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SEMESTER V

COURSE CODE	CATEGORY	COURSE NAME	TEACHING & EVALUATION SCHEME								
							THEORY			PRACTICAL	
			L	T	P	CREDITS	END SEM University Exam	Two Term Exam	Teachers Assessment*	END SEM University Exam	Teachers Assessment*
BTAU501	DCS	SUPPLY CHAIN MANAGEMENT AND OR	3	0	0	3	60	20	20	0	0

Legends: **L** - Lecture; **T** - Tutorial/Teacher Guided Student Activity; **P** – Practical; C - Credit;
***Teacher Assessment** shall be based following components: Quiz/Assignment/ Project/Participation in Class, given that no component shall exceed more than 10 marks.

Course Educational Objectives (CEOs):

This course provides a fundamental understanding of (A) Supply chain management (B) linear programming, assignment models and transportation model (C) Network model and waiting line models.

Course Outcomes (COs):

After completion of this course the students will be able to describe the followings:

1. Students will be able to understand & describe supply chain, inventory management and supply chain integration.
2. Students will be able to solve linear-programming problems.
3. Students will be able to solve assignment and transportation problems.
4. Students will be able to do network analysis and waiting line problems.

Syllabus

Unit-I

Supply Chain: Introduction, Fundamentals of Supply Chain and Importance; Development of SCM concepts and Supply chain strategy; Strategic Supply Chain Management and Key components; Internal and External drivers for automobile industries, Key issues (National and International) for automotive industries.

Unit-II

Supply Chain Inventory Management: Economic Order quantity Models; Recorder Point Models, Multichannel Inventory systems; Supply chain Facilities Layout, Capacity Planning. Inventory optimization; Dynamic Routing and Scheduling, Demand forecasting.
SC Integration: Push, pull and push-pull systems; SC strategies; direct shipment, cross-docking trans-shipment; centralized versus decentralized control, central versus local facilities.

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Unit-III

Introduction: History and development of Operations Research; Scientific Methods, Characteristics, Scope, Models in Operations Research,

Linear Programming: Formulation, graphical methods, simplex method, Big- M- method.

Unit-IV

Linear programming models:

Assignment Models: Definition, Mathematical Representation, Formulation and Solution, Alternate optimal solution.

Transportation Models: Definition, Formulation and solution, Alternate optimal solution, Stepping stone method, Modified distribution (MODI) or u-v method.

Loading, unloading operations and queuing processes in automotive industries.

Unit-V

Network Analysis: Network diagram, Time estimation; Basic steps in PERT and CPM, PERT computation, CPM computation, critical path, Float, Cost analysis, crashing the network.

Waiting Line Model: Introduction, classification, state in queue; probability distribution of arrival and service times; Single server model (M/M/I), multiple server models (MMS); Birth and death process.

Reference Books:

1. *"Textbook of Logistics and Supply Chain Management" by D. K. Agrawal, Macmilan, 2003.*
2. *"Fundamentals of Supply Chain Management: Twelve Drivers of Competitive Advantage" by John T. Mentzer, SAGE Publications, 2004.*
3. *"Operations Research" by Tasha Hamady 7th edition, (USA: Macmillan Publishing Company), 2003.*
4. *"Operations Research" by Perm Kumar Gupta,Dr. D.S Hira, S.Chand publication, 2010.*
5. *"Operations Research" by Tasha, Tata McGraw Hill, 2002.*
6. *"Operations Research" by Wagner, PHI. New Delhi, 2003.*
7. *"Operations Research" by Ravi dram & Philips, Tata McGraw Hill, 2005.*
8. *"Operations Research" by Gupta & Hira, S. Chand., 2008.*

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COURSE CODE	CATEGORY	COURSE NAME	TEACHING & EVALUATION SCHEME								
							THEORY			PRACTICAL	
			L	T	P	CREDITS	END SEM University Exam	Two Term Exam	Teachers Assessment*	END SEM University Exam	Teachers Assessment*
BTME502	DCS	METROLOGY AND MECHANICAL MEASUREMENT	2	1	2	4	60	20	20	30	20

Legends: **L** - Lecture; **T** - Tutorial/Teacher Guided Student Activity; **P** – Practical; C - Credit;
***Teacher Assessment** shall be based following components: Quiz/Assignment/ Project/Participation in Class, given that no component shall exceed more than 10 marks.

