APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY

B. Tech. Syllabus

S5 and S6

Course code	Course Name	L-T-P - Credits	Year of Introduction
AU301	Auto Transmission	3-1-0 -4	2016

Prerequisite : Nil

Course Objectives

- To understand the need and working of automotive transmission system,
- To ccompare various types of transmission system and
- To introduce the various types of drives

Syllabus

Clutch – necessity – types- torque capacity – clutch facing – clutch adjustments- locking devices. Gear box – need- types – gear ratio – gear box oil seals- Hydrodynamic drive –fluid flywheel- torque converters - Epicyclic transmission – over drives – hydrostatic drives & CVT – Automatic transmission.

Expected outcome.

- The students will be able to select proper transmission system for a vehicle, identify and solve problems related to transmission system.

Text Books:

1. Newton and Steeds: Motor vehicle, Wildlife Publications, London
2. Crouse and Anglin: Automotive mechanics, McGraw Hill Publication 1993
3. Herban Singh Royath: The automobile, S. Chand and CO. Ltd, Delhi.
4. W. Thomson: Fundamentals of automotive transmission, Pitman and paperbacks publications
5. Narang: Automobile Engineering, Khanna Publications, New Delhi.
6. Judge.A.W., " Modern Transmission systems ", Chapman and Hall Ltd., 1990.

References:

1. SAE Transactions 900550 & 930910.
2. Hydrostatic transmissions for vehicle applications, I Mech E Conference, 1981-88.
3. Crouse,W.H., Anglin,D.L.," Automotive Transmission and Power Trains construction", McGraw Hill, 1976.
4. Heinz Heisler, "Advance vehicle Technology", Butterworth-Heinemann, 2002

Course Plan

Module	Contents	Hours	Sem. Exam Marks
I	***Clutches***: Necessity of clutch in a automobile, different types of clutches, friction clutches, cone clutch, Single plate - multi coil & diaphragm spring clutches, multi plate clutch, centrifugal clutches, electromagnetic clutches, hydraulic clutches, torque capacity of clutches, clutch facing, materials, clutch adjustments, over running clutches, necessity and field of application, sprag and roller clutches, locking devices	9	15%
II	***Gear box***: Need for a gear box, types of gear transmission, number of gear ratios, 3 speed and 4 speed transmission, determination of gear ratios for vehicles, performance curves in	9	15%

	different gears, Types of gearboxes- Selective & progressive types, sliding mesh, constant mesh, synchromesh gear box, gear types & materials, gearbox oil seals- static & dynamic seals.		
FIRST INTERNAL EXAMINATION			
III	**Hydrodynamic drive**: Advantages and limitations, fluid flywheel- constructional details, working, merits and demerits, slip performance characteristics, constructional details of typical torque converters - single and dual stator, matching of torque converters, torque converter lockup.	9	15%
IV	**Epicyclic transmission:** Principle of planetary gear transmission, Fundamental laws, Typical 2 speed and three speed planetary gear box, Simpson and Revangnaux planetary transmission, Wilson planetary transmission, over drives, Electric control system for overdrive.	9	15%
SECOND INTERNAL EXAMINATION			
V	**Hydrostatic drives & CVT**: Advantages and limitations, principles of hydrostatic drive systems: construction and working of typical drives, comparison of hydrostatic with hydrodynamic drives, Continuously variable transmission (CVT) –mechanical and hydrostatic, Relative merits and demerits.	10	20%
VI	**Automatic transmission**: General description of working of typical automatic transmissions and their control system, components and parts of Automatic transmission, comparison with conventional transmission. Three speed and reverse Transaxle automatic Transmission, ECTi Automatic transmission with intelligent electronic control system., concept of Automated manual transmission.	10	20%
END SEMESTER EXAM			

Question Paper Pattern

Maximum marks: 100 Time: 3 hours

The question paper shall consist of three parts

Part A

4 questions uniformly covering modules I and II. Each question carries 10 marks

Students will have to answer any three questions out of 4 (3X10 marks =30 marks)

Part B

4 questions uniformly covering modules III and IV. Each question carries 10 marks

Students will have to answer any three questions out of 4 (3X10 marks =30 marks)

Part C

6 questions uniformly covering modules V and VI. Each question carries 10 marks

Students will have to answer any four questions out of 6 (4X10 marks =40 marks)

Note: In all parts, each question can have a maximum of four sub questions, if needed

Course code	Course Name	L-T-P - Credits	Year of Introduction
AU303	Fuels and Combustion	3-0-0 - 3	2016

Prerequisite : Nil

Course Objectives

- To introduce the various fuels used in IC engines and their properties.
- To familiarise the Combustion phenomenon in SI and CI engines.

Syllabus

Conventional Fuels – petroleum – fuel types and characteristics – combustion in SI engines – combustion chambers – abnormal combustion – combustion in CI engines – combustion chambers for CI engines – uncontrolled combustion – supercharging and turbocharging – intercooling – vegetable oil as fuel – alcohols as fuels – performance, emission and combustion characteristics-gaseous fuels – hydrogen fuel .

Expected outcome.

On completion of this course, the students will be able to get clear idea about various types of conventional and alternative fuels used in IC Engines and the combustion phenomenon in SI and CI Engines

Text Book:

1. Sharma S P and Mohan Chander, Fuels and Combustion, Tata Mcgraw Hill, 1984.
2. M. L. Mathur, R. P. Sharma - Internal Combustion Engines, Dhanpat Rai Publications
3. R.K. Rajput, Internal Combustion Engines, Laxmi Publications
4. Heinz Heisler, Advanced EngineTechnology, Society of Automotive Engineers Inc
5. V Ganesan, Internal Combustion Engine Tata McGraw Hill Publishing Company Ltd., New Delhi 2006.
6. Bhatt, B.I and Vora, S.M., Stoichiometry, 2nd Edition, Tata Mcgraw Hill, 1996
7. Clive Davis, Calculations in Furnace Technology, Pergamon Press, Oxford, 1970.

References:

1. Annamalai, K and Puri, I.K, Combustion science and Engineering, CRC Press, 2007
2. Borman, G.L. and Ragland, K.W., Combustion Engineering, McGraw Hill International Editions, 1998.
3. John B Heywood, Internal Combustion Engine Fundamentals, McGraw Hill Publishing Company.
4. Lichty , I.C.Engines McGraw Hill
5. Obert E F,Internal Combustion Engine and air Pollution, McGraw Hill book company, New York.
6. Samir Sarkar, Fuels and Combustion, 2nd Edition, Orient Longman, 1990
7. Smith & Stinson , Fuels & Combustion, McGraw-Hill

Course Plan

Module	Contents	Hours	Sem. Exam Marks
I	Conventioanl Fuels: Structure of petroleum, refining process – liquid fuel types and their characteristics – Gasoline Fuels – Qualities & properties - rating of fuels - Octane number, Alternative fuels. Diesel fuels, Properties and qualities, Cetane number	6	15%
II	Combustion in SI engines: - P-θ diagram- Stages of combustions- Ignition lag. Dependence of ignition timing on load and speed. Flame Propagation- factors / engine variables affecting	6	15%

	combustion stages. Different combustion chambers in SI engines. Abnormal combustion – Knock theories - detonation effects-factors and variables affecting knock-surface ignition		
FIRST INTERNAL EXAMINATION			
III	Combustion in CI engines: P-θ diagram – parameters affecting Ignition delay, uncontrolled combustion, diesel knock - controlling methods. Diesel knock, comparison with SI knock and control. Direct and indirect injection combustion chambers for CI engines. Importance of Swirl, squish and turbulence. Factors controlling combustion chamber design. Supercharging and Turbocharging, Different methods of turbocharging, Intercooling,.	7	15%
IV	Vegetable oil as fuels: Various vegetable oils and their important properties. Different methods of using vegetable oils engines – Blending, preheating Transesterification and emulsification of Vegetable oils – Performance in engines – Performance, Emission and Combustion Characteristics in diesel engines.	7	15%
SECOND INTERNAL EXAMINATION			
V	Alcohols as fuels : Alcohols as fuels. Production methods of alcohols. Properties of alcohols as fuels. Methods of using alcohols in CI and SI engines. Blending, dual fuel operation, surface ignition and oxygenated additives. Performance, emission and combustion characteristics in CI and SI engines. Concept of FFV.	7	20%
VI	Gaseous Fuels: Production methods of Biogas, Natural gas and LPG. Properties studies. CO2 and H2S scrubbing in Biogas., Modification required to use in SI and CI Engines- Performance and emission characteristics of Biogas, NG and LPG in SI and CI engines. Hydrogen as engine fuel - Production methods of hydrogen. Combustive properties of hydrogen. Problems associated with hydrogen as fuel and solutions. Different methods of using hydrogen in SI and CI engines. Performance, emission and combustion analysis in engines. Hydrogen storage - safety aspects of hydrogen.	9	20%
END SEMESTER EXAM			

