SYLLABUS

FOR

B.TECH. PROGRAMME

IN

MECHANICAL ENGINEERING

INSTITUTE OF TECHNOLOGY

ZAKURA CAMPUS
UNIVERSITY OF KASHMIR
SRINAGAR J&K, 190006

COURSESTRUCTUREFOR
B.Tech 8thSemesterMechanical
ATUNIVERSITYOFKASHMIR

CourseCode	CourseTitle	Teaching Periods per week			Credits
		L	T	P	
MEE- 8117	Production & OperationsManagement	3	1	0	4
MEE- 8217	Internal Combustion Engines	3	1	0	4
MEE- 8317	Departmental Elective- I	2	1	0	3
MEE-8417	Departmental Elective - II	2	1	0	3
MEE- 8517	Final Year Project	0	6	8	10
MEE- 8217L	I.C. Engine Lab.	0	0	2	1
	Total	**10**	**10**	**10**	**25**

ELECTIVE- I		ELECTIVE - II	
CourseCode	**CourseTitle**	**CourseCode**	**CourseTitle**
MEE 80*	Value Engineering	MEE 80#	Power Plant Engineering (PPE)
MEE 80*	Theory of Elasticity (TOE)	MEE 80#	CAD of Thermal systems
MEE80*	Introduction to Acoustics	MEE80#	Introduction to MEMS
MEE80*	HVAC		
MEE 80*	Fracture Mechanics		

MEE-8117

Production and Operations Management

UNIT I

Managing and planning operations: Introduction to operations management (OM), historical perspective and growth, operations strategies for competitive advantage,forecasting (FC), nature and use of FC, sources of data, demand pattern, FC models, designing products, services and processes, new product design, product development, product life cycle, product development process, product reliability, process technology life cycle, flexible manufacturing systems.

UNIT II

Scheduling systems and aggregate planning for products and services: operations planning and scheduling systems, the aggregate planning process, strategies for developing aggregate planning, master schedule and rough cut capacity planning, implementing aggregate plans and master schedules, material requirement planning (MRP).

UNIT III

Managing for world class competition Japanese contribution for WCM: JIT manufacturing, basic concepts of TQM, ISO, Poka-Yoke and Kaizen, business process re-engineering, lean manufacturing, concepts of supply chain management.

Text Book:

1. Panneerselvam R, " Production and Operations Management", *2nd Edition*, 2005

Reference Books:

1. Roberta S. Russell, Taylor B.W, "Operations Management", *Pearson Prentice Hall, 4thedition.*, 2001.
2. Everett, E.A., Ronald J.E, "Production and Operations Management" *Prentice Hall of India, 5th edition*, New Delhi, 2001
3. Evans J.R., Collier D.A., "Operations Management, An Integrated Goods and Services Approach", *Cengage Learning India*,New Delhi, 2007.

MEE-8217

Internal Combustion Engines

UNIT I

Thermodynamics of actual working fluids: working fluid before combustion, valve and port timing diagrams, thermodynamic properties of fuel-air mixture before combustion, use of combustion charts for unburned mixture, use of combustion charts for burned mixture appropriate treatment of fuel air mixtures, fuel air cycles: definition, constants, volume fuel air cycle, limited pressure cycle, characteristics of fuel-air cycles, comparison of real and fuel cycles, air capacity of four stroke engines: ideal air capacity , volumetric efficiency , ideal induction process, actual induction process, effect of operating conditions on volumetric efficiency, effect of design on volumetric efficiency, estimating air capacity.

UNIT II

Two stroke engines: scavenging process, ideal scavenging process, relationship of scavenging ratio and scavenging efficiency, power to scavenger, supercharged two stroke engines,combustion and detonation**:** chemistry of combustion, normal combustion in S.I engines , pre-ignition and auto-ignition comparison, detonation in S.I engines, combustion in C.I engines, detonation in C.I engines, methods of reducing detonation , preliminary detonation, preliminary facts about fuel and dopes, octane and cetane numbers, effect of design on detonation, mixture requirements, steady running, mixture requirements, transient mixture requirements, mixtures requirements for fuel injection engines, mixture requirements for S.I engines, performance of supercharged engines: engine performance measures, commercial engine ratings, basic performance equations for un-supercharged engines, effect of atmospheric conditions, altitude and compression ratio on performance characteristics, performance curves, supercharged engines: definitions, reasons for supercharging, supercharging of S.I engines, supercharging of diesel engines.

