Detailed Program

Bachelor of Technology (B.Tech.)

(Mechanical Engineering)

Semester-III

(2016-20)

DOC201717040008

RNB GLOBAL UNIVERSITY
RNB Global City, Ganganagar Road,
Bikaner, Rajasthan 334601

OVERVIEW

RNB Global University follows Semester System. Accordingly, each academic year is divided into two semesters, **Odd (July-December) and Even (January-June).** Besides this, the university follows a system of continuous evaluation along with regular updating in course curricula and teaching pedagogy.

The curriculum for B.Tech. Program for (July-Dec.) Semester, 2017 along with examination pattern is as follows:

Semester -III

S. No.	Course Code	Course Title	Credits
1.	19002600	Applied Mathematics-III	4
2.	11012200	Human Values, Business and Managerial Ethics	2
3.	19002700	Material Science	3
4.	19002800	Material Science Lab	1
5.	19002900	Applied Thermodynamics	3
6.	19003000	Applied Thermodynamics Lab	1
7.	19003100	Manufacturing Science-I	3
8.	19003200	Manufacturing Science-I Lab	1
9.	19003300	Mechanics of Solids	3
10.	19004200	Ability & Skill Enhancement Module – III	3
11.	99002000	NSS/NCC /Similar activities	1
12.	99002100	Club Activities	1
13.	99001700	Seminar	1
Total Credits			**27**

EVALUATION SCHEME- THEORY

The evaluation of the theory paper of B. Tech would be based on Internal and External Assessments. Internal Assessment would consist of 50% of the marks (50 marks) and external assessment (in form of End Term Exam) would consist of remaining 50% marks (50 marks). Detailed scheme of Internal and External Assessments as follows:

Internal Assessment

Area of Assessment	Marking	Maximum Marks
Sessional-I	As per marks obtained	10
Sessional-II	As per marks obtained	10
Assignment + Presentation	15	15
Overall Conduct and Discipline	To be decided by concerned Faculty Member	5
Attendance	Student with 80% attendance will get 5 marks and 0.25 marks for every 1% attendance above 80 %	10
Total	**50**	

External Assessment

Type	Marks
Theory	50

EVALUATION SCHEME -PRACTICAL

The evaluation of the practical paper of B. Tech would be based on Internal and External Assessments. Internal Assessment would consist of 50% of the marks (50 marks) and external assessment (in form of End Term Exam) would consist of remaining 50% marks (50 marks). Detailed scheme of Internal and External Assessment is as follows:

Internal Assessment

Type	Details	Marks
Marks obtained in various manuals, practical file, participation, any model prepared, output of practical	Average of marks obtained	35
Discipline	To be decided by concerned faculty	5
Attendance	80% - 5 marks and 0.25 percent for every one percent above 80 %	10
TOTAL	**50**	

External Assessment

Type	Marks
Practical	50

EVALUATION SCHEME- NSS/NCC AND CLUB ACTIVITIES

1. NSS/NCC will be evaluated internally.
2. The students have to join club/clubs with the active participation in different activities of club. The students would be continuously assessed.

CURRICULUM

Course Name: Applied Mathematics-III

Course Code: 19002600

Course Outline

Unit I Fourier Series and Fourier Transforms : Euler's formulas, conditions for a Fourier expansion, change of interval, Fourier expansion of odd and even functions, Fourier expansion of square wave, rectangular wave, saw-toothed wave, half and full rectified wave, half range sine and cosine series. Fourier integrals, Fourier transforms, Shifting theorem, Fourier transforms of derivatives, Fourier transforms of integrals, Convolution theorem, Fourier transform of Dirac-delta function.

Unit II Functions of Complex Variable: Definition, Exponential function, Trigonometric and Hyperbolic functions, Logarithmic functions. Limit and Continuity of a function, Differentiability and Analyticity of function. Cauchy-Riemann equations, necessary and sufficient conditions for a function to be analytic, polar form of the Cauchy-Riemann equations. Harmonic functions, application to flow problems, Integration of complex functions. Cauchy-Integral theorem and formula

Unit III Power series, radius and circle of convergence, Taylor's, Maclaurin's and Laurent's series. Zeroes and singularities of complex functions, Residues Evaluation of real integrals using residues (around unit and semi-circle only)
Linear Programming: Linear programming problems formulation, solving linear programming problems using (i) Graphical method (ii) Simplex method (iii) Dual simplex method.

