

**13. Courses of Study and Scheme of Assessment
BE MECHANICAL ENGINEERING (SANDWICH)**

(2019 Regulations)

Course Code	Course Title	Periods / week			Maximum Marks					
		Lecture	Tutorial	Practical	Credits	CA	FE	Total	CAT	
SEMESTER IX										
19	Open Elective II	3	0	0	3	50	50	100	OE	
19M	Professional Elective IV	3	0	0	3	50	50	100	PE	
19M	Professional Elective - V	3	0	0	3	50	50	100	PE	
19M	Professional Elective - VI	3	0	0	3	50	50	100	PE	
19M720	Project Work - I	0	0	4	2	50	50	100	EEC	
19M900	Industrial Training - IX	0	0	10	5*	100	0	100	PC	
Total 16 periods		12	0	4+10	14+5*	350	250	600		
SEMESTER X										
19M820	Project Work - II	0	0	8	4	50	50	100	EEC	
Total 8 periods		0	0	8	4	50	50	100		

* Will be counted for TGPA (Training Grade Point Average) computation

CA Continuous Assessment

FE Final Examination

CAT - Category; BS - Basic Science; HS - Humanities and Social Sciences; ES - Engineering Sciences; PC - Professional Core; PE - Professional Elective; OE - Open Elective; EEC - Employability Enhancement Course; MC – Mandatory Course.

PROFESSIONAL ELECTIVES

Design Stream

- 19M001 Geometric Modeling
- 19M002 Advanced Strength of Materials
- 19M003 Advanced Finite Element Analysis
- 19M004 Failure Analysis and Design
- 19M005 Vibration and Noise Engineering
- 19M006 Mechanical Design of CNC Machine Tools
- 19M007 Theory of Elasticity and Plasticity
- 19M008 Mechanics of Composite Materials
- 19M009 Introduction to Aircraft Systems
- 19M010 System Modeling and Control
- 19M011 Foundation Skills in Integrated Product Development
- 19M012 Design of Automotive Systems
- 19M013 Automobile Engineering

Manufacturing Stream

- 19M026 Manufacture and Inspection of Gears
- 19M027 Pneumatic and Hydraulic Systems
- 19M028 Non-Traditional Machining
- 19M029 Additive Manufacturing
- 19M030 Flexible Manufacturing Systems
- 19M031 Artificial Intelligence and Deep Learning
- 19M032 Solid State Joining Processes
- 19M033 Internet of Things for Mechanical Applications
- 19M034 Production Tooling

Industrial Engineering Stream

- 19M051 Lean Manufacturing
- 19M052 Supply Chain Management
- 19M053 Quality Engineering
- 19M054 Engineering Economics
- 19M055 Enterprise Resource Planning
- 19M056 Six Sigma in Manufacture and Service
- 19M057 Statistical Process Analysis and Optimization
- 19M058 Value Analysis and Value Engineering

Thermal Stream

- 19M076 Computational Fluid Dynamics
- 19M077 Refrigeration and Air Conditioning
- 19M078 Renewable Energy
- 19M079 Solar Energy Conversion Systems
- 19M080 Energy Conservation and Management
- 19M081 Advanced Heat and Mass Transfer
- 19M082 Energy and Climate Change
- 19M083 Power Plant Engineering
- 19M084 Advanced Fluid Dynamics

ONE-CREDIT COURSES

MECHANICAL ENGINEERING

- 19MF01 Simulators for Integrated Products
- 19MF02 Corrosion Science and Engineering
- 19MF03 Non-Destructive Testing of Aircraft Structures
- 19MF04 Cooling of Electronic Equipment
- 19MF05 Experimental Methods in Thermal and Fluid Sciences
- 19MF06 Challenges in Implementing Lean Manufacturing
- 19MF07 Process Engineering and Costing
- 19MF08 Applications of Value Engineering
- 19MF09 Pressure Vessel and Piping
- 19MF10 Design Validation and Qualification: Testing and Evaluation
- 19MF11 High Temperature Materials for Energy Applications
- 19MF12 Nanotechnology for Clean Energy Applications

ENGLISH

- 19GF01 Interpersonal and Organizational Communication
- 19GF02 Human Values through Literature

HUMANITIES

- 19OFA1 Export – Import Practices
- 19OFA2 Insurance - Concepts and Practices
- 19OFA3 Public Finance
- 19OFA4 Security Analysis and Portfolio Management