Question Paper Pattern

Maximum marks: 100 Time: 3 hours

The question paper shall consist of three parts

Part A

4 questions uniformly covering modules I and II. Each question carries 10 marks

Students will have to answer any three questions out of 4 (3X10 marks =30 marks)

Part B

4 questions uniformly covering modules III and IV. Each question carries 10 marks

Students will have to answer any three questions out of 4 (3X10 marks =30 marks)

Part C

6 questions uniformly covering modules V and VI. Each question carries 10 marks

Students will have to answer any four questions out of 6 (4X10 marks =40 marks)

Note: In all parts, each question can have a maximum of four sub questions, if needed

Course code	Course Name	L-T-P-Credits	Year of Introduction
ME305	COMPUTER PROGRAMMING & NUMERICAL METHODS	2-0-1-3	2016

Prerequisite: Nil

Course Objectives:

- To equip students with fundamentals of computer programming
- To provide fundamental idea about the use of computer programming and numerical methods for analyzing the basic engineering problems.

Syllabus

Introduction to computer programming concept, control statements, basics pointers, Introduction to Class and Object, Errors and approximations, curve fitting, Solution of Partial differential equations, Numerical problems and preparation of computer programs.

Expected outcomes:

- The students will be able to write computer programs for numerical solutions for engineering problems like system of equations and heat equations..

Text Books

1. Balagurusamy, Computer Programming 1e McGraw Hill Education , 2013
2. Balagurusamy, Numerical Methods 1e McGraw Hill Education, 1999
3. Jose S., Computer Programming and Numerical Methods, Pentagon, 2015.
4. Ravichandran D., Programming with C++, Tata McGraw Hill, 2007.

Reference Books

1. Balaguruswamy E., Object Oriented Programming with C++, Tata McGraw Hill, 1992.
2. Barkakati N., Object Oriented Programming in C++, SAMS, 1991.
3. Gerald C. F. and P. O. Wheatley, Applied Numerical Analysis, Pearson,2004.
4. Kamthane A. M., Object Oriented Programming with ANSI & Turbo C++,
5. Lippman S. B. and J. Lajoie, C++ Primer, Pearson Education, 2005. Pearson Education, 2009.

Course Plan

Module	Contents	Hours	Sem. Exam Marks
I	Introduction to Computer programming concept –internal representation of data - Algorithm and flow chart, Basics of procedure oriented and object oriented programming. Introduction to C++: Structure of C++ program; Keywords; Identifiers; Data types – integer, real, character, string, boolean, enumeration, Constant and Variables; Operators – assignment, arithmetic, relational, logical, increment, decrement and conditional operators; Statements – simple & compound, declaration statements. Input and output streams.	5	15%
II	Control statements: `if`, `if-else`, `switch`, `for`, `while`, `do-while`, `break` and `continue` statements, Arrays – one dimensional & two dimensional; Functions: inline functions, function over loading, Functions with default arguments, recursion.	7	15%
	FIRST INTERNAL EXAM		

III	Basics of Pointers. Function call by value, call by reference. Preparation of programs for evaluation of Factorial of a number, infinite series, Sorting, Searching and Matrix multiplication.	8	15%
IV	Introduction to Class and Object- definition, data members, member function. private & public member functions, member access, friend declaration, class objects, predefined classes, initialization. Inheritance- base class and derived class. Simple programs using the above features. (No programming questions for University examination and internals)	7	15%
SECOND INTERNAL EXAM			
V	Errors and approximations, sources of errors. Solution of linear system of equations: Gauss elimination, Gauss-Jordan and Gauss–Seidel methods. Interpolation: Lagrange and Aitken techniques.	7	20%
VI	Curve fitting: method of least squares, non-linear relationships, Linear correlation, measures of correlation. Solution of Partial differential equations: classification, Laplace equation, Finite difference method. Numerical problems and preparation of computer programs for the above methods	8	20%
END SEMESTER EXAM			

Question Paper Pattern

Maximum marks: 100 **Time: 3 hrs**

The question paper should consist of three parts

Part A
There should be 2 questions each from module I and II
Each question carries 10 marks
Students will have to answer any three questions out of 4 (3X10 marks =30 marks)

Part B
There should be 2 questions each from module III and IV
Each question carries 10 marks
Students will have to answer any three questions out of 4 (3X10 marks =30 marks)

Part C
There should be 3 questions each from module V and VI
Each question carries 10 marks
Students will have to answer any four questions out of 6 (4X10 marks =40 marks)

Note: Each question can have a maximum of four sub questions, if needed.

Course code	Course Name	L-T-P - Credits	Year of Introduction
AU305	Vehicle Maintenance	3-0-0- 3	2016

Prerequisite: Nil

Course Objectives

- To understand the need for vehicle maintenance and its importance
- To familiarize the maintenance procedure for various components of an automobile
- To know the various troubles and trouble shooting related to the automobile components.
- To make familiar with Diagnostic tools used in Automobiles for detection of problems

Syllabus

Maintenance, Records and Schedules – types –service station – engine trouble diagnosis and tune up – diagnosing instruments – trouble shooting – maintenance and repair of fuel supply, lubrication and cooling systems – maintenance of air conditioning system – maintenance of chassis components – maintenance of electrical systems

Expected outcome.

- On completion of this course, the students will be able to inspect, diagnose and rectify the problems occurring in the various components of the vehicle.

Text Book:

1. Ed May, "Automotive Mechanics Volume 1 & 2" , Mc Graw Hill Publications, 2003
2. G.B.S. Narang - Automobile Engineering, Khanna Publishers
3. Knott and Phil Knott, "An Introductory Guide to Motor Vehicle Maintenance: Light Vehicles", EMS publishing, 2010
4. Williarn.H. Crouse / Donald.L. Anglin -Automotive mechanics, TATA McGraw Hill publishing Co. India

References:

1. Boyce Dwiggins - Automobile Repair Guide, Theodor Audel and Co, Indiana-
2. Antony.E. Schwaller - Motor Automotive Technology, Delmar Publishers
3. A-W Judge- Maintenance of High speed Diesel Engine, Chapman Hall Ltd
4. A.W Judge - Motor Vehicle Engine Servicing, 3rd Edition, Pitman paper mark, London
5. Bosch Automotive Handbook, Sixth Edition, 2004
6. Vehicle Service Manuals and reputed manufacturers.
7. Tim Giles, "Automotive service: Inspection, maintenance and repair", 3rd edition, 2007

