JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD

II Year B.Tech. Ag. Engg.-II Sem	L	T/P/D	C
	4	-/-/-	4

(A43003) HEAT AND MASS TRANSFER

Objective: To enable the students to know about the transport phenomenon in metals through heat and mass transfer for applications in unit operations of dairy and food engineering.

Unit – I:

Introductory concepts, application of Heat and mass transfer-modes of heat transfer examples, Fourier's law of heat transport, Introduction to steady state heat transfer –one dimensional steady state heat conduction equation. Thermal conductivity of different materials – measurement-Insulation Materials, One dimensional steady state conduction through plane and composite walls, Conduction through tubes and spheres with and without heat generation, Conduction through multilayer tubes.

Unit – II

Electrical analogy-conduction through materials in parallel, Combined convection and conduction and overall heat transfer coefficients-problem solving, Concept of critical thickness of insulation for a cylinder-problem solving, Radiation heat transfer-Introduction. Absorptive, reflectivity and transmissivity of radiation. Black body and monochromatic radiation, Plank's law, Stefan-Boltzman law, Kichoff's law, grey bodies and emissive power, solid angle intensity of radiation, Radiation exchange between black surfaces, geometric configuration factor, Heat transfer analysis involving conduction, convection and radiation by networks.

Unit – III:

Unsteady state heat transfer-unsteady state system with negligible internal thermal resistance-equation for different geometries, Fins-heat transfer from extended surfaces-types of fins-problem Solving, Free and force convection. Newton's law of cooling, heat transfer coefficient in convection. Dimensional analysis of free and forced convection.

Unit IV:

Useful non dimensional numbers and empirical relationships for free and forced convection, Equation of laminar boundary layer on flat plate and a tube, Laminar forced convection on a flat plate and in a tube, Combined free and forced convection, Types of heat exchangers, fouling factor, log mean temperature difference, heat exchanger performance, transfer units, Heat exchanger analysis restricted to parallel and counter flow heat exchangers.

Unit – V:

Steady state molecular diffusion in fluids at rest and in laminar flow-Flick's law mass transfer coefficients-Reynold's analogy.

REFERENCES:

1. Transport processes and Unit Operations, Geabjiokus C.J. 1978. Allyn and Bacon Inc., Newton, Massachusetts.

2. Heat Transfer, Holman JP 1989. Mc Graw Hill Book Co., New Delhi.

3. Fundamentals of Heat and Mass Transfer, Incropera F P and De Witt D P 1980 John Wiley and Sons. New York.

4. Engineering Heat Transfer, Gupta CP and Prakash R 1994. Nem Chand and Bros., Roorkee.

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II Year B.Tech. Ag. Engg.-II Sem	L	T/P/D	C
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(A43006) THEORY OF MACHINES

Objective: To educate the students about the kinematics of machine elements, links and pairs and other systems in different machines for applications in the manufacturing of machines and their elements.

Unit–I:

Introduction, Element, Link, Pairs. Kinematics Chains and Pairs- Types, lower and higher pairs. Mechanism – types and inversions. Lower and higher pairs. Four bar chain, slider crank chain and their inversions. Determination of velocity and acceleration using graphical (relative velocity and acceleration) methods. Instantaneous center – Lindring.

Unit II

Types of gears, Law of gearing. Velocity of sliding between two teeth in mesh Involute and cucloidal profile for gear teeth. Spur gear, nomenclature, interference and undercutting. Introduction to helical, spiral, bevel and worm gear. Simple, compound, reverted and epicyclical gear trains.

Unit-III:

Determining the velocity ratio by tabular method. Turning moment Diagrams, Coefficient of fluctuation of speed and energy. Weight of fly wheel, flywheel applications. Belt drives, types of drives. Belt materials, Length of belt, Power transmitted, Velocity ratio, Belt size for flat and v-belts.

Units-IV:

Effect of centrifugal tension, creep and slop on power transmission, chain drives Types of friction, Laws of dry fiction, Friction of pivots and collars. Single disc, Multiple disc and cone clutches. Rolling friction, Anti-friction bearings.

Unit-V:

Types of Governors, Constructional details and analysis of Watt, Porter and Proell governors – Spread of governors. Effect of friction, controlling force, curves, sensitiveness, stability, hunting, Isochronism's, power and effort of a governor, Static and dynamic balancing, Balancing of rotating masses in one and different planes, Partial primary balancing of reciprocating masses. Cams and Foversees.