Unit IV Probability Distributions and Hypothesis Testing: Conditional probability, Bayes theorem and its applications, expected value of a random variable. Properties and application of Binomial, Poisson and Normal distributions,
Testing of a hypothesis, tests of significance for large samples, Student's t-distribution (Applications only), Chi-square test of goodness of fit.

Suggested Readings:

1. Advanced Engg. Mathematics: F Kreyszig.
2. Higher Engg. Mathematics: B.S. Grewal.
3. Engineering Mathematics by Babu Ram Pearson media Publication
4. Advance Engg. Mathematics: R.K. Jain, S.R.K.Iyenger.
5. Advanced Engg. Mathematics: Michael D. Greenberg.

Course Name: Human Values, Business and Managerial Ethics

Course Code: 11012200

Course Outline

Unit - I Values & Ethics

Concept of Values and its formation; Values and Behaviour. What is Ethics? Nature and scope of Ethics; Morality vs. Legality dilemma. Facts and value; Ethical subjectivism and Relativism, Moral Development (Kohlberg's 6 stages of Moral Development), Ethics and Business, Myth of a moral business.

Unit – II Decision making (Normal Dilemmas and Problems): Application of Ethical theories in Business (i) **Utilitarianism** (J.Bentham and J.S. Mill), (ii) **Deontology** (I. Kant) (iii) **Virtue Ethics** (Aristotle). **Economic Justice: Distributive Justice**, John Rawls **Libertarian Justice** (Robest Nozick)

Unit – III Corporate Social Responsibility of Business: Concept of CSR; Changing expectation of society; Model's of CSR: - Carroll's Model; Ackerman's Model. Why Social Responsibility of Business? Arguments in Favour and in against of Social Responsibility **Consumerism and Consumer Rights**

Unit – IV Ethical Issues in Business: Marketing: Characteristics of Free and Perfect competitive market, Monopoly oligopoly, Corruption and Bribery; Ethics in Advertising (Truth in Advertising). **Finance:** Fairness and Efficiency in Financial Market, Insider Trading, Greenmail, Golden parachute. **HR:** Workers Right and Duties: Work place safety, sexual harassment, whistle blowing.

Unit – V Managerial Ethics Ethical Decision Making. Role of Moral philosophy in decision making; Argument for and against of Ethics in Business. Challenge of ethical issues due to Globalization. Power and Politics in organization. Hierarchism as an organizational values. Indian ethos in Management.

Suggested Readings

1. Business Ethics Text and Cases , C.S.V.Murthy, Himalaya Publishing House
2. Business Ethics, Francis & Mishra, TMH
3. Business Ethics, Fernando A. C. , Pearson
4. Values & Ethics, Kaur Tripat, Galgotia Publishers
5. Ethics in Management: A Vedantic Perspective; Chakraborty, S. K. Oxford University Press

Course Name: Material Science

Course Code: 19002700

Course Outline

Unit I Structure of metal: Crystal structure (BCC, FCC and HCP, Packing factor and density calculation), X-ray diffraction, miller indices, lattices, imperfections, elementary treatment of point and line defects and their relation to mechanical properties**.**
Diffusion: Diffusion mechanisms, steady state and non-steady state diffusion, factors affecting diffusion

Deformation: Slip, twinning, effect of cold and hot working on mechanical properties, principles of recovery, re-crystallization and gain growth.

