

SEMESTER VIII

CODE	COURSE OF STUDY	L	T	P	C
ME402	Principles of Operations Research	3	0	0	3
ME404	Industrial safety and Maintenance Engineering	3	0	0	3
	Elective – IV	3	0	0	3
	Elective – V	3	0	0	3
ME492	Project Work Phase – II	0	0	15	6
	Total	12	0	15	18

LIST OF ELECTIVES**SEMESTER VIII****Elective – IV**

CODE	COURSE OF STUDY	L	T	P	C
ME462	Industrial Robotics	3	0	0	3
ME464	Combustion Engineering	3	0	0	3
ME466	Dynamics of Machinery	3	0	0	3
ME468	Renewable Energy	3	0	0	3
ME470	Automotive Fuels, Pollution, and Control	3	0	0	3

Elective – V

ME472	Advanced Machining Processes	3	0	0	3
ME474	Petroleum Engineering	3	0	0	3
ME476	Composite Materials	3	0	0	3
ME478	Direct Energy Conversion Systems	3	0	0	3
ME480	Project Management (or) Any one Elective from other Departments	3	0	0	3

SEMESTER VIII

ME402 Principles of Operations Research

UNIT-I

Linear Programming: Formulation and graphical solution of LPP's. Reduction of a LPP to the standard form. Simplex method, Big-M method, Two-phase method. Dual linear programming problem. Solution of the primal problem from the solution of the dual problems. Transportation Problems: Initial basic feasible solution using N-W corner rule, row minimum, column minimum, least cost entry and Vogel's approximation method. Optimal solutions. Degeneracy in Transportation problems. Assignment Problem.

UNIT-II

CPM and PERT: Network diagram - Events and activities - Project planning - reducing critical events and activities - critical path calculations - example - sequencing problems - 2 machines and n jobs, n machines and 2 jobs, m machines and n jobs problem.

UNIT-III

Dynamic Programming: Formulation - Invest problem - General allocation problem - Stage coach problem - Production scheduling.

UNIT-IV

Decision Theory: Two person Zero Sum game, saddle point determination, algebraic method, graphical method-replacement analysis.

UNIT-V

Introduction to Markov Process - M/M/1, M/M/C Queues with finite and infinite waiting space.

Text Books

1. Kanti Swarup, Man Mohan & P. K. Gupta: Introduction to Operations Research by (Sultan Chand & Sons)
2. J.C. Pant: Introduction to Operations Research, (Jain Brothers, New Delhi)

3. Taha H.A., “Operations Research”, Sixth Edition, Prentice Hall of India, 2003.

Reference Books:

1. Hillier & Lieberman: Operations Research, TMH

2. Shennoy G.V. and Srivastava U.K., “Operation Research for Management”, Wiley Eastern, 1994.

3. Bazara M.J., Jarvis and Sherali H., “Linear Programming and Network Flows”, John Wiley, 1990.

4. Philip D.T. and Ravindran A., “Operations Research”, John Wiley, 1992.

5. Hillier and Libebberman, “Operations Research”, Holden Day, 1986

6. Budnick F.S., “Principles of Operations Research for Management”, Richard D Irwin, 1990.

7. Tulsian and Pasdey V., “Quantitative Techniques”, Pearson Asia, 2002.

ME404 Industrial Safety and Maintenance Engineering

UNIT – I

Safety and productivity - causes of accidents in industries – accident reporting and investigation - measuring safety performance - Safety organizations and functions - Factories act and rules.

UNIT – II

Safety Codes and Standards - General Safety considerations in Material Handling equipments - Machine Shop machineries - pressure vessels and pressurized pipelines – welding equipments – operation and inspection of extinguishers – prevention and spread of fire – emergency exit facilities.

UNIT – III

Objectives of maintenance - types of maintenance – Breakdown, preventive and predictive maintenance - Repair cycle - Repair Complexity, Lubrication and Lubricants. Maintenance of Mechanical transmission systems and process plants.

UNIT – IV

Predictive Maintenance - vibration and noise as maintenance tool - wear debris analysis - Condition monitoring concepts applied to industries - Total Productive Maintenance (TPM) - Economics of Maintenance- Computer aided maintenance.