TEXT BOOK:

1. Theory of Mechanisms and Machines Jgdish Lal 1991. Metropolitan

Book Co. Pvt. Ltd., 1 Netaji Subash Marg, New Delhi.

2. Theory of Machines, Khurmi R S and Gupta JK 1994. Eurasia Publishing House Pvt. Ltd., Ram Nagar, New Delhi.

REFERENCES:

1. Theory of Machines, Thomas Bevan 1984. CBS Publishers

2. Theory of Machines, Ballaney P L 1985 Khanna Publishers, 2- B Nath Market, Nai Sarak, New Delhi

3. Mechanisms and Machine Theory, Rao J S and Dukkipatti R V 1990. Wiley Astern Ltd., New Delhi

4. Theory of Machines, Rattan S B 1993. Tata McGraw Hill Publishing Co. Ltd., 12/4 Asf Ali Road, New Delhi.

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II Year B.Tech. Ag. Engg.-II Sem	L	T/P/D	C
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(A40113) SOIL MECHANICS

Objective: Students will be trained on concepts and analysis of soil properties, stress conditions of loaded soil, consolidation and soil failure theories. The knowledge imparted will be used in higher level design considerations for construction of soil and water conservation structures, irrigation and drainage structures.

Unit–I:

Introduction of soil mechanics – Field of Soil Mechanics. Soil on three phase systems – Physical and index properties of soil. Classification of soils - General, Particle size classification. Classification of soils - textural classification, I.S. classification. Stress condition in soils – Effective and neutral stress.

Unit-II:

Concept on Bousinesq's analysis – Vertical pressure distribution on vertical line, vertical pressure under a uniformly loaded circular area, vertical pressure due to a line load. Concept on Bousinesq's analysis – Vertical pressure under strip load, vertical pressure under a uniformly loaded rectangular area, equivalent point load method. Concept on Westerguard's analysis – Point load pressure distribution, uniformly loaded circular area. Westerguard's analysis – Uniformly loaded rectangular area, comparisons between Bousinesq's and Westerguard's solutions. Newmark's influence chart – Preparation, problems.

Unit -III

Shear strength – Introduction, Hohr's stress circle, stress systems with principal planes parallel to the coordinate axes. Shear strength – Introduction, Mohr's stress circle, stress systems with principal planes parallel to the coordinate axes. Shear strength – Mohr – Coulomb failure theory, effective stress principle. Measurement of shear strength – Introduction, direct shear test, tri-axial compression test, stress conditions in soil specimen during tri-axial testing. Measurement of Shear strength – Advantages of tri-axial test, graphical solutions, unconfined compression test, vane shear test. Problems on shear strength.

Unit-IV:

Compaction of Soils – Standard test and Modified proctor test. Abbot Compaction test. Jodhpur mini compaction test. Field compaction method and control. Consolidation of soil – one dimensional analysis spring analogy– Terzaghi's theory. Laboratory consolidation test. Calculation of coefficient

of volume change – Coefficient of consolidation.

Unit-V:

Earth pressure – Plastic equilibrium in soils. Active and Passive states of earth pressure. Rankine's theory of earth pressure. Earth pressure for cohesive soils. Simple numerical Exercises on earth pressure. Stability of slopes – infinite and finite slopes. Friction Circle method. Taylor's stability number.

TEXT BOOK:

1. Soil Mechanics and Foundations, Punmia B C, Jain A K and Jain A K, 2005. Laxmi Publications (p) LTD. New Delhi

REFERENCES:

1. Basic and Applied Soil Mechanics, Gopal Ranjan and Rao A S R 1993. Welley Easters Ltd., New Delhi.

2. Soil Engineering Vol.1, Alam Singh 1994. CBS Publishers, and Distributions, Delhi.

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II Year B.Tech. Ag. Engg.-II Sem	L	T/P/D	C
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(A43004) HYDROLOGY

Objective : To enable the students to acquire knowledge and skills on hydrological (rainfall and runoff) measurements in watersheds, hydrological design of structures, prediction of volume and rates of runoff with tools like hydrographs and unit hydrographs, reservoir planning with flood routing techniques for application in natural resources management.

Unit-I:

Hydrology-definition, hydrology cycle and its components. Forms of Precipitation Rainfall, Characteristics of rainfall in India (types of monsoon). Measurement of Rainfall and Non-Recording Rain gauges- Rain gauge network density for Presentation of Rainfall data – Mass Curve and hyetograph, Mean Precipitation over an area – Arithmetic Mean, Thiessen Polygon, Isohyetal methods, DAD Relationships and curves. Probability Analysis of Rainfall – Return Period, Plotting position by Weibull's method.

