Applied Probability and Statistics

S.E. Sem. IV [PROD]

EVALUATION SYSTEM

	Time	Marks
Theory Exam	3 Hrs.	100
Practical Exam	–	–
Oral Exam	–	–
Term Work	–	–

SYLLABUS

1. **Probability Theory**
   Concept of random experiment, Sample points, sample space, types of events: Mutually exclusive, indep, equally likely Probability (event) function (with axioms stated)
   Addition and Multiplication Theorem on Probability (without proof) Bayes Theorem (only statement and problems).

2. **Random Variables**
   Definitions : Random Variables (Discrete and continuous) Probability mass and density functions, Cumulative Dist Functions.
   Expectation, variance, co–variance, Moments (about origin and about mean) moment generating function with derivation of moments using M.G.F. Co efficient (M.G.F.) of correlation and Kurtosis in terms of central moments (only formulae and Problems) Theoretical Distributions 1) Binomial 2) Poisson 3)Normal and standard normal (with definitions and problems of mean, variance and moments)

3. **Correlation and Regression**
   Karl Pearson's Correlation coefficient (definition, properties – no proof (only problems)
   Rank no proof correlation (Spearman) with ranks repeated non–repeated.
   Regression Analysis: Regression lines of X on Y and Y on X using principle of least squares (normal using equations) and also by direct regression coefficients.
   Fitting of curves: Only straight line and parabola.

4. **Tests of Hypothesis**
   Definitions: Population, sample Null and alternate hypothesis, Type-I and Type-II errors, level of significance, critical region, degree of freedom, small and large sample.
   Procedure for Test of Hypothesis (use of statistical tables) Students t–test (Small Samples).

   To test the significant difference between
   Sample (single) mean and population mean (only problems)
   Two sample means (independent and Dependent Paired t–test (only problems) Chi–square test (only problems)
   Independence of attributes (using contingency table) Fitting of Binomial and Poisson distributions with test for goodness of fit.

5. **Large Sample Test (Z – transform or Normal test)**
   Single sample mean and population mean. Two sample mean

6. **Analysis of Variance (F–test) (only problems)**
   One way Classification (Short–cut method and coding method), Two–way classification (Short–cut method and coding method), Latin square (Short–cut method and coding method).

Reference :

1. Probability and Statistics for Engineers and Scientists (*Walpole*) – Pearson education.
2. Statistical Methods (*S.P.Gupta*)
3. Probility & Statics (*Schaum series*)
4. Introductory statistics (*Weiss*) – Pearson education.
5. Probability and Statistical Inference (*Hogg/Rao*) – Pearson education.
6. Methematical Statistics (*Gupta & Kapoor*)
7. INTERNET REFERENCE : www.ocw.mit.edu

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Fluid Mechanics and Fluid Power

S.E. Sem. IV [PROD]

EVALUATION SYSTEM

	Time	Marks
Theory Exam	3 Hrs.	100
Practical Exam	–	25
Oral Exam	–	–
Term Work	–	25

SYLLABUS

1. **General Properties of Fluids and Fluid Static**
   Viscous fluids "Newtonian and non–Newtonian, their stress strain relationship (general description only) pressure at a point in fluid, Variation of pressure with depth, fluid application to manometer, transmission of pressure in a fluid, thrust on plane surface, centre of pressure horizontal, and vertical plane surfaces and inclined plane surface, forces on immersed bodies.

2. **Fluid Dynamics**
   Various types of flow (general description only), continuity equation, energy equation, momentum equation. Application of energy and continuity equation for fluid flow measurement closed conduit (No derivations, only applications are to be imparted).

3. **Flow in Pipes**
   Laminar and turbulent flow in pipes (elementary treatment only), Darcy's equation, and laminar flow between flat parallel stationary plates. Laminar flow between parallel plates one of which is moving, losses in bends, couplings and valves.

4. **Hydraulic Pumps and Motors**
   Introduction, variable capacity and fixed capacity types gear, vane and piston pumps, ram units and rotary actuators performance curves for variables speed drives, combination of pump and motor units.

5. **Valves**
   Introduction, types of valves viz. "check valve, relief valve, speed control valves, pressure compensating valves, pressure compensated flow control valves, unloading valves, direction control valves, sequence valves and counter balance valve.