UNIT – V

Reliability: Definition, concept of reliability based design, failure analysis - failure rate, MTTF, MTBF, failure pattern, failure prediction, system reliability: Series, Parallel and Mixed configurations - Availability and Maintainability concepts- Applications. Non Destructive Examination – Base line data- residual life prediction.

Text Books:

- 1.P.Gopalakrishnan - Maintenance and Spare parts Management, Prentice Hall of India Pvt. Ltd., New Delhi, 1990.
2. L.S.Srinath - Reliability Engineering, Affiliated East West press, 2003
3. Rolland P.Blake - Industrial Safety, Prentice Hall of India Pvt. Ltd., New Delhi, 1973.
- 3.Blake R.B., “Industrial Safety” Prentice Hall, Inc., New Jersey, 1973
- 4.Heinrich H.W. “Industrial Accident Prevention” McGraw-Hill Company, New York, 1980.

Reference Books:

- 1.H.P.Garg, Industrial Maintenance, S.Chand & Co Ltd., New Delhi, 1990.
2. E.Balagurusamy, Reliability Engineering, Prentice Hall of India P Ltd., New Delhi, 2003.
- 3.Krishnan N.V. “Safety Management in Industry” Jaico Publishing House, Bombay, 1997.
4. John Ridley, “Safety at Work”, Butterworth & Co., London, 1983.

ME492 Project Work Phase – II

Project work phase II will be an extension of the project work started in the seventh semester. On completion of the work, a project report should be prepared and submitted to the department. The project work and the report will be evaluated by an internal assessment committee for 50 marks. Out of these 50 marks 15 marks are based on Internal assessment marks obtained in

Phase I The external university examination, which carries a total of 50 marks, will have report evaluation and viva voce examination conducted by a committee of one external examiner and one internal examiner appointed by the institute. Each group of students will be assigned a project Topic in the current and frontier areas. The group of student has to conduct a detailed study/survey on the project topic and prepare a report. The student will make an oral presentation followed by a brief question and answer session. The project presentation and report for a total of 100 marks will be evaluated by an external member assigned by the institute.

SEMESTER VIII

Elective- IV&V

ME462 Industrial Robotics

UNIT-I

Classification and characteristics

UNIT-II

Principles and problems in robot design and control

UNIT-III

Transmission system.

UNIT-IV

Vision system.

UNIT-V

Programming and languages.

Text Books:

1. Mair, G.M., Industrial Robotics, Prentice-Hall, 1988.

2. Considine, D.M. and Considine, G.D., Standard Hand Book of industrial Automation, Chapman and Hall, 1986.

Reference Books:

1. Groover, M.P., Weiss, M., Nagel, R.N., and Odrey, N.G., Industrial Robotics, Technology, Programming, and Applications, McGraw-Hill, 1995.
2. Craig J.J., "Introduction to Robotics Mechanics and Control", Pearson Education, 2008.
3. Deb S.R., "Robotics Technology and Flexible Automation" Tata McGraw Hill Book Co., 1994.
4. Koren Y., "Robotics for Engineers", Mc Graw Hill Book Co., 1992.
5. Fu.K.S., Gonzalz R.C. and Lee C.S.G., "Robotics Control, Sensing, Vision and Intelligence", McGraw Hill Book Co., 1987.
6. Janakiraman P.A., "Robotics and Image Processing", Tata McGraw Hill, 1995.
7. Rajput R.K., "Robotics and Industrial Automation", S.Chand and Company, 2008.
8. Surender Kumar, "Industrial Robots and Computer Integrated Manufacturing", Oxford and IBH

ME464 Combustion Engineering

UNIT-I

Combustion of fuels - Combustion equations and air-fuel ratio calculations.

UNIT-II

Thermodynamics of combustion - Thermochemistry - Kinetics of combustion.

UNIT-III

Laminar and turbulent flames - Quenching, flammability, ignition and flame stabilization.

UNIT-IV

Combustion in SI and CI engines.

UNIT-V

Emission and control methods.

Text Books:

1. Turns, S.R., An Introduction to Combustion, 2nd ed., McGraw-Hill, 2000.
2. Glassman, I., Combustion, 3rd ed., Academic Press, 1996.

