Uttarakhand Technical University, Dehradun

Scheme of Examination as per AICTE Flexible Curricula

Evaluation Scheme & Syllabus

for

B. Tech Second Year

W.E.F. Academic Session 2019-20

3rd and 4th SEMESTER

Bachelor of Technology (B. Tech.)

[MECHANICAL ENGINEERING]

Uttarakhand Technical University, Dehradun
New Scheme of Examination as per AICTE Flexible Curricula
Bachelor of Technology (B.Tech.)
[Mechanical Engineering]

III Semester

W.E.F. Academic Session 2019-20

S.No.	Subject Code	category	Subject Name	Maximum Marks Allotted					Total Marks	Contact Hours per week			Total Credits
				Theory			Practical						
				End Sem.	MiMid Sem. Exam.	Quiz/ Assignment	End Sam	Term work / Sessional		L	T	P	
1.	BAST 301	BSC-5	Mathematics-III	100	30	20	-	-	150	3	1	-	4
2.	BMET 302	DC-1	Basic Thermodynamics	100	30	20	-	-	150	3	1	-	4
3.	BMET 303 BMEP 303	DC-2	Materials Science & Technology	100	30	20	30	20	200	3	-	2	4
4.	BMET 304 BMEP 304	DC-3	Strength of Material	100	30	20	30	20	200	3	1	2	5
5.	BMET 305 BMEP 305	DC-4	Manufacturing Science & Technology-I	100	30	20	30	20	200	3	1	2	5
6	BCSP 307	DC	Programming Practices (Introduction to MATLAB)					50	50			4	2
7.	BAST 107	DLC - 1	Evaluation of Internship-I Completed at I Year Level	-	-	-	-	50	50			4	2
			Total	500	150	100	90	160	1000	15	4	10	26
8	BCST 308	MC	Cyber Security	Non Credit Course									
			NSS/NCC										

1 Hr Lecture	1 Hr Tutorial	2 Hr Practical
1 Credit	1 Credit	1 Credit

Uttarakhand Technical University, Dehradun
Scheme of Examination as per AICTE Flexible Curricula
W.E.F. Academic Session 2019-20
Bachelor of Technology (B.Tech.)
[Mechanical Engineering]
IV Semester

S. No.	Subject Code	category	Subject Name	Maximum Marks Allotted					Total Marks	Contact Hours per week			
				Theory			Practical						
				End Sem.	Mid Sem. Exam.	Quiz/ Assignment	End Sem.	Term work / Lab Work & Sessional		L	T	P	
1.	BMET 401 BMEP 401	DC	Applied Thermodynamics Engineering	100	30	20	30	20	200	3	1	2	5
2.	BECT 402	DC	Energy & Environmental Engineering	100	30	20	-	-	150	3	1	-	4
3.	BMET 403 BMEP 403	DC	Theory of Machines	100	30	20	30	20	200	3	1	2	5
4.	BMET 404 BMEP 404	DC	Fluid Mechanics	100	30	20	30	20	200	3	1	2	5
5.	BMET 405 BMEP 405	DC	Manufacturing Science & Technology-Ii	100	30	20	30	20	200	3	0	2	4
6.	BMEP 406	DLC *	Computer Aided Machine Drawing Lab	-	-	-	30	20	50	-	-	2	1
7.	BMEP 407	DLC	90 hrs Internship based on using various software's – Internship - II	To be Completed at the end of fourth semester (Summer Break) & its evaluation/credit to be added in fifth semester.									
			Total	500	150	100	150	100	1000	15	4	10	24
			NSS/NCC										

1 Hr Lecture	1 Hr Tutorial	2 Hr Practical
1 Credit	1 Credit	1 Credit

B. Tech. II Year (Third Semester) - Mechanical Engineering

BAST 301	Mathematics – III	3L-1T-0P	4 Credits

Students Should have the knowledge of Mathematics I and Mathematics II

Course Objective:

The objective of this course is to familiarize the students with Laplace Transform, Fourier Transform, techniques in numerical methods & some statistical techniques. It aims to present the students with standard concepts and tools at B.Tech first year to superior level that will provide them well towards undertaking a variety of problems in the concern discipline.

The students will learn:

- The idea of Laplace transform of functions and their applications.
- The idea of Fourier transform of functions and their applications.
- To evaluate roots of algebraic and transcendental equations.
- Interpolation, differentiation, integration and the solution of differential equations.
- The basic ideas of statistics including measures of central tendency, correlation, regression and their properties.

COURSE OUTCOMES(s):

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

1. Remember the concept of Laplace transform and apply in solving real life problems.
2. Understand the concept of Fourier transform to evaluate engineering problems
3. Understand to evaluate roots of algebraic and transcendental equations.
4. Understand interpolation, differentiation, integration and the solution of differential equations.
5. Understand the concept of correlation, regression, moments, skewness and kurtosis and curve fitting.

Unit 1: Fourier Transforms: (8 hours)
Fourier integral, Fourier Transform, Complex Fourier transform, Inverse Transforms, Convolution Theorem, Fourier sine and cosine transform, Applications of Fourier transform to simple one dimensional heat transfer equations.

Unit 2: Laplace Transform: (8 hours)
Definition of Laplace transform, Existence theorem, Laplace transforms of derivatives and integrals, Initial and final value theorems, Unit step function, Dirac- delta function, Laplace transform of periodic function, Inverse Laplace transform, Convolution theorem, Application to solve linear differential equations.

Unit 3: Solution of Algebraic and Transcendental equations & Interpolation (8 hours)
Number and their accuracy, Solution of algebraic and transcendental equations: Bisection method, Iteration method, Newton-Raphson method and Regula-Falsi method. Rate of convergence of these methods (without proof),
Interpolation: Finite differences, Relation between operators, Interpolation using Newton's forward and backward difference formula. Interpolation with unequal intervals: Newton's divided difference and Lagrange's formula.

Unit 4: Numerical differentiation, Integration & Solution of ODE (8 hours)
Numerical Differentiation, Numerical integration: Trapezoidal rule, Simpson's 1/3rd and 3/8 rule Runge- Kutta method of fourth order for solving first order linear differential equations. Milne's predicator-corrector method.

Unit 5: Statistical Techniques (8 hours)
Introduction: Measures of central tendency, Moments, Moment generating function (MGF) , Skewness, Kurtosis, Curve Fitting : Method of least squares, Fitting of straight lines, Fitting of second degree parabola, Exponential curves. Correlation and Rank correlation, Regression Analysis: Regression lines of y on x and x on y, regression coefficients, properties of regressions coefficients and non-linear regression.