Course Educational Objectives (CEOs)

To introduce basic principles and applications of (A)Metrology and Inspection (B)Linear and angular, force, torque and temperature measurements, (C) Displacement, Velocity/Speed, and Acceleration, Measurement, (D)metrology of screw threads and gears.

Course Outcomes (COs)

The theory should be taught and practical should be carried out in such a manner that students are able to acquire different learning outcomes in cognitive, psychomotor and affective domain to demonstrate following course outcomes.

1. Students will describe basic concepts of Metrology
2. Students will select linear measuring instrument for measurement of various components
3. Students will select angular and taper measurement devices for measurement of various components
4. Students will select appropriate temperature measuring device for various applications
5. Students will describe methods of measurement for various quantities like force, torque, power, displacement, velocity/seed and acceleration
6. Students will be able to describe the metrology of screw threads and gears.

Syllabus

Unit - I

General concepts of measurement: Definition, standards of measurement, errors in measurement; limit-gauging, various systems of limits, fits and tolerance, interchangeability; ISI and ISO system. Basic principles and design of standards of measuring gauges, types of gauges and their design, accuracy and precision, calibration of instruments; principles of light interference, interferometer, measurement and calibration.

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Unit – II

Linear and angular measurements: Slip gauges, micrometers, Vernier's, dial gauges, surface plates; Comparators- mechanical, electrical, pneumatic and optical comparator; angular measuring instruments- sine bar, angle gauges, spirit level, autocollimators, clinometers; measurement of straightness, flatness and squareness.

Measurement of surface finish: Surface finish- definitions, types of surface texture, surface roughness measurement methods, comparison, profile-meters, pneumatic and replica, measurement of run out and concentricity.

Unit –III

Metrology of screw threads and gears: internal/external screw thread, terminology, measurement of various elements of threads, thread micrometer method, two wire and three wire methods; gear terminology, measurement of various elements, constant chord method, base tangent method, plug method; gear tester, gear tooth measurement; rolling gear tester.

Unit – IV

Temperature Measurement: Temperature standards, Temperature scales; Thermometry based on thermal expansion, Liquid in glass thermometers, Bimetallic Thermometers, Electrical resistance thermometry, Resistance Temperature Detectors; Thermistors, Thermoelectric Temperature Measurement, Temperature measurement with thermocouples, thermocouple standards.

Pressure and Velocity Measurement: Relative pressure scales, pressure reference instruments; barometer, manometer, deadweight tester, pressure gauges and transducers; total and static pressure measurement in moving fluids.

Unit-V

Strain Measurement: Stress and strain, resistance strain gauges, gauge factor; strain gauge electrical circuits, multiple Gauge Bridge, bridge constant, apparent strain and temperature compensation, bending compensation.

Force measurement: Load cells, piezoelectric load cells.

Torque measurement: Measurement of torque on rotating shafts; Power estimation from rotational speed and torque.

Reference books:

1. *"Elements of Workshop Technology" by Hajra Choudhury, Vol.II. Media Promoters,1986*
2. *"Manufacturing Technology - Metal Cutting and Machine Tools" by Rao. P.N, Tata McGraw-Hill, New Delhi, 2003.*
3. *"Machine Tool Practices" by Richerd R Kibbe, John E. Neely, Roland O. Merges and Warren J.White, Prentice Hall of India, 1998.*
4. *"Fundamentals of Metal Machining and Machine Tools" by Geofrey Boothroyd, Mc Graw Hill, 1984.*

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5. *"Process and Materials of Manufacture" by Roy. A. Lindberg, Fourth Edition, PHI/Pearson Education 2006.*
6. *"Engineering metrology and instrumentation" by Rajput R.K, Kataria&sons publishers, 2009*
7. *"A text book of engineering metrology" by Gupta. I.C., Dhanpat rai and sons, 2006.*

List of Experiments

1. To Measure the angle using Sine bar.
2. To study and use of Vernier's, micrometer and dial gauges
3. To study Performance on surface measurements
4. To study Measurement of straightness, flatness and squareness
5. To study Measurements of Surface roughness using Mechanical Comparator.
6. To study Performance on linear and angular measurements and check different characteristics of measurements.
7. To study Performance on Temperature measurements and check different characteristics of measurements and also do calibration.
8. To study Performance on Stress, strain and force measurements and check different characteristics of measurements and also do calibration.
9. To study Performance on Speed/Velocity, acceleration measurements.
10. To study Measurement of screw threads by one wire and two wire.