LANGUAGE ELECTIVES

- 19G001 Communication Skills for Engineers
- 19G002 German- Level A1.1
- 19G003 French Language Level 1
- 19G004 Basic Japanese

Summary of Credit Distribution

BE MECHANICAL ENGINEERING (SANDWICH)												
S. No	Course Category	Credits Per Semester										Total Credits
		1	2	3	4	5	6	7	8	9	10	
1	HS	3	2	0	0	3	0	0	4	0	0	12
2	BS	12	8	3	3	0	0	0	0	0	0	26
3	ES	4	8	4	4	0	3	0	0	0	0	23
4	PC	0+5*	0+5*	14+5*	12+5*	16+5*	15+5*	0+5*	10+5*	0+5*	0	67
5	PE	0	0	0	0	0	0	6	3	9	0	18
6	OE	0	0	0	0	0	3	0	0	3	0	6
7	EEC	0	0+2 [£]	0	1	1	1	0	2	2	4	13
8	MC	-	-	-	-	-	-	-	-	-	-	-
	TOTAL	* 19+5	£* 18+2+5	* 21+5	* 20+5	* 20+5	* 22+5	* 6+5	* 19+5	* 14+5	4	165

£ Summer Term Course(s)

* Will be counted for TGPA (Training Grade Point Average) computation

CAT - Category; BS - Basic Science; HS - Humanities and Social Sciences; ES - Engineering Sciences; PC - Professional Core; PE - Professional Elective; OE - Open Elective; EEC - Employability Enhancement Course; MC – Mandatory Course.

19M100 INDUSTRIAL TRAINING I

0 0 10 5*

MODULE 1 – INTRODUCTION TO INDUSTRIAL ENVIRONMENT AND PRACTICES: Definition of industry, types of industry - product, process, hybrid; Different scales of operations - large, medium, small, tiny; Industry definitions and examples; Organizational structure and various departments, functions within an industry; Equipment and personal industrial safety (general and electrical) and discipline outside industries. [10]

MODULE 2 - FAMILIARIZATION OF MECHANICAL HAND TOOLS: Screw drivers, spanners, pliers, hammers, chisels and wrenches; Dismantling and assembly - CPU, pump, etc. [10]

MODULE 3 - FAMILIARIZATION OF ELECTRICAL AND ELECTRONICS TOOLS: Tester, clamp meter, multi meter, crimper, wire cutter, Philip screw drivers, soldering iron etc; Simple exercises - checking the fuse, junction box wiring, soldering a circuit, crimping of wires and USB socket. [10]

MODULE 4 - FAMILIARIZATION OF CARPENTRY HAND TOOLS: Chisel, mallets, jack planes, mortise gauge, hand saw, etc; Simple exercises - sawing and planning, nailing a wooden box, making of different type of joints, making a table /wooden box/ models. [10]

MODULE 5 - FAMILIARIZATION OF FITTING TOOLS: Files, hacksaw, tri-square, rulers, punches, chisel, etc; Simple exercises - filing, marking, cutting, fitting, forming. [10]

MODULE 6 - FAMILIARIZATION OF MEASURING TOOLS AND INSTRUMENTS: Measuring tape, foot ruler, vernier, micrometer, calipers, bore-dial, gauges, anemometer, hygrometer/sling psychrometer, thermo-couples, pyranometer, etc; Measurement of various pump components, wind speed, humidity, temperature, and radiation. [10]

MODULE 7 - FAMILIARIZATION OF PLUMBING TOOLS: Pipe wrench, threading die, etc; Simple exercises - threading of pipes, construction of water line using GI and PVC fittings etc. [20]

MODULE 8 - FAMILIARIZATION OF FOUNDRY TOOLS: Moulding boxes, board, trowels, riser and sprue pins, vent wires, strike bar, bellows, rammers, etc; Simple exercises - moulding of solid pattern, split pattern, core making, gate, runner and riser cutting, casting of simple component with aluminum etc. [20]

MODULE 9 - FAMILIARIZATION OF CIVIL TOOLS: Trowels, plumb block, water level, spirit level, etc; Simple exercises - making of small model with cement mortar, stacking of bricks as a wall, fabrication of reinforcement structures in MS, etc. [20]

MODULE 10 - CONCEPTS OF BASIC SCIENCE: Hands-on experiments relating to concepts of Basic Physics and Chemistry – Forces, Hooke's Law, Newton's Law, Work Energy Theorem, gyroscope, flow sensors, models mimicking human mechanisms – applications in industry. [20]