Reference Books:

1. E. Kreyszig: Advanced Engineering Mathematics; John Wiley & Sons
2. B.V. Ramana: Higher Engineering Mathematics; Tata McGraw- Hill Publishing Company Limited, New Delhi.
3. Peter V.O' Neil. Advanced Engineering Mathematics, Thomas (Cengage) Learning
4. B.S. Grewal, Higher Engineering Mathematics, Khanna Publishers, 35th Edition, 2000.
5. T.Veerarajan : Engineering Mathematics (for semester III), Tata McGraw-Hill, New Delhi.
6. R.K. Jain and S.R.K. Iyenger: Advance Engineering Mathematics; Narosa Publishing House, New Delhi.
7. P. Kandasamy, K. Thilagavathy, K. Gunavathi, Numerical Methods, S. Chand & Company, 2nd Edition, Reprint 2012.
8. S.S. Sastry, Introductory methods of numerical analysis, PHI, 4th Edition, 2005.
9. N.P. Bali and Manish Goyal, Computer Based Numerical and Statistical Techniques , Laxmi Publications, Reprint, 2010.
10. J.N. Kapur: Mathematical Statistics; S. Chand & Sons Company Limited, New Delhi.
11. D.N.Elhance,V. Elhance & B.M. Aggarwal: Fundamentals of Statistics; Kitab Mahal Distributers, New Delhi.

BMET-302	Basic Thermodynamics	3L:1T:0P	4 credits

OBJECTIVES:

- To learn about work and heat interactions, and balance of energy between system and its
- surroundings
- To learn about application of I law to various energy conversion devices
- To evaluate the changes in properties of substances in various processes
- To understand the difference between high grade and low grade energies and II law. limitations on energy conversion

COURSE OUTCOMES(COs):

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

- Fundamental knowledge of laws and principles of thermodynamics.
- Knowledge of heat and work transfer and their effect, application of first law of thermodynamics to different machines as well as second law of thermodynamics.
- Knowledge of steady flow energy equation and its use in compressor, turbines, nozzles, evaporators etc.
- Knowledge of quality of energy and its balance

Unit-1 : FUNDAMENTALCONCEPTS AND DEFINITIONS-1

Definition of thermodynamics, System, Surrounding and universe, Phase, Concept of continuum, Macroscopic & microscopic point of view. Density, Specific volume, Pressure, Temperature scales; Various Thermometers. Thermodynamic equilibrium, Property, State, Path, Process, Cyclic and non cyclic processes, Reversible and irreversible processes, - Thermodynamic definition of work; examples; Displacement work; Path dependence of displacement work and illustrations for simple processes Quasi static process, Energy and its forms

Unit-2 : LAWS OF THERMODYNAMICS

Zeroth law Definition of thermal equilibrium.

First law of thermodynamics : Enthalpy First Law for Flow Processes(SFEE) ,Derivation of SFEE; Steady flow processes including throttling; Unsteady processes; Limitations of first law of thermodynamics, PMM-I, Steady flow energy equation for various devices

Second law of thermodynamics : Thermal reservoirs, Energy conversion, Heat engines, Heat pump & Refrigerator, Coefficient of Performance(COP), Kelvin Planck &Clausius statement, Equivalence of the two statements., Carnot cycle and Carnot engine, Carnot theorem and it's corollaries, PMM-II. Entropy: Clausius inequality, Concept of Entropy, Entropy change of pure substance in different thermodynamic processes, Reversible and irreversible processes , Tds equation, Principle of entropy increase, T-S diagram,Statement of the third law of thermodynamics

Unit-3: AVAILABILITY , EXERGYAND ENRTOPY GENERATION

Irreversibility and Availability, Availability functions for systems and Control volumes undergoing different processes, Lost work. Second law analysis for a control volume. Exergybalance equation and Exergy analysis.
Thermodynamic relations: Conditions for exact differentials. Maxwell relations.Clapeyron equation, Joule-Thompson coefficient and Inversion curve, Coefficient of volume expansion, Adiabatic and sothermal compressibility

Unit-4: PURE SUBSTANCE
Definition of Pure substance, Ideal Gases and ideal gas mixtures, Real gases and real gas mixtures, - Const. temperature and Const. pressure heating of water; Ideal Gas,Equations of states, Definitions of saturated states; P-v-T surface; Use of steam tables; Saturation tables; Superheated tables; Identification of states & determination of properties, Mollier's chart.

Unit-5: THERMODYNAMIC CYCLES
Carnot cycle, Air standard cycles, Otto cycle, Diesel cycle, Limited pressure cycle or Dual cycle, comparison of Otto, Diesel and Dual cycles, Brayton cycle, Aircraft propulsion, Basic Rankine cycle.

Text Books:

1. Sonntag, R. E, Borgnakke, C. and Van Wylen, G. J., 2003, 6th Edition, Fundamentals of Thermodynamics, John Wiley and Sons.
2. Jones, J. B. and Duggan, R. E., 1996, Engineering Thermodynamics, Prentice-Hall of India
3. Moran, M. J. and Shapiro, H. N., 1999, Fundamentals of Engineering Thermodynamics, John Wiley and Sons.
4. Nag, P.K, 1995, *Engineering Thermodynamics, Tata McGraw-Hill Publishing Co. Ltd.*

BMET 303 **BMEP 303**	**Materials Science & Technology**		**3L:0T:0P**	**4 credits**

OBJECTIVES:

The course should enable the students to:

- To Understand about the Different types Of Materials and their Properties
- To understand the various ferrous materials and their production process and Properties
- To study and examine the Non Ferrous metals and Testing of Materials
- To study the magnetic and electric properties of materials
- To understand the various Non-Metallic Materials and their uses.

COURSE OUTCOMES(COs):

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

- Introduction and importance of materials, concept of unit cell space lattice, imperfection and defect in solid.
- Mechanical properties and testing, micro structural exam, phase diagram, equilibrium diagram and brief introduction to ferrous material, heat treatment.
- Magnetic and electric properties along with introduction to ceramics, plastic and other materials are studied.

Unit -1 :Introduction to Materials and their Defects

Introduction: Material Science & its objective, importance of materials. Different Types of Materials Physical, Chemical Properties, Ductile & brittle material, Stress vs. Strength. Toughness, Hardness, Fracture, Fatigue and Creep. Stress strain diagram

Crystallography and Imperfections: Concept of unit cell space lattice, Crystalline and Non Crystalline Structure Bravais lattices, Atomic packing factor and density. Miller indices. X-ray crystallography techniques. Imperfections, Defects & Dislocations in solids

Unit – 2:Ferrous Materials and their Properties

Ferrous Materials:Introduction to Ferrous Materials and their importance. Iron an Iron Ores.

