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B. TECH AGRICULTURAL ENGINEERING
(AMR24 – IInd YEAR COURSE STRUCTURE & SYLLABUS)

B. Tech – II Year I Semester

S.No.	Category	Title	L	T	P	Credits
1	BS & H	Statistical Methods and Numerical Analysis	3	0	0	3
2	BS & H	Universal human values – understanding harmony and Ethical human conduct	2	1	0	3
3	Engineering Science	Fluid Mechanics and Open Channel Hydraulics	2	0	0	2
4	Professional Core	Farm Power and Tractor Systems	3	0	0	3
5	Professional Core	Engineering Mechanics	3	0	0	3
6	Engineering Science	Fluid Mechanics and Open Channel Hydraulics Lab	0	0	2	1
7	Professional Core	Field Operation and Maintenance of Tractors Lab	0	0	3	1.5
8	Professional Core	Engineering Mechanics Lab	0	0	3	1.5
9	Skill Enhancement Course	Machine and Production Drawing	0	1	2	2
10	Audit Course	Environmental Science	2	0	0	-
Total			**15**	**2**	**10**	**20**

B. Tech – II Year II Semester

S.No.	Category	Title	L	T	P	Credits
1	Management Course- I	Managerial Economics and Financial Analysis	2	0	0	2
2	Engineering Science	Properties and Strength of Materials	3	0	0	3
3	Professional Core	Ground Water Hydrology, Wells and Pumps	3	0	0	3
4	Professional Core	Surveying and Leveling	3	0	0	3
5	Professional Core	Heat and Mass Transfer	3	0	0	3
6	Professional Core	Ground Water Hydrology, Wells and Pumps Lab	0	0	2	1
7	Professional Core	Surveying and Leveling Lab	0	0	3	1.5
8	Professional Core	Heat and Mass Transfer Lab	0	0	3	1.5
9	Skill enhancement	Analysis/Simulation using MATLAB	0	1	2	2

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	Course					
10	BS&H	Design Thinking and Innovation	1	0	2	2
Total			**15**	**1**	**12**	**22**
Honors (Pool – 1)/Minor Courses			**3**	**1**	**0**	**4**
Mandatory Community Service Project Internship of 8 Weeks Duration During Summer Vacation… To be evaluated in III Year I Semester						

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II Year - I Semester

L	T	P	C
3	0	0	3

STATISTICAL METHODS AND NUMERICAL ANALYSIS

OBJECTIVE: To enable the students for acquiring the knowledge about statistical methods, Numerical analysis, Numerical integration, numerical integration by Trapezoidal, Simpson's and Weddle's rules, Laplace transform, Laplace transforms of elementary functions and Experimental designs.

UNIT - I

Statistical methods, testing of hypothesis, concepts, testing of significance based on Z-test, t- test, F-test, Chi-square test, contingency table, correlation, regression, testing of significance of correlation and regression, multiple linear regression, ANOVA, one-way and two-way classifications, factorial experiment concepts (2^2, 2^3, mixed factorials).

UNIT - II

Numerical analysis: Finite differences, various difference operators and their relationships, factorial notation, interpolation with equal intervals, Newton's forward and backward interpolation formulae.

UNIT - III

Numerical integration, numerical integration by Trapezoidal, Simpson's and Weddle's rules; Numerical solution of ordinary differential equations by Picard's method, Taylor's series method, Euler's method, modified Euler's method, Runge-Kutta method; Laplace transforms: Definition of Laplace transform, Laplace transforms of elementary functions,

UNIT - IV

Properties of Laplace transforms, inverse Laplace transforms, transforms of derivatives, integrals, transform of function multiplied by t^n, transform of function divided by t, convolution theorem, application of Laplace transforms to solve ordinary differential equations and simultaneous differential equations.

UNIT - V

Experimental designs: Basic designs, completely randomized design (CRD) - Layout and analysis with equal and unequal number of observations, randomized block design (RBD) - Layout and analysis, Latin square design (LSD) - Layout and analysis; Response surface methodology.

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TEXTBOOKS

1. Erwin Kreyszig, 2006. Advanced Engineering Mathematics, 9th Ed. John Wiley & Sons, New York, USA.
2. B.S. Grewal. 2004. Higher Engineering Mathematics. Khanna Publishers, Delhi.

REFERENCES

1. P.P. Gupta and C.C. Malik. 1993. Calculus of Finite Differences and Numerical Analysis. Krishna Prakash Mandor, Meerut.

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II Year - I Semester

L	T	P	C
2	1	0	3

UNIVERSAL HUMAN VALUES – UNDERSTANDING HARMONY AND ETHICAL HUMAN CONDUCT

COURSE OBJECTIVES:

i. Development of a holistic perspective based on self-exploration about themselves (human being), family, society and nature/existence.
ii. Understanding (or developing clarity) of the harmony in the human being, family, society and nature/existence
iii. Strengthening of self-reflection.
iv. Development of commitment and courage to act.

UNIT – I:

Course Introduction - Need, Basic Guidelines, Content and Process for Value Education **(8 Hrs)**

Purpose and motivation for the course, recapitulation from Universal Human Values-I
Self-Exploration–what is it? - Its content and process; 'Natural Acceptance' and Experiential Validation- as the process for self-exploration
Continuous Happiness and Prosperity- A look at basic Human Aspirations
Right understanding, Relationship and Physical Facility- the basic requirements for fulfilment of aspirations of every human being with their correct priority
Understanding Happiness and Prosperity correctly- A critical appraisal of the current scenario
Method to fulfil the above human aspirations: understanding and living in harmony at various levels.
Include practice sessions to discuss natural acceptance in human being as the innate acceptance for living with responsibility (living in relationship, harmony and co-existence) rather than as arbitrariness in choice based on liking-disliking.

UNIT – II:

Understanding Harmony in the Human Being - Harmony in Myself! **(12 Hrs)**

Understanding human being as a co-existence of the sentient 'I' and the material 'Body'
Understanding the needs of Self ('I') and 'Body' - happiness and physical facility Understanding the Body as an instrument of 'I' (I being the doer, seer and enjoyer) Understanding the characteristics and activities of 'I' and harmony in 'I'
Understanding the harmony of I with the Body: Sanyam and Health; correct appraisal of Physical needs, meaning of Prosperity in detail
Programs to ensure Sanyam and Health.

Include practice sessions to discuss the role others have played in making material goods available to me. Identifying from one's own life. Differentiate between prosperity and accumulation. Discuss program for ensuring health vs dealing with disease.

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UNIT – III: **(8 Hrs)**

Understanding Harmony in the Family and Society- Harmony in Human- Human Relationship
Understanding values in human-human relationship; meaning of Justice (nine universal values in relationships) and program for its fulfilment to ensure mutual happiness; Trust and Respect as the foundational values of relationship.
Understanding the meaning of Trust; Difference between intention and competence
Understanding the meaning of Respect, Difference between respect and differentiation; the other salient values in relationship.
Understanding the harmony in the society (society being an extension of family): Resolution, Prosperity, fearlessness (trust) and co-existence as comprehensive Human Goals
Visualizing a universal harmonious order in society- Undivided Society, Universal Order- from family to world family.
Include practice sessions to reflect on relationships in family, hostel and institute as extended family, real life examples, teacher-student relationship, goal of education etc. Gratitude as a universal value in relationships. Discuss with scenarios. Elicit examples from students' lives.

UNIT – IV:
Understanding Harmony in the Nature and Existence -Whole existence as Coexistence
(10 Hrs)

Understanding the harmony in the Nature
Interconnectedness and mutual fulfilment among the four orders of nature- recyclability and self- regulation in nature
Understanding Existence as Co-existence of mutually interacting units in all- pervasive space
Holistic perception of harmony at all levels of existence.
Include practice sessions to discuss human being as cause of imbalance in nature (film "Home" can be used), pollution, depletion of resources and role of technology etc.

UNIT – V:
Implications of the above Holistic Understanding of Harmony on Professional Ethics **(8Hrs)**
Natural acceptance of human values Definitiveness of Ethical Human Conduct
Basis for Humanistic Education, Humanistic Constitution and Humanistic Universal Order
Competence in professional ethics: a. Ability to utilize the professional competence for augmenting universal human order b. Ability to identify the scope and characteristics of people friendly and eco- friendly production systems, c. Ability to identify and develop appropriate technologies and management patterns for above production systems.
Case studies of typical holistic technologies, management models and production systems
Strategy for transition from the present state to Universal Human Order:

a. At the level of individual: as socially and ecologically responsible engineers, technologists and managers
b. At the level of society: as mutually enriching institutions and organizations Sum up.

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Include practice Exercises and Case Studies will be taken up in Practice (tutorial) Sessions eg. To discuss the conduct as an engineer or scientist etc.

Text Books:

1. R R Gaur, R Asthana, G P Bagaria, "A Foundation Course in Human Values and Professional Ethics", 2nd Revised Edition, Excel Books, New Delhi, 2019. ISBN 978-93-87034-47-1
2. R R Gaur, R Asthana, G P Bagaria, "Teachers' Manual for A Foundation Course in Human Values and Professional Ethics", 2nd Revised Edition, Excel Books, New Delhi, 2019. ISBN 978-93-87034-53-2

Reference Books:

1. Jeevan Vidya: EkParichaya, A Nagaraj, Jeevan Vidya Prakashan, Amar kantak, 1999.
2. N. Tripathi, "Human Values", New Age Intl. Publishers, New Delhi, 2004. The Story of Stuff (Book).
3. Mohandas Karamchand Gandhi "The Story of My Experiments with Truth"
4. E. F.Schumacher. "Small is Beautiful" Slow is Beautiful –Cecile Andrews
5. J C Kumarappa "Economy of Permanence" Pandit Sunderlal "Bharat Mein Angreji Raj" Dharampal, "Rediscovering India"
6. Mohandas K. Gandhi, "Hind Swaraj or Indian Home Rule" India Wins Freedom - Maulana Abdul Kalam Azad Vivekananda - Romain Rolland(English)
7. Gandhi - Romain Rolland (English)

MODE OF CONDUCT

Lecture hours are to be used for interactive discussion, placing the proposals about the topics at hand and motivating students to reflect, explore and verify them. Tutorial hours are to be used for practice sessions.

While analyzing and discussing the topic, the faculty mentor's role is in pointing to essential elements to help in sorting them out from the surface elements. In other words, help the students explore the important or critical elements.

In the discussions, particularly during practice sessions (tutorials), the mentor encourages the student to connect with one's own self and do self-observation, self-reflection and self-exploration.

Scenarios may be used to initiate discussion. The student is encouraged to take up "ordinary" situations rather than" extra-ordinary" situations. Such observations and their analyses are shared and discussed with other students and faculty mentor, in a group sitting.

Tutorials (experiments or practical) are important for the course. The difference is that the laboratory is everyday life, and practicals are how you behave and work in real life.

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Depending on the nature of topics, worksheets, home assignments and/or activities are included. The practice sessions (tutorials) would also provide support to a student in performing actions commensurate to his/her beliefs. It is intended that this would lead to development of commitment, namely behaving and working based on basic human values.

Course Outcomes: At the end of the course students will be able to

CO's	Statements	Bloom's Level
CO1	Become more aware of themselves, and their surroundings (family, society, nature)	L2
CO2	Become more responsible in life, and in handling problems with sustainable solutions, while keeping human relationships and human nature in mind.	L 5
CO3	Have better critical ability.	L 4
CO4	Become sensitive to their commitment towards what they have understood (human values, human relationship and human society).	L 2
CO5	apply what they have learnt to their own self in different day-to-day settings in real life, at least a beginning would be made in this direction.	L3

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L	T	P	C
2	0	0	2

II Year - I Semester

FLUID MECHANICS AND OPEN CHANNEL HYDRAULICS

OBJECTIVE: To enable the students to design efficient water conveyance systems like canals, channels and pipes from places of origin to delivery points by acquiring knowledge on the principles of mechanics of fluids, water measurement and regulation and open channel hydraulic principles.

OUTCOMES:

- Acquaintance of skills on basic principles of fluid, their properties, flow patterns, classification of flow regimes etc.,
- Impart knowledge on boundary layer theory and their principals, analysis of fluid flow and theories of flow regimes–energy calculations.
- Development of skills on Buoyancy principals, flow measuring devises, their flow dynamics. Skill development on flow through pipes & their concepts, dynamics of mix flow principles of dimensional analysis and similitude, open channel flow dynamic.
- Skill development on open channel flow dynamics, concepts & principles, their design procedures.

UNIT–I

Fluids-Definitions-classification-properties, dimensions. Fluid pressure–Introduction–measurement of fluid pressure, piezo meter tube manometry, types of manometers. Mechanical gauges-Bourdon's tube pressure gauge, diaphragm pressure gauge, dead weight pressure gauge. Fluid static force on submerged surfaces, total force on horizontal, vertical and inclined surfaces. Center of pressure of an inclined immersed surface, center of pressure of a composite section. Pressure on a curved surface and its applications. Kinematics of fluid flow– Introduction, continuity of fluid flow, Types of flow lines.

UNIT–II

Boundary layer theory- Thickness of boundary layer, Thickness of boundary layer in alaminar flow, Thickness of boundary layer in a turbulent flow, Prandtl's experiment of boundary layer separation. Dynamics of fluid flow – Various forms of energy in fluid flow, frictional loss, general equation. Bernoulli's theorem, Euler's equation of motion. Practical applications of Bernoulli's theorem, verturimeter, pitot tube, orifice meter.

UNIT–III

Buoyancy of flotation–metacentric height. Flow through orifices(measurement of discharge) – Types of orifices, jet of water, vena contract a, hydraulic coefficients, experimental method for hydraulic Coefficients, discharge through a rectangular orifice.

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Flow through orifices (measurement of time) – Time of emptying a square, rectangular or circular tank through an orifice at its bottom, time of emptying a hemispherical tank through an orifice at its bottom. Time of emptying a circular horizontal tank through an orificeat its bottom. Time of empty in gatank of variable cross-section through an orifice. Flow through mouthpieces – Types of Mouthpieces; Loss of head of a liquid flowing in a pipe, discharge through a mouthpiece. Flow over notches- Types of notches, discharge over a rectangular notch, triangular notch, stepped notch. Time of emptying a tank over a rectangular notch, triangular notch. Flow over weirs – Types of weirs, discharge over a weir, Francis's formula for discharge over a rectangular weir(effect of end contractions), Bazin's formula for discharge over a rectangular weir, velocity of approach, determination of velocity of approach.

UNIT–IV

Flow through simple pipes – Loss of head in pipes, Darcy's formula for loss of head in pipes, Chezy's formula for loss of head in pipes. Transmission of power through pipes, Time of emptying a tank through a long pipe, Time of flow from one tank into another through a long pipe. Flow through compound pipes – Discharge through a compound pipe (pipes in series), discharge through pipes in parallel, equivalent size of a pipe, discharge through branded pipes from one reservoir to another. Dimensional analysis and similitude– Rayleigh's method and Buckingham'spi theorem. Types of similarities, dimensional analysis, dimension less numbers, introduction to fluid machinery. Open channel hydraulics- classification of open channel and definitions. Chezy's formula for discharge through an open channel.

UNIT–V

Bazin's formula for discharge through open channel, numerical problems on design through open channel, Kutter's formula for discharge, problems on design. Manning's formula for discharge through an open channel. Channels of most economical crosssections – Conditions for maximum discharge through a channel of rectangular section, trapezoidal section, circular section. Specific energy concept - Specific energy of a following fluid, specific energy diagram, critical depth, type of flows, critical velocity. Velocity and pressure profiles in open channels. Hydraulic jump, types of hydraulic jumps, depth of hydraulic jump, loss of head due to hydraulic jump.

TEXTBOOKS

1. Hydraulics and Fluid Mechanics, Modi PM and SethS.M.1973.Standard Book House, Delhi.
2. Open Channel Hydraulics, ChowVT,1983, McGraw Hill Book Co.,New Delhi.

REFERENCES

1. A Text book of Hydraulics, Fluid Mechanics and Hydraulic Machines, Khurmi,R.S.1970.,S.Chand& Company Ltd., New Delhi.

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II Year - I Semester

L	T	P	C
3	0	0	3

FARM POWER AND TRACTOR SYSTEMS

OBJECTIVE: To enable the students for acquiring the knowledge pertaining to systems like transmission system clutch, types of clutches, types of Gear, sliding, constant mesh type tractor power out lets like P.T.O, belt pulley, drawbar, traction theory rolling, resistance, rim pull, crawler tractor.

OUTCOMES:

- Skill development on farm power sources classification I.C engine components and construction, operating systems.
- Skill development on fuel supply ignition, cooling & lubrication electrical ignition, fuels& their properties, governing systems of IC engines, power transmission, clutches & its applications.
- Acquaintance of knowledge on clutch types, concepts & principles, single and multiple plate clutches, working mechanism, gear theory and principles, differential unit of its functions, final drive & its applications.
- Skill development on principles of fluid coupling &torque connector, brakes principles, classification & friction concepts of hydraulic system in factors.
- Skill development on tractor powers outlets, P.T.O and its applications, Tractor testing and its main components, CG estimation, Tractor chassis its mechanics.

UNIT-I

Source of farm power–Conventional and non-conventional energy sources, classification of tractor and I.C engines, study of I.C engine components and their construction, operating principles and functions, Engine systems and their construction details and adjustment.

UNIT-II

Valves and valve mechanism, fuel and air supply stems, cooling and lubricating systems, electrical and ignition systems, I.C engine fuels and their properties, detonationandknockinginICengines,Studyofpropertiesofcoolants,antifreezeandanti-corrosion materials, Lubricant types & study of their properties – Engine governing systems. Introduction to transmission system – Power transmission system of tractor – Functions of