MODULE 11 - INDUSTRIAL VISITS: Motor and pump manufacturing, engineering machinery manufacturing and foundry [10]

Total: P: 150

REFERENCES:

1. Module-wise "Industrial Training Manual" prepared by Training Department, PSG Industrial Institute.

19M200 INDUSTRIAL TRAINING II

0 0 10 5*

MODULE 1 – INTRODUCTION TO INDUSTRIAL SAFETY: Procedure, equipment, safety programme, safety standards, OSHA act, first aid and safety symbols. [10]

MODULE 2- DISMANTLING AND ASSEMBLY OF DOMESTIC APPLIANCES - Wet grinder, mixie, electric iron box, fan, etc. [10]

MODULE 3 – EXPOSURE AND HANDS ON EXERCISES ON DOMESTIC ELECTRICAL WIRING - Tube light fitting, two-way switch, fan and regulator, motor starter, etc. [10]

MODULE 4 – HANDS ON EXERCISES ON ELECTRONIC COMPONENTS: PC boards, bread boards, gates, microprocessors and other electronic components. [20]

MODULE 5 - DISMANTLING AND ASSEMBLY OF HYDRAULIC COMPONENTS - Water taps, flush tanks, hand pump and gear pump, valves, etc. [20]

MODULE 6 - HANDS ON EXERCISES ON ROTATING MACHINES – MONOBLOCK PUMPS - Winding, assembly, stator and rotor fabrication, inspection, painting, testing, balancing, and machining etc. [10]

MODULE 7 - HANDS ON EXERCISES ON ROTATING MACHINES – SUBMERSIBLE PUMPS - Winding, assembly, stator and rotor fabrication, inspection, painting, testing, balancing, and machining etc. [10]

MODULE 8 - HANDS ON EXERCISES – BASIC FOUNDRY PRACTICES – Understanding of fundamental Foundry processes and practices – melting, pouring, pattern-making, machining, testing and inspection. [10]

MODULE 9 - HANDS ON EXERCISES - BASIC LATHE ASSEMBLY – Headstock, tailstock, apron and feedbox, gearbox assembly. [10]

MODULE 10 – BASIC SCIENCE CONCEPTS: Hands-on experiments with wireless sensors – acceleration, pressure, light, current, voltage, heart rate, conductivity, spirometer, CO₂, O₂ - applications in Industry. [20]

MODULE 11 – INDUSTRIAL VISITS TO VARIOUS PROCESS INDUSTRIES [20]

Total: P: 150

REFERENCES:

1. Module-wise “Industrial Training Manual” prepared by Training Department, PSG Industrial Institute.

19M300 INDUSTRIAL TRAINING III

0 0 10 5

MODULE 1 - POWER TRANSMISSION SYSTEMS I: Exposure to different modes of power transmission using V-belt and flat belt, rope, chain and sprocket, etc.; Development of schematic diagrams and models for typical applications. (10)

MODULE 2 - POWER TRANSMISSION SYSTEMS II: Familiarization of gear drive systems comprising spur gears, helical gears, bevel gears, worm and worm wheel and rack and pinion; Development of schematic diagrams and models for typical applications such as speedometer, wall clock mechanism, etc. (20)

MODULE 3 - MECHANISMS: Hands-on exercises on building replica of machines, mechanisms, bridges, and vehicles using miniature assembly kits, foam, wood, etc. (20)

MODULE 4 - SHEETMETAL WORKING: Familiarization of sheet metal tools and processes; Making of simple sheet metal objects like dust pan, measuring jar, coin bank, etc. taking into consideration aesthetic, safety and ergonomic design aspects. (10)

MODULE 5 - WELDING I: Familiarization of welding tools and welded joints; Fabrication of simple objects like letter shapes, desk stand, window frame, ladder, etc. (20)

MODULE 6 - MACHINING: Hands-on exercises on machining of industrial components using operations like facing, plain turning, step turning, taper turning, chamfering, grooving, drilling, reaming, tapping, counter boring, countersinking, etc. (20)

MODULE 7 - METROLOGY: Measurement of geometrical parameters such as straightness, flatness, angularity and perpendicularity; Measurement of surface roughness; Calibration of instruments using slip gauges, CMM (coordinate measuring machine). (10)

MODULE 8 - ELECTRONIC CIRCUITS II: Assembly of simple electronic components like electronic doorbell, digital clock, electronic horn, water level indicator, etc. (20)

