TECHNO INDIA UNIVERSITY
WESTBENGAL

EM 4, Sector V, Salt Lake, Kolkata-700091, West Bengal, India
Phone: +91 9836544416/17/18/19, Fax: +91 33 2357 1097

4-Year Bachelor of Technology (B.Tech.) Curriculum and Syllabus for Mechanical Engineering (ME)
Seventh Semester

Course Code	Course Title	Contact Hrs. / Week			Credit
		L	T	P	
Theory					
TIUSD-701	Career Advancement & Skill Development-VII	2	1	0	3
TIUME-701	Steam Power Plant	3	1	0	4
TIUME-702	Machine Design-II	3	1	0	4
TIUME-703	Mechanical Measurement and Instrumentation	3	1	0	4
TIUME-704	Industrial Management	3	1	0	4
Practical					
TIUME-791	Vocational Training	0	0	0	2
TIUME-792	Colloquium	0	0	3	2
TIUME-793	Project-I	0	0	3	2
Sessional					
TIUCSL-781	Entrepreneurship Skill Development-VII	0	0	3	2
Total Credits					27

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Syllabus

Steam Power Plant

TIUME-702

L-T-P: 3-1-0   **Credit: 4**

Vapour Power Cycles: Effect of operating variables on Regenerative cycles, Binary vapour cycle. Co generative cycles. Availability analysis of cycles.

Boilers:

(i) Introduction: Classification. Fire-tube and water-tube boilers. Mountings and Accessories.

(ii) Coal and combustion: Coal analysis. Combustion calculations using both mass and energy balance, heating values.

(iii) Types of coal feeding and firing methods.

(iv) Introduction to power station boiler.

(v) Circulation theory and processes.

(vi) Auxiliary heating surfaces: Superheater, reheater, economizer, air preheater.

(vii) Draft: Definition, classifications and calculations.

(viii) Losses in boilers. Equivalent evaporation. Boiler efficiency.

(ix) Basics of water treatment.

(x) Basics of ash handling.

Steam Turbine:

(i) Parts & classifications.

(ii) Nozzles: types, flow through nozzles, nozzle efficiency.

(iii) Impulse turbine: Flow through impulse blading, velocity diagram, work done, Blade efficiency.

(iv) Multistaging of turbines: pressure compounding and velocity compounding.

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(v) Impulse-Reaction turbine: Flow through impulse-reaction blading, velocity diagram, Degree of reaction, Parsons Turbine.

(vi) Principles of turbine governing.

(vii) Different losses in turbine, blade erosion.

Condenser: Classification, Elements of condensing plant, Power plant condensers, Air leakage - effect and removal.

Power plant economics: Load curve, load factor, utilization factor etc. Fixed and variable operating cost, Principle of load sharing.

Recommended Books:

1. Power Plant Engineering by P.K. Nag, McGraw Hill Education (India) Private Limited.

2. Powerplant Technology by M.M. El-Wakil, McGraw Hill Education (India) Private Limited.

3. Power Plant Engineering by Black & Veatch, CBS Publisher.

4. Steam & Gas Turbines and Power Plant Engineering by R. Yadav, Central Publishing House.

5. A Textbook of Power Plant Engineering by R.K. Rajput, Laxmi Publications.

Machine Design-II

TIUME-703

L-T-P: 3-1-0   **Credit: 4**

Clutches: Use of clutch, Classification of clutches based on actuating method, operating principle, coupling method, Description of friction clutch, mechanically operated clutch release mechanism, Actuating force and frictional torque equation based on uniform pressure and uniform wear, friction materials.

Brakes: Band Brake, short shoe brake, self-energizing and de-energizing brake, long shoe drum brake – pressure distribution, force and torque analysis etc.

Couplings: Rigid, Flexible, Resilient, Fluid, Magnetic etc.

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Design of gear drive: (i) Spur Gear – Introduction, Modes of Gear tooth failure, Beam strength of gear tooth and Lewis equation, Lewis form factor, Service factor dynamic load, Buckingham equation, Spott's equation, Error on gear tooth, Wear strength, Derivation of load stress factor, Buckingham equation for wear, problems.

(ii) Helical Gear- Type of helical gears, virtual no. of teeth, Minimum face width, Force analysis, Beam strength, Dynamic load, Wear strength, problems.

(iii) Bevel Gear: Force analysis, Formative no. of teeth, Beam strength, Dynamic load, Wear strength, problems.

(iv) Worm Gear: Uses, drawback, self- locking arrangement, centre distance calculation, force analysis, friction in worm gear, efficiency, selection of material, problems.

Design of rotors: Shafts and axles with bearing mountings, High-speed rotor - constant thickness and variable thickness design in post-elastic region, limit speed analysis, interference fits in rotors.

Chain drive: Types, roller chain - constructions, polygonal effect, power rating, failure Sprocket wheel, chain lubrication.

Rolling contact bearings: Types, static load capacity- Stribeck equation, dynamic load capacity, equivalent load, load-life relation, bearing life selection, load factors, Bearing selection from Manufacturer's catalogues, Selection of taper roller bearing, Design for cyclic load and speed, Bearing reliability, lubrication, mountings.

Recommended Books:

1. Design of Machine Elements by V.B. Bhandari, McGraw Hill Education (India) Private Limited.

2. Mechanical Engineering Design by J.E. Shigley, C.R. Mischke, R.G. Budynas and K.J. Nisbett, McGraw Hill Education (India) Private Limited.

3. Design of Machine Elements by M.F. Spotts, L.E. Hornberger, T.E. Shoup, S.R. Jayaram and C.V. Venkatesh, Pearson India.

