

Detailed Program
Bachelor of Technology (B.Tech.)
(Mechanical Engineering)

Semester-V
(2016-20)

DOC201806110019



RNB
GLOBAL UNIVERSITY
Educating stars for tomorrow

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-December) Odd Semester, 2018 along with examination pattern is as follows:

Course Scheme

Semester -V

S. No.	Course Code	Course Title	L	T	P	Credits
1.	19006500	Management of Manufacturing Systems	3	0	0	3
2.	19006600	Automobile Engineering	3	1	0	4
3.	19006700	Automobile Engineering Lab	0	0	4	2
4.	19006800	Machine Design	3	1	0	4
5.	19006900	Heat and Mass Transfer	3	0	0	3
6.	19007000	Heat and Mass Transfer Lab	0	0	2	1
7.	19007100	Renewable Energy Technology	3	0	0	3
8.	19006300	Ability & Skill Enhancement Module - V	2	0	0	2
9.	19007300	Summer Internship and Report	0	0	8	4
10.	99002700	Human Values & Social Service/NCC/NSS	-	-	-	1
11.	99002800	Workshops & Seminars	-	-	-	1
Total			17	2	14	28

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

The distribution of Internal Assessment Marks is as follows:

Type	Details	Marks
Mid Term	Two Mid-term Sessional of 15 marks each (15+15)	30
Marks obtained in various Tests, Assignments, Presentations, Quiz, Tutorials, etc.	Average of marks obtained	15
Attendance	75%+ : 5 marks	5
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	45
Attendance	75%+ : 5 marks	5
TOTAL	50	

External Assessment

Type	Marks
Practical	50

CURRICULUM

Course Name: Management of Manufacturing Systems

Course Code: 19006500

Course Outline:

Unit I: Introduction

Production functions, Management systems, production and productivity.

Plant Organization: Principles of organization, Organization structure-line and staff organization.

Plant Location, Layout: Process layout, product layout and combination – methods of layout, economics of layout; group technology.

Unit II: Production Planning & Control

Types of products, demand, demand forecasting, marketing strategies, scheduling and control of scheduling production control.

Method Study: Definition and concepts, method study procedures, symbols, advantages, Operation process chart, Flow process charts, Two hand process chart, Motion study, micro motion, SIMO charts, Systems Concepts, Classification analysis techniques, Principle of motion economics.

Work Measurement: Definition, objectives & techniques, Time study equipment, performance rating, allowances, standard time, work sampling, PMTS.

Unit III: Industrial Maintenance

Types, organization for maintenance department, Breakdown and preventive maintenance and corrective maintenance.

Inventory control and replacement analysis: Introduction replacement policy and method adopted, EOQ.

Unit IV: Management Concepts

Development of management principles, scientific management, human relation aspects.

Production Cost Concepts: Introduction, cost of production, cost centre and unit, Classification and analysis of cost break Even Analysis.

Suggested Readings:

1. Ravi Shankar, "Industrial Engg & Management", Galgotia Publications.
2. S.K. Sharma, "Industrial Engg. & Operation Management", S.K. Kataria & Sons.
3. Joseph S. Martinich, "Production & Operation Management", John Wiley & Sons.
4. S. N. Chary, "Production and operations management, TMH 4th edition.
5. Harold T. Amrine, John A. Ritchey, Colin L. Moodie, Joseph F. Kmec "Manufacturing organization and Management" Pearson publication 6th edition.
6. S. Anil Kumar, N. Suresh "Production and operations management", New age International, 2nd Ed.
7. M. Mahajan, "Industrial Engg. & Production Management", Dhanpat Rai & Co

Course Name: Automobile Engineering

Course Code: 19006600

Course Outline:

Unit I: Introduction

Conventional motor vehicle, vehicle classification, frame and frameless construction, vehicle dimensions, power requirements, vehicle performance, gear ratio for maximum acceleration, stability of two wheel drive and four wheel drive vehicles. **Clutch and Transmission:** Single-Plate clutch, multi-plate clutch, dry clutch, wet clutch, centrifugal,

semi-centrifugal clutch, servo clutch mechanism, requirements for manual and automatic transmission, their type and constructional detail.