MODULE 9 - eLEARNING USING DIGITAL RESOURCE: Online manufacturing related certification modules on engineering drawing, joining processes, safety, and electrical systems. (10)

MODULE 10 - INDUSTRIAL VISITS: Visit to various process industries associated with food, milk, textiles etc. (10)

Total: P: 150

REFERENCES:

2. Sharma PC, “Machine Tools and Tool Design”, S. Chand & Company, 2004.
3. Faculty of Mechanical Engineering, PSG College of Technology, “Design Data”, Kalaikathir Achchagam, 2019.
4. HMT, “Production Technology”, Tata McGraw-Hill Ltd., 2009.
5. Daniel E Puncochar Ken Evans, “Interpretation of Geometric Dimensioning and Tolerancing”, Industrial Press, 2011.

19M400 INDUSTRIAL TRAINING IV

0 0 10 5

MODULE 1 – PREPARATION OF PROCESS CHART: Interpretation of production drawings, identification of part features and their corresponding manufacturing processes, tooling and inspection gauges; preparation of process chart. (10)

MODULE 2 – PREPARATION OF PRODUCTION DRAWING I: Creation of geometric models based on 2D drawings; Assigning limits, fits and tolerances, and surface finish based on the specified functional requirements; Preparation of production drawing using modeling software. (20)

MODULE 3 – MACHINING USING SPECIAL PURPOSE MACHINES: Introduction to jigs, fixtures, work and tool holding equipment; Hands-on exercises on machining typical engineering components using milling, grinding and shaping operations. (20)

MODULE 4 – CNC PART PROGRAMMING I: Generation of CNC codes for a given part using manual programming and automated programming using CAM software, and cycle time estimation. (20)

MODULE 5 – ADDITIVE MANUFACTURING TECHNIQUES: Building prototype models using additive manufacturing techniques (10)

MODULE 6 – WELDING II: Familiarization of MIG and TIG welding techniques, fabrication of components and assemblies (10)

MODULE 7 – DISMANTLING AND ASSEMBLY I: Dismantling and assembly of machine sub-assemblies like headstock, tailstock, apron box, thread and feed gear box. (10)

MODULE 8 – DISMANTLING AND ASSEMBLY II: Dismantling and assembly of automotive vehicles-two wheeler and BAJA vehicles (20)

MODULE 9 – METALLURGICAL AND NON-DESTRUCTIVE TESTING: Microstructure study on spheroidal graphite and steel castings; Hardness testing of various materials such as mild steel, cast iron, aluminium, brass, bronze, rubber and plastics; Ultrasonic, magnetic particle and die penetrant testing on shafts. (10)

MODULE 10 – eLEARNING USING DIGITAL RESOURCE: Online manufacturing related certification modules on machining, casting, heat treatment, plating, etc. (10)

MODULE 11 – INDUSTRIAL VISITS: Visit to various process industries such as cement, paper, automated foundries, dyeing industries (10)

Total: P: 150

REFERENCES:

1. Daniel E Puncocchar, Ken Evans, "Interpretation of Geometric Dimensioning and Tolerancing" Industrial Press,2011.
2. Hoffman EG, "Jigs and Fixtures Design", Thomson Learning,2005.
3. Pham D T, Dimov SS, "Rapid manufacturing", The technologies and applications of rapid prototyping", Springer-Verlag,2001.
4. Little R L, "Welding and Welding Technology", Tata McGraw Hill, New Delhi, 2004.

19M500 INDUSTRIAL TRAINING V

0 0 10 5

MODULE 1 - DEVELOPMENT OF FREE HAND DRAWINGS: Free hand sketching of orthographic views and sectional views of the parts of a typical assembly like pump assembly; Dimensioning the sketches after measurement of size of the features of the part and assembly. (10)

MODULE 2 – DEVELOPMENT OF GEOMETRIC MODELS: Conversion of free hand sketches of the selected assembly into geometric models using any solid modeling software; Preparation of bill of materials (20)

MODULE 3 – PREPARATION OF PRODUCTION DRAWING II: Identification of fits and tolerances based on the application of the selected assembly; Determination of dimensional and geometrical tolerances, and surface finish for the part features (10)

MODULE 4 – PROCESS PLANNING AND COST ESTIMATION: Identification of suitable manufacturing processes for various parts of the selected assembly; Preparation of process plans that highlight necessary tooling, spindle speeds and feeds; Cost estimation of parts and assembly (20)