Unit II Fracture: Types of fracture ductile and brittle, fatigue **Creep:** Basic consideration in the selection of material for high and low temperature service, creep curve, effect of material variables on creep properties, brittle failure at low temperature.
Solidification: Phases in metal system, lever rule, solidification of metal and alloys, solid solution, eutectic, eutectoid and inter-metallic compounds, Iron carbon equilibrium diagram, TTT-diagram. Effect of alloying elements on TTT diagram, S-N curve

Unit III Heat Treatment: Principles and purpose of heat treatment of plain carbon steels, annealing, normalizing, hardening, tempering, isothermal treatment, case hardening – carburizing, nitriding etc, precipitating hardening of aluminum alloys. Hardenability: determination of hardenability Jominy end quench test.
Materials: Plain Carbon steels, effect of alloying elements, properties, uses, springs, and wear resisting steels, IS standards codes for steels.

Unit IV Corrosion: Types of corrosion, Galvanic cell, rusting of Iron, Methods of protection from corrosion.
Fiber Reinforced Composites: General characteristics, Applications, Introduction to Fibers – glass, carbon, Kevlar 49 fibers. Matrix – Polymeric, Metallic, Ceramic Matrix, Coupling agents and fillers

Suggested Readings:

1. Callister "Materials Science and Engineering": An Introduction, 6th Edition
2. Parashivamurthy K.I "Material Science and Metallurgy", Pearson,
3. Sidney H Avner," Introduction to Physical Metallurgy", Tata McGraw-Hill,New Delhi-1997.
4. Degarmo E. Paul et.al, "Materials & Processes in Manufacture", Prentice Hall India, New Delhi, 2001.
5. L. Krishna Reddi, "Principles of Engineering Metallurgy", New Age Publication, New Delhi, 2001.
6. Buduisky et al, "Engineering Materials & Properties", Prentice Hall India, New Delhi, 2004.
7. Peter Haasten, "Physical Metallurgy", Cambridge Univ. Press, 1996.
8. Raymond A Higgin., "Engineering Metallurgy Part 1", Prentice Hall India, New Delhi, 1998

Course Name: Material Science Lab

Course Code: 19002800

List of Experiments

(A). Experiments on Material Science (at least 5 of the following):

1. Preparation of a plastic mould for small metallic specimen.
2. Preparation of specimen for micro structural examination-cutting, grinding, polishing, etching.
3. Determination of grain size for a given specimen.
4. Comparative study of microstructures of different specimens of different materials (mild steel, gray C.I., brass, copper etc.)
5. Experiments on heat treatment 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. Study of corrosion and its effects.
8. Study of microstructure of welded component Macro & micro examination of the welded specimen.

(B). Experiments on Material Testing (at least 5 of the following):

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.

Course Name: Applied Thermodynamics

Course Code: 19002900

Course Outline

Unit I Basic Concept: Thermodynamic systems; Surrounding and Boundary; Thermodynamic Property –Intensive and Extensive; Thermodynamic Equilibrium; State; Path; Process and Cycle; Quasi-static; Reversible and Irreversible Processes; Working Substance; Concept of Thermodynamic Work and Heat; Equality of Temperature; Zeroth Law of Thermodynamics and its utility; Numericals

Unit II First Law Of Thermodynamics: Internal Energy and 1st Law Applied to Non- flow process; PMMFK ; Enthalpy Steady flow energy equation; Steady and unsteady Flow Process; Throttling Process and Free Expansion Process; Numerical Second Law Of Thermodynamics: Limitations of First Law; Heat Source and Heat Sink; Heat Engine; Refrigerator and Heat Pump; Kelvin- Planck and Clausius Statements and their Equivalence; PMMSK; Carnot Cycle; Carnot Theorem; and its Corollaries; Thermodynamic Temperature Scale; Entropy; Clausius Inequality; Principle of Entropy Increase; Entropy Change in Different Processes; Introduction to Third Law of Thermodynamics; Numerical

Unit III Availability And Irreversibility: High and Low Grade Energy; Availability and Unavailable Energy; Loss of Available Energy Due to Heat Transfer Through a Finite Temperature Difference; Dead state of a system; Availability of a Non-Flow or Closed System; Availability of a Steady Flow System; Helmholtz and Gibb's Functions; Effectiveness and Irreversibility