Course Plan

Module	Contents	Hours	Sem. Exam Marks
I	Maintenance, Records and Schedules: Importance of maintenance, types of maintenance, Inspection, scheduled maintenance, Job card, PDI chart, requirement of service station, service station records (stores & maintenance), layout and personnel for service station, Typical maintenance schedule for two wheeler, LMV and HMV.	7	15%
II	Typical maintenance schedule for two wheeler, LMV and HMV. Engine trouble diagnosis and tune-up: Overhauling of engine - types of overhauling (Top overhauling and major overhauling), specific tools used for overhauling, de-carbonizing and degreasing, engine time up, Engine fault diagnosing instruments, use of	7	15%

	automobile stethoscope, computerized engine analyzers/scanners, OBD II usage for troubleshooting, troubles and trouble shooting related to engines.		
FIRST INTERNAL EXAMINATION			
III	Maintenance and repair of fuel supply, Lubrication and cooling system: Fuel pump testing , Carburetor servicing and tuning, servicing of gasoline injection system, FIP calibration and phase setting, injector testing, Electronic fuel injection and engine management. service - fault diagnosis- servicing emission controls, types of engine oils and additives, engine oil change intervals,.	7	15%
IV	Maintenance of cooling and Air-conditioning systems: radiator service, checking of the thermostat, servicing of coolant pump. Maintenance of air conditioning parts like compressor, condenser, expansion valve, evaporator - Replacement of hoses- Leak detection- AC Charging- Fault diagnosis.	7	15%
SECOND INTERNAL EXAMINATION			
V	Maintenance and Repair of chassis components: Servicing of clutch assembly, gear box, propeller shaft, troubles and trouble shooting chart on transmission, differential maintenance and repair, backlash adjustment, servicing of braking system, identification and rectification of brake faults, brake testing, steering system maintenance and repair, tyre rotation, tyre re-treading, checking and adjusting of suspension system, wheel balancing, wheel alignment.	7	20%
VI	Maintenance of Auxiliaries: Maintenance of starter motor, dynamo and alternator, regulator unit, battery maintenance, methods of testing & servicing various electrical accessories like horn, headlight (aiming and focusing), gauges, Testing the spark plug and ignition coil with special equipments, checking and setting the ignition timing in conventional engines.	7	20%
END SEMESTER EXAM			

Question Paper Pattern

Maximum marks: 100 Time: 3 hours

The question paper shall consist of three parts

Part A

4 questions uniformly covering modules I and II. Each question carries 10 marks

Students will have to answer any three questions out of 4 (3X10 marks =30 marks)

Part B

4 questions uniformly covering modules III and IV. Each question carries 10 marks

Students will have to answer any three questions out of 4 (3X10 marks =30 marks)

Part C

6 questions uniformly covering modules V and VI. Each question carries 10 marks

Students will have to answer any four questions out of 6 (4X10 marks =40 marks)

Note: In all parts, each question can have a maximum of four sub questions, if needed

Course code.	Course Name	L-T-P - Credits	Year of Introduction
AU309	Heating, Ventilating & Air Conditioning	3-0-0- 3	2016

Prerequisite: Nil

Course Objectives

- To impart basic concepts used in the heating ventilation and air conditioning.
- To get basic knowledge of various heating and cooling methods adopted in industry.
- To understand the working of variouscomponents used in the Air conditioning.

Syllabus

Air and water heating system - Introduction to ventilation –types – systems – air cleaning devices. Refrigeration – unit of refrigeration – COP – refrigerants – psychometry – psychometric processes – vapour compression refrigeration – working – cycle – vapour absorption system – air conditioning- air conditioning -types – processes – human comfort – air conditioning control systems.

Expected outcome.

Upon completion of the course, the students will

- Be able to understand the various systems in HVAC.
- Get the basic knowledge about the processes and components in HVAC.

Text Books:

1. C P Arora , Refrigeration &Air Conditioning, Tata Mc Graw hill publication
2. Manohar Prasad , Refrigeration &Air Conditioning, New Age International.

References:

1. Edward G. Pita P.E., Air Conditioning Principles and Systems: An Energy Approach, 4/e, Prentice Hall of India Ltd.
2. Herbert W. Stanford, HVAC Water Chillers and Cooling Towers: Fundamentals, Application, and Operation, 2/e, CRC Press.
3. Roy J Dossat, Thomas J. Horan , Principles of Refrigeration, 5/e, Pearson

Course Plan

Module	Contents	Hours	Sem. Exam Marks
I	Air and water heating system: Air heating system -Classification - gravity warm heating system, forced warm air heating system, Advantages & Disadvantages of warm air heating system. Common problems and remedies of warm air heating system. Water heating system - Classification based on water circulation, One pipe & two pipe, gravity hot water heating. Forced hot water heating system.	7	15%
II	Introduction to ventilation- Fundamentals of good indoor air quality Need for ventilation, Effects of Relative humidity in ventilation, Control of microbial growth, Psychometric performance of contact volume system. Types of ventilation system. Supply system - Devices used in supply systems, Air Inlet system. Filters heating & cooling equipment, Fans, Duct, Grills, Diffusers Exhaust system General exhaust systems. Removal of pollutants and contaminated air. Air cleaning devices.	7	15%

FIRST INTERNAL EXAMINATION			
III	Introduction to Air conditioning: Unit of refrigeration, COP. Refrigerants: Primary and secondary refrigerants. Designation of refrigerants, Desirable properties of refrigerants, Material compatibility, Toxicity, Flammability, Thermodynamic properties of refrigerants, Inorganic, Halo carbon refrigerants. Secondary refrigerants. Refrigerants mixtures, Newer refrigerants.	7	15%
IV	Psychrometry: Properties of moist air. Important Psychrometry properties, Dry bulb temperature, Humidity ratio, degree of saturation, Dew point temperature and Enthalpy, Psychometric chart Psychrometric process in air conditioning equipment, Bypass factor and sensible heat factor.	7	15%
SECOND INTERNAL EXAMINATION			
V	Vapour compression refrigeration system- Analysis, components and working of vapour compression refrigeration cycle, cycle-representation, Vapour absorption system - Simple vapour Absorption system. Temperature control methods in automobiles. Air conditioning processes: Mixing process- Summer, winter and year round air Conditioning system, Hot and dry outdoor conditions. Hot and humid outdoor conditions. Comfort air conditioning:	7	20%
VI	Thermodynamics of human body. Body regulation process against heat and cold. Comfort & Comfort chart, Effective temperature, Factors governing optimum effective temperature, Selection of outside and inside design conditions, Air conditioning control systems, basic elements of the control system, Temperature, Humidity & Pressure controls.	7	20%
END SEMESTER EXAM			

Question Paper Pattern

Maximum marks: 100 Time: 3 hours

The question paper shall consist of three parts

Part A
4 questions uniformly covering modules I and II. Each question carries 10 marks
Students will have to answer any three questions out of 4 (3X10 marks =30 marks)

Part B
4 questions uniformly covering modules III and IV. Each question carries 10 marks
Students will have to answer any three questions out of 4 (3X10 marks =30 marks)

Part C
6 questions uniformly covering modules V and VI. Each question carries 10 marks
Students will have to answer any four questions out of 6 (4X10 marks =40 marks)

Note: In all parts, each question can have a maximum of four sub questions, if needed

Course code	Course Name	L-T-P – Credits	Year of Introduction
AU402	TWO AND THREE WHEELERS	3-0-0-3	2016

Prerequisite : Nil

Course Objectives

- To understand the constructional details operating characteristics and vehicle design aspects.

Syllabus

The power unit- two and four stroke, fuel and ignition system, transmission systems-clutches-gear box, chassis and sub systems-frames-suspension, brakes and wheels, two and three wheeler-case study.

Expected outcome.

- The students will acquire two and three wheeler technology and latest developments in the industry.

Text Book:

- Irving. P. E., Motor cycle Engineering, Temple Press Book, London, 1992.

References

1. Bryaut. R. V., Vespa maintenance and repair service.
2. Encyclopedia of Motor cycling, 20 volumes, Marshall Cavensih, New York and London, 1989.
3. K.K. Ramalingam, Two Wheelers, Scitech publications, Chennai.
4. Raymond Broad, Lambretta- A practical guide to maintenance and repair, 1987.
5. The Cycle Motor Manual. Temple Press Ltd., London, 1990.