UNIT III

Heat losses and cooling: Area of heat flow engines, temperature profile, engine cooling system, numericals on heat transfer in IC engines, Engine design: selection of type, engine speed and principles of similitude. numerical on alternative fuels, numerical on diesel fuel injection system, numericals on engine specification and verification, numerical on two stroke engines, general design of petrol and diesel engine, numericals on engine design, determination of main dimensions, comparative numerical on two stroke engines and four stroke engines.

Text Book:

1. Heywood, J.B., “Internal Combustion Engine fundamentals”, *Mc-Graw Hill Book Co*., USA, 1989.

Reference Books:

1. Domkundvar V.M., “A course in internal combustion engines”, *DhanpatRai and company*, New Delhi, 1999.

MEE-8317

Theory of Elasticity

UNIT I

Introduction: Elasticity, stress components of stress and strain, Hooks law, equations in polar coordinates, plane stress and plane strain, strain at a point, Mohr circle for strain rosette, differential equation of equilibrium, boundary conditions, compatibility equations, overview of Airys stress functions.

UNIT II

Two dimensional problems in rectangular coordinates: solution by polynomials, St.Venants principles, determination of displacement, bending of beams, solution by Fourier series, Two dimensional problems in polar coordinates: equations in polar coordinates, equation about 1-axis, and pure bending in curved bars.

UNIT III

Determination of strains and displacement: Effect of circular hole on stress distribution in plate concentrated and vertical loading of a straight boundary, circular disc, general solution and its applications, analysis of stress and strain in three dimensions: stress at a point, principal stress, stress ellipsoid and stress director surface, homogenous deformation, strain at a point, principle strain rotation.

Text Books:

1. Timoshenko, S.P. and Goodier, J.N., "Theory of Elasticity," *Mc-Graw Hill Book Company*, N.Y., USA, 1970.

Reference Books:

1. Love, A.E.H., "The Mathematical Theory of Elasticity," *Dover Publications*, NewYork, USA, 1944.

MEE-8417

Power Plant Engineering

UNIT I

Introduction: Energy source for generation of electric power, principle types of power plants, their special features and applications, major power plants in India, steam power plants:Selection of site, general layout of the power plant, special features of the modern steam boilers, circulation principle, steam separation and purification, economizers and air pre-heater types and estimation of performance, super-heater and superheat control, feed water heaters, cooling tower, temperature and pressure control, introduction to hydro electric power plant: types of hydro-electric plant in combination with steam plant, runoff river plant in combination with steam plant, storage plant in combination with steam or nuclear plant, coordination of hydro-electric and gas turbine stations, coordination of different types of power plants.

UNIT II

Nuclear Power Plants: Nuclear fuel, nuclear energy by fission, main components of nuclear reactors, pressurized water, boiling water, liquid metal and gas nuclear reactors, diesel power plants: plant layout, two and four stroke cycle diesel engines, fuel injection, lubrication and cooling systems, supercharging and starting systems, gas and steam turbine combined cycles:simple gas and steam combined cycle power generation.

UNIT III

Economic Analysis of Power Plants and Tariffs: The cost of electrical energy, selection of types of generating equipment, performance and operating characteristics of power plant, load division among generators, tariff methods of electrical energy, combined operation of different power plants:Advantages of combined working, load division among power stations, storage.

Text Book:

1. Rajput R.K., "A text book of power plant engineering", *Laxmi Publication, Pvt. Ltd*., New Delhi, 2007.

Reference Books:

1. Domkundwar, S., "Power Plant Engineering", *S.C. Chand and company*, New Delhi, 2000.
2. Joel W, Roy E, "Modern Power Plant Engineering", *Prentice-Hall of India Ltd.*, New Delhi, 1985.