Unit IV Ideal And Real Gases: Concept of an Ideal Gas; Basic Gas Laws; Characteristic Gas Equation; and Universal Gas Constant; Vander Waal's Equation of state; Reduced Co-ordinates; Compressibility factor and law of corresponding states; Mixture of Gases; Mass; Mole and Volume Fraction; Gibbs Dalton's law; Gas Constant and Specific Heats; Entropy for a mixture of non-reactive gases; Numerical

Unit V Pure Substance: Pure Substance and its Properties; Phase and Phase Transformation; Vaporization; Evaporation and Boiling; Saturated and Superheat Steam; Solid–Liquid–Vapour Equilibrium; T-V; P-V and P-T Plots; Properties of Dry; Wet and Superheated Steam; Property Changes during Steam Processes; Use of steam tables and Mollier Diagram for Process calculation; Throttling And Measurement of Dryness Fraction of Steam.

Unit VI Thermodynamic Relations: Maxwell Relations; Clapeyron Equation; Relations for changes in Enthalpy and Internal Energy & Entropy; Specific heat capacity Relations; Joule Thomson coefficient & inversion curve;

Suggested Readings:

1. Nag, P.K., McGraw Hill. "Engineering Thermodynamics", Tata
2. Pulkrabek, W. W., Engineering Fundamentals of Internal Combustion Engines, Pearson education Asia, New Delhi (2007).
3. Vasandani, V. P. and Kumar, D. S., Heat Engineering, Metropolitan Book Company, New Delhi (2003).
4. Joel, R., Basic Engineering Thermodynamics, Pearson Education Asia, New Delhi (1996).
5. Granet, I., Thermodynamics & Heat Power, Pearson Education Asia, New Delhi (2003).
6. Rao, Y VC., "Theory and Problems of Thermodynamics", Wiley Eastern Ltd, 2007
7. Arora C P., "Engineering Thermodynamics", Tata McGraw Hill; 2008
8. Domkundwar., "Thermal Engineering", Dhanpat Rai & Company, 2006
9. Estope, TD and Meconkey A., "Applied Thermodynamics for Engineers Technologists", AWL, 1999

Course Name: Applied Thermodynamics Lab

Course Code: 19003000

List of Experiments

Minimum 10 experiments out of following;

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

Course Name: Manufacturing Science-I

Course Code: 19003100

Course Outline

Unit I Metal Casting Processes: Advantages and limitations, sand mold making procedure. Patterns: Pattern materials, pattern allowances, types of pattern, color coding. Molding materials: Molding sand composition, sand preparation, sand properties and testing, Sand molding processes. Cores: Types of cores, core prints, chaplets, and chills.
Gating systems: Gates and risers. Melting practice: Cupola furnace, defects in castings and their remedies, Shell molding, precision investment casting, permanent mold casting, die casting, centrifugal casting, continuous casting.

Unit II Metal Forming Processes: Nature of plastic deformation, hot working and cold working .Principles of rolling, roll passes, roll pass sequences. Forging: Forging operations, smith forging, drop forging, press forging, forging defects.

Unit III Extrusion and Sheet metal operations: Extrusion principle, hot extrusion, cold extrusion, wire drawing, swaging, tube making. Sheet metal operations: Press tools operations, shearing action, drawing dies, spinning, bending, stretch forming, embossing and coining.

Unit IV Welding Process: Principles of welding, brazing and soldering, Classification of Welding Processes, gas welding and cutting process, equipment Arc welding power source and consumables Resistance welding: Principle and equipments, resistance spot welding, resistance seam welding, electro slag welding, forge welding.