Course Plan

Module	Contents	Hours	End Sem. Exam Marks
I	**The power plant** Two stroke and four stroke SI and CI engine construction and working, merits and demerits, symmetrical and unsymmetrical valve and port timing diagrams, scavenging process.	7	15%
II	**Fuel and ignition system** Fuel system- Different circuits in two wheeler fuel systems, fuel injection system, lubrication system Ignition systems- magneto coil and battery coil spark ignition system, electronic ignition system, starting system- kick starter system-self starter system, recent technologies	7	15%
	FIRST INTERNAL EXAMINATION		
III	**Transmission system** Clutches- single- multi plate and centrifugal clutches, Gear box and its various gear controls in two wheelers.	7	15%
IV	**Chassis and sub-systems** Main frame for two and three wheelers. Its types, chassis and different drive systems for two wheelers Front and rear suspension systems-shock absorbers, panel meters and controls on handle bar, freewheeling devices	7	15%

SECOND INTERNAL EXAMINATION			
V	**Brakes and wheels** Drum brakes and disc brakes-construction- working and types, front and rear brake link lay outs, brake actuation mechanism, spokes wheel, cast wheel, disc wheel and its merits and demerits Tyres and tubes construction and types, steering geometry	8	20%
VI	**Two and three wheelers- case study** Case study of sports bike, motor cycles, scooters and mopeds-auto rickshaws, pick up van, delivery van and trailer, servicing and maintenance, recent developments	6	20%
END SEMESTER EXAM			

Question Paper Pattern

Maximum marks: 100 Time: 3 hours
The question paper shall consist of three parts

Part A
4 questions uniformly covering modules I and II. Each question carries 10 marks
Students will have to answer any three questions out of 4 (3X10 marks =30 marks)

Part B
4 questions uniformly covering modules III and IV. Each question carries 10 marks
Students will have to answer any three questions out of 4 (3X10 marks =30 marks)

Part C
6 questions uniformly covering modules V and VI. Each question carries 10 marks
Students will have to answer any four questions out of 6 (4X10 marks =40 marks)

Note: In all parts, each question can have a maximum of four sub questions, if needed

Course code	Course Name	L-T-P - Credits	Year of Introduction
**341	DESIGN PROJECT	0-1-2-2	2016
Prerequisite : Nil			

Course Objectives

- To understand the engineering aspects of design with reference to simple products
- To foster innovation in design of products, processes or systems
- To develop design that add value to products and solve technical problems

Course Plan

Study : Take minimum three simple products, processes or techniques in the area of specialisation, study, analyse and present them. The analysis shall be focused on functionality, strength, material, manufacture/construction, quality, reliability, aesthetics, ergonomics, safety, maintenance, handling, sustainability, cost etc. whichever are applicable. Each student in the group has to present individually; choosing different products, processes or techniques.

Design: The project team shall identify an innovative product, process or technology and proceed with detailed design. At the end, the team has to document it properly and present and defend it. The design is expected to concentrate on functionality, design for strength is not expected.

Note : The one hour/week allotted for tutorial shall be used for discussions and presentations. The project team (not exceeding four) can be students from different branches, if the design problem is multidisciplinary.

Expected outcome.

The students will be able to

i. Think innovatively on the development of components, products, processes or technologies in the engineering field
ii. Analyse the problem requirements and arrive workable design solutions

Reference:

Michael Luchs, Scott Swan, Abbie Griffin, 2015. Design Thinking. 405 pages, John Wiley & Sons, Inc

Evaluation

First evaluation (Immediately after first internal examination)	20 marks
Second evaluation (Immediately after second internal examination)	20 marks
Final evaluation (Last week of the semester)	60 marks

Note: All the three evaluations are mandatory for course completion and for awarding the final grade.

Course code	Course Name	L-T-P - Credits	Year of Introduction
ME333	HEAT ENGINES LAB	0-0-3-1	2016

Prerequisite : Nil

Course Objectives

- To give hands on experience in tesing different properties of fuels & lubricants
- To perform characteristic tests on petrol and diesel engines.

List of Exercises/Experiments :

1. Determination of viscosity using Saybolt Viscometer.
2. Determination of viscosity using Redwood Viscometer.
3. Determination of Flash point and Fire point using Pensky Marten's Apparatus.
4. Fuel Injection Pump Testing and Calibration of Fuel Injection pump.
4. Performance Test on Multi cylinder Four Stroke Diesel Engine.
5. Performance Test on Multi cylinder Four Stroke Petrol Engine.
6. Retardation Test on Twin cylinder Four Stroke Diesel Engine.
7. Morse Test on Multi cylinder Four Stroke Petrol engine.
8. Heat Balance Test on Multi cylinder Four Stroke Diesel Engine.
9. Volumetric Efficiency Test on Multi cylinder Four Stroke Diesel Engine.
10. Volumetric Efficiency Test on Multi cylinder Four Stroke Petrol Engine.
11. Cooling curve Test on Twin cylinder Four stroke Diesel Engine.
12. Valve Timing on Four stroke Diesel/ Petrol Engine
13. Determination of calorific value of liquid fuel using bomb calorimeter
14. Determination of calorific value of gaseous fuel using Junker's calorimeter

Note: Minimum 12 experiments are mandatory

Expected outcome:

The students will be able to

i. Test different Properties of fuels and lubricants.
ii. Test petrol and diesel engines to evaluate their performance

List of Equipments

- Saybolt viscometer
- Redwood viscometer
- Pensky Marten's flash & fire point apparatus
- Fuel pump testing and calibrating machine
- Single/multicylinder engine (petrol/diesel) for valve timing
- Single/Twin cylinder 4 stroke diesel engine with rope drum/electrical dynamometer
- Multi cylinder petrol engine with eddycurrent/hydraulic dynamometer
- Multi cylinder diesel engine with eddycurrent/hydraulic dynamometer
- Bomb Calorimeter
- Junker's gas calorimeter

Course No.	Course Name	L-T-P - Credits	Year of Introduction
AU333	COMPUTER PROGRAMMING LAB	0-0-3 - 1	2016

Prerequisite : ME305 Computer programming & numerical methods

Course Objectives

- To expose to problem solving techniques and flow charts.
- To execute C programs to cover control structures functions, arrays, structures, pointers and files

List of Exercises/Experiments : (Minimum 12 are mandatory)

1. Problem formulation, Problem Solving and Flowcharts
2. C Programming using Simple statements and expressions
3. Scientific problem solving using decision making and looping.
4. Simple programming for one dimensional and two dimensional arrays.
5. Solving problems using String functions
6. Programs with user defined functions – Includes Parameter Passing
7. Program using Recursive Function and conversion from given program to flow chart.
8. Program using structures and unions.Checking leap year
9. Finding sum of digits and reverse of a number
10. Sine and Cosine series generation
11. Linear search
12. Matrix addition, transpose and multiplication
13. Programs using structure and union
14. Programs using functions, recursive calls,macros
15. Programs using pointers
16. Matrix operation using pointers

Expected outcome.

The students will be able to

i. apply good programming design methods for program development.
ii. design and implement C programs for simple applications

Text Book:

1. Anita Goel and Ajay Mittal, "Computer Fundamentals and Programming in C", Dorling Kindersley (India) Pvt. Ltd., Pearson Education in South Asia, 2011.
2. Pradip Dey, Manas Ghosh, "Fundamentals of Computing and Programming in C", First Edition, Oxford University Press, 2009
3. Byron S Gottfried, "Programming with C", Schaum's Outlines, Second Edition, Tata McGraw- Hill, 2006.
4. Kernighan,B.W and Ritchie,D.M, "The C Programming language", Second Edition, Pearson Education, 2006

Course code	Course Name	L-T-P-Credits	Year of Introduction
ME302	Heat and Mass Transfer	3-1-0-4	2016

Prerequisites : ME203 Mechanics of fluid

Course Objectives:

- To introduce the various modes of heat transfer and to develop methodologies for solving a wide variety of practical heat transfer problems
- To provide useful information concerning the performance and design of simple heat transfer systems
- To introduce mass transfer

Syllabus:

Modes of Heat Transfer: Conduction: Most general heat conduction equation, One dimensional steady state conduction with and without heat generation, Critical radius of insulation, Elementary ideas of hydrodynamics and thermal boundary layers, Convection heat transfer: Newton's law of cooling, Dimensionless numbers, Dimensional analysis, Problems. Fins: Types of fins : Fin efficiency and effectiveness. Boiling and condensation heat transfer, Introduction to heat pipe. Transient heat conduction. Heat exchangers, LMTD and NTU methods. Radiation: laws of radiation, Electrical analogy, Radiation shields. Mass Transfer :Mass transfer by molecular diffusion, Convective mass transfer.

