



Deenbandhu Chhotu Ram University of Science and Technology
Murthal (Sonepat) - 131 039 (Haryana)
Mechanical Engineering Department

Vision:

Mission:

Program Educational Objectives:

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

Programme Outcomes

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

Programme Specific Outcomes

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

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

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

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

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

Note:

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

B. Tech. Mech. Engg. : Scheme & Syllabi are approved in 14th meeting of Academic Council held on 11.06.2019. Effective from Academic Session 2019-20 and applicable to all students admitted in 2018 and onwards.

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BT 221C BIOLOGY FOR ENGINEERS

B. Tech. Semester – III (Mechanical Engineering)

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

UNIT - I

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

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

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

UNIT – II

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

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

UNIT - III

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

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

UNIT - IV

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

TEXT BOOK:

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

REFERENCE BOOKS:

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

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1. .

ME 201C ENGINEERING MECHANICS
B. Tech. Semester – III (Mechanical Engineering)

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

UNIT- I

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

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

UNIT-II

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

UNIT-III

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

UNIT-IV

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

TEXT BOOK:

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

REFERENCE BOOKS:

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

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ME 203C THERMODYNAMICS

B. Tech. Semester – III (Mechanical Engineering)

L T P Credits
3 1 - 4

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

UNIT - I

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

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

UNIT - II

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

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

UNIT - III

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

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

UNIT - IV

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

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

TEXT BOOK:

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

REFERENCE BOOKS:

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

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ME 202C APPLIED THERMODYNAMICS
B. Tech. Semester – IV (Mechanical Engineering)

L T P Credits
3 1 - 4

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

UNIT I

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

Gas power cycles, Air standard Otto, Diesel and Dual cycles

UNIT II

Vapor power cycles Rankine cycle with superheat, reheat and regeneration; exergy analysis; Super-critical and ultra super-critical Rankine cycle; Analysis of steam turbines, velocity and pressure compounding of steam turbines.

Air standard Brayton cycle, effect of reheat, regeneration and intercooling; Combined gas and vapor power cycles.

UNIT III

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

UNIT IV

Basics of compressible flow, Stagnation properties, Isentropic flow of a perfect gas through a nozzle, choked flow, subsonic and supersonic flows- normal shocks- use of ideal gas tables for isentropic flow and normal shock flow- Flow of steam and refrigerant through nozzle, super-saturation - compressible flow in diffusers, efficiency of nozzle and diffuser.

Reciprocating compressors, staging of reciprocating compressors, optimal stage pressure ratio, effect of intercooling, minimum work for multistage reciprocating compressors

TEXT BOOKS:

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

REFERENCES BOOKS:

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

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ME 204C FLUID MECHANICS AND FLUID MACHINES
B. Tech. Semester – IV (Mechanical & Aeronautical Engineering)

L T P Credits
3 1 - 4

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

UNIT I

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

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

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

UNIT II

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

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

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

UNIT III

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

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

UNIT IV

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

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

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

TEXT BOOKS:

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

REFERENCES BOOKS:

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

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ME 206C STRENGTH OF MATERIALS
B. Tech. Semester – IV (Mechanical Engineering)

L	T	P	Credits
3	1	-	4

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

UNIT I

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

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

UNIT II

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

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

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

UNIT III

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

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

UNIT IV

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

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

TEXT BOOKS:

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

REFERENCE BOOKS:

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

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ME 208C MATERIALS ENGINEERING
B. Tech. Semester – IV (Mechanical Engineering)

L T P Credits
3 - - 3

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

UNIT I

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

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

UNIT II

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

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

UNIT III

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

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

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

UNIT IV

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

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

.TEXT BOOKS:

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

REFERENCE BOOKS:

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

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ME 210C INSTRUMENTATION AND CONTROL

B. Tech. Semester – IV (Mechanical Engineering)

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

UNIT- I

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

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

UNIT-II

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

UNIT-III

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

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

UNIT-IV

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

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

TEXT BOOKS:

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

REFERENCE BOOKS:

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

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ME 212C LABORATORY-I THERMAL
B. Tech. Semester – IV (Mechanical Engineering)

L T P Credits
0 0 2 1

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

List of Experiments:

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

MC203C Constitution of India

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

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

Unit 1 (10 Lectures)

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

Unit 2 (12 Lectures)

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

Unit 3 (12 Lectures)

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

Unit 4 (11 Lectures)

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

Text Books:

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

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

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

Scheme of End Semester Examinations (Major Test):

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

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MC 201C Environmental Studies

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

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

UNIT - I

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

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

UNIT - II

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

UNIT - III

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

UNIT - IV

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

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

REFERNCE BOOKS:

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

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MGT 201C Engineering Economics

B. Tech. Semester – III (Mechanical Engineering)

L T P Credits
3 - - 3

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

UNIT – I

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

UNIT - II

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

UNIT - III

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

UNIT - IV

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

TEXT BOOKS:

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

REFERNCE BOOKS:

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

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

B. Tech. Semester – III (Mechanical Engineering)

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

UNIT- I

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

UNIT-II

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

UNIT-III

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

UNIT-IV

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

REFERENCE BOOKS:

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

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ECE 211C **Basic Electronics Engineering**
B. Tech. Semester – III (Mechanical Engineering)

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

UNIT-I

Semiconductor Devices and Applications: Introduction to P-N junction Diode and V-I characteristics, Half wave and Full-wave rectifiers, capacitor filter. Zener diode and its characteristics, Zener diode as voltage regulator. Regulated power supply IC based on 78XX and 79XX series.

Introduction to BJT, its input-output and transfer characteristics, BJT as a single stage CE amplifier, frequency response and bandwidth.

UNIT-II

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

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

UNIT-III

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

UNIT-IV

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

TEXT/REFERENCE BOOKS:

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

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