Unit II: Steering and Suspension

Steering mechanisms and steering system including power steering, steering geometry, suspension principle, rigid axle suspension and independent suspension, suspension system elements, hydraulic suspension, pneumatic suspension, leaf spring, Mc-pherson strut.

Unit III: Drive Line

Propeller shaft, universal joint, constant velocity joint, slip joint, differential, axle and hub.
Braking System: Introduction to braking system and their types, ABS, brake compensation.

Unit IV: Wheel and Tyres

Disc pressed wheels, alloy wheels, multi-piece wheels, tyre description, types and manufacturing, tubed and tubeless tyres, radial tyres, tyre specifications and coding, tread pattern, aqua-planning. **Emission control devices:** Catalytic convertor and its types, EGR.

Unit V: Vehicle Electronics

Electrical and electronic systems in automobiles, starting motor drives, automotive accessories and safety features in automobile. **Trouble shooting in various components.**
Trends in automobile sector: Hybrid, solar powered vehicles.

Suggested Readings:

1. Hiller, V. A. W., Fundamentals of Motor Vehicle Technology, Nelson Thornes, UK (2012).
2. Giri, N. K., Automobile Mechanics, Khanna Publishers, New Delhi (2011).
3. Garrett, T. K., Newton, K. and Steeds, W., The Motor Vehicle, Butterworth Heinemann, Great Britain, London (2001).
4. Norton, A. A., Book of the Car, Automobile Association, London (1977).
5. Heinz, H., Advance Vehicle Technology, Arnold Publishers, Butterworth Heinemann, London (1999).
6. Crouse, W. and Anglin, D., Automotive Mechanics, Tata McGraw Hill, New Delhi (2006).
7. Heinz, H, Engine and Vehicle Technology, Arnold Publishers, Butterworth Heinemann, London (2002)

Course Name: Automobile Engineering Lab

Course Code: 19006700

Course Outline

Laboratory Work:

1. Study of vehicle chassis and construction.
2. Study of single plate and multi-plate clutch in an automobile.
3. Study of Construction and working of following gear boxes: Contact mesh gear box; synchronous gear box, parts of automatic transmission system,
4. Study of Components of suspension system of automobile (2-wheel, 4 wheel),
5. Study of Steering system of an automobile.
6. Study of Electric system, starting system.
7. Study of braking system of an automobile.
8. Study of radiator.
9. Study of turbocharger and supercharger.
10. Study of differential, axles, study of propeller shaft, universal joints and slip joint,
11. Study of catalytic convertor.
12. Visit to automobile service station for troubleshooting exercises; Group assignments on above topics.

Course Name: Machine Design**Course Code: 19006800****Course Outline:****Unit I**

Introduction: Definition, Design requirements of machine elements, Principles of mechanical design, Aesthetic and Ergonomic considerations in design, Use of standards in design, Manufacturing consideration in design, Selection of preferred sizes, Indian Standards designation (BIS). Designation of carbon & alloy steels, Selection of materials for static and fatigue loads.

Unit II

Design of fasteners:

- a) RIVETS: Design of rivets for boiler joints, lozenge joints (uniform strength joint), eccentrically loaded riveted joints.
- b) BOLTS: Understanding the various stresses/ failure in bolted joints, design of cylindrical covers, basic and eccentrically loaded bolts.

- c) WELDS: Design for various loading conditions in torsion, shear or direct load, eccentrically loaded welded joints.

Unit III

Design of spigot and socket cotter joint, Gib and Cotter joint and knuckle joint Power Screws: Forms of threads, multiple threads, Efficiency of square threads, Trapezoidal threads, Stresses in screws, Design of screw jack.

Unit IV

Mechanical Springs: Types, Material for helical springs, End connections for compression and tension helical springs, Stresses and deflection of helical springs of circular wire, Design of helical springs subjected to static and fatigue loading, leaf and laminated springs.