Flow Diagram for Production of Ferrous Materials,Production of Cast Iron and Steel, Classification of Cast Iron, Steel their properties and Importance. Iron Carbon Equilibrium Diagram and Phase Transformation

Heat Treatment: Various types of heat treatment such as Annealing, Normalizing, Quenching, Tempering and Case hardening. Time Temperature Transformation (TTT) diagrams

Unit -3:Non Ferrous Metals. Testing and Microstructure Examine of Materials

Non-Ferrous metals and alloys: Introduction to Various Non-Ferrous Metals and their properties, Alloys, Importance of Copper and its, Alloys, Brass and Bronze, Aluminum and its Alloys

Testing Tastings such as Strength tastings, Hardness testing, Impact tastings, Fatigue testing Creep testing, Non-destructive testing (NDT)
Micro structural Exam: Microscope principle and methods. Preparation of samples and Microstructureexam and grain size determination. Comparative study of microstructure of various metals & alloys such as Mild steel, CI, Brass

Unit -4 : Magnetic and Electric Properties of Materials
Magnetic Properties: Concept of magnetism - Dia, para, Ferro Hysteresis. Soft and hard magnetic materials, Magnetic storages, Electric properties: Energy band concept of conductor, insulator and semi-conductor, Super conductivity and its applications. Messier effect. Type I & II superconductors

Unit -5:Non Metallic Materials
Plastics: Introduction to Plastics, Various types of polymers/plastics and its applications, Difference between Thermoplastics and Thermosetting Plastics.
Other materials: Heat Insulating Materials, Electrical Insulating Materials, Refractory Materials Ceramics Materials, Composite Materials, Adhesive, Paint, Varnish, Putty, Nano Materials and Smart Materials, Corrosion and its control

List of Experiments: (At least 8 of the following)

1. Preparation of plastic mould for small metallic specimen.
2. Specimen preparation for micro structural examination-cutting, grinding, polishing, etching.
3. Grain size determination of a given specimen.
4. Comparative study of microstructures of different material specimens (mild steel, gray cast iron, brass, copper etc.)
5. Heat treatment experiments such as annealing, normalizing, quenching, case hardening and comparison of hardness before and after heat treatment.
6. Material identification of, say, 50 common items kept in a box.
7. Faradays law of electrolysis experiment.
8. Study of corrosion and its effects.
9. Study of microstructure of welded component and HAZ. Macro and Micro Examination.
10. Suitable experiment on Magnetic/ Electrical/ Electronic materials

Text Books:

1. *Callister/Balasubramaniam – Callister"s Material Science & Engineering Wiley India*
2. *Van Vlack - Elements of Material Science & Engineering John Wiley & Sons.*
3. *Material Science by R.K.Rajput.*
4. *Raghvan - Material Science, Prentice Hall*

BMET 304 **BMEP 304**	**Strength of Materials**	**3L:1T:5P**	**5 credits**

OBJECTIVES:

The course should enable the students to:

- Confidently tackle equilibrium equations, moments and inertia problems.
- To solve real field problems through evaluating the relationship between stress and strain.
- To understand the shear force and bending moment diagrams of symmetrical beams.
- To determine deflection, bending and shear stresses developed in beams of various sections
- To understand and apply the concept of stress and strain to analyze and design structural members and machineparts under axial load, shear load, bending moment and torsion.

COURSE OUTCOMES(COs):

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

- Knowledge stress and strain, drawing Mohr circle and various stress and strain curve and material properties for isotropic material and their theory of failure.
- Study of shear force and bending moment diagrams, deflection due to bending.
- Torsion of circular shaft energy theorem, castigliaon's theorem etc. are studied

Unit -1: SYSTEM OF FORCES AND MOMENTS

Introduction to Engineering Mechanics covering, Force Systems Basic concepts, Particle equilibrium in 2-D & 3-D; Rigid Body equilibrium; System of Forces, Coplanar Concurrent Forces, Components in Space – Resultant- Moment of Forces and its Application; Couples and Resultant of Force System, Equilibrium of System of Forces, Free body diagrams, Equations of Equilibrium of Coplanar Systems and Spatial Systems; Static Indeterminacy

Unit - 2 SIMPLE STRESSES AND STRAINS& TORSION

Elasticity and plasticity – Types of stresses & strains–Hooke's law– stress – strain diagram for mild steel – Working stress – Factor of safety – Lateral strain, Poisson's ratio & volumetric strain – Elastic moduli & the relationship between them – Bars of varying section – composite bars – Temperature stresses. Strain energy – Resilience – Gradual, sudden, impact and shock loadings. Theory of pure torsion – Derivation of Torsion equations : $T/J = q/r = N\theta/L$ – Assumptions made in the theory of pure torsion – Torsional moment of resistance – Polar section modulus – Power transmitted by shafts

Unit – 3 BEAMS

Definition of beam – Types of beams – Concept of shear force and bending moment – S.F and B.M diagrams for different (cantilever, simply supported and over hanging Beam). Theory of simple

bending, Derivation of bending equation: M/I = f/y = E/R Neutral axis– Determination bending stresses – section modulus of rectangular and circular sections (Solid and Hollow), I, T, Angle and Channel sections – Design of simple beam sections

Unit -4DEFECTION OF BEAMS &THEORIES OF FAILURE

Moment-curvature relation, load-defection differential equation, area moment method, and superposition theorem. Stresses and deflections due to transverse shears. Maximum principal stress theory, maximum shear stress theory, Total strain energy theory, shear strain energy theory, graphical representation and derivation of equation for each and their application to problems relating to two dimensional stress systems only

Unit -5THICK & THIN CYLINDERS & TORSION

Thick Cylinders: Derivation of Lame's equations, calculation of radial longitudinal and hoop stresses and strains due to internal pressure in thick cylinders, compound cylinders, hub shrunk on solid shafts., Thin cylinder: Hoop's stress, maximum shear stress, circumferential and longitudinal strains.

List of Experiments.

1. Strength test of a given mild steel specimen on UTM with full details and stress versus strain plot on the machine.
2. Other tests such as shear, bend tests on UTM.
3. Impact test on impact testing machine like Charpy, Izod or both.
4. Hardness test of given specimen using Rockwell and Vickers/Brinell testing machines.
5. Spring index test on spring testing machine.
6. Fatigue test on fatigue testing machine.
7. Creep test on creep testing machine.
8. Experiment on deflection of beam, comparison of actual measurement of deflection with dial gauge to the calculated one, and or evaluation of young's modulus of beam.
9. Torsion test of a rod using torsion testing machine.
10. Study of NDT (non-destructive testing) methods like magnetic flaw detector, ultrasonic flaw detector, eddy current testing machine, dye penetrant tests.
11. Bend Test of steel bar
12. Shear test.