Unit-II:

Intensity-Duration-Frequency-Relationship $(i = (KT^x)/(D+A)^n)$ Determination of net effective rainfall-infiltration indices- Phi index. Runoff-definition- components of runoff-direct runoff and base flow, overload flow and interflows, pictorial representation of different routes of runoff. Runoff characteristics of streams – perennial, intermittent and ephemeral streams, Measurement of stream flows.

Unit-III:

Measurement of stage and velocities, staff gauge, wire gauge, automatic stage recorders, current meters (horizontal and vertical axis meters), calibration $(V = a N_s + b)$. Rainfall-Runoff relations $(R = a P + b)$, curve fitting and determination of 'a' and 'b' and (correlation coefficient), factors affecting runoff. Definition and Estimation of peak runoff and design peak runoff rate, rational method and curve number techniques.

Unit-IV:

Hydrographs-definitions and components, factors affecting flood hydrographs, hydrograph separation for simple and complex storms – Method I (straight line method, $N = b A^{0.2}$), other Methods II and III. Unit Hydrographs-concept and the three implications of the definitions and the two basic assumptions (linear response and time invariance). Effects of the characteristics of storms(duration of rain, time-intensity pattern, areal distribution of runoff and amount of runoff) on the shape of the resulting

hydrographs .Derivation of Unit hydrographs, average unit hydrographs from several storms of the same duration (proper procedure of computing average perk flow and time to peak). Derivation of unit hydrographs for complex storms.

Unit-V:

The conversion of unit hydrograph duration, methods for unit hydrographs of different durations, (1) method of superposition and (2) S-curve. S-curve method, explanation of concept and application. conversion of unit graph duration by S-curve method, determination of lower duration graph from the given higher duration graph and vice-versa. Synthetic unit hydrograph, Concept, Snyder' synthetic unit hydrograph, formulas relating hydrograph features (basin lag, Peak flow and time base of the unit hydrograph). Instantaneous unit hydrograph, Concept and Regulation, Flood mitigation, Floodplain mapping, Retards. Flood Routing-introduction, two broad categories of flood routing and channel routing, hydrologic routing and hydraulic routing, basic equations. Hydrologic storage routing, Schematic representation of storage routing, modified Pul's method (semi-graphical method). Explanation of the features of the modified Pul's method. Flood routing through a reservoir by modified Pul's method. Applications of Hydrology in land and water management, watershed management.

TEXT BOOKS:

1. Engineering Hydrology. Raghunath H.M. 1986. Willey Eastern Limited, New Delhi.

2. Watershed Hydrology, Suresh R. 1997. Standard Publisher and Distributors, New Delhi.

REFERENCES:

1. Engineering Hydrology. Subramanyam K. 1984. Tata Mc. Graw – Hill Publishing Co., Limited, New Delhi.

2. Hydrology for Engineers Linsly R.K. Kholer A. & Paul Hus J.L.H. 1988, Mc. Graw – Hill Book Co. New Delhi.

3. Watershed Management. Dhruvanarayana, VV. 1990. ICAR Publication, New Delhi.

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II Year B.Tech. Ag. Engg.-II Sem	L	T/P/D	C
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(A43002) FARM MACHINERY AND EQUIPMENTS -I

Objective: Primary and Secondary tillage implements along with earth moving machinery, seeding and plant protection equipment will be discussed to get awareness on the mechanical area of the agricultural engineering.

Unit – I:

Objectives of Farm Mechanization, sources of farm power, classification of farm machines. Materials of construction and heat treatment. Principles of operation and selection of machines used for production of crops. Field capacities of different implements and their economics. Problems on field capacities and cost of cultivation.

Unit – II

Classification and types of tillage, Primary tillage implements-Mould board plough and its parts, Disc plough, and other ploughs, Secondary tillage equipments- Disc harrows, implements-Cultivators, and intercultural implements, Forces acting on tillage tools, Problems on forces analysis, Draft measurement of tillage equipments, Draft and unit draft related problems.

Unit – III:

Earth moving equipment-terminology, Earth moving equipments, construction and their working principles, Earth moving equipment- shovels, Bulldozers, Earth moving equipments- Trenches and elevators.

Unit - IV

Seeding methods, Different types of seed metering mechanism, different types of furrow openers. Calibration of Seed drills. Adjustment of Seed Drills

Unit-V:

Objectives and uses of plant protection equipment. Types of sprayers and dusters. Sprayers calibration and selection. Constructional features of different components of sprayers and dusters and their adjustments. Transplanting methods, different types of Transplanting machinery and their working principle, adjustments in Transplanting equipment. Fertilizer application equipment – fertilizer meeting mechanism calibration of fertilizer equipment.

REFERENCES:

1. Farm Machinery, Stone A A 1958. John wiley and sons, New York.

2. Farm Machinery and Equipment, Smith H P 1971. Tata McGraw Hill Publishing Co. Ltd., New Delhi.

3. Principals of Agricultural Engineering, Michael A M and OJha T P 1985 Vol.I, Jain Brothers, New Delhi.

4. Principals of Farm Machinery, Kepner R A, Bainer R and Barger E L 1987. CBS Publishers and Distributors, Delhi.

5. Elements of Agricultural Engineering, Jagadeshwar Sahay 1992. Agro Book Agency, Patna.

6. Land Reclamation Machinery, Borshahov Mansurov Sergecv 1988. Mir Publishers, Moscow.

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II Year B.Tech. Ag. Engg.-II Sem   L   T/P/D   C

                                       -    -/3/-   2

(A43082) SOIL SCIENCE AND AGRONOMY FIELD LAB

PART-A

1. Study of soil profile and collection of soil samples.
2. Determination of bulk density ad particle density of soils.
3. Determination of soil texture.
4. Determination of Proctor moisture content.
5. Determination of soil moisture at different tensions.
6. Determination of hydraulic conductivity of soil.
   Choose any six labs
7. Determination of infiltration rate soil.
8. Determination of soil strength and soil colour.
9. Determination of pH and EC of soils.
10. Determination of organic carbon content in soils.
11. Estimation of available P & K of soils.
12. Determination of anions and cations in irrigation water.

PART-B

1. Visit to college farm.
2. Study of meteorological instruments.
3. Measurement of rainfall and evaporation.
4. Practice of Ploughing.
5. Practice of pudding.
6. Identification of crops and seeds.
7. Identification of manures and fertilizers.
   Choose any six labs
8. Seed bed preparation for nursery.
9. Practice of sowing.
10. Soil moisture estimation by direct method.
11. Practice of fertilizer application.
12. Practice of inter cultivation.
13. Practice of weeding.
14. Practice of harvesting.
15. Practical examination.

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                                       -    -/3/-   2

(A40381) MACHINE DRAWING AND COMPUTER GRAPHICS LAB

1. Preparation of manual drawings with dimensions from Model and Isometric drawings of objects and machine components.
2. Assembly drawings of machine components – Screw jack, knuckle joint, stuffing box and cotter joint
3. Drawing of missing views.
4. Dimensioning methods and principles of dimensioning
5. Concept of sectioning, Revolved and oblique section. Explanation of full sectioning and half sectioning concepts.
6. Sectional drawing of simple machine parts – foot step bearing, shaft support, stuffing box
7. Types of rivet heads and riveted joints. Processes for producing leak proof joints. Symbols for different types of welded joints.
8. Square headed and hexagonal nuts and bolts.
9. Different types of lock nuts, studs, machine screws
10. Application of computers for design. Definition of CAD, benefits of CAD.
11. CAD System components & computer hardware for CAD.
12. Explanation of draw tool bar commands in Auto CAD software
13. Drawing of riveted joints and thread fasteners.
14. Computer Graphics for agricultural engineering applications.
15. Practice in the use of basic and drawing commands on AutoCAD.
16. Generating simple 2-D drawings with dimensions using AutoCAD.
17. Small projects using CAD / CAM.

REFERENCES:

1. Elementary Engineering Drawing. Bhat. N.D. 1995. Charotar Publishing House, Anand.
2. Machine Drawing. Bhatt N.D and Panchal V.M. 1995. Charotar Publishing House, Anand.
3. Machine Drawing. Narayana K.L. Kannaiah P. and Venkata Reddy K. 1996. New Age International Ltd., New Delhi.
4. Mastering CAD / CAM with Engineering Subscription Card. Ibrahim Zeid, McGraw-Hill Science / Engineering / Math; 1st Edition (May 21, 2004).
5. Principals of CAD / CAM / CAE/ Systems. Kunwoo Lee, Addison – Wesley.