Unit V

Shafts: Cause of failure in shafts, Materials for shaft, Stresses in shafts, Design of shafts subjected to twisting moment, bending moment and combined twisting, bending moments and thrust loads, Shafts subjected to fatigue loads.

Keys and Couplings: Types of keys, splines, Selection of square & flat keys, Strength of sunk key, Design of rigid and flexible couplings.

Suggested Readings:

1. Bhandari, V. B., Design of Machine Elements, Tata McGraw Hill, New Delhi (2007).
2. Shigley, J., Mechanical Engineering Design, McGraw Hill Book Company Inc., New York (2003).
3. Machine Design-Sharma and Agrawal, S.K. Kataria& Sons.
4. Machine Design, U C Jindal, Pearson Education.
5. Design of Machine Elements, Sharma and Purohit, PHI.
6. Design of Machine Design-M.F. Spott, Pearson Education
7. Machine Design-Maleev and Hartman, CBS Publishers.
8. Mechanical Engineering Design, 9e – Joseph E. Shigely, McGraw Hill Education.
9. Elements of Machine Component Design, Juvinal & Marshek, John Wiley & Sons

Course Name: Heat and Mass Transfer

Course Code: 19006900

Course Outline

Unit I: Heat Conduction

General heat conduction equation in rectangular, polar and spherical co-ordinates, one dimensional heat conduction, concept of thermal resistance, series and parallel connections, variable thermal conductivity, composite walls, critical insulation thickness, unsteady heat conduction: Systems with negligible internal resistance, Biot and Fourier number and their significance, lumped heat capacity analysis. Use of Hiesler and Grober

Charts. Heat transfer from extended surfaces: Types and applications of fins, heat transfer through rectangular and circular fins. Fin effectiveness and efficiency, error estimation in temperature measurement in thermo well.

Unit II: Heat Convection

Dimensional analysis, momentum and energy equation for boundary layers over a flat plate; Forced and Natural convection: Empirical equations for plates, pipes and spheres; Thermal boundary layer (in heat convection), dimensional analysis, physical significance of dimensionless numbers, Reynolds analogy for laminar flow, tube bundles.

Unit III: Heat Exchangers

Classification, LMTD and effectiveness-NTU methods, design criteria, fouling factors and standards, heat pipe. **Boiling and Condensation:** Pool boiling curves, forced boiling, techniques for enhancement of boiling, Nusselt's theory of condensation, condensation number, film-wise and drop wise condensation.

Unit IV: Thermal Radiation

Nature of thermal radiation, definitions of absorptivity, reflectivity, transmissivity, monochromatic emissive power. Total emissive power and emissivity, concept of black body & gray body, Kirchhoff's law, Wein's law and Planck's law. Deduction of Stefan Boltzmann equation. Lambert cosine rule, intensity of radiation. Energy exchange by radiation between two black surfaces. Geometric shape factor. Radiation network method, network for two surfaces which see each other and nothing else, radiation shields.

Unit V: Mass Transfer

Fick's Law, equimolar diffusion, isothermal evaporation, mass transfer coefficients, humidification operations. **Latest Development in Heat Transfer Technology:** Nanofluids and other new technologies.

Suggested Readings:

1. Holman, J.P., Heat Transfer, McGraw-Hill Book Company, Singapore (2008).
2. Cengel, Y., Heat Transfer- A practical approach, Tata McGraw Hill, New Delhi (2007).
3. Krieth, F and Bohn, M., Principles of Heat Transfer, Thomson Learning, Australia (2002).
4. Long, C., Essential Heat Transfer, Pearson Education Asia, New Delhi (1999).
5. Incropera, F.P. and DeWitt, D.P., Fundamentals of Heat and Mass Transfer, John Wiley and Sons, Singapore (2006).