Reference Books:

1. Heywood, J.B., Internal Combustion Engine Fundamentals, McGraw-Hill, 1988.
2. Mukunda, H.S., Understanding Combustion, Macmillan, 1992.
3. Samir Sarkar, Fuels & Combustion, 2nd Edition, Orient Longman, 1990
4. Bhatt, vora Stoichiometry, 2nd Edition, Tata Mcgraw Hill, 1984
5. Blokh AG, Heat Transfer in Steam Boiler Furnace, Hemisphere Publishing Corpn, 1988
6. Civil Davies, Calculations in Furnace Technology, Pergamon Press, Oxford, 1966
7. Sharma SP, Mohan Chander, Fuels & Combustion, Tata Mcgraw Hill, 1984 EIA

ME466 Dynamics of Machinery

UNIT-I

Single degree of freedom systems - Periodic excitations - Impulse response - Virtual work.

UNIT-II

Forced vibrations.

UNIT-III

Two degree of freedom systems - coupled vibrations.

UNIT-IV

Vibration of continuous systems.

UNIT-V

Wave and Euler equations - Vibration of plates.

Text Books:

1. Rao, J.S. and Gupta, K., Introductory Course on Theory and Practice of Mechanical Vibration, New Age International Pvt. Ltd., 2004.
2. J.E.Shigley and J.J.Uicker - Theory of Machines & Mechanisms, McGraw Hill International Edition, 2006.
3. Rattan - Theory of Machines, Tata McGraw Hill, 2009.
4. Thomas Bevan - Theory of Machines, CBS Publishers & Distributors, 2004.

Reference Books:

1. Thomson, W.T., Theory of Vibration with Applications, CBS Publishers, New Delhi, 1990.
1. J.S.Rao and R.V.Dukkipati - Mechanism and Machine Theory, New Age International, 2004.
2. P.L.Ballaney - Mechanics of Machines, Khanna Publishers, 2005.
3. Robert F.Steidel Jr. - An introduction to Mechanical Vibrations, John Wiley & Sons Inc., New York, 2003

ME468 Renewable Energy

UNIT-I

Solar energy - Solar radiation - Heat transfer equations.

UNIT-II

Solar thermal energy conversion - Efficiencies - Solar photo voltaic energy.

UNIT-III

Bio energy - Conversion - bio degradation - Biogas generation - Fuel properties – Biomassgasifier.

UNIT-IV

Wind energy - Data and energy estimation, Conversion - Wind mill - Performance, applications- Geothermal.

UNIT-V

Tidal energy - Magneto hydrodynamic - Thermionic - Fuel cell.

Text Books:

1. Sukhatme, S.P., Solar Energy: Principle of Thermal Collection and Storage, 2nd ed., Tata McGraw Hill, 2000.
2. Rao, S. and Parulekar, R.B., Energy Technology - Nonconventional, Renewable and Conventional, Khanna Publishers, 1995.
3. Twidell, J.W. & Weir, A., "Renewable Energy Sources", EFN Spon Ltd., UK, 2006.

Reference Books:

1. Rai, G.D., Nonconventional Energy Sources, Khanna Publishers, 1999.
2. Le Gourieres, D., Wind Power Plant - Theory and Design, Pergaman Press, 1982.
3. Godfrey Boyle, "Renewable Energy, Power for a Sustainable Future", Oxford University Press,U.K., 1996.
4. Tiwari. G.N., Solar Energy – "Fundamentals Design, Modelling & Applications", Narosa Publishing House, New Delhi, 2002.
5. Freris. L.L., "Wind Energy Conversion Systems", Prentice Hall, UK, 1990.
6. Johnson Gary, L. "Wind Energy Systems", Prentice Hall, New York, 1985
7. David M. Mousdale – "Introduction to Biofuels", CRC Press, Taylor & Francis Group, USA2010
8. Chetan Singh Solanki, Solar Photovoltaics, "Fundamentals, Technologies and Applications", PHI Learning Private Limited, New Delhi, 2009.

ME470 Automotive Fuels, Pollution and Control

UNIT – I

Liquid Fuels : Gasoline and Diesel - Physical and chemical properties. Fuel rating – octane rating and cetane rating - Fuel additives. Gaseous Fuels: LPG and CNG – Alternative Fuels : sources –

Liquid fuels – vegetable oil and its derivatives – methanol and ethanol Gaseous fuels : methane and producer gas – physical and chemical properties.

