curves and surfaces

Unit 1:-

Introduction and background of Computer Graphics, Need of Computer Graphics, Importance of Computer Graphics in the area of CAD/CAM/CAE,

Display devices: Refresh Cathode ray Tubes, Random Scan and Raster Scan monitors, Colour CRT Monitors, Direct view Storage Tubes, Continuous Refresh and Storage display, LED and LCD Monitors.

Unit 2:-

Graphics programming, Initializing the graphics, C Graphical functions, simple programs

Graphic primitives: Points & Lines, Line drawing Algorithm, DDA and Bresenham's Algorithm. Fill Algorithm: Scan-Line Polygon Fill algorithm, Boundary Fill Algorithm, Flood Fill Algorithm, Area Filling. Generation of circles.

Unit 3:-

Two Dimensional Transformations and Clipping and Windowing

What is transformation?, Matrix representation of points, Basic transformation, Need for Clipping and Windowing, Line Clipping Algorithms, The midpoint subdivision Method, Sutherland – Hodgeman Algorithm, Viewing Transformations

Unit 4:-

Need for 3-Dimensional Imaging, Techniques for 3-Dimesional displaying, Parallel Projections, Perspective projection, Intensity cues, Stereoscope effect, Kinetic depth effect, Shading.

Unit 5:-

Curves and Surfaces

Shape description requirements, parametric functions, Bezier methods, Bezier curves, Bezier surfaces, B-Spline methods, Need for hidden surface removal, The Depth - Buffer Algorithm, Scan Line coherence algorithm, Span – Coherence algorithm,

Unit 6:-

Solid Area Scan Conversion and Three Dimensional Transformations

Solid Area Scan Conversion, Scan Conversion of Polygons, Algorithm Singularity, Three Dimensional transformation, Translations, Scaling, Rotation, Viewing Transformation, The Perspective, Algorithms, Three Dimensional Clipping, Perspective view of Cube.

TERM WORK:

Should contain at least 6 assignments (one per unit) covering thesyllabus.

PRACTICAL:

Should contain following programs developed using C++. Some Sample practical are listedbelow.

1. Write a program with menu option to input the line coordinates from the user to generate a line using Bresenham□s method and DDA algorithm. Compare the lines for their valueson theline.
2. Develop a program to generate a complete circle basedon

   Bresenham□s CircleAlgorithm

   Midpoint CircleAlgorithm

3. ImplementtheBresenham□s/DDAalgorithmfordrawingline(programmerisexpectedto shift the origin to the center of the screen and divide the screen into requiredquadrants).
4. Write program to perform the following 2D and 3D transformations on the given input figure

   Rotatethrough degree

   Reflection

   Scaling

   Translation.
5. Develop a program to clip a line using Cohen-Sutherland line clipping algorithm between (x1,y1)(x2, y2) against a window (xmin, ymin)(xmax, ymax).
6. Write a program to implement polygon filling.
7. Write a program to draw Bezier and B-Spline Curves with interactive user inputs for control polygon defining the shape of the curve.
8. Write a program to generate a 2D/3D fractal figures (Sierpinski triangle, Cantor set, Tree etc).

TEXT BOOKS:

1. "CGraphics and Projects" , B M Havaldar , Anmol publication.
2. "Computer Graphics", Hearn and Baker, Published by Dorling Kindersleypvt.Ltd., 2nd Edition
3. "Computer Graphics for Scientists and Engineers", Asthana and Sinha, New Age International(P) Ltd. Publishers, New Delhi, 2nd RevisedEdition
4. Computer Graphics-Donald hearn and M.Pauline Baker-Prentice Hall of India Pvt Ltd.
5. Introduction to Computer Graphics – N. Krishnamurhy - TMH Publication.

REFERENCE BOOKS:

1. "Principles of Interactive Computer Graphics", Newman and Sproull, Mc GrawHill Education.
2. Computer Graphics –Harrington S. – TMH Publication.
3. Computer Graphics - Schaum's Outline –TMH Publication

S.Y. B. Tech. (MECHANICAL ENGINEERING) Semester: IV

08. WORKSHOP PRACTICE IV

SUBJECT CODE:PCC ME 218

TeachingScheme:	**Examination Scheme:**
Practical: 2 Hrs.perweek	**Term Work: 25 Marks**
Credit: 01	**Practical Exam: 25Marks**

Pre-requisites: Engineering Graphics, Basic Mechanical Engineering

Course Objectives:

1) To study Machine layout, installation of Machine Tools, selection of Tools.
2) To study Lathe Machine, Drilling Machine, Milling Machine.
3) To study machining operations and prepare Job with its process sheet on Lathe machine.
4) To study basics of CNC and VMC Machine

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

1) Understand Machine layout, method of Machine Tool installation, selection of Tools for various machining operation.
2) Understand Construction, Mechanism and Application of Lathe Machine, Drilling Machine, and Milling Machine.
3) Understand machining operations and prepare Job with plain turning, taper turning, external threading and knurling operation along with its process sheet
4) Understand basics of CNC and VMC Machine

Term Work:

1) Machine layout, existing machine specifications, Installation procedure of Machine Tools
2) Selection of tools for metal cutting based on work piece materials
3) Study of Construction, Mechanism and Application of following machines (any two)
    a. Lathe Machine
    b. Drilling Machine
    c. Milling Machine
4) One Job of MS material; plain turning, taper turning, external threading and knurling operation with its process sheet.
5) Introduction to CNC and VMC Machine (Construction working theoretical treatment only)
6) Industrial visit to study Plastic Shaping, Forming, Conventional Machine Shop and gear manufacturing processes

NOTE:

1) The load of Workshop Practice IV will be allotted to the Teaching Faculty.
2) Assessment of Journal based on above Term Work and Industrial Visit Report.
3) Term work will consist of Job Carrying 15 Marks, Journal Assessment along with

internal oral 10 marks.

4) Practical Examination is on basis of Job done (25 Marks)