Text Books:

1. *Irving H. Shames (2006), Engineering Mechanics, 4th Edition, Prentice Hall*
2. *Andy Ruina and RudraPratap (2011), Introduction to Statics and Dynamics, Oxford University*
3. *S. S Ratan, ―Strength of Materials‖, Tata McGraw-Hill, 2nd Edition, 2011.*
4. *S. Ramamrutam, R. Narayan, ―Strength of Materials‖, Dhanpat Rai Publishing Company, 18th Edition, 2014.*
5. *W.A. Nash, ―Strength of Materials‖, Tata McGraw-Hill, 4th Edition, 2007*
6. *Egor P. Popov, Engineering Mechanics of Solids, Prentice Hall of India, New Delhi, 2001.*
7. *R. Subramanian, Strength of Materials, Oxford University Press, 2007.*

BMET 305 **BMEP 305**	**Manufacturing Science & Technology-I**	**3L:1T:2P**	**4 credits**

Course Objective:-

- To emphasize the importance of manufacturing
- To study the basic manufacturing processes and tools used
- To understand different conventional machining processes
- To understand different nonconventional process
- To understand different joining processes

COURSE OUTCOMES(COs):

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

- To make acquaintance foundry processes like pattern design and making and manufacturing of casting.
- To study metal forming processes such as forging, rolling, extrusion and wire drawing
- To study die design set and sheet metal working process.
- To study and design principles of jigs and fixture

Unit I: INTRODUCTION TO MANUFACTURING

Importance of manufacturing. Economic and technological considerations in manufacturing. Classification of manufacturing process and their relative merits and demerits. Materials and manufacturing processes for common items

Unit -2 : FOUNDRY PRACTICES

FOUNDRY PRACTICES: Basic principle and survey of casting processes. Types of patterns and allowances. Types and properties of moulding sand. Elements of mould and design considerations, Gating, Riser, Runner, Core. Solidification of castings. Sand casting, defects and remedies and inspection. Cupola furnace. Introduction to Die Casting.

Unit -3: METAL FORMING PROCESSES

Metal Forming Fundamentals: Elastic and plastic deformation, yield criteria. Hot working vs cold working. Analysis (equilibrium equation method) of Forging process for load estimation with sliding friction, sticking friction and mixed condition for slab. Work required for forging. Hand, Power and Drop Forging. Analysis of Wire drawing and maximum-reduction, Tube drawing, Extrusion and its applications. Condition for Rolling force and power in rolling. Rolling mills and rolled-sections. Defects in metal forming processes.

Unit -4: PRESS WORKING

Presses and their classification, Die and punch assembly and press work methods and processes. Cutting/Punching mechanism, Blanking vs Piercing. Compound vs Progressive die. Flat-face vs

Inclined-face punch and Load (capacity) needed. Analysis of forming process like cup/deep drawing. Bending and spring-back.

Unit -5: POWDER METALLURGY&PLASTICS

POWDER METALLURGY: Powder metallurgy manufacturing process. The need, process, advantage andapplications.

JIGS & FIXTURES: Locating and clamping devices and principles. Jigs and Fixtures and its applications. PLASTICS: Manufacturing of plastic components, Review of plastics, and its past, present and future uses.Injection moulding. Extrusion of plastic section. Welding of plastics. Future of plastic and its applications. Resins and Adhesives

Minimum 10 experiments out of following.

1. Design of pattern for a desired casting (containing hole)
2. Pattern making
3. Making a mould (with core) and casting.
4. Sand testing (at least one such as grain fineness number determination)
5. Forging: hand forging processes.
6. Forging: power hammer study & operation
7. Bending & spring back.
8. Powder metallurgy experiment.
9. Jigs & Fixture experiment.
10. Study of Linear Measuring Instruments.
11. Measurement of Taper Angle Using Slips, Rollers & Sine bar
12. Tool Makers Microscope.
13. Measurement of Surface Finish.
14. Machine Tool Alignment Tests.

Text Books:

1. *Manufacturing science By Gosh And Mallik ,East West press pvt ltd ,2nd edition.1999*
2. *Production engineering science by P.C.Pandey and C.K.Singh , Standard Publishers , 7th Edition ,2006.*
3. *Production Technology by R.K.Jain ,Khanna Publishers ,17th Edition,2001.*
4. *Basic Manufacturing Processes, By Dr. R.C.S Mehta and N.S Gaira, 2017.*

BCSP 307	Programming Practices (Introduction to MATLAB)	0L:0T:4P	2 Credits

Course Objectives:

1. The course is intended to assist undergraduates in learning the basics of programming in general and programming MATLAB in particular.
2. Basics of programming in MATLAB will be covered, with the goal of having students become comfortable enough to continue learning MATLAB and other programming languages on their own.

Course Outcomes:

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

1. Use MATLAB for programming purposes
2. Learn and explore MATLAB further on their own
3. Use this learning experience to learn other programming languages.

UNIT 1: INTRODUCTION

Data types and variables: Introduction to MATLAB, Data Types, Inter-conversion of Data types, MATLAB Variables, Keywords and Constant, Session Command. *MATLAB Operators and Operations:* Operators (Arithmetic, Relational, Logical, Bitwise), Set Operations, Operator Precedence, Mathematical Functions.

UNIT 2: PROGRAMMING IN MATLAB

Script and Function: Decision Making, Loops, branches, Functions, Working on Script File (Creating, Saving and Executing), MATLAB I/O, Formatted I/O Method.

UNIT 3: ARRAYS AND GRAPHICS

Matrices and Arrays: Introduction to Matrices, Operations on Arrays/Matrices, Manipulations of Arrays/Matrices, Expansion of Matrix Size, Reduction of Matrices/Arrays order,

Graphics: Introduction to plot, Basic 2-D Plots (Style options, Labels, Axis control, etc.), specialized 2-D Plots, drawing multiple plots. Using MATLAB for fractals and chaos and Conway game of life

UNIT 4: FILE HANDLING AND DEBUGGING

File Handling: Introduction to file handling, working on files, accessing of Text File, Saving/ Loading MATLAB Variables, reading data without opening file, reading and writing Excel.

Debugging: Introduction to debugging, Break points, debugger, stepping, watching variable values, debugging commands.