Expected outcome:

The students will be able to

1. Apply principles of heat and mass transfer to engineering problems
2. Analyse and obtain solutions to problems involving various modes of heat transfer
3. Design heat transfer systems such as heat exchangers, fins, radiation shields etc..

Text Books:

1. Sachdeva R C, Fundamentals of Engineering Heat and Mass Transfer, New Age Science Limited, 2009
2. R.K.Rajput. Heat and mass transfer, S.Chand& Co.,2015
3. Nag P K., Heat and Mass Transfer, McGraw Hill,2011
4. Kothandaraman, C.P., Fundamentals of Heat and Mass Transfer, New Age International, New Delhi, 2006

Data Book:

- Heat and Mass Transfer data book: C.P. Kothandaraman, S. Subramanya, New age International publishers,2014

References Books:

1. Yunus A Cengel, Heat Transfer: A Practical Approach, McGraw Hill,2015
2. Holman J P, Heat Transfer, McGraw Hill, 2011
3. Frank P. Incropera and David P. Dewitt, Heat and Mass Transfer, John Wiley and sons, 2011

Course Plan			
Module	**Contents**	**Hours**	**End Sem. Exam Marks**
I	Modes of Heat Transfer: Conduction: Fourier law of heat conduction-Thermal conductivity of solids, liquids and gases-Factors affecting thermal conductivity- Most general heat conduction equation in Cartesian, cylindrical and spherical coordinates One dimensional steady state conduction with and without heat generation conduction through plane walls, cylinders and spheres-variable thermal conductivity conduction shape factor- heat transfer through corners and edges. Critical radius of insulation.	12	15%
II	Elementary ideas of hydrodynamics and thermal boundary layers-Thickness of Boundary layer-Displacement, Momentum and Energy thickness (description only). Convection heat transfer: Newton's law of cooling- Laminar and Turbulent flow, Reynolds Number, Critical Reynolds Number, Prandtl Number, Nusselt Number, Grashoff Number and Rayleigh's Number. Dimensional analysis Buckingham's Pi theorem- Application of dimensional analysis to free and forced convection- empirical relations- problems using empirical relations	10	15%
FIRST INTERNAL EXAMINATIONEXAM			
III	Transient heat conduction-lumped heat capacity method. Fins: Types of fins - Heat transfer from fins of uniform cross sectional area- Fin efficiency and effectiveness. Boiling and condensation heat transfer(elementary ideas only),Introduction to heat pipe.	8	15%
IV	Combined conduction and convection heat transfer-Overall heat transfer coefficient - Heat exchangers: Types of heat exchangers, AMTD, Fouling factor, Analysis of Heat exchangers- LMTD method, Correction factor, Effectiveness-NTU method, Special type of heat exchangers (condenser and evaporator, simple problems only)	8	15%
SECOND INTERNAL EXAMINATION			
V	Radiation- Nature of thermal radiation-definitions and concepts- monochromatic and total emissive power-Intensity of radiation- solid angle- absorptivity, reflectivity and transmissivity-Concept of black body- Planck' law- Kirchoff's law- Wein's displacement law-Stefan Boltzmann's law- black, gray and real surfaces-Configuration factor (derivation for simple geometries only)- Electrical analogy- Heat exchange between black/gray surfaces- infinite parallel plates, equal and parallel opposite plates-perpendicular rectangles having common edge- parallel discs (simple problems using charts and tables). Radiation shields(no derivation).	10	20%

VI	Mass Transfer :Mass transfer by molecular diffusion- Fick's law of diffusion- diffusion coefficient Steady state diffusion of gases and liquids through solid- equimolar diffusion, Isothermal evaporation of water through air- simple problems. Convective mass transfer- Evaluation of mass transfer coefficient- empirical relations- simple problems- analogy between heat and mass transfer.	8	20%
END SEMESTER EXAM			

Question Paper Pattern

Use of approved data book permitted

Total marks: 100, Time: 3 hrs

The question paper should consist of three parts

Part A

There should be 2 questions each from module I and II

Each question carries 10 marks

Students will have to answer any three questions out of 4 (3X10 marks =30 marks)

Part B

There should be 2 questions each from module III and IV

Each question carries 10 marks

Students will have to answer any three questions out of 4 (3X10 marks =30 marks)

Part C

There should be 3 questions each from module V and VI

Each question carries 10 marks

Students will have to answer any four questions out of 6 (4X10 marks =40 marks)

Note: Each question can have a maximum of four sub questions, if needed.

Course code	Course Name	L-T-P - Credits	Year of Introduction
ME316	Principles of Machine Design	3-0-0-3	2016

Prerequisite : NIL

Course Objectives

- To review concepts of statistics and mechanics
- To introduce fundamental approaches to failure prevention of components
- To provide knowledge in the design of common machine elements like shaft, spring cotter joints and couplings

Syllabus

Introduction to Design, Materials and their properties, Theories of Failure, Shock and impact loads, Threaded Joints, Bolted joints, Design of riveted joints, Cotter and Knuckle joints, Design of welded joints, Helical springs, Leaf springs, Shafting, Design of Coupling.

Expected outcome.

The students will be able to find out various stresses induced in a machine element under different types of loading conditions and devise machine components for its conceptual design.

Text Book:

1. Jalaludeen , Machine Design, Anuradha Publications, Chennai,2014
2. R. L. Norton, Machine Design – An Integrated Approach, Pearson Education, 2001
3. V.B.Bhandari, Design of Machine elements, McGraw Hill, 2010

Data books permitted for reference in the final examination:

1. K. Mahadevan, K. Balaveera Reddy, Design Data Hand Book, CBS Publishers & Distributors, 2013
2. Narayana Iyengar B.R. & Lingaiah K., Machine Design Data Handbook, Tata McGraw Hill/Suma Publications, 1984
3. PSG Design Data Book, DPV Printers, Coimbatore, 2012

References:

1. E. Shigley, Mechanical Engineering Design, McGraw Hill,2003
2. Juvinall R.C & Marshek K.M., Fundamentals of Machine Component Design, John Wiley,2003
3. M. F. Spotts, T. E. Shoup, Design of Machine Elements, Pearson Education, 2006
4. Rajendra Karwa, Machine Design, Laxmi Publications,2006

Course Plan

Module	Contents	Hours	End Sem. Exam Marks
I	Design Principles - different phases in design cycle; common engineering materials, properties and selection, Tensile deformation of different material types – True stress and true strain, stress strain curves.	3	15%
	Stresses in machine parts, Tension, compression, shear, Bending and torsional stresses, Combined stress – Stress concentration – Concepts of Stress intensity factor and Fracture toughness	4	
II	Factor of safety, Margin of safety, Variable load, Variable stress - Endurance limit, S-N Curve-Fatigue strength and Endurance limit,	3	15%

	Theories of failure.		
	Combined steady and variable stress - Gerber, Goodman and Soderberg method, Design approach to fatigue - Design for infinite life and finite life.	4	
FIRST INTERNAL EXAMINATION			
III	Detachable joints - Pins, Keys, Splines, cotters, set screws, threaded fasteners, power screws, shaft couplings (theory only)	3	15%
	Welded joints, types of joints, strength of welds, fillet welds, stress distribution in welded joints, Eccentric loaded welded joints.	4	
IV	Riveted joints - Types of riveted joints, Failures of riveted joints, Strength of rivets, Design of boiler joints-longitudinal and circumferential joints, Joints for structural use, lozenge joint, Eccentric loaded riveted joints.	4	15%
	Pressure vessels - thin cylinders and thick cylinders, Stresses due to internal and external pressures, hydraulic accumulators, Compound cylinders	3	
SECOND INTERNAL EXAMINATION			
V	Shafts – Types of Shafts, Stresses in shafts, Design of shafts, Shafts subjected to combined twisting moment and bending moment, Shafts subjected to axial load in addition to combined torsion and bending loads.	4	20%
	Design of hollow shafts, Design of shafts on the basis of rigidity. Effect of key ways. Design of shafts subjected to fluctuating loads.	3	
VI	Springs - Classification and use of springs - spring materials - Effect of end turns, Stress concentration - Energy absorbed, deflection, Design of helical, coaxial springs.	3	20%
	Design for fluctuating loads, Vibration in springs, buckling of springs. Design of leaf springs - Flat springs, semi elliptical laminated leaf springs, nipping.	4	
END SEMESTER EXAM			