6. **Oil Hydraulic Circuits**
   Introduction, basic circuits, general classification of valves in circuit, meter–in circuit, meter–out circuit.

Reference:

1. Fluid Mechanics (*V.L.Streeter afld E.B.wylie*)
2. Fluid Mechanics & Hydraulic Machines (*R.K.Bansal*)
3. Power Hydraulics (*A.B.Goodwin*)
4. Industrial Hydraulics Manual (*Sperry & Vickers Co.*)
5. Hydraulic and Pneumatic Power (*H. L. Stewart*)
6. For production
7. Fluid mechanics and hydraulic machines (*R. K. Rajput*)

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Manufacturing Engineering – II

S.E. Sem. IV [PROD]

EVALUATION SYSTEM

	Time	Marks
Theory Exam	3 Hrs.	100
Practical Exam	–	–
Oral Exam	–	–
Term Work	–	–

SYLLABUS

1. **Automats**
   Major classification, horizontal and vertical, single spindle and multispindle, bar type and chuck type screw type and Swiss type, tools and tool holders, typical tooling setup for simple work pieces, special attachments, threading attachments, high speed drilling attachments, chutes, magazines, and hoppers for feeding.

2. **Numerically Controlled Machines**
   NC and CNC lathes, CNC turning centers, paper tape, magnetic tapes, working principles Machining centers, special purpose machines.

3. **Grinding Machines**
   Grinding process, grinding machines–cylindrical, centre type, universal, plain, plunge centre type, chucking type, centreless grinding machines–through feed, in feed, end feed, internal grinding machines– horizontal, vertical spindle–rotary/reciprocating types, tool and cutter grinders, special grinding machines.

4. **Grinding Wheels**
   Types of abrasives–natural, artificial, grain size, types of bonds, grade, structure, shapes and sizes, 18 for marking system of grinding wheel, selection of grinding wheels, grinding fluids, balancing of grinding wheels, truing and dressing , mounting of grinding wheels, safety.

5. **Screw Thread Cutting Machines**
   Thread production process, thread chasing, thread milling, thread whirling, die threading and tapping, thread rolling, thread grinding, self opening die heads, chasers – radial, and tangential (tool geometry omitted.)

6. **Gear Teeth Cutting Machines**
   Gear milling, gear hobbing, principles of hobbing (kinematics omitted). hobbing techniques, hob size, material (tool geometry omitted), gear shaper cutter (tool geometry omitted). Gear finishing processes–gear shaving, gear lapping, gear grinding, gear burnishing.

7. **Modern Development**
   Machining Centers, Special Purpose Machine

8. Unconventional machining processes (only basic principles, machines and application)
   Electrical discharge machining (EDM) Electrochemical machining (ECM)
   Chemical machining (CHM) Ultrasonic machining (USM)
   Abrasive jet machining (AJM) Laser beam machining (LBM)
   Electron beam machining (EBM) Plasma arc machining (PAM)

Reference :

1. Production Technology (*HMT*) – T.M.H. Publishing Co.
2. Elements of workshop Technology (*Hajra Chowdhary and Bose*) – Vol. II
3. Material and Manufacturing processes (*De Garmo*)
4. Manufacturing process, (*Begman*)
5. Production Technology, (*Raghuvanshi*)
6. Production Technology (*Chapman*) – Vol. 1 and 2 and 3
7. Production Technology (*R. K. Jain*)

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Electrical and Electronics Engineering

S.E. Sem. IV [PROD]

EVALUATION SYSTEM

	Time	Marks
Theory Exam	3 Hrs.	100
Practical Exam	–	–
Oral Exam	–	–
Term Work	–	25

SYLLABUS

1. **Electromechanical Energy Conversion**
   Three phase induction motor, working principle, construction, types and torque speed characteristics of DC Machines, DC Generator – working principle, EMF equation and classification.

   DC motor – working principle, torque equation, types, characteristic, speed control of DC motor, starting methods and stepper motors. (problems to be included)

2. **Transformers**
   Single phase and three phase transformers: Working principles and testing methods. Efficiency regulation. Equivalent circuits. (Problems to be included)

3. **Integrated Circuits and Devices**
   Operational Amplifiers ~ basics, ideas OP–AMP ratings, OP–AMP applications, linear and digital IC's counters, registers, multiplexers, de multiplexers, decoder and encoder.