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							THEORY			PRACTICAL	
			L	T	P	CREDITS	END SEM University Exam	Two Term Exam	Teachers Assessment*	END SEM University Exam	Teachers Assessment*
BTAU503	DCS	AUTOMOTIVE TRANSMISSION SYSTEM	3	1	2	5	60	20	20	30	20

Legends: **L** - Lecture; **T** - Tutorial/Teacher Guided Student Activity; **P** – Practical; C - Credit;
***Teacher Assessment** shall be based following components: Quiz/Assignment/ Project/Participation in Class, given that no component shall exceed more than 10 marks.

Course Educational Objectives (CEOs)

This course provides a fundamental understanding (A) To develop the basic knowledge of the students in mechanics torque conversion areas(B)To develop the skills of the Students in the areas of alternative drives and concepts (C)To develop the basics of the students in the field of transmission system of the vehicle.

Course Outcomes (COs)

After completion of this course the students are expected to be able to demonstrate following knowledge, skills and attitudes

1. Students would be able to understand the working principle of the transmission system components.
2. Students would be able to understand the different types of clutches, gearboxes, driveline and final drive and its application.
3. Students would be able to understand about the multi stage and poly-phase torque converters and their performance characteristics.
4. Students would be able to understand about Automatic transmission.

Syllabus

Unit - I

Transmission Requirements: Requirements of transmission system; general arrangement of power transmission; general arrangement of rear engine vehicle with live axles, general Arrangement of dead axle and axles transmission; four wheel drive transmission.

Unit – II

Clutches: Introduction, Types of clutches; Materials requirement for designing of clutches; working and principle of cone clutch, single plate, diaphragm spring, multiline, centrifugal, over running and free electromagnetic clutch.
Gear box: Need of gear boxes; types of gear boxes: sliding mesh, constant mesh, epicyclic gear boxes, synchronizers: principle, early and later Warner synchronizer, Vauxhall synchronizer gear materials lubrication and design of gear box.

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Unit - III

Fluid coupling: Principle of operation, Construction details, Torque capacity, Performance characteristics, Problems on design, Reduction of drag torque.

Torque converter: Principle of operation, Constructional details, Performance characteristics; Converter coupling, Construction, Free wheel, Characteristic performance.

Unit - IV

Automatic Transmission & Application of Automatic Transmission: Principle of working of Epicyclic gear train; Construction and working principle of FordT model gear box, Wilson gear box, construction, working and derivation of gear ratios; Octal electromagnetic transmission; Automatic over-drive; Hydraulic control system for automatic transmission. Chevrolet Automatic transmission, Turbo glide transmission, Power glide transmission, Toyota "ECT-I" (Automatic transmission with intelligent electronic control systems) - Mercedes Benz automatic transmission; Hydraulic clutch actuation system for automatic transmission.

Unit-V

Hydrostatic drives: Advantages and disadvantages; principles of hydrostatic drive systems, construction and working of typical hydrostatic drives; Janney Hydrostatic drive.

Electrical drives: Advantages and limitations, principles of Ward Leonard system of control Modern electric drive for buses and performance characteristics.

Reference Books:

1. *"Torque converters", by Heldt P.M; Publisher; Chilton Book Co., 4th ed., 1951.*
2. *"Motor Vehicles", by Newton, Steeds & Garret; Publisher: B.H. Publication, 2000.*
3. *"Modern Transmission Systems", by Judge, A.W., Publisher: Chapman& Hall Ltd, 1969.*
4. *"Automatic Transmission", by Check Chart; Publisher: Harper & Row Publication, 1973.*
5. *"Automobile Engineering" Vol. 1, by Dr. Kripal Singh; Publisher: Standard Publishers Distributors, 2017.*

List of Experiments

1. Demonstration of garage, garage equipment'sand tools, preparation of different garage layout.
2. Demonstration of washing & greasing of vehicle.
3. Engine oil change & periodic maintenance of vehicle.
4. Dismantling & assembly of Clutch (light / heavy duty vehicle).
5. Dismantling & assembly of Constant mesh gearbox and synchromesh gearbox.
6. Dismantling & assembly of Drive line (universal joint, propeller shaft, and slip joint).

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7. Dismantling & assembly Final drive & differential.
8. Rear axle hub greasing.
9. Dismantling & assembly of automatic transmission.
10. Dismantling & assembly of fluid flywheel & torque converter.