Question Paper Pattern

Maximum marks: 100 Time: 3 hours

The question paper shall consist of three parts

Part A

4 questions uniformly covering modules I and II. Each question carries 10 marks

Students will have to answer any three questions out of 4 (3X10 marks =30 marks)

Part B

4 questions uniformly covering modules III and IV. Each question carries 10 marks

Students will have to answer any three questions out of 4 (3X10 marks =30 marks)

Part C

6 questions uniformly covering modules V and VI. Each question carries 10 marks

Students will have to answer any four questions out of 6 (4X10 marks =40 marks)

Note: In all parts, each question can have a maximum of four sub questions, if needed

Course code	Course Name	L-T-P-Credits	Year of Introduction
EE312	Electrical and Electronics Engineering	3-0-0-3	2016

Prerequisite : Nil

Course Objective

- To give exposure to the working of Electrical Machines that function as prime movers in industrial systems/machine-tools.
- To make aware on factors affecting the choice of motor for a given application
- To introduce power electronics which form the essential part of modern drives

Syllabus

Transformers, Induction motors, Direct current machines, Control system motors, Factors affecting the choice of motor, Power Electronics

Expected Outcome

The students will be able to

i. know about electrical machines that form part of various industrial systems
ii. understand the working of electric machine driven industrial systems and machine tools in a better way.

Text Book:

Hughes, Edward, et al. "*Hughes electrical and electronic technology*". Pearson education, 2008.

References:

1. Gross, Charles A. "*Electric machines*". CRC press, 2006.
2. Vithayathil, Joseph. "*Power electronics principles and applications*". Tata McGraw-Hill Education, 1995.
3. Venkataratnam, K. "*Special electrical machines*". Universities Press, 2009.
4. Mohan, Ned, and Tore M. Undeland. "*Power electronics: converters, applications, and design*". John Wiley & Sons, 2007.
5. Guru, Bhag S., and Hüseyin R. Hiziroglu. "*Electric machinery and transformers*", Oxford University Press, 2001.

Course Plan

Module	Contents	Hours	End Sem. exam marks
I	Transformers-Operating principle, ideal and practical transformers, EMF equation, No load phasor diagram, equivalent circuit, phasor diagram of a transformer on load. Approximate equivalent circuit of transformer and its simplification. Voltage regulation, efficiency, condition for maximum efficiency, transformer tests.	9	15%
II	Three phase Induction motors- principle of action, frequency of rotor emf and current. Factors determining the torque. Torque-slip curve, comparison of slip ring and cage rotors. Single phase induction motors-capacitor run induction motor, split phase motors, shaded pole motors.	6	15%
	First Internal Exam		

III	Direct current machines-general arrangement of a dc machine, calculation of e.m.f. generated in an armature winding, armature reaction, commutation. Armature and field connections. A dc machine as generator or motor. Speed of a motor, speed characteristics of shunt, series and compound motors. Torque characteristics of shunt, series and compound motors.	8	15%
IV	Control system motors-Motors for regulators, RPC system requirements, Geneva cam, stepper motor, variable reluctance motor, hybrid stepping motor, drive circuits.	6	15%
Second Internal Exam			
V	Motor selection-Factors affecting the selection motors-speed, power rating and duty cycles, load torques. The motor and its environment.	4	20%
VI	Power electronics- introduction to power electronics, thyristor circuits, limitations to thyristor operation, thyristors in practice, The fully controlled a.c./d.c. converter, ac/dc inversion. Switching devices in inverters.	9	20%
End Semester Exam			

Question Paper Pattern

Maximum marks: 100 Time: 3 hours

The question paper shall consist of three parts

Part A
4 questions uniformly covering modules I and II. Each question carries 10 marks
Students will have to answer any three questions out of 4 (3X10 marks =30 marks)

Part B
4 questions uniformly covering modules III and IV. Each question carries 10 marks
Students will have to answer any three questions out of 4 (3X10 marks =30 marks)

Part C
6 questions uniformly covering modules V and VI. Each question carries 10 marks
Students will have to answer any four questions out of 6 (4X10 marks =40 marks)

Note: In all parts, each question can have a maximum of four sub questions, if needed.

Course code	Course Name	L-T-P-Credits	Year of Introduction
ME308	COMPUTER AIDED DESIGN AND ANALYSIS	3-0-0-3	2016

Prerequisite: ME201 Mechanics of solids

Course Objectives:

1. To impart basic knowledge on Computer Aided Design methods and procedures
2. To introduce the fundamentals of solid modelling
3. To introduce the concepts of finite element analysis procedures.

Syllabus

Introduction to CAD/CAM, Basics of geometric and solid modeling, transformation, representation points, lines, surfaces and solid models. Introduction to finite element analysis, solution procedures, interpolation, isoparametric formulation, applications.

Expected outcome:

The students will be able to

1. Gain a basic knowledge on Computer Aided Design methods and procedures
2. Understand the fundamentals of solid modelling
3. Have a basic knowledge in finite element analysis procedures.

Text Books:

1. M.P. Groover, E.M. Zimmers, Jr.CAD/CAM; Computer Aided Design and Manufacturing, Prentice Hall of India, 1987
2. T. R. Chandrupatla and A. D. Belagundu, Introduction to Finite Elements in Engineering, Pearson Education, 2001

References:

1. Chris Mcmahon and Jimmie Browne - CAD/CAM – Principle Practice and Manufacturing Management, Addision Wesley England,1998
2. D. F. Rogers and J. A. Adams, Mathematical Elements in Computer Graphics, McGraw-Hill,1990
3. Daryl Logan, A First course in Finite Element Method, Thomson Learning,2007
4. David V Hutton, Fundamentals of Finite Element Analysis, THM,2003
5. Donald Hearn, M. Pauline Baker and Warren Carithers, Computer Graphics with open GL, Pearson Education,2001
6. Grigore Burdea, Philippe Coiffet, Virtual Reality Technology, John Wiley and sons,2003
7. Ibrahim Zeid, CAD/ CAM Theory and Practice, McGraw Hill,2007
8. P. Radhakrishnan and S. Subramanyan, CAD / CAM / CIM, New Age Int. Ltd.,2008

Course Plan			
Module	**Contents**	**Hours**	**End Sem. Exam Marks**
I	Introduction to CAD , Historical developments, Industrial look at CAD, Comparison of CAD with traditional designing, Application of computers in Design	2	15%
	Basics of geometric and solid modeling, Packages for CAD/CAM/CAE/CAPP	1	
	Hardware in CAD components, user interaction devices, design database, graphic Standards, data Exchange Formats, virtual Reality.	4	
II	Transformation of points and line, 2-D rotation, reflection, scaling and combined transformation, homogeneous coordinates, 3-D scaling.	4	15%
	Shearing,rotation, reflection and translation, combined transformations, orthographic and perspective projections, reconstruction of 3-D objects.	3	
FIRST INTERNAL EXAM			
III	Algebraic and geometric forms, tangents and normal, blending functions, reparametrization, straight lines, conics, cubic splines, Bezier curves and B-spline curves.	4	15%
	Plane surface, ruled surface, surface of revolution, tabulated cylinder, bi-cubic surface, bezier surface, B-spline surfaces and their modeling techniques.	3	
IV	Solid models and representation scheme, boundary representation, constructive solid geometry.	3	15%
	Sweep representation, cell decomposition, spatial occupancy enumeration, coordinate systems for solid modeling.	4	
SECOND INTERNAL EXAM			
V	Introduction to finite element analysis - steps involved in FEM-Preprocessing phase – discretisation - types of elements	2	20%
	Formulation of stiffness matrix (direct method, 1-D element) - formulation of load vector - assembly of global equations - implementation of boundary conditions - solution procedure - post processing phase	3	
	Simple problems with axial bar element (structural problems only)	2	
VI	Interpolation – selection of interpolation functions - CST element - isoparametric formulation (using minimum PE theorem) – Gauss-quadrature	4	20%

	Solution of 2D plane stress solid mechanics problems (linear static analysis)	3	
END SEMESTER EXAM			

Question Paper Pattern

Maximum marks: 100 **Time: 3 hrs**

The question paper should consist of three parts

Part A
There should be 2 questions each from module I and II
Each question carries 10 marks
Students will have to answer any three questions out of 4 (3X10 marks =30 marks)

Part B
There should be 2 questions each from module III and IV
Each question carries 10 marks
Students will have to answer any three questions out of 4 (3X10 marks =30 marks)

Part C
There should be 3 questions each from module V and VI
Each question carries 10 marks
Students will have to answer any four questions out of 6 (4X10 marks =40 marks)

Note: Each question can have a maximum of four sub questions, if needed.