Course Name: Heat and Mass Transfer Lab

Course Code: 19007000

Course Outline

Laboratory Work:

1. Calculate the thermal conductivity of insulating powder.
2. Calculate the thermal conductivity for heat transfer through composite wall.
3. Calculate the thermal conductivity of lagging material on pipe / metal rod.
4. Calculate the thermal conductivity by two slab guarded hot plate method.
5. Calculate the heat transfer coefficient in natural convection.
6. Calculate the heat transfer coefficient in forced convection heat transfer from a heated pipe.
7. Calculate the heat transfer coefficient in forced convection heat transfer through pin-fin apparatus.
8. Calculate the emissivity of a test plate.
9. Calculate the critical heat flux in pool boiling.
10. Verification of Stefan Boltzmann's law of radiation.
11. Study the phenomenon of drop wise and film wise condensation,
12. Study the working of two phase heat transfer unit.
13. Study the Performance of parallel flow and counter flow heat exchanger.
14. Study the Super thermal conducting heat pipe and comparison with the best conductor.
15. Demonstration in Nano fluid laboratory; Industrial visit.

Course Name: Renewable Energy Technology

Course Code: 19007100

Course Outline:

Unit I : Introduction

World Energy Use – Reserves of Energy Resources – Environmental Aspects of Energy Utilisation – Renewable Energy Scenario in Rajasthan, India and around the World – Potentials – Achievements / Applications – Economics of renewable energy systems

Unit II: Solar Energy

Solar Radiation – Measurements of Solar Radiation – Flat Plate and Concentrating Collectors – Solar direct Thermal Applications – Solar thermal Power Generation – Fundamentals of Solar Photo Voltaic Conversion – Solar Cells – Solar PV Power Generation – Solar PV Applications.

Unit III: Wind Energy

Wind Data and Energy Estimation – Types of Wind Energy Systems – Performance – Site Selection – Details of Wind Turbine Generator – Safety and Environmental Aspects.

Unit IV: Bio Energy

Biomass direct combustion – Biomass gasifiers – Biogas plants – Digesters – Ethanol production – Bio diesel – Cogeneration – Biomass Applications.

Unit V: Other Renewable Energy Sources

Tidal energy – Wave Energy – Open and Closed OTEC Cycles – Small Hydro-Geothermal Energy – Hydrogen and Storage – Fuel Cell Systems – Hybrid Systems.

Suggested Readings

1. Ashok Desai V, Non-Conventional Energy, Wiley Eastern Ltd, 1990
2. Mittal K.M, Non-Conventional Energy Systems, Wheeler Publishing Co. Ltd, 1997.
3. Ramesh R, Kurnar K.U, Renewable Energy Technologies, Narosa Publishing House, New Delhi, 1997.

Course Name: Ability & Skill Enhancement Module- V**Course Code: 19006300****Course Outline – Final Assessment - Interview with an Entrepreneur /Leader****Unit I: Leadership**

What is leadership? Traits of Leadership, Identifying leaders and traits of Leadership, Movie/ Story/ Interviews of leaders: Identify leadership qualities, Debate/ Discussion/ Presentations on leaders.

Unit II: Entrepreneurship

What is Entrepreneurship, Traits of Successful Entrepreneurs, Movie/ Story/Interviews of Entrepreneurs: Identify Entrepreneurial qualities, Debate/ Discussion/Presentation on Entrepreneurs.

Unit III: Organizational Skills & Employability Skills

What are organizational skills, how to develop them, the skills needed to become a successful entrepreneur/administrator, good communication, ambition, courage, hardwork, planning, accountability. Organizational skills can be developed by discipline making a system, rules, delegation of power at workplace, etc.

How to enhance employability; skills, why do we need them, different workplaces, having different needs, different skills, how to recognize different work skills.

Unit IV: Decision making

The process of decision making, its steps, what are its basics, what are the basics of organizational decision making process, entrepreneurial decision making, how to make a right decision at right time, dilemma.

Unit V: Interview Skills

Conducting Interviews with Leaders/ Entrepreneurs, Preparing Questions, Interviewing the fellow person, do's & dont's while taking interview.

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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