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							THEORY			PRACTICAL	
			L	T	P	CREDITS	END SEM University Exam	Two Term Exam	Teachers Assessment*	END SEM University Exam	Teachers Assessment*
BTAU504	DCS	MANUFACTURING TECHNOLOGY	3	0	2	4	60	20	20	30	20

Legends: **L** - Lecture; **T** - Tutorial/Teacher Guided Student Activity; **P** – Practical; C - Credit;
***Teacher Assessment** shall be based following components: Quiz/Assignment/ Project/Participation in Class, given that no component shall exceed more than 10 marks.

Course Objectives:-
The primary objective of the course is to describe the (A) Unconventional machining processes, Jigs and Fixtures (B) Gear manufacturing, (C) Group technology and flexible manufacturing system, (D) Computer integrated manufacturing.

Course Outcomes:-
After completion of this course the students will be able to describe the followings:

1. Students will be able to understand & describe concepts of unconventional machining process.
2. Students will be able to describe Jigs and fixtures and its uses.
3. Students will be able to describe the principles of gear manufacturing and its nomenclature.
4. Students will be able to understand the working principles Group technology and flexible manufacturing system.
5. Students will be able to understand the concepts of computer integrated manufacturing.

Syllabus

Unit-I
Unconventional machining processes: Need for unconventional processes; Classifications of Unconventional Manufacturing Processes; Construction and working principal of unconventional machining processes such as USM, WJM, AJM, Chemical Machining, Electrolytic Grinding, EDM, LBM, EBM, Plasma Arc Cutting etc. and applications & limitations.

Unit-II
Jigs and Fixtures:
Definition, Principles of location, locating method and devices; principles of clamping, clamping devices; drilling jigs and its types; drill bushes, fixture and economics; types of fixture; milling, grinding, broaching, assembly fixtures indexing jig and fixtures, indexing devices.

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Unit-III

Gear Manufacturing

Types of gears; nomenclature of spur and helical gears; Gear generating and forming processes: concept, differences and applications, working and application of gear milling, gear hobbing and gear shaping machines; Nomenclature of gear hob and gear shaping cutter; Gear Cutting parameters for commonly used materials and work-piece; Gear finishing processes- shaving & grinding.

Unit-IV:

Flexible Manufacturing System: definition, types of FMS and applications; concept of flexibility, need of flexibility, types of flexibilities and its measurement; economic justification for FMS; Functional requirements for FMS equipments.

Unit-V

Group Technology: GT concept, advantages of GT; part family formation-coding and classification Systems; part-machine group analysis; Production flow analysis; Methods for cell formation; FMS related problem and Solution Methodology.

Reference Book:

1. *"Workshop Technology" by W. A. J. Chapman part I, II & III, 5th ed., 2001.*
2. *"Automation, Production System & Computer Integrated Manufacturing" by Mikell P. Groover, Prentice Hall, 2008.*
3. *"Manufacturing Technology" by P. N. Rao, Vol. 1 and 2, 2018.*
4. *"Fundamentals of Machining and Machine Tools" by D.G. Boothroy and W.A. Knight, Marcel Dekker, NY, 2007.*
5. *"Metal Cutting Theory and Practice" by Bhattacharya, New Central Book Agency, 2000.*
6. *"Fundamentals of Metal Cutting and Machine Tools" by B.L. Juneja and G.S. Sekhon, New Age International, 2003.*
7. *"Principles of Metal Cutting" by G. Kuppuswamy, Universities Press, 1996.*
8. *"Metal forming-Fundamentals and Applications" by T Altan, Soo-Ik-Oh and H.L. Gegel, American Society of Metals,* Metal Park, 1983
9. *"Metal cutting Theory & Cutting Tool Designing" by V. Arshinov, G Alekseev, 1970.*
10. *"Elements of Workshop Technology" by Hazra Chaudhary Vol I, II, 12th ed., 2007.*

List of Experiments:

1. Explain working principles and working parameters of non-conventional machining methods.
2. To study various Non-traditional Machining processes
3. Study and experimentation with EDM
4. Study and experimentation with plasma arc cutting
5. To study various types of jigs used in production.
6. To study various types of fixtures used in production
7. Describe constructional features and working of various gear manufacturing machines

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8. Explain procedural steps for producing accurate gears using gear milling machines
9. Explain procedural steps for producing accurate gears using gear hobbing machines
10. Explain procedural steps for producing accurate gears using gear shaping machines.
11. Describe the working principal of group technology system and its application.
12. Describe the working principal of Flexible manufacturing systems and its application.
13. To study of Computer integrated manufacturing.