4. **Solid State Controls and Applications**
   Timers and relays, applications of Silicon Controlled Rectifiers (SCR) in control of DC and AC motor, resistance–welding (welding control with solid–state circuits (elaboration is needed from application point of view).

5. **Microprocessors and Applications**
   Memory systems, Microprocessor (only 8085 Architecture and instructions), programmable controllers, regulation of voltage and motor speed (microprocessor based, block diagram and flow chart approach only)

Reference:

1. Electronic Devices and Circuit Theory (*Boylestad and Nashelsky*)
2. Electric Machines and Transformers (*Anderson Leonard and Jack Macneil*)
3. OP-Amplifier (*Gayakwad*)
4. Microprocessor (*Gaonkar*)
5. Digital Principles & Applications (*Malvino & Leach*)
6. SCR (*G. E. Mamal*)
7. Electrical Technology (*Cotton*)
8. Electrical Machines (M.*G.Say*)

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Thermal Engineering

S.E. Sem. IV [PROD]

EVALUATION SYSTEM

	Time	Marks
Theory Exam	3 Hrs.	100
Practical Exam	–	25
Oral Exam	–	–
Term Work	–	25

SYLLABUS

1. **Revision of Thermodynamics Concepts**
   System, surrouding state path property Reversible and irreversible process thermodynamic work, heat, Temperature, thermal equilibrium, Zeroth taw of thermodynamics.

2. **First law of Thermodynamics**
   Joule's experiment to verify first law, First law applied to non–cyclic process. Internal energy as a property. Joule's experiment of internal energy. Equation of state of ideal gas. Universal and specific gas constant. Application of First law to non flow processes, viz. constant volume, constant pressure, constant temperature, adiabatic and polytrophic processes, heat and work calculations.

3. **Fi First Law of Thermodynamics Applied to Flow Processes**
   Flow, work, enthalpy, control volume. Application of first law to open system. Steady flow energy equation. Throttling process Joule's porous plug experiment. Joule Thomson's coefficient. Work done in steady flow processes in terms of pressure and volume. Application to boiler, nozzle, condenser etc.

4. **Second Law of Thermodynamics**
   Limitations of first law of thermodynamics. Heat engine, thermal efficiency, reversed heat engine, coefficient of performance. Carnot cycle. Kelvin–Planck and Clausius statements and their equivalence. Perpetual motion machines of first and second kind. Carnot's theorem Thermodynamic temperature scale. Entropy: Clausius inequality Entropy, temperature – entropy diagrams. Entropy changes for an ideal gas during reversible processes.

5. **Analysis of I.C. Engines**
   Otto, Diesel and dual combustion cycles, air standard efficiency and mean effective pressure, study of constructional details of I.C. Engines. Four stroke' and two stroke cycle I.C. engines S.I. and C.I. engines. Study of simple carburettor, fuel pump, fuel injector and nozzle of I.C. engines. Cooling and lubrication systems of I.C. engines, Ignition system of S.I. engines. Governing of I.C. engines. Valve timing diagrams. Calculation of I.P. F.P. and S.P. determination of indicated and brake thermal efficiency and specific fuel consumption. Testing of I.C. engines. Heat–balance sheet.

6. **Air Compressors**
   Uses of compressed air classification, single stage reciprocating air compressor without clearance. Work and power calculation, isothermal and adiabatic efficiency, two stage air compressor with prefect inter cooling. Ideal intercooler pressure. F.A.D. and volumetric efficiency. Effect of clearance volume.

7. **Gas Turbines**
   Advantages and disadvantages of gas turbines. Constant pressure Joule cycle with isentropic and irreversible adiabatic expansion. Open cycle gas turbine, work, power and thermal efficiency. Closed cycle gas turbine. Constant volume cycle gas turbine.

8. Heat Transfer

One dimensional, steady state, heat transfer by conduction through plane wall, radial heat transfer by conducting through hollow cylinder and hollow sphere. Conduction through a composite plane and cylindrical wall.

Heat flow by convection. Free and forced convection. Nusselt, Reynold and Prandtl number; heat transfer between two fluids separated by composite plane and cylindrical wall. Over all heat transfer coefficient. Heat exchangers. Types of heat exchangers. Log Mean Temperature difference. Wien's law, Stefan Boltzman's and Kirchoffs laws, (problems and derivations to be cut down) Problems based on LMTD only in which overall heat transfer coefficient to be given.