UNIT – II

Pollutants from automobiles - carbon, nitrogen and sulfur compounds – aldehydes – particulate matter and smoke – odour – Influence of fuel constituents on pollutant emissions. Impact of pollutants on health and environment – Norms – ambient emission norms – noise level norms – waste disposal norms,

UNIT – III

Formation of hydrocarbons, oxides of nitrogen, sulphur and carbon monoxide in SI and CI engines. Formation of particulate emission from CI engine – Formation of aldehydes – Effect of operating parameters on the formation of pollutants.

UNIT – IV

Chassis Dynamometer tests – CVS methods – Sampling techniques – Emission measurement – Chemiluminescence and NDIR Analyzers – Flame ionization detector – smoke measurement : Comparison and obscuration's methods – Bosch smoke meter-measurement of particulate matter.

UNIT – V

Influence of operating parameters in the control of pollutants – changes in the design of combustion chamber – Fuel modification – Exhaust gas recirculation - Catalytic convertors for spark ignition engines - NO_x reduction methods – Fuel additives to control emission - particulate traps.

Text Books:

1. John B. Heywood, Internal Combustion Engine Fundamentals, McGraw Hill International Edition, 1988.

2. V.Ganesan, Internal Combustion Engines, Tata McGraw Hill, New Delhi, 1995.

Reference Books:

1. Paul Degobert, Automobiles & Pollution, Society of Automotive Engineers, 1995.
2. Obert, Edward, Internal Combustion Engines and Air Pollution, Harper and Row
3. Crouse William, Automotive emission control, Gregg Division, McGraw Hill, New York, 1971.
4. George, Springer and Donald J Patterson, Engine emissions, pollutant formation and measurement, Plenum press, 1973.
5. Osamu hirao, Present and future Automotive fuels, John Wiley and sons, New York, 1975.

Electives -V

ME472 Advanced Machining Processes

UNIT-I

Non-traditional machining processes – classification.

UNIT-II

Chemical and electrochemical processes - material removal - maskants and etchants – types of chemical material removal - application and limitations - Electrochemical material removal.

UNIT-III

Thermoelectrical processes - types - electrical discharging machining, electron beam machining, ion beam machining and plasma arc machining.

UNIT-IV

Mechanical processes - ultrasonic machining abrasive jet machining - abrasive flow machining - water jet cutting.

UNIT-V

Special Machining Processes - polygonal turning and drilling deep hole drilling and trepanning - shaped tube electrolytic machining - thread rolling - roller burnishing – electrical discharge wire

cutting - thermal deburring - orbital grinding micromachining – Numerical control and automated processes.

Text Books:

1. Production Technology by HMT, Tata McGraw Hill, 2002.
2. Wellar, P.C., Non-Traditional Machining Processes, SME, Michigan, 1984.

Reference Books:

1. Pandey, P.C., Modern Machining Processes, Tata McGraw Hill Company, 2004.
2. SeropeKalpakjian, Manufacturing Processes for Engineering Materials, 3rd ed., Addison Wesley Publishing Company, 1997.

ME474 Petroleum Engineering

UNIT-I

Overview and history of the petroleum industry and petroleum engineering, including nature of oil and gas reservoirs, petroleum exploration and drilling, formation evaluation, well completions and production, surface facilities, reservoir mechanics, and improved oil recovery - Importance of ethical, societal, and environmental considerations and current events on activities in the petroleum industry.

UNIT-II

Introduction to petroleum drilling systems, drilling rig components, drilling fluids, pressure loss calculations, casing, well cementing, and directional drilling. Thermodynamic behavior of naturally occurring hydrocarbon mixtures; physical properties of Petroleum reservoir fluids. Basics of heat transfer and fluid mechanics- flow of non-Newtonian fluids; multi-phase flow; flow in porous media, non-Darcy flow.