MEE-8517

Fracture Mechanics

UNIT I

Summary of basic problems and concepts in fracture: A crack in a structure, crack tip stresses, The Griffith criterion, crack opening displacement criterion, crack propagation, mechanisms of fracture and crack growth, cleavage fracture, ductile fracture, fatigue cracking, environmental assisted cracking, service failure analysis.

UNIT II

The elastic crack-tip stress field: Airy stress function, complex stress function, solution to crack problems, the effect of finite size, some special cases, elliptic cracks, the energy principles, the concept of energy release rate, the criterion for crack growth, the crack resistance, the concept of J-integral.

UNIT III

Crack-tip plastic zone: Irwin's plastic zone correction, the Dug-dale approach, plane stress versus plane strain, plastic constraint factor, the thickness effect, application of Von Mises and Tresca yield criteria to obtain plasticity effected regions, dynamics and crack arrest, crack speed and kinetic energy, the dynamic stress intensity and elastic energy release rate, principles of crack arrest.

Text Book:

1. Anderson T.L., "Fracture Mechanics Fundamentals and applications",*CRC, Taylor & Francis*,2005

Reference Book:

1. JanssenM.J.,Zuidema, J., Wanhill R.J.H., "Fracture Mechanics", *Spon Press*, , 2004.

MEE-8217L

I.C Engines Lab

Experiments to be conducted

1. Study of two stroke spark ignition engine model.
2. Study of four stroke spark ignition engine model.
3. Study of four stroke diesel engine model.
4. Study of rotary wankel engine.
5. Study of models of gas turbine engines.
6. Study of single cylinder four stroke direct injection diesel engine. (cut section)
7. Study of multi-cylinder optical spark ignition engine.
8. Experimental study of characteristic performance curves of spark ignition engine using gasoline as fuel.
9. Experimental study of characteristic performance curves of compression ignition engine using diesel as fuel.
10. Experimental study of characteristic performance curves of compression ignition engine using biodiesel blends, with diesel as fuel.
11. Study of engine components (cylinder block, crank shaft etc).
12. Study of components of ignition system of S.I. Engines.

Course No.: MEE - 8317 VALUE ENGINEERING C L T(3 2 1)

UNIT I:

Introduction to value engineering (VE) & value analysis (VA), Life Cycle of a product, Methodology of VE, Reasons for the existence of unnecessary costs. Quantitative definition of Value, use Value and Prestige value, Estimation of product Quality/Performance, Types of functions, Relationship between use functions and Esteem Functions in product design, Functional cost and functional worth, Effect of value improvement on profitability, Tests for poor value, Aims of VE-systematic approach.

UNIT II

Elementary introduction to VE, Job plan functional approach to value improvement, Various phases and techniques of the job plan, Factors governing project selection, Types of projects, Life cycle costing for managing the total value, concepts in LCC, Present value concept, Annuity concept, net present value, Pay Back period, internal rate of return on investment (IRR), Examples and Illustrations. Creative thinking and creative judgement, positive or constructive discontent, Tangible and intangible costs of implementation, False material, Labour and overhead saving, VE/VA yardsticks, Relationship between savings and probability of success, Reliability Estimation, system Reliability, Reliability elements in series and parallel.

UNIT III

PHASES AND TECHNIQUES OF VE JOB PLAN:

General Phase, Information phase, Function phase, Creativity/Speculation Phase, Evaluation Phase, Investigation Phase and Recommendation Phase: Value improvement recommendation theory, determination of cut-off point (cop), road blocks in implementation. Decision Matrix/Evaluation Matrix, Quantitative comparison of Alternatives, Estimation of weights factors and efficiencies, Utility transformation functions, Bench marking, Perturbation of weight factors (sensitivity analysis), and Examples.

FAST Diagramming: Critical path of functions, HOW, WHY & WHEN Logic, Supporting and all time functions.

Reference Books:

1. Arthur E. Mudge, "Value Engineering- A Systematic Approach", *McGraw Hill Book Co.*, 1971.
2. Miles L.D., "Techniques of value Analysis and Engineering", *McGraw Hill Book Co., New York, 1970.*
3. ASTME-American society for Tool and Manufacturing Engineers," Value engineering in Manufacturing", *Prentice Hall Inc. USA, 1967.*