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							THEORY			PRACTICAL	
			L	T	P	CREDITS	END SEM University Exam	Two Term Exam	Teachers Assessment*	END SEM University Exam	Teachers Assessment*
BTME505	DCS	CAD CAM CIM	2	1	4	5	60	20	20	30	20

Legends: **L** - Lecture; **T** - Tutorial/Teacher Guided Student Activity; **P** – Practical; C - Credit;
***Teacher Assessment** shall be based following components: Quiz/Assignment/ Project/Participation in Class, given that no component shall exceed more than 10 marks.

Course Educational Objectives (CEOs):

This course provides a fundamental understanding of (A)The Design concepts with the help of computer Application (B) Comprehensive Knowledge of computer applications including geometric, Modeling, Assemblies and Manufacturing.

Course Outcomes (COs):

After completion of this course the students are expected to be able to demonstrate following knowledge, skills and attitudes

1. Student will be able to understand the various Design concepts with the help of computer application.
2. Students would be able to get familiarized with the computer graphics application in design and understand the basic 2D & 3D commands of CAD and distinguish the CAD from manual paper drafting, in current industrial & product development scenarios.
3. Students would be able to understand the Solid and Assembly modeling tools to develop virtual product and part programming for manufacturing in various experiments & real life.
4. Students will be able to acquire knowledge of the applications of computers in design and manufacturing of real world product.

Syllabus

Unit – I

Introduction: Introduction to CAD , Why CAD Software ,Scope, objective, benefit , limitation & evaluation, Engineering Design process, Considerations, Formulation Importance, Regulatory and social issues in Indian context, Conceptual Design, Product Design Cycle, Total life cycle, Digital Prototyping, Information requirements of mfg organizations; business forecasting and aggregate production plan; MPS, MRP and Production Activity Control (PAC), introduction of CAD, CAE, CAM, CAP, CAPP, CATD and CAQ.

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Unit – II

Graphics Fundamentals & Standards: Definition, Software configuration of a Graphic system, Functions of a Graphics package; CAD Interface, Coordinate system, Creating Basic Drawings, Creating Additional Drawing Objects, Altering Objects; Drawing Organization and Inquiry Commands, Modify and Manipulating Objects, Construction and Reference Geometry, Hatching Objects, Utility Commands, Layers& Blocks, Text, Table & Dimensions, Introducing Printing, Plotting, and Layouts.

Database for graphic modeling; PDM, PIM, EDM; define EDM, features of EDM need for CAD data standardization, data exchange formats; GKS, PHIGS, CORE, IGES, DXF STEP DMIS AND VDI; ISO standard for data exchange.

Unit – III

Geometric Modeling & Assembly: Introduction to Geometric Modeling, Types of models, Construction of 3D Solid Primitives, Create 3D Solids from Objects, Extrude, Revolve, Sweep, Loft , Combine or Slice 3D Objects, Move Rotate & Scale 3D Objects, Object Sectioning, Save and Publish Section Objects Wire frame Models, Wire frame Entities, Curve Representation.

Assembly Modeling, Mating conditions, Generation of assembling sequences, basics of boundary presentation- Spline, Bezier, B-Spline, and NURBS; Sculpture and Ruled surfaces, Precedence diagram, Liaison-sequence analysis. Mechanical tolerance: Tolerance concepts, Geometric tolerance, Types of geometric tolerances, Location tolerances, drafting practices in dimensioning and Tolerance, Tolerance Analysis.

Unit – IV

Computer-Aided Manufacturing & Part Programming: Computer-Aided Manufacturing, Computer Applications in a Manufacturing Plant; Key Aspects of CAM in a Manufacturing System and Manufacturing Control; G Code & M Code generation through CAD CAM software, Feature Technology; NC, DNC, CNC; Programmed Automations; Machine control unit, Part program, NC tooling. NC machine tools; Nomenclature of NC machine axes, Types of NC machine tools, Machining centers, Automatic tool changes (ATC), Turning centers; ISO codes for turning tools and holders; ATC, modular work holding and pallets; time and power estimation in milling, drilling and turning; adaptive control, sequence control and PLC; simple part programming examples.