REFERENCES:

1. Delores M. Etter, David C. Kuncicky, Holly Moore, "*Introduction to MATLAB 7.0*", Pearson, 2013.
2. Rudra Pratap, "*Getting Started with MATLAB*", OXFORD University Press, 2010.
3. Agam Kumar Tyagi, "*MATLAB and Simulink for Engineers*", University Press, 2012.

WEB REFERENCES - https://ocw.mit.edu/courses/mathematics/18-s997-introduction-to-matlab-programming- fall-2011/syllabus/

BCST 308	Cyber Security	Non- Credit Course

Course Objectives:

1. Understand the basic concept of Cyber Security.
2. Understand the basic concept of Viruses.
3. Understand the basic concept of Digital Attacks.
4. Understand the basic concept of Phishing.
5. Understand the basic concept of Cyber Law.

Course Outcomes:

After the completion of this course the student will able to:

1. Know about various attacks and viruses in cyber systems
2. Know about how to prevent digital attacks
3. Know about how to prevent Phishing Attacks
4. Know about how to do secure transactions

UNIT-1

Introduction to information systems, Types of information Systems, Development of Information Systems, Introduction to information security, Need for Information security, Threats to Information Systems, Information Assurance, Cyber Security, and Security Risk Analysis.

UNIT-2

Application security (Database, E-mail and Internet), Data Security Considerations-Backups, Archival Storage and Disposal of Data, Security Technology-Firewall and VPNs, Intrusion Detection, Access Control.

Security Threats -Viruses, Worms, Trojan Horse, Bombs, Trapdoors, Spoofs, E-mail viruses, Macro viruses, Malicious Software, Network and Denial of Services Attack, Security Threats to E-Commerce-Electronic Payment System, e- Cash, Credit/Debit Cards. Digital Signature, public Key Cryptography.

UNIT-3

Developing Secure Information Systems, Application Development Security, Information Security Governance & Risk Management, Security Architecture & Design Security Issues in Hardware, Data Storage & Downloadable Devices, Physical Security of IT Assets,

Access Control, CCTV and intrusion Detection Systems, Backup Security Measures.

UNIT-4

Security Policies, Why Policies should be developed, WWW policies, Email Security policies, Policy Review Process-Corporate Policies-Sample Security Policies, Publishing and Notification Requirement of the Policies.

Information Security Standards-ISO, IT Act, Copyright Act, Patent Law, IPR. Cyber Laws in India; IT Act 2000 Provisions, Intellectual Property Law: Copy Right Law, Software License, Semiconductor Law and Patent Law.

References:

1. Charles P. Pfleeger, Shari Lawerance Pfleeger, "Analysing Computer Security ", Pearson Education India.
2. V.K. Pachghare, "Cryptography and information Security", PHI Learning Private Limited, Delhi India.
3. 3.Dr. Surya Prakash Tripathi, Ritendra Goyal, Praveen kumar Shukla ,"Introduction to Information Security and Cyber Law" Willey Dreamtech Press.

4. Schou, Shoemaker, “ Information Assurance for the Enterprise”, Tata McGraw Hill. 5. CHANDER, HARISH,” Cyber Laws And It Protection ” , PHI Learning Private Limited ,Delhi ,India

IV Semester

BMET-401 **BMEP 401**	**APPLIED THERMODYNAMICS**	**3L-1T-2P**	**5 Credit**

COURSE OBJECTIVE:

- To learn about the basic application of thermodynamics
- To learn about application of generation of energy.
- To evaluate the changes in properties of substances in various processes

Course Outcomes:

On completion of the course, learner will be able to–

- Understand generation of power
- Layout of thermal power plant
- Understanding of steam turbine

Course Contents:

Unit-I

Review of Thermodynamics : Brief review of basic laws of thermodynamics, Helmholtz & Gibb's function, Mathematical conditions for exact differentials. Maxwell Relations, Clapeyron Equation, Joule -Thompson coefficient and Inversion curve. Coefficient of volume expansion, Adiabatic & Isothermal compressibility. Availability & Irreversibility.

Unit-II

Properties of Steam and Boilers : Properties of steam. Use of stream table & Mollier Chart. Steam generators-classifications. Working of fire-tube and water-tube boilers, boiler mountings & accessories, Draught & its calculations, air pre heater, feed water heater, super heater. Boiler efficiency, Equivalent evaporation. Boiler trial and heat balance. 6

Unit-III

Steam Engines : Rankine and modified Rankine cycles, working of stream engine Indicator diagram.

Steam & Gas Nozzles : Flow through nozzle, variation of velocity, area and sp. Volume, nozzle efficiency, Throat area. Super saturated flow.

Unit-IV

Vapour Power cycles: Effect of Pressure & temp. on Rankine cycle Reheat cycle, Regenerative cycle, feed water heaters. Steam Turbines : Classification, impulse and reaction turbines, Staging, Stage and overall efficiency, re-heat factor, bleeding, comparison with steam engines. Governing of turbines. Velocity diagram of simple & compound multistage impulse & reaction turbines & related calculations work done efficiencies of reaction, impulse Reaction Turbines, state point locus, Reheat factor.

Unit-V

Gas Turbine & Jet Propulsion: Gas turbine classification Brayton cycle, Principles of gas turbine, Gas turbine cycles with intercooling, reheat & regeneration stage efficiency, polytropic efficiency. Deviation of actual cycles from ideal cycles.

LIST OF EXPERIMENTS:

1. Study of Fire Tube boiler.
2. Study of Water Tube boiler.
3. Study and working of Two stroke petrol Engine.
4. Study and working of Four stroke petrol Engine.
5. Determination of Indicated H.P. of I.C. Engine by Morse Test.
6. Prepare the heat balance sheet for Diesel Engine test rig.
7. Prepare the heat balance sheet for Petrol Engine test rig.
8. Study and working of two stroke Diesel Engine.
9. Study and working of four stroke Diesel Engine.
10. Study of Velocity compounded steam turbine.
11. Study of Pressure compounded steam turbine.
12. Study of Impulse & Reaction turbine.
13. Study of steam Engine model.
14. Study of Gas Turbine Model.