Course code	Course Name	L-T-P - Credits	Year of Introduction
HS300	Principles of Management	3-0-0-3	2016

Prerequisite : Nil

Course Objectives

- To develop ability to critically analyse and evaluate a variety of management practices in the contemporary context;
- To understand and apply a variety of management and organisational theories in practice;
- To be able to mirror existing practices or to generate their own innovative management competencies, required for today's complex and global workplace;
- To be able to critically reflect on ethical theories and social responsibility ideologies to create sustainable organisations.

Syllabus

Definition, roles and functions of a manager, management and its science and art perspectives, management challenges and the concepts like, competitive advantage, entrepreneurship and innovation. Early contributors and their contributions to the field of management. Corporate Social Responsibility. Planning, Organizing, Staffing and HRD functions, Leading and Controlling. Decision making under certainty, uncertainty and risk, creative process and innovation involved in decision making.

Expected outcome.

A student who has undergone this course would be able to

i. manage people and organisations
ii. critically analyse and evaluate management theories and practices
iii. plan and make decisions for organisations
iv. do staffing and related HRD functions

Text Book:

Harold Koontz and Heinz Weihrich, *Essentials of Management*, McGraw Hill Companies, 10th Edition.

References:

1. Daft, *New era Management*, 11th Edition, Cengage Learning
2. Griffin, *Management Principles and Applications*, 10th Edition, Cengage Learning
3. Heinz Weirich, Mark V Cannice and Harold Koontz, *Management: a Global, Innovative and Entrepreneurial Perspective*, McGraw Hill Education, 14th Edition
4. Peter F Drucker, *The Practice of Management*, McGraw Hill, New York
5. Robbins and Coulter, *Management*, 13th Edition, 2016, Pearson Education

Course Plan

Module	Contents	Hours	Sem. Exam Marks
I	Introduction to Management: definitions, managerial roles and functions; Science or Art perspectives- External environment-global, innovative and entrepreneurial perspectives of Management (3 Hrs.)– Managing people and organizations in the context of New Era- Managing for competitive advantage - the Challenges of Management (3 Hrs.)	6	15%

II	**Early Contributions and Ethics in Management**: Scientific Management- contributions of Taylor, Gilbreths, Human Relations approach-contributions of Mayo, McGregor's Theory, Ouchi's Theory Z (3 Hrs.) Systems Approach, the Contingency Approach, the Mckinsey 7-S Framework Corporate Social responsibility- Managerial Ethics. (3 Hrs)	6	15%
FIRST INTERNAL EXAMINATION			
III	**Planning:** Nature and importance of planning, -types of plans (3 Hrs.)- Steps in planning, Levels of planning - The Planning Process. – MBO (3 Hrs.).	6	15%
IV	**Organising for decision making:** Nature of organizing, organization levels and span of control in management Organisational design and structure –departmentation, line and staff concepts (3 Hrs.) Limitations of decision making- Evaluation and selecting from alternatives- programmed and non programmed decisions - decision under certainty, uncertainty and risk-creative process and innovation (3 Hrs.)	6	15%
SECOND INTERNAL EXAMINATION			
V	**Staffing and related HRD Functions:** definition, Empowerment, staff – delegation, decentralization and recentralisation of authority – Effective Organizing and culture-responsive organizations –Global and entrepreneurial organizing (3 Hrs.) Manager inventory chart-matching person with the job-system approach to selection (3 Hrs.) Job design-skills and personal characteristics needed in managers-selection process, techniques and instruments (3 Hrs.)	9	20%
VI	**Leading and Controlling:** Leading Vs Managing – Trait approach and Contingency approaches to leadership - Dimensions of Leadership (3 Hrs.) - Leadership Behavior and styles – Transactional and Transformational Leadership (3 Hrs.) Basic control process- control as a feedback system – Feed Forward Control – Requirements for effective control – control techniques – Overall controls and preventive controls – Global controlling (3 Hrs.)	9	20%
END SEMESTER EXAM			

Question Paper Pattern

Max. marks: 100, Time: 3 hours .
The question paper shall consist of three parts

Part A: 4 questions uniformly covering modules I and II. Each question carries 10 marks
Students will have to answer any three questions out of 4 (3X10 marks =30 marks)
Part B : 4 questions uniformly covering modules III and IV. Each question carries 10 marks
Students will have to answer any three questions out of 4 (3X10 marks =30 marks)
Part C: 6 questions uniformly covering modules V and VI. Each question carries 10 marks
Students will have to answer any four questions out of 6 (4X10 marks =40 marks)

Note: In all parts, each question can have a maximum of four sub questions, if needed.

Course code	Course Name	L-T-P - Credits	Year of Introduction
AU368	Tractors and Farm Equipment	3-0-0- 3	2016

Prerequisite : Nil

Course Objectives

- To impart basic knowledge about tractors and various farm machineries
- To understand the working of various components of tractors, various farming processes and equipment used in farming.

Syllabus

Tractors – types- components- safety rules – application – layout – power unit – various systems – preventive maintenance – tillage equipment – plough – hitching – harvesting – threshing – cultivation machinery – harrows – corn drills – potato crop machinery – sugar beet crop machinery

Expected outcome.

Upon completion of the course, students will

i. Be able to understand the various systems in tractors and farm equipments.
ii. Get the basic knowledge about the farming processes and equipments used in farming.

Text Books:

1. Nakra C.P., "Farm machines and equipments" Dhanparai Publishing company Pvt. Ltd.
2. Rodichev and G. Rodicheva, *Tractor and Automobiles*, MIR Publishers, Moscow, 1987.

References:

1. Geleman and M. Maskovin, *Farm Tractors*, MIR. Publishers, Moscow, 1975.
2. Guruvech A. and B. Sorekin, *Tractors*, MIR Publishers Moscow, 1975.
3. Kolchin A. and V. Demidov, *Design of Automotive Engines for Tractor*, MIR Publishers, Moscow, 1972.
4. Smith H. P. and L. H. Wilkes, *Farm Machinery and Equipment*, TATA McGraw Hill Publications, 1977.