Unit V Powder Metallurgy: Powder manufacturing, compaction and sintering processes. Advantages and applications of Powder Metallurgy

Unit VI Plastics: Introduction, Raw material for plastics, Properties of plastics, types, Thermo setting plastics, Thermoplastics, Moulding compounds, Fabrication, machining and joining of plastics

Suggested Readings

1. Principles of Manufacturing Materials & Processes – Campbell J. S., Publisher – McGraw Hill
2. Manufacturing Science - Ghosh A; Mallik A.K. Affiliated East-West Press Pvt. Ltd., New Delhi
3. Foundry Technology K.P. Sinha, D.B. Goel, Roorkee Publishing House. Welding and Welding Technology – Richard L. Little Tata McGraw Hill Ltd. Principle of Metal casting - Rosenthal, Tata McGraw Hill, New Delhi
4. Manufacturing Processes and Systems: Ostwald Phillip F., Munoz Jairaj, John Wiley & Sons
5. Manufacturing Technology-Foundry, Forming and Welding - P.N. Rao, Tata McGraw Hill, New Delhi..
6. Elements of Manufacturing Processes – B.S. Nagendra Parasher, RK Mittal, PHI N. Delhi

Course Name: Manufacturing Science-I Lab

Course Code: 19003200

CASTING PRACTICALS

1. To study ingredients of molding sand and core sand.
2. To determine clay content in a moulding sand sample.
3. To determine moisture content in a moulding sample.
4. To find shatter index of moulding sand sample.

5. To conduct hardness test for mould and core.
6. To test tensile, compressive, transverse strength of moulding sand in dry condition.
7. Determination of permeability of a moulding sand sample.
8. Measurement of grain finances number.
9. To study various features of cupola furnace and its charges calculations.
10. Prepare a green sand mould for any stable engg. component.

WELDING PRACTICALS

1. Specimen preparation and making of lap joint, Butt, T- joints with oxy- acetylene gas welding.
2. Making of lap, Butt, T- joints etc. with electric arc welding.
3. Study of MIG welding equipment and making a weld joint in this process.
4. Study of TIG welding equipment and making a weld joint in this process
5. Study of different process parameters in Friction welding and preparing a weld joint by this process.
6. To study various welding equipments namely generators welding torch etc.
7. To study the resistance welding processes and prepare welded joint.

Course Name: Mechanics of Solids

Course Code: 19003300

Course Outline

Unit I Simple Stresses & strains: Concept of stress at a point, Tensile, Compressive, shear and volumetric stresses and Strains, Young's modulus, modulus of rigidity, complementary shear stress, lateral strain and Poisson's ratio. Strain relationships.
Compound bars and Temperature stresses: Stresses in compound bars carrying axial loads and subjected to temperature stresses.

Unit II Simple bending: Shear force and bending moment diagrams of cantilevers, simply supported beams under concentrated, uniformly loaded and varying loads with and without overhangs.
Stresses in beams and cantilevers under bending, beam of uniform strength, bending due to eccentric loads. Shear stress in beams, strain energy, Castigliano's theorm
Slope and defection of cantilevers and beams under concentrated and uniformly distributed loads. Moment Area method, MaCaulay's method; principle of superposition

Unit III Columns: Combined direct and bending stresses in columns, Euler's and Rankine Gordon equations.
Torsion: Stresses and strains in pure torsion of solid circular shafts and hollow circular shafts. Power transmitted by shafts; combined bending and torsion. Strain energy in torsion
Complex stresses and strains: Principle stress and strain due to combination of stresses, Mohr's circle, strain energy, theories of Failures.
Springs: Close-coiled springs, leaf springs.
Cylinders: Thin and thick cylinders, Lame's Theorem, compound cylinders, spherical vessels.

Suggested Readings:

1. Dr. Sadhu Singh "Strength of Materials", Khanna Pub.
2. Hibbler R.C., "Mechanics of Materials", Prentice Hall, New Delhi, 1994.
3. Timoshenko S.P., Gere J "Elements of Strength of Materials", East-West affiliated, New Delhi,
4. Bhavikatti S. S. Strength of Materials", Vikas Publishers 2000
5. Sri Nath L.S. et.al., "Strength of Materials", McMillan, New Delhi,2001
6. Popov Eger P., "Engg. Mechanics of solids", Prentice Hall, New Delhi, 1998
7. Fenner, Roger.T, "Mechanics of Solids", U.K. B.C. Publication, New Delhi, 1990

Note: The review of Syllabus happens on periodic basis for the benefit of the students. In case there are changes in curriculum due to review, students would be intimated in writing.

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