Unit-V

Computer Integrated Manufacturing & Group Technology: Introduction to CIM, Scope of Computer integrated Manufacturing, CIM Wheel; Types of Manufacturing systems; Machine tools and related equipment; Material handling systems; Computer control systems; FMS. Importance of batch and job shop production; merits of converting zigzag process layout flow to smooth flow in cellular layout, Production Flow Analysis (PFA) and clustering methods; concept of part families and coding; hierarchical, attribute and hybrid coding; OPITZ, MICLASS and DCLASS coding; FMS; material handling robots, Computer Aided Process Planning (CAPP).

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Reference Books:

1. *"CAD/CAM/CIM" by P. Radhakrishnan, Subramanian S and Raju V; New Age Pub., 2008.*
2. *"Principles of CIM", by S. Kant Vajpay; PHI, 1995.*
3. *"CAD/CAM" by Rao PN; TMH, 2010.*
4. *"CAD/CAM Computer Aided Design and Manufacturing", by Mikell P. Groover and Emory W. Zimmer, 2008.*
5. *"Computer Integrated Design and Manufacturing" by David D. Bedworth, Mark R. Henderson, Philip M. Wolfe, McGraw-Hill, 1991.*
6. *"Mastering CAD", by George Omura with Brian Benton Autodesk, 2004.*
7. *"PTC Creo Parametric 3.0 for Designers" byTickoo S, Textbooks Published by BPB, 2015.*
8. *"SOLIDWORKS 2017 for Designers", by Tickoo S, Textbooks Published by BPB, 2017.*
9. *"CATIA V5-6R2016 for Designers", by Tickoo S, Textbooks Published by BPB, 2017.*
10. *"Autodesk Inventor Professional 2017 for Designers", byTickoo S, Textbooks Published by BPB, 2017.*

List of Experiments

The students will be required to carry out the following exercises using educational software (Auto CAD,Creo, Solid works, Master CAM etc).

1. Setting up of drawing environment by setting drawing limits, drawing units, naming the drawing, naming layers, setting line types for different layers using various type of lines in engineering drawing, saving the file with .dwg extension.
2. Layout drawing of a building using different layer and line colours indicating all Building details. Name the details using text commands, Make a title Block.
3. To Draw Orthographic projection Drawings (Front, Top and side) of safety valve, knuckle joint, cotter joint & Plummer block etc.
4. Make an Isometric dimensioned drawing from orthographic drawings.
5. Draw different types of bolts and nuts with internal and external threading in Acme and square threading standards. Save the bolts and nuts as blocks suitable for insertion.
6. Draw 3D models by extruding, revolve, sweep, loft & other 3D Modelling commands in AutoCAD.
7. Prepare Assembled 3d cad models of knuckle joint, cotter joint & Plummer block through Creo cad modelling software.
8. Apply Constraints & Mechanism on 4 bar & piston cylinder mechanism through Creo Mechanism tools.
9. Generate G codes & M codes of any models through CAM tools of Creo Software.
10. Write the program prepare any work piece through CNC Machine.

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							THEORY			PRACTICAL	
			L	T	P	CREDITS	END SEM University Exam	Two Term Exam	Teachers Assessment*	END SEM University Exam	Teachers Assessment*
BTME507	DS	INDUSTRIAL TRAINING	0	0	2	1	0	0	0	0	50

Legends: **L** - Lecture; **T** - Tutorial/Teacher Guided Student Activity; **P** – Practical; C - Credit;
***Teacher Assessment** shall be based following components: Quiz/Assignment/ Project/Participation in Class, given that no component shall exceed more than 10 marks.

Course Educational Objective of Industrial Training:-
The objective of undertaking industrial training is to provide work experience so that student's engineering knowledge is enhanced and employment prospects are improved. The student should take this course as a window to the real World and should try to learn as much as possible from real life experiences by involving and interacting with industry staff. Industrial training also provides an opportunity to students to select an Engineering problem and possibly an industry guide for their Major Project in final semester

Scheme of Studies:-
Duration: Minimum 2 weeks in summer break after IV semester, assessment to be done in V semester.

Scheme of Examination:-
For the assessment of industrial training undertaken by the students, following components are considered with their weightage.