MODULE 5 – MACHINING TIME CALCULATION – Estimation of machining time for various parts of the selected assembly; Preparation of PERT/CPM charts (10)

MODULE 6 – CNC PART PROGRAMMING II: Manual part programming for simple parts; Generation of part programs for complex parts of the selected assembly using CAM software; Cycle time analysis (10)

MODULE 7 – SHEET METAL MODELING– Basics of sheet metal fabrication; Introduction to any one sheet metal modeling software; Design and modeling of sheet metal components for automotive, aerospace and naval applications (20)

MODULE 8 – FAMILIARIZATION OF SENSORS AND IOT: Familiarization of types of sensors,signal amplifiers, A/D and D/A converters used in engineering applications; Measurement and control of parameters of equipment such as fan, motor, air-conditioner, etc., through mobile phone/internet (20)

MODULE 9 – eLEARNING USING DIGITAL RESOURCE: Learning and assessment through on–line manufacturing engineering related certification modules on metal forming, polymer processing, Industry 4.0 and additive manufacturing (20)

MODULE 10– INDUSTRIAL VISITS: Visit to industries such as foundries with modern equipment, industries with automated production lines, etc (10)

Total: P: 150

REFERENCES:

1. Kevin Otto, Kristin Wood, "Product Design: Techniques in Reverse Engineering and New Product Development", Pearson education, 2006.
2. James D Meadows," Geometric Dimensioning and Tolerancing", Marcel Dekkar, 2010.

3. Peter Smid, "CNC Programming Handbook", Industrial Press, Inc, 2007
4. ASME, "Manufacturing Planning and Estimation – Hand book", McGraw Hill, New York

19M600 INDUSTRIAL TRAINING VI

0 0 10 5

MODULE 1 – MATERIAL PROCUREMENT: Procurement of raw materials as per the bill of materials prepared for the assembly selected during **Industrial Training V (MODULES 1 to 6)**. (10)

MODULE 2 – MANUFACTURE OF PARTS: Manufacture of the parts as per the process plans for the selected assembly using conventional and CNC machines. (90)

MODULE 3 – ASSEMBLY OF PARTS: Assembly of mechanical, electrical and electronic parts; Inspection of the assembly to ascertain the fits and tolerances; Painting / coating of parts. (30)

MODULE 4 – PERFORMANCE TESTING: Testing of the completed assembly to evaluate the performance. (10)

MODULE 5 – eLEARNING USING DIGITAL RESOURCE: Learning and assessment through on-line manufacturing engineering related certification modules on engine, compressor, axles, bearing and oil seal, brake, tire, mechanical power transmission (10)

MODULE 6 – INDUSTRIAL VISIT: Visit to industries involved in the manufacture of agricultural equipment, stone crusher, etc (10)

Total: P: 150

REFERENCES:

1. Harry Peck, "Designing for manufacturing", Pitman Publications, 1983.
2. Igor Karassik, Joseph Messina, Paul Cooper, Charles Heald, "Pump Handbook", McGraw Hill Professional, 2000.
3. Robert Matousek, "Engineering Design", London Blackie & Son (India) Ltd., 1974
4. K.C. John, "Machine Drawing", PHI Learning Pvt. Ltd., 2009

19M700 INDUSTRIAL TRAINING VII

0 0 10 5

EXTERNAL INTERNSHIP – Internship at a suitable manufacturing industry and / or university within India or overseas as per the timeline indicated in the scheme of syllabus. (150)

Norms and guidelines for internship:

The students of seventh semester will undergo Internship as detailed below.

No. of working hours - 8 hours per day or as instructed by the industry; students will strictly follow the industry norms and timings.

During the course of internship, students will study the following with respect to the industry, with specific emphasis on work allocation as provided by the Industry supervisor: Industry profile, product range, catalogue, infrastructure, turnover, labor force, industrial structure, location, layout, ISO9000 and other standards, product development, manufacturing and material handling systems, and quality systems.

Evaluation of students' performance during the internship will be carried out through faculty visit to industry, presentation, viva-voce and technical report.

Students will identify the scope for future assignments which could be extended as projects.

Total: P: 150

REFERENCES:

As this is an industry-oriented course, students will be governed by the regulations of the industry they are assigned to, and hence no specific reference books are prescribed.