4. Machine Design: An Integrated Approach by R.L. Norton, Pearson India.

5. Machine Design by U.C. Jindal, Pearson India.

6. A Textbook of Machine Design by P.C. Sharma and D.K. Aggarwal by S.K. Kataria & Sons.

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Mechanical Measurement and Instrumentation

TIUME-704

L-T-P: 3-1-0   **Credit: 4**

Introduction. Functional elements of an instrument. Active Passive transducers. Analog/digital mode of operation. Null/deflection methods of measurement. Generalized I/O configuration of measurement systems.

Methods of correction of interfering and modifying inputs.

Static characteristics: Static calibration. Basic statistics. Uncertainty analysis. Least square calibration curve. Static sensitivity. Linearity, Threshold, noise floor, Resolution, Hysteresis Dead space, Span, Scale readability.

Loading effects.

Dynamic characteristics: Generalized mathematical model, Operational and sinusoidal transfer functions. Zero order instrument. First order instrument: Step, Ramp, Frequency and impulse response of first order instruments. Second order instruments: Step, Terminated-ramp, Ramp, frequency and impulse response of second order instruments. Dead time elements.

Logarithmic plotting of frequency response curves. Response of general form of instruments to periodic and transient inputs.

Wheatstone bridge application with examples. Measuring instruments for measurement of Displacement, Velocity, Acceleration, Force, Pressure, Flow and Temperature.

Signal conditioning and Data acquisition systems.

Recommended Books:

1. Experimental Methods for Engineers by J.P. Holman, McGraw Hill Education (India) Private Limited.

2. Instrumentation, Measurement and Analysis by B.C. Nakra and K.K. Chaudhry, McGraw Hill Education (India) Private Limited.

3. Mechanical Measurements by T.G. Beckwith, J.H. Lienhard V and R.D. Marangoni, Pearson.

4. Mechanical Measurements and Instrumentation by R.K. Rajput, S.K. Kataria & Sons.

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5. A Course in Mechanical Measurements and Instrumentation & Control by A.K. Sawhney and Puneet Sawhney, Dhanpat Rai & Co.

Industrial Management

TIUME-705

L-T-P: 3-1-0   **Credit: 4**

Introduction: Concepts of Management and Industrial Management; Development of management thoughts and ideas – Contribution of Taylor and others; System concepts in management.

Organization: Organization structure, various types, organization principles – unity of command, responsibility, authority, span of control, structural balance, communication, division of labour, etc.

Types of Production – Plant location and plant layout (various types).

Materials Management – Inventory – types, different cost, EOQ and EPQ models, Basic ideas of MRP and MRP II, purchasing functions, vendor rating etc., ABC analysis, Basic ideas of supply chain management.

Forecasting – Factors affecting demand, Types of forecasts and forecasting techniques, Time series analysis and various qualitative and quantitative forecasting techniques, forecasting errors.

Scheduling – Gantt chart, network scheduling – PERT, CPM, crashing.

Linear Programming – Fundamentals, formulations, various variables, graphical solutions etc., Sequencing – simple cases, introduction to transportation models.

Quality Control and Inspection – Concept of quality, quality control and inspection, Acceptance sampling – OC curve, control charts, Introduction to ISO 9000 standards, Total quality management, quality circle, brainstorming, fishbone diagram, Pareto analysis.

Work Study – Work measurement, time study, motion study, method study, job evaluation, merit rating.

Queuing Theory – Basic concept and a simple model.

Maintenance Management – Types of maintenance, replacement models, bath tub curve, terotechnology and some fundamentals of safety management.

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Break Even Analysis – Some basic ideas and applications.

Reliability Analysis and Risk Management – Basic concepts, hazard rate, reliability functions, MTTF.

Basic ideas of Agile Manufacturing, Lean manufacturing, Flexible manufacturing and group technology, Ergonomics.

Recommended Books:

1. Operations Research by A.M. Natarajan, P. Balasubramani and A. Tamilarasi, Pearson Education.

2. Operations Research by P.J. Jha, McGraw Hill Education (India) Private Limited.

3. Operations Research by P.K. Gupta and D.S. Hira, S. Chand & Company Ltd.

4. Operations Research: Theory and Applications by J.K. Sharma, Macmillan Publishers India Ltd.

5. Industrial Engineering and Management by O.P. Khanna, Dhanpat Rai Publications.

6. Industrial Engineering and Management by P. Kumar, Pearson Education.

Vocational Training

TIUME-791

L-T-P: 0-0-0   **Credit: 2**

Vocational Training of four weeks at an Institute approved organization to be done during vacation in Semester VI, credit to be given in Semester VII. Students shall have to submit a report endorsed by the Industry Training Manager/ Lab-in-charge of R & D organisation.

Colloquium

TIUME-792

L-T-P: 0-0-3   **Credit: 2**

Each student will be required to submit to the class teacher at least two different articles containing about 2000 words on two different engineering topics assigned by the class teacher, and will be required to give concise talks on those topics in the class according to the direction of the class teacher, and will have to participate in the discussion on such talks of

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other students also. The result of those assignments will be considered as that of practical work. There will be no written examination for this course.

Project-I

TIUME-793

L-T-P: 0-0-3   **Credit: 2**

Each student has to work on a research topic or advanced design and analysis project for two semesters. The evaluation is to be carried out in each semester separately. The project can be selected from different specialization branches related to Mechanical Engineering (Heat Power/Fluid Mechanics/Machine Design/ Applied Mechanics/ Production). A list of topics will be offered by the department. Students have to submit a project report to the respective supervisors and give a presentation of the work done in front of a specialization specific evaluation board. For each project, distribution of marks will be: 50 marks to be evaluated by the supervisor and 50 marks to be evaluated by the specialization specific evaluation board.

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