(a) Term Work in Industry **Marks Allotted**
Attendance and General Discipline:-
Daily diary Maintenance:-
Initiative and participative attitude during training:-
Assessment of training by Industrial Supervisor:-

Total:

(b) Practical/Oral Examination (Viva-Voce) in Institution **Marks Allotted**
1. Training Report:-
2. Seminar and cross questioning:-

Total
*During training students will prepare a first draft of training report in consultation with section

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in-charge. After training they will prepare final draft with the help of T.P.O. /Faculty of the Institute. Then they will present a seminar on their training and they will face viva-voce on training in the Institute.

Learning through industrial training:-

During industrial training students must observe following to enrich their learning Industrial environment and work culture.

1. Organizational structure and inter personal communication.
2. Machines/equipment/instrument-their working and specifications.
3. Product development procedure and phases.
4. Project Planning, monitoring and control.
5. Quality control and assurance.
6. Maintenance system
7. Costing system
8. Stores and purchase systems.
9. Layout of Computer/EDP/MIS centers.
10. Roles and responsibilities of different categories of personnel.
11. Customer services.
12. Occupational Health and Safety: Issues at workplace, safety at workplace etc.

Students are supposed to acquire the knowledge on above by-

1. Direct Observations without disturbing personnel at work.
2. Interaction with officials at the workplace in free/ tea time
3. Study of Literature at the workplace (e.g. User Manual, processes, schedules, etc.)
4. "Hand's on" experience
5. Undertaking/assisting project work.
6. Solving problems at the work place.
7. Presenting a seminar
8. Participating in group meeting/discussion.
9. Gathering primary and secondary data/information through various sources, storage, retrieval and analysis of the gathered data.
10. Assisting official and managers in their working
11. Undertaking a short action research work.
12. Consulting current technical journals and periodicals in the library.

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Daily Diary: -Industrial Training

Name of the Trainee---------- College ----------

Industry / work place ---------- Week No----------

Department /Section ---------- Date ----------

Dates---------- Brief of observations made, work done, problem/project undertaken, Discussion held, literature consulted etc

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Signature of Supervisor (TPO/Faculty) Signature of Trainee Signature of Official in-charge for Training (In Industry)

Supervision of Industrial Training

Faculty and TPO are supposed to plan industrial training in such a manner that students get exposure on most of the above area in the field.

One faculty member or TPO will plan industrial training of students in consultation with training manager of the industry (work place) as per the predefined objectives of training.

Monitoring visits will be made by training and placement officer/faculty in-charge for the group of Students, of the college during training.

Guidance to the faculty / TPO for Planning and implementing the Industrial Training:-

Keeping in view the need of the contents, the industrial training program, this is spread to Minimum 2 weeks duration, has to be designed in consultation with the authorities of the workplace; Following are some of the salient points:

Spelling out the objectives of the industrial training in behavioral terms and same is informed in advance to the 1) students, 2) Authorities of the work place and 3)Supervising faculty members.

1. Discussing and preparing students for the training for which meetings with the students has to be planned.
2. Meeting with industrial personnel and orienting them regarding the objective of the training and the expectations of the program.
3. Correspondence with the authorities of the work place.

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4. Orientation classes for students on how to make the training most beneficial- monitoring daily diary, writing weekly reports, how to interact with various categories of industrial personnel, how to behave and undertake responsibilities, how to gather information from the workplace, ethics etc.
5. Guiding students to make individual plans (week wise/ day wise) to undertake industrial training.
6. Developing a system of maintaining training records, by teachers for every batch of students for convenient retrieval.
7. Inviting industrial personnel to deliver lectures on some aspects of training

Action plan for planning stages at the Institutional Level:-

S. No.	Activity	Commencing Week	Finishing Week	Remark
1.	Meeting with Principal			
2.	Meeting with colleagues			
3.	Correspondence with work place(Industry concerned)			
4.	Meeting with authorities of work place			
5.	Orientation of students for industry training			
6.	Scrutinizing individual training plan of students			
7.	Commencement of individual training			
8.	First monitoring of industrial training			
9.	Second monitoring of industrial training			
10.	Finalization of Training report			
11.	Evaluation of performance at industry level			
12.	Evaluation of Industry Program in the Institutions.			