9. Refrigeration and Air Conditioning

Applications of refrigeration, relative c.o.p. and ton of refrigeration, air refrigeration, Sell coleman cycle or PV and T.S. diagram, c.o.p and power calculations. Vapour compression refrigeration system. Representation on T–S and P–H diagram. CO P, power, capacity and mass flow rate calculation effects of sub cooling, vapour absorption system of refrigeration. Desirable properties of an idea refrigerant. Comparison of ammonia, S02, CO2. Freon (R–11 and R–22) as refrigerants, study of domestic refrigerator and water cooler. Central air condition system, study of window air conditioner and package air conditioner.

Reference :

1. Thermal engineering (*R.K. Rajput*) –Laxmi Publication.
2. A course in Thermal engineering (*Domkundwar, Kothandaraman and Khajuria*) –Dhanatrai Publication.
3. Engineering Thermodynamics (*P.K.Nag*) – Tata McGraw Hill Publishers.
4. Engineering Thermodynamics (*G.F.C. Rogers, Y.R. Mayhew*) – ELBS/Longman Publication.
5. Thermodynamics and Heat Engines Volume I (*R. Yadav*) – Central Public House, Reprint 1992.
6. Thermodynamics for Engineers (*M.L. Mathur & S.C. Gupta*) – Jain Brothers
7. Thermal Engineering (*Ballanney*) – Khanna Publishers.

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Engineering Design

S.E. Sem. IV [PROD]

EVALUATION SYSTEM

	Time	Marks
Theory Exam	4 Hrs.	100
Practical Exam	–	–
Oral Exam	–	–
Term Work	–	25

SYLLABUS

1. **Introduction**
   Steps involved in designing, types of designs, considerations in designing, Design–manufacturing interface, material selection, factor of safety and its implications.

2. **Operational Joints**
   Introduction, strength of joints: cotter joints, knuckle joints, sleeve type cotter joint, gib and cotter joint, pinned joints, turn buckle.

3. **Shafts, Keys, Couplings and Pulleys**
   Shafts subjected to axial loads, twisting and bending moments, design of keys. Muff coupling, flange couplings, bushed pin type flexible coupling, marine type coupling. Design of flat and V–belt pulleys.

4. **Machine Elements**
   Machine parts subjected to direct and eccentric loading, finding area of cross section of machine members of frames having following cross section–Circular, rectangular, box, square, triangular, T.I. and trapezoidal sections only, design of rivets or bolts subjected to eccentric loading on the above types of frame fastenings.

5. **Curved Member and Crane Hooks**
   Having following cross section only: Circular, triangular, square, rectangular, trapezoidal (Circular rings and chain links are excluded).

6. **Gear Wheels**
   Design of spur gears, simple gears calculation, design of gears based on beam strength and wear/ Lewis and Buckingham's equation

7. **Design of Colums/Struts Subjected to Buckling**
   Design of connecting road

8. **Design of Springs**
   Classification and applications, design of helical, compression and tension springs, co–axial springs, Design of leaf springs–straight and laminated and semi elliptical. Strain energy of springs–design of buffer springs.

9. **Riveted Joints**
   Design of joints subjected to eccentric loading. Boiler joints, longitudinal and circumferential joints, single riveted double riveted and triple riveted joints having equal/unequal cover straps, chain and zigzag riveted arrangements, use of Indian Boiler Regulation (IBR) in design.

10. **Design of Welded Joints**
    Strength of welded joints, welded joints subjected to eccentric loads, special cases of welded joints.

11. **Pressure Vessels**
    Thick and compound cylinders, determination of wall thickness of cylinders, hoop and radial stresses, plotting hoop and radial stress distribution curves.

Reference:

1. Elements of machine Design (*N.C. Pande, C.S.Shah*)
2. Design of machine elements (*M.F. Spotts*)
3. Engineering Design (*Schaum's Series*)
4. Engineering Design (*Keal Pujara*)
5. Engineering Design (*Black*)
6. Engineering Design (*Patel*)
7. Machine Design (*R.K. Jain*)
8. Machine Design (*J.E. Taylorand, J.S. Wringley*)

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