Textbooks/References:

1. Applied thermodynamics by Onkar Singh, New Age International (P) Publishers Ltd.
2. Thermal Engg. By P.L. Blallaney, Khanna Publisher
3. Theory of Stream Turbine by W.J. Kearton
4. Steam & Gas Turbine by R.Yadav, CPH Allahabad
5. Thermal Engg. By R.K. Rajput, Laxmi Publication
6. Turbine Compressons & Fans by S.M. Yahya, TMH
7. Gas Turbine, by Ganeshan, Tata McGraHill Publishers.
8. Heat Engines byb R. Yadav, CPH Allahabad.
9. Engg. Thermodynamics by Nag
10. Engg. Thermodynamics by C.P. Arora..
11. Gas turbine Theory & Practice, by Cohen & Rogers, Addison Weslay Long man Lt

BCET 402	Energy and Environmental Engineering	3L:1T:0P	4 Credits

Course Objectives:

The objective of this course is to apply knowledge of mathematics, science, technology and engineering appropriate to energy science and engineering degree discipline and to enhance the understanding of conventional and non-conventional energy sources and its relationship with the ecology and environment. More precisely the objectives are:

1. Use mathematical or experimental tools and techniques relevant to the energy and energy-related environmental disciplines along with an understanding of their processes and limitations.
2. Equip the students with knowledge and understanding of various possible mechanisms about renewable energy projects
3. To produce graduates strong in understanding on energy resources, technologies and systems, energy management fundamentals, and capable in innovative technological intervention towards the present and potential future energy.
4. To identify, formulate and solve energy and energy-related environmental problems by pursuing development of innovative technologies that can generate clean and sustainable energy to address energy scarcity and combat pollution and climate change.

Course Outcomes

1. Apply advanced level knowledge, techniques, skills and modern tools in the field of Energy and Environmental Engineering.
2. Distinguish the different energy generation systems and their environmental impacts.
3. Respond to global policy initiatives and meet the emerging challenges with sustainable technological solutions in the field of energy and environment.

Detailed Content

Unit I:

Introduction to Energy Science - Introduction to energy systems and resources; Introduction to Energy, sustainability & the environment, Global Energy Scenario: Role of energy in economic development. Indian Energy Scenario: Introduction to Energy resources & Consumption in India. Common terminologies

Unit II

Energy Sources - Overview of energy systems, sources, transformations, efficiency, and storage. Fossil fuels (coal, oil, oil-bearing shale and sands, coal gasification) - past, present & future, Remedies & alternatives for fossil fuels - biomass, wind, solar, nuclear, wave, tidal and hydrogen; Sun as Source of Energy, Availability of Solar Energy, Nature of Solar Energy, Solar Energy & Environment. Various Methods of using solar energy. Commercial and noncommercial forms of energy, Fossil fuels, Renewable sources including: Nuclear Energy, Hydel Energy, Storage of Hydrogen, Hydrogen Production, Hydrogen Energy Geothermal, Tide and Wave Energy, Bio-fuels in India.

Unit III

Energy Efficiency and Conservation - Introduction to clean energy technologies and its importance in sustainable development; Carbon footprint, energy consumption and sustainability; introduction to the economics of energy; How the economic system determines production and consumption; linkages between economic and environmental outcomes; How future energy use can be influenced by economic, environmental, trade, and Research policy.

Unit IV

Energy & Environment - Environment**:** Introduction, Multidisciplinary nature of environmental studies- Definition, scope and importance, Need for public awareness. Ecosystem: Concept, Energy flow, Structure and function of an ecosystem. Food chains, food webs and ecological pyramids, Forest ecosystem, Grassland ecosystem, Desert ecosystem and Aquatic ecosystems, Ecological succession. Environmental Pollution: Definition, Cause, effects and control measures of - Air pollution, Water pollution, Soil pollution, Marine pollution, Noise pollution, Thermal pollution and Nuclear hazards , solid waste Management.

Unit V

Environmental Protection and Ethics - Environmental Protection- Role of Government Initiatives by Non-governmental Organizations (NGO) Environmental Education. Ethics and moral values Objectives of ethics, Professional and Non- professional ethics Sustainable Development of the ecology and environment Codes of ethics and their limitations

Suggested reading material:

1. Schaeffer, John. 2007. Real Goods Solar Living Sourcebook: The Complete Guide to Renewable Energy Technologies and Sustainable Living (30th anniversary edition). Gaiam.
2. Boyle, Godfrey, Bob Everett, and Janet Ramage (eds.) 2004. Energy Systems and Sustainability: Power for a Sustainable Future. Oxford University Press, 619 pages (ISBN: 0-19-926179-2)
3. Energy Management Principles: C.B.Smith (Pergamon Press)
4. Renewable Sources of Energy and Conversion Systems: N.K.Bansal and M.K.Kleeman.
5. EnergyManagement: W.R.Murphy, G.Mckay (Butterworths)
6. Ristinen, Robert A. Kraushaar, Jack J. AKraushaar, Jack P. Ristinen, Robert A. (2006) Energy and the Environment, 2nd Edition, John Wiley
7. Ravindranath, N. H., & Hall, D. O. (1995). Biomass, energy and environment: a developing country perspective from India. Oxford University Press.
8. Popp, D., Newell, R. G., & Jaffe, A. B. (2010). Energy, the environment, and technological change. In Handbook of the Economics of Innovation (Vol. 2, pp. 873-937). North-Holland.

BMET 403 **BMEP 403**	**THEORY OF MACHINES**	**03L;01T;02P**	**5 Credits**

Course Objectives

Mechanical devices are characterized by the fact that they have mobility and must move to perform their function. This differentiates mechanical engineering from other fields of engineering such as civil engineering, in which structures are generally immobile, and electrical engineering, in which one is generally concerned with the motion of electrons and not structures. The study of kinematics and dynamics of machines is an applied field of mechanical engineering that is concerned with understanding the relationship between the geometry and the motions of the parts of a machine and the forces that produce this motion. The overall objective of this course is to learn how to analyze the motions of mechanisms, design mechanisms to have given motions, and analyze forces in machines. This includes relative motion analysis and design of gears, gear trains, cams, and linkages, simultaneous graphical and analytical analysis of position, velocity, and acceleration, considering static and inertial forces.

On completing the course, the student will be able to:

- Understand the fundamentals of the theory of kinematics and dynamics of machines.
- Understand techniques for studying motion of machines and their components.
- Use computer software packages in modern design of machines.

Course Outcomes:

On completion of the course, learner will be able to–

- Identify mechanisms in real life applications.
- Perform kinematic analysis of simple mechanisms.
- Perform static and dynamic force analysis of slider crank mechanism.
- Determine moment of inertia of rigid bodies experimentally.
- Analyze velocity and acceleration of mechanisms by vector and graphical methods.

Unit 1:

Introduction, mechanisms and machines, kinematics and kinetics, types of links, kinematic pairs and their classification, types of constraint, degrees of freedom of planar mechanism, Grubler‟s equation, mechanisms, inversion of four bar chain, slider crank chain and double slider crank chain.

Velocity analysis: Introduction, velocity of point in mechanism, relative velocity method, velocities in four bar mechanism, instantaneous center.