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SEMESTER V

COURSE CODE	CATEGORY	COURSE NAME	TEACHING & EVALUATION SCHEME								
			L	T	P	CREDITS	THEORY			PRACTICAL	
							END SEM University Exam	Two Term Exam	Teachers Assessment*	END SEM University Exam	Teachers Assessment*
BTAU508	DCS	VEHICLE MAINTENANCE AND RECONDITIONING LAB	0	0	4	2	0	0	0	0	50

Legends: **L** - Lecture; **T** - Tutorial/Teacher Guided Student Activity; **P** – Practical; C - Credit;
***Teacher Assessment** shall be based following components: Quiz/Assignment/ Project/Participation in Class, given that no component shall exceed more than 10 marks.

Course Educational Objectives (CEOs)

To knowledge of (A) Maintenance and Safety, Engine Subsystem (B) Clutch, Steering, Brake, suspension (C)Wheel, Air Conditioning and Electrical Components.

Course Outcomes (COs)

After completion of this course the students are expected to be able to demonstrate following knowledge, skills and attitudes

1. Students would be able to understand the need of maintenance and safety.
2. Students would be able to understand about maintenance of engine subsystem.
3. Students would be able to understand transmission and driveline, i.e. propeller shaft, rear axle etc.
4. Students will be able to understand the maintenance of steering, brakes and wheel.
5. Students would be able to understand automobile safety and their need.
6. Students would be able to understand the maintenance of air conditioning and electrical components.

Syllabus

Unit – I

Introduction of Maintenance: Maintenance need, importance, primary and secondary functions; classification of maintenance work; vehicle insurance; basic problem diagnosis, automotive service procedures, workshop operations vehicle maintenance; vehicle identification. **Safety:** personnel safety, machines and equipment safety, vehicles, fire safety - first aid; basic tools – special service tools – measuring instruments; condition checking of seals, gaskets and sealants; scheduled(preventive) maintenance, unscheduled (breakdown) maintenance; service intervals - towing and recovering, reports, log sheets, trip sheets and other forms.

Unit- II

Maintenance of Engine Subsystem: General engine service, dismantling of engine components, engine repair, working on the underside, front, top, ancillaries service of basic engine parts;

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cooling and lubricating system; fuel system, intake and exhaust system; electrical system, electronic fuel injection and engine management service; fault diagnosis; emission controls.

Unit-III

Transmission and Driveline Maintenance: General checks, adjustment and service dismantling, identifying, checking and reassembling transmission, removing and replacing propeller shaft; servicing of cross and yoke joint and constant velocity joints; rear axle service, points removing axle shaft and bearings; servicing differential assemblies error diagnosis.

Unit – IV

Steering: maintenance and service of steering linkage, steering column, rack and pinion steering, recirculating ball steering service; worm type steering, power steering system.

Brake: maintenance and service of hydraulic brake, drum brake, disc brake, parking brake, bleeding of brakes.

Suspension: maintenance and service of coil spring, leaf spring, shock absorbers; dismantling and assembly procedures.

Wheel: wheel alignment and balance; removing and fitting of tyres; tyre wear and tyre rotation.

Unit-V

Air Conditioning : maintenance of air conditioning parts like compressor, condenser, expansion valve, evaporator, replacement of hoses, leak detection, AC charging, fault diagnosis; body repair like panel beating, tinkering, soldering, polishing, painting.

Electrical Components: Maintenance of batteries, starting system, charging system and body electrical -fault diagnosis using scan tools.

Reference Books:

1. *"Automotive Mechanics" by Ed May, Volume 1 and 2 , McGraw Hill Publications, 2003*
2. *"Fleet Management" by John Doke, McGraw Hill Co., 1984*
3. *"Engineering: Lightweight",by Brian Cantor, Patrick Grant, Colin Johnson Automotive Functional, and Novel Materials, Taylor and Francis, 2008.*
4. *"Automobile and Mechanical Electrical Systems", by Tom Denton, Butterworth-Heinemann, 2011.*
5. *"The Automobile Chassi",by Jornsen Reimpell Helmut Sto; Engineering Principles, Jurgen Betzler (P) Ltd, 2nd Ed., 2001.*

List of Experiments

1. Study of cylinder re-boring-checking the cylinder bore.
2. Study of valve grinding, valve lapping.
3. Setting the valve angle and checking for valve leakage
4. Calibration of fuel injection pump
5. Wheel alignment – testing of camber, caster

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6. Testing kingpin inclination, toe-in and toe-out
7. Chassis alignment testing
8. Brake adjustment and brake bleeding.
9. Head light adjustment.
10. Tyre changing
11. Wheel balancing

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