19M800 INDUSTRIAL TRAINING VIII

0 0 10 5

MODULE 1 - OVERVIEW OF NEW PRODUCT DEVELOPMENT (NPD): Overview of NPD process structure, NPD models, fuzzy front-end (FFE), product design, product implementation, fuzzy back-end, Intellectual property rights. (10)

MODULE 2 - CONCEPTUALIZATION OF NOVEL IDEA/PRODUCT: Conceptual design, performing design sensitivity analysis, idea screening and evaluation, 5s, SWOT analysis; Conceptualization of a novel idea/product. (10)

MODULE 3 - DETAILED DESIGN: Design of the product/system–development of geometrical models of parts/assemblies, calculation

of mechanical loads, loads on individual parts using free body diagrams, material selection, functional simulation of product/assembly, design for sustainability, ergonomics and aesthetics, development of production drawing. (50)

MODULE 4 - FABRICATION AND TESTING: Fabrication of the product / assembly, testing and refinements. (60)

MODULE 5 - INDUSTRIAL VISIT: Visit to industries involved in non-traditional machining, sheet metal process, composite material product manufacturing, etc. (10)

MODULE 6 – eLEARNING USING DIGITAL RESOURCE: On-line manufacturing related certification modules in areas of gear, belt, transmission, quality and business excellence. (10)

Product should be exhibited and demonstrated at the end of the semester

Total: P: 150

REFERENCES:

1. Kevin Otto, Kristin Wood, " Product Design: Techniques in reverse engineering and new product development", Pearson education, 2006.
2. Karl T.Ulrich, Steven D.Eppinger, "Product Design and Development", Tata McGraw Hill, New Delhi, 2016
3. Michael Asbhy "Material selection in Mechanical Design" Butterworth-Heinemann, 2016
4. Kenneth B. Kahn, "The PDMA handbook of New product development", John Wiley & sons, Inc, 2013

19M900 INDUSTRIAL TRAINING IX

0 0 10 5

MODULE 1 – ENVIRONMENTAL AND SOCIETAL IMPACT OF INDUSTRY: Corporate social responsibility relevant to an industry, societal and environmental issues relating to industry and their possible solutions; regional, state, national and global statistics relating to manufacturing and industry. (20)

MODULE 2 – PREPARATION OF INDUSTRY ANNUAL REPORT: Factors and parameters relating to various aspects of industry, and preparation of an industry annual report. (10)

MODULE 3 – INDUSTRIAL STATUTES AND GOVERNANCE: Governance aspects of an industry, wages and salary administration, welfare benefits - ESI, PF, bonus, incentive schemes; statutes and labor law, standing orders, disciplinary action and domestic enquiry, negotiations with unions on wages and bonus, representation before tribunals, labor court; training and development, career planning and performance appraisals, rewards and incentive schemes, counselling and attrition planning, exit interviews, pollution norms and workmen's compensation act. (20)

MODULE 4 – INDUSTRY OPERATIONS AND FINANCIAL INDICES: Industry operational parameters and indices, financial performance indicators, assets and capital management, balance sheets and annual reports, pollution compliance reports (10)

MODULE 5 – ENTREPRENEURIAL SKILL: Entrepreneurial competencies, creative and idea generation, out of the box thinking, spin-off and knowledge transfer, fund generation, government norms and support for entrepreneurs, Intellectual property rights (20)

MODULE 6 – SALES: Identification of prospective buyers, handling objections, competition management sales forecasting, planning and analysis– on field sales of products in campus and nearby. (20)

MODULE 7 – MARKETING: Preparation of brochures and promotional materials, online marketing of a product, lead generation for sales team. (10)

MODULE 8 – INDUSTRIAL ENGINEERING: Design of experiments, statistical data analysis and hypothesis testing, inventory analysis, manufacturing systems simulation, line balancing of systems, poka-yoke, radio frequency identification techniques. (30)

MODULE 9 – INDUSTRIAL VISIT: Visit to specific theme oriented industry, sales and marketing departments in industries (10)

Total: P: 150

REFERENCES:

1. R.K.Jain, Sunil S.Rao, "Industrial Safety, Health and Environment Management Systems", Khanna Publishers, 2000
2. Taxmann, Labour Laws, Taxmann's Store, 2019
3. James Riggs, David Bedworth, Sabah Randhawa, "Engineering Economics", 4th edition, Tata McGraw Hill, 2004
4. Nandan H., "Fundamentals of Entrepreneurship", Prentice Hall India, New Delhi, 2013