Acceleration analysis:

Introduction, acceleration of a point on a link, acceleration diagram, Corioli‟s component of acceleration, crank and slotted lever mechanism,.

Unit 2:

Cams:

Introduction, classification of cams and followers, cam profiles for knife edge, roller and flat faced followers for uniform velocity, uniform acceleration,

Gears and gear trains

Introduction, classification of gears, law of gearing, tooth forms and their comparisons, systems of gear teeth, length of path of contact, contact ratio, minimum number of teeth on gear and pinion to avoid interference, simple, compound, reverted and planetary gear trains, sun and planet gear train.

Unit 3:

Force analysis:

Static force analysis of mechanisms, Alembert‟s Principle, dynamics of rigid link in plane motion, dynamic force analysis of planar mechanisms, piston force and crank effort. Turning moment on crankshaft due to force on piston, Turning moment diagrams for single cylinder double acting steam engine, four stroke IC engine and multi-cylinder engines, Fluctuation of speed Flywheel.

Unit 4:

Balancing :

Introduction, static balance, dynamic balance, balancing of rotating masses, two plane balancing, graphical and analytical methods, balancing of reciprocating masses.

Governors:

Introduction, types of governors, characteristics of centrifugal governors, gravity controlled and spring controlled centrifugal governors, hunting of centrifugal governors, inertia governors. Effort and Power of governor

Unit 5:

Brakes and dynamometers:

Introduction, Law of friction and types of lubrication, types of brakes, effect of braking on rear and front wheels of a four wheeler, dynamometers, belt transmission dynamometer, torsion dynamometer, hydraulic dynamometer.

List of Experiment:

1. Study of simple linkers/models/mechanisms.
2. Exp. on Velocity acceleration.
3. Exp. on cam.
4. Exp. on Governor.
5. Exp. on critical speed of shaft (whirling of shaft)

6. Exp. on Gyroscope
7. Exp. on Balancing (static & dynamic)
8. Exp. on 4-bar mechanism
9. Exp. on Gears (tooth profile, interference etc.)
10. Exp. on Gear trains.
11. Exp. on Mechanism
12. Exp. on Vibration (spring)

Text/Reference Books:

1. *Kinematics and dynamics of machinery: Wilson and Sadler, Third edition, Pearson.*
2. *Theory of Mechanisms and Machines: Amitabha Ghosh and Ashok kumar Mallik, Third Edition Affiliated East-West Press.*
3. *Theory of Machines and Mechanisms: Joseph Edward Shigley and John Joseph Uicker, Jr. Oxford University Press*
4. *Kinematics and dynamics of machinery: R L Norton, McGraw Hill*
5. *Theory of Machines: S.S. Rattan, McGraw Hill*
6. *Theory of Machines: Thomas Bevan, CBS Publishers.*

BMET 404 **BMEP 404**	**FLUID MECHANICS**	**3L-1T-2P**	**5 Credit**

Course Objectives:

- To introduce and explain fundamentals of Fluid Mechanics, which is used in the applications of Aerodynamics, Hydraulics, Marine Engineering, Gas dynamics etc.
- To give fundamental knowledge of fluid, its properties and behavior under various conditions of internal and external flows.
- To develop understanding about hydrostatic law, principle of buoyancy and stability of a floating body and application of mass, momentum and energy equation in fluid flow.
- To imbibe basic laws and equations used for analysis of static and dynamic fluids. 5. To inculcate the importance of fluid flow measurement and its applications in Industries.
- To determine the losses in a flow system, flow through pipes, boundary layer flow and flow past immersed bodies.

Course Outcomes:

On completion of the course, learner will be able to–

- Use of various properties in solving the problems in fluids
- Use of Bernoulli‟s equation for solutions in fluids
- Determination of forces drag and lift on immersed bodies

Unit 1: Introduction:
Fluid and continuum, Physical properties of fluids, Rheology of fluids.
Kinematics of Fluid flow: Types of fluid flows: Continuum & free molecular flows. Steady andunsteady, uniform and non-uniform, laminar and turbulent flows, rotational and irrotational flows, compressible and incompressible flows, subsonic, sonic and supersonic flows, sub-critical, critical and supercritical flows, one, two and three dimensional flows, streamlines, continuity equation for 3D and 1D flows, circulation, stream function and velocity potential, source, sink, doublet and half-body.

Unit 2: Fluid Statics:
Pressure-density-height relationship, manometers, pressure transducers, pressure on plane and curved surfaces, centre of pressure, buoyancy, stability of immersed and floating bodies, fluid masses subjected to linear acceleration and uniform rotation about an axis.

Dynamics of Fluid Flow: Euler‟s Equation of motion along a streamline and its integration, Bernoulli‟s equation and its applications- Pitot tube, orifice meter, venturi meter and bend meter, Hot-wire anemometer and LDA, notches and weirs, momentum equation and its application to pipe bends.

Unit 3: Dimensional Analysis and Hydraulic Similitude:
Dimensional analysis, Buckingham‟s Pi theorem, important dimensionless numbers and their significance, geometric, kinematics and dynamic similarity, model studies.

Unit 4: Laminar and Turbulent Flow:
Equation of motion for laminar flow through pipes, Stokes‟ law, transition from laminar to turbulent flow, turbulent flow, types of turbulent flow, isotropic, homogenous turbulence, scale and intensity of turbulence, measurement of turbulence, eddy viscosity, mixing length concept and velocity distribution in turbulent flow over smooth and rough surfaces, resistance to flow, minor losses, pipe in series and parallel, power transmission through a pipe, siphon, water hammer, three reservoir problems and networks.

Unit 5: Boundary Layer Analysis:
Boundary layer thickness, boundary layer over a flat plate, laminar boundary layer, application of momentum equation, turbulent boundary layer, laminar sub layer, separation and its control, Drag and lift, drag on a sphere, a two dimensional cylinder, and an aero foil, Magnus effect.

List of Experiment:

1. To measure the surface tension of a liquid.
2. To determine the metacentric height of a ship model experimentally.
3. To study the transition from laminar to turbulent flow and to determine the lower critical Reynolds number.
4. To determine the coefficients of velocity, contraction and discharge of an orifice (or a mouth piece) of a given shape. To plot the flow net for a given model using the concept of electrical analogy.
5. To find the velocity distribution in a pipe and hence to compute the discharge by integrating the velocity profile obtained.
6. To verify the Bernoulli‟s theorem.
7. To calibrate an orifice meter and venturimeter and to study the variation of the coefficient of discharge with the Reynolds number.
8. To calibrate and to determine the coefficient of discharge for rectangular and triangular notches.
9. To verify Darcy‟s law and to find out the coefficient of permeability of the given medium.
10. To verify the momentum equation.
11. To study the boundary layer velocity profile and to determine boundary layer thickness and displacement thickness. Also to determine the exponent in the power law of velocity distribution.
12. To study the variation of friction factor, „f‟ for turbulent flow in smooth and rough commercial pipes.
13. To determine the loss coefficients for the various pipe fittings.
14. To study the flow behavior in a pipe bend and to calibrate the pipe bend for discharge measurement.

Reference Books :

1. *S Narasimhan: First Course in Fluid Mechanics, University Press*
2. *Som, S.K. & Biswas G.: Introduction of fluid mechanics & Fluid Machines, TMH, 2000, 2nd edition.*
3. *M M Das: Fluid Mechanics & Turbo machines, Oxford University Press*
4. *Hunter Rouse, "Elementary Mechanics of Fluids", John Wiley & Sons. Omc. 1946*
5. *Vijay Gupta and S.K.Gupta, " Fluid Mechanics and its Applications", Wiley Eastern Ltd, 1984.*

BMET 405 **BMEP 405**	**MANUFACTURING SCIENCE & TECHNOLOGY - II**	**3L-0T-2P**	**4 Credit**

Course Objective:

To understand the concept and basic mechanics of metal cutting, working of standard machine tools such as lathe, shaping and allied machines, milling, drilling and allied machines, grinding and allied machines and broaching To understand the basic concepts of non-traditional machining processes.

Course Outcomes:

- Select appropriate Manufacturing Processing to manufacture any component.
- Select appropriate Joining Processes to join Work piece.
- Design & manufacturing different products by cutting processes.
- Demonstrate operation such as Turning, Facing, Threading, Knurling and Grooving on Centre Lathe.

Unit 1: A Metal Cutting and Machine Tools Metal Cutting-

Mechanics of metal cutting. Geometry of tool and nomenclature .ASA system Orthogonal vs. oblique cutting. Mechanics of chip formation, types of chips. Shear angle relationship. Merchant‟s force circle diagram. Cutting forces, power required. Cutting fluids/lubricants. Tool materials. Tool wear and tool life. Machinability. Brief introduction to machine tool vibration and surface finish. Economics of metal cutting.

Unit 2: Machine Tools

i. Lathe : Principle, types, operations, Turret/capstan, semi/Automatic, Tool layout.
ii. Shaper, slotter, planer : operations & drives.
iii. Milling : Milling cutters, up & down milling. Dividing head & indexing. Max chip thickness & power required.
iv. Super finishing : Honing, lapping, polishing.
v. Milling : Milling cutters, up & down milling. Dividing head & indexing. Max chip thickness &

Unit 3: Grinding & super finishing

i. Grinding : Grinding wheels, abrasive, cutting action. Grinding wheel specification. Grinding wheel wear - attritions wear, fracture wear. Dressing and Truing. Max chip thickness and Guest criteria. Surface and Cylindrical grinding. Center less grinding.
ii. Super finishing: Honing, lapping, and polishing.

Limits, Fits & Tolerance and Surface-roughness:

Introduction to Limits, Fits, Tolerances and IS standards, and surface-roughness.

Unit 4: Metal Joining (Welding)

Survey of welding and allied processes. Gas welding and cutting, process and equipment. Arc welding : Power sources and consumables. TIG & MIG processes and their parameters Resistance welding - spot, seam projection etc. Other welding processes such as atomic hydrogen, submerged arc, electroslag, friction welding. Soldering & Brazing.

Thermodynamic and Metallurgical aspects in welding and weld,. Shrinkage/residual stress in welds. Distortions & Defects in welds and remedies. Weld decay in HAZ.

Unit 5: Introduction to non-conventional Manufacturing Process

Benefits, application and working principle of EDM, ECM, LBM, EBM, USM. AJM, WJM. Similarly, non-conventional welding application such as LBW, USW, EBW, Plasma arc welding, Explosive welding. HERE- Explosive Forming.

List of Experiments:

(At least 8 of the following along-with study of the machines/processes)

1. Shear-angle determination (using formula) with tube cutting (for orthogonal) on lathe machine.
2. Bolt (thread) making on Lathe machine.
3. Tool grinding (to provide tool angles) on tool-grinder machine.
4. Gear cutting on Milling machine.
5. Machining a block on shaper machine.
6. Finishing of a surface on surface-grinding machine.
7. Drilling holes on drilling machine and study of twist-drill.
8. Study of different types of tools and its angles & materials.
9. Experiment on tool wear and tool life.
10. Experiment on jigs/Fixtures and its uses
11. Gas welding experiment.
12. Arc welding experiment.
13. Resistance welding experiment.
14. Soldering & Brazing experiment.
15. Study and understanding of limits, fits & tolerances.

REFRENCE BOOKS

- *Modern Machining Processes by P.C. Pandey & H.S. Shan*
- *Manufacturing science by Degarmo, Wiley India*
- *Manufacturing Technology Metal Cutting & Machine Tools by PN Rao, TMH*
- *Manufacturing Process by Sontosh Bhatnagar, BSP Hyderabad*

BMEP 406	Computer Aided Machin Drawing Lab	0L;0T;2P	1 Credit

List of Experience

1. Introduction: Graphic language, Classification of drawings, Principles of drawing: IS codes for Machine drawing, Lines, Scales, Sections, Dimensioning, Standard abbreviations.
2. Orthographic Projections: Principles of first and third angle projections, drawing and sketching of machine elements in orthographic projections, spacing of views.
3. Screwed (Threaded) fastners: Introduction, Screw thread nomenclature, Forms of threads, Thread series, Thread designation. Representation of threads, Bolted joints, Locking arrangements for nuts, Foundation bolts.
4. Keys and Cotters: Keys, Cotter joints.
5. Shaft couplings: Introduction, Rigid and flexible coupling.
6. Riveted Joints: Introduction, Rivets and riveting, Rivet heads, Classification of riveted joints.
7. Assembly drawing: Introduction, Engine parts, Stuffing box etc.
8. Fee hand sketching: Introduction, Need for free hand sketching, Free hand of sketching of some threaded fasteners and simple machine components.

Note: Modelling and drafting of above experiments by using Autocad / Solid Works / Catia / Creo etc.

References:

1. N. Siddeshwar, P.Kannaiah, V.V.S. Shastry : Machine drawing, TMH, New Delhi.
2. K.L. Narayana, P. Kannaiah, K. Venkat Reddy : Machine drawing, New Age Intemational Publications, 2nd edition.
3. Engineering drawing practice for schools and colleges, SP46-1998 (BIS)