UNIT-III

Physical properties of petroleum reservoir rocks; lithology, porosity, elastic properties, strength, acoustic properties, electrical properties, relative and effective permeability, fluid saturations, capillary characteristics, and rock-fluid interaction. Introduction to well logging methods & evaluation of well logs for formation evaluation. Basic logging principles, theory of tool

operation, analysis of open hole logs to estimate, rock and fluid description and evaluation from open hole logs properties, including determination of porosity, net pay thickness and saturation. Capillary pressure-saturation relationships, shaly sand analysis, core-log integration and resource determination.

UNIT-IV

Steady-state, pseudo steady-state, and transient well testing methods to determine well and reservoir parameters used in formation evaluation; applications to wells that produce gas and liquid petroleum; rate forecasting; deliverability testing. Determination of reserves; material balance methods; aquifer models; fractional flow and frontal advance; displacement, pattern, and vertical sweep efficiencies in water floods; enhanced oil recovery processes; design of optimal recovery processes.

UNIT-V

Introduction to production operations and oil field equipment, multiphase flow in pipes, bottom hole pressure prediction, inflow/outflow performance, production systems and backpressure analysis, hydraulic fracturing fluids and equipment; downhole and artificial lift equipment, tubular, work over/completion nomenclature and procedures; produced fluids, fluid separation and metering, safety systems, pressure boosting and monitoring. Analysis of investments in petroleum and mineral extraction industries; depletion petroleum taxation regulations. Well control; underbalanced drilling; offshore drilling; horizontal, extended reach, multi-lateral drilling operations.

Text books:

1. Nontechnical Guide to Petroleum Geology, Exploration, Drilling and Production, 2nd Edition, Hyne, Norman J., Penn Well Books, 2001.
2. Drilling Fluid Engineering Manual. Textbook prepared by M-I Drilling Fluids Co., 1998;
3. The Properties of Petroleum Fluids, 2nd ed., McCain, W. D., Penn Well Publishing Co., Tulsa, Oklahoma, 1990.
4. Tiab, D., Donaldson, E.C: Petrophysics: Theory and Practice of Measuring Reservoir Rock and Fluid Transport Properties, 2nd edition, Elsevier, New York, NY, 2004.

5. Fundamentals of Reservoir Engineering, L. P. Dake, Elsevier Scientific Publishing Co, New York, 1978.

Reference Books:

1. Reservoir Engineering Handbook, T. Ahmed, Gulf Professional Publishing, 2001.
2. Petroleum Production Systems, M. J. Economides, A. D. Hill, and C. Ehlig-Economides, Prentice Hall, Englewood Cliffs, NJ, 1994.
3. Petroleum Engineering Handbook, edited by H.B. Bradley, Society of Petroleum Engineers, 1987.

ME476 Composite Materials

UNIT-I

Definition of Composite materials – Classification of composites, Need and General characteristics – advantages and limitations.

UNIT-II

Matrices – Polymers – thermo set – thermo plastics, metal matrix – types, ceramics, reinforcement – Types, continuous, whiskers and particles – reinforcing materials.

UNIT-III

Primary processing – Bag moulding, compression moulding – Pultrusion and Filament winding, Solid state processing, Liquid state processing, In situ methods. Secondary processing and heat treatment of MMCs

UNIT-IV

Introduction to Physical Properties, mechanical properties, fatigue, creep and damping properties – Effects of environment on the properties.

UNIT-V

Selection of constituents for end application, Design considerations, Applications – case studies.

Text Books:

1. P.K.Mallick - Fiber reinforced Composites, Marcel Decker Inc., USA, 1993.
2. S.C.Sharma - Composite Materials, Narosa Publishing House, 2000.
3. P.K.Mallick & S.Newsman, Composite Materials Technology – Processes and Properties, Hansen Publisher, Munich, 1990.

Reference Books:

1. KrishanK.Chawla, Composite Materials – Engineering and Science, Springer Verlag, UK, 1998.
2. Sanjay K.Mazumdar, Composites Manufacturing, CRC Press, UK, 2002

ME478 Direct Energy Conversion Systems**UNIT-I**

Energy: Types and classification – Energy sources – Energy conversion processes. Direct and Indirect energy conversion-Fuels for Energy conversion-Introduction to irreversible thermodynamics.

UNIT-II

Basic ideas of quantum physics – Pauli Exclusion Principle – Shell structure of electrons – Fermi Energy – Energy levels – Bonding in crystals – Energy bands –Intrinsic and Extrinsic semiconductors – junctions – types.

UNIT-III

Photovoltaic conversion – solar cell configurations – characteristics of solar cells- performance of solar cells - Thermoelectric converters – Thermoelectric refrigerators – Thermionic converters and other thermal – electric conversion systems.

UNIT-IV

Introduction to plasma physics – Temperature and ionization– confinement of plasma: Magnetic confinement and inertial confinement – Principles of Magneto hydrodynamic conversion-Ideal and practical MHD generators performance – MHD technology.

UNIT-V

Fuel cells and Batteries – Principles of EMF generation – Description of fuel cells – Applications of fuel cells – Description of batteries: Primary, Secondary, Reserve and advanced battery system – Types – Characteristics – applications.

Text Books:

1. S.W.Angrist, Direct Energy Conversion, Allyn and Bacon, Boston, 1982
- 2 W.Culp Archie, Principles of energy conversion, Tata McGraw Hill Publishing Co.Ltd., New Delhi-2000.
3. K.Messerle Hugo Magneto hydrodynamic Electric Power Generator,JohnWiley&Sons, 1995.

Reference Books:

1. D.Lindon, Handbook of Batteries and Fuel Cells, McGraw Hill Book Co., 1984.
2. M.A.Greem, Solar Cells, Prentice Hall Inc, Englewood Cliffs, 1982.
3. Rakosh Das Begamudre, Energy Conversion System, New Age International (P) Ltd., New Delhi, 2000.
4. M.A.Greem, Solar Cells, Prentice Hall Inc, Englewood Cliffs, 1982.

ME480 Project Management

UNIT – I

Indian project management scenario, Projects - Project ideas and preliminary screening. Developments - Project planning to Project completion - Pre-investment phase, Investment phase, operational phase - Governmental Regulatory framework. Capital Budgeting : Capital cost-time-value (CTV) system, managing project resources flow-Project management techniques – types of projects – LSTK-EPCM.

UNIT – II

Stages - Opportunity studies - General opportunity studies, specific opportunity studies, pre-feasibility studies, functional studies or support studies, feasibility study expansion projects, data for feasibility study. Market and Technical Appraisal : Market and Demand analysis, Market Survey, Demand forecasting. Technical analysis- Materials and inputs, Choice of Technology, Product mix, Plant location, capacity, Machinery and equipment.

UNIT – III

Appraisal process, Concepts and Techniques, Cost and Benefit from Financial angle - Basic principles for measuring costs and benefits, components of cash flow. Time value of money - Present and future value. Appraisal criteria - Urgency, Payback period, Rate of return, Debt service coverage ratio, Net present value, Benefit cost ratio, Internal rate of return, Annual capital charge, Investment appraisal in practice.

UNIT – IV

Cost of capital - Cost of different sources of finance, Cost of debt, preference capital, and Equity capital, Weighted average Cost of capital, Marginal cost of capital. Risk analysis- Measures of risk, Sensitivity analysis, and Decision tree analysis. Social cost benefits analysis (SCBA) - Rationale for SCBA, UNIDO approach. Cost of Capital. Means of financing, Term Loans, Financial Institutions. Profitability - Cost of Production, Break-even analysis. Assessing the tax burden and financial projections.

UNIT – V

Forms of Project Organization, Project Planning, Implementation, and Control - Network construction, CPM, PERT, Development of Project schedule, Crashing of Project Network, Scheduling based on the availability of Resources (Manpower and Release of Funds). Introduction to Foreign collaboration projects - Governmental policy framework, Need for foreign technology, Royalty payments, Foreign investments and procedural aspects.

Text Books:

- 1.P.Gopalakrishnan and V.E.RamaMoorthy Project Management, Macmillan India Ltd., New Delhi, 1993.
2. Prasanna Chandra, Projects - Preparation, Appraisal, Budgeting and Implementation, Tata McGraw Hill Publishing Company Ltd., New Delhi, 1980.

Reference Books:

1. B.B.Goel, Project Management - Principles and Techniques, Deep & Deep Publications, New Delhi, 1986.
2. UNIDO Series on Project Management