Course Plan

Module	Contents	Hours	Sem. Exam Marks
I	Introduction to tractors -Tractors and tractors units, General Description of Tractors: Classification of tractors - Components of tractor – Safety rules. applications of tractors, Rating of Tractors, Wheeled and Crawler tractor. Layout of wheeled tractor, hydraulic control system, power take off, tractor stability and ride characteristics.	7	15%
II	Layout of crawler tractors, crawler details, methods of selection of equipments, selection of machines, basic rules for matching machines, selection of equipments including the nature of operating selection based on the type of soil, selection based on haul distance, selection based on weather conditions.	7	15%
	FIRST INTERNAL EXAMINATION		
III	Power Plant in Tractors: Engine cycles – Operation of multicylinder engines - General engine performance characteristics, Cooling system - Classification - Liquid cooling system - Components, Lubricating system servicing and troubles - Air cleaner and turbo charger - Fuel tanks and filters - Fuel pumps.	7	15%

IV	Control System of Tractors: power transmission, steering system, brakes and braking system, wheels, rims and tyres and accessories of wheeled tractors, power transmission. steering clutch and braking system in crawler tractors. Preventive maintenance of engine components and various systems of a tractor.	7	15%
SECOND INTERNAL EXAMINATION			
V	Primary and Secondary Tillage equipments - DISC Plough – Mould Board Plough – Tiller and Harrows – Construction and maintenance – furrow mounted plough – plough controls - Mounting the plough – ploughing methods – systematic ploughing , round and round ploughing and one way ploughing - hitching – Three point linkage – Cage Wheel and its uses.	7	20%
VI	Harvesting – conventional and Modern Harvesters – Threshing – Principle of Paddy Threshers construction and maintenance — safety precautions. Cultivation machinery – cultivators – effects and uses of cultivator – disc harrows – spring tine cultivator – seed harrows – chain harrows –rotary cultivator – uses. Corn drills – seed metering mechanisms –Combine harvester – potato crop machinery – hand feed and automatic – sugar beet crop machinery.	7	20%
END SEMESTER EXAM			

Question Paper Pattern

Maximum marks: 100 Time: 3 hours

The question paper shall consist of three parts

Part A
4 questions uniformly covering modules I and II. Each question carries 10 marks
Students will have to answer any three questions out of 4 (3X10 marks =30 marks)

Part B
4 questions uniformly covering modules III and IV. Each question carries 10 marks
Students will have to answer any three questions out of 4 (3X10 marks =30 marks)

Part C
6 questions uniformly covering modules V and VI. Each question carries 10 marks
Students will have to answer any four questions out of 6 (4X10 marks =40 marks)

Note: In all parts, each question can have a maximum of four sub questions, if needed

Course code	Course Name	L-T-P-Credits	Year of Introduction
ME332	COMPUTER AIDED DESIGN AND ANALYSIS LAB	0-0-3-1	2016

Prerequisite: ME308 Computer aided design and analysis

Course Objectives:

- To provide working knowledge on Computer Aided Design methods and procedures
- To impart training on solid modelling software
- To impart training on finite element analysis software

Syllabus

Introduction to solid modeling and Finite Element Analysis software.
Exercises on modeling and assembly.
a. Creation of higher end 3D solid models.(minimum 3 models)
b. Creation of assembled views of riveted joints, cotter joints and shaft couplings. (minimum 3 models)
Exercises on the application of Finite Element Method/Finite Volume Method to engineering systems:-

a. Structural analysis. (minimum 3 problems)
b. Thermal analysis. (minimum 2 problems)
c. Fluid flow analysis. (minimum 1 problem)

Expected outcome:

The students will be able to

i. Gain working knowledge in Computer Aided Design methods and procedures
ii. Solve simple structural, heat and fluid flow problems using standard software

Points to note:

- Any appropriate solid modeling software (like CATIA, Solids Works, ProE, IDEAS, Siemens Solid Edge and NX, free software, etc.) and package (like ANSYS, Comsol Multi Physics, NASTRAN, ABAQUS, ADINA, Siemens Femap Nastran,free software etc.) may be used.
- **Evaluation**

  Class exercises 60 marks
  Regular class viva 10 marks
  Final internal exam using software 30 marks
  All the above three evaluations are mandatory.

References Books:

1. Daryl Logan, A First course in Finite Element Method, Thomson Learning, 2007
2. David V Hutton, Fundamentals of Finite Element Analysis, Tata McGraw Hill,2003
3. Ibrahim Zeid, CAD/ CAM Theory and Practice, McGraw Hill, 2007
4. Mikell P. Groover and Emory W. Zimmer, CAD/ CAM – Computer aided design and manufacturing, Pearson Education,1987
5. T. R. Chandrupatla and A. D. Belagundu, Introduction to Finite Elements in Engineering, Pearson Education, 2012

Course code	Course Name	L-T-P - Credits	Year of Introduction
AU334	VEHICLE TESTING LAB	0-0-3- 1	2016

Prerequisite : AU305 Vehicle maintenance

Course Objectives

- To study of various equipments / Machines used for Automobile testing applications..
- To familiarize with test process involved for diagnosis of various systems and components of an automobile.
- To diagnose components of the automobile vehicle system and familiarize with trouble shooting procedure.

List of Exercises/Experiments

1. Checking the exhaust of gasoline vehicle with infra red gas analyzer.
2. Checking the emission of diesel vehicle with smoke meter.
3. Checking the emission using Multigas analyzer for the given vehicle.
4. Wheel alignment: Checking the camber, caster, kingpin inclination, toe in & out with optical aligner or computerized wheel aligner.
5. Removal of tyre, inspection of tyre and tube, carryout the necessary repair and reassemble with automatic or semiautomatic tire changer.
6. Wheel balancing: Balancing of wheels by using computerized wheel balancing machine.
7. Vehicle testing - Performance Testing of vehicle with chassis dynamometers (2 / 4 wheelers)
8. Checking the engine with Scan tool and familiar with DTC.
9. Brake testers: Testing of brakes using brake testers
10. Testing of Shock Absorbers.
11. Fault diagnostic of Air Conditioning System.
12. Head Light Aiming and Focusing with Head light aligners.
13. Testing auto electrical components:

a) Battery testing - Specific gravity test, open volt test, HRD test.
b) Testing generator and regulator - testing the generator for short circuit, open circuit, testing the regulator unit
c) Testing and checking of spark plugs - Cleaning and testing the spark plug with spark plug cleaner & testing machine.
d) Testing of ignition coil
e) Checking of dwell angle and rpm.

Expected outcome.

The students will be able to

i. identify various systems and components in automobile and also to handle any maintenance issue in a vehicle
ii. identify the troubles of the vehicles from the symptoms shown.

Text Book:

1. Boyce Dwiggins – Automobile Repair guide, Theodor Audel and Co., Indiana – 1978.
2. A. W. Judge – Maintenance of high speed diesel engine, Chapmann Hall Ltd.
3. A. W. Judge – Motor vehicle engine servicing 3rd edition, Pitman paper mark, London, 1969.
4. Vehicle service manuals and reputed manufacturers.

List of Equipment needed for the laboratory

Sl. No.	NAME OF THE EQUIPMENT	Qty.
1	Exhaust gas analyzer	1
2	Diesel Smoke Meter	1
3	Multi-gas analyser	1
4	Computerized wheel aligner	1
5	Automatic/ Semi Automatic Tyre Changer	1
6	Tyre Inflator	1
7	Computerized Wheel balancing equipment apparatus	1
8	Chassis dynamometer 2/4 wheeler	1
9	Scan Tool and new generation vehicle for	1
10	Brake tester	1
11	Shock absorber tester	1
12	Air Conditioning testing equipment.	1
13	Head light aligner	1
14	Battery test bench comprising all necessary tools to check specific gravity, open vot, HRD and provide condition of battery	1
15	Growler and regulator tester	1
16	Spark Plug testing and cleaning equipment with compressor connection	1
17	Ignition coil tester	1
18	Dwell and rpm tester	1

Course code	Course Name	L-T-P - Credits	Year of Introduction
**352	Comprehensive Examination	0-1-1-2	2016
Prerequisite : Nil			

Course Objectives

- To assess the comprehensive knowledge gained in basic courses relevant to the branch of study
- To comprehend the questions asked and answer them with confidence.

Assessment

Oral examination – To be conducted by the college (@ three students/hour) covering all the courses up to and including V semester– 50 marks
Written examination - To be conducted by the Dept. on the date announced by the University– common to all students of the same branch – objective type (1 hour duration)– 50 multiple choice questions (4 choices) of 1 mark each covering the six common courses of S1&S2 and six branch specific courses listed – questions are set by the University - no negative marks – 50 marks.

Note: Both oral and written examinations are mandatory. But separate minimum marks is not insisted for pass. If a students does not complete any of the two assessments, grade I shall be awarded and the final grade shall be given only after the completion of both the assessments.
The two hours allotted for the course may be used by the students for discussion, practice and for oral assessment.

Expected outcome.

- The students will be confident in discussing the fundamental aspects of any engineering problem/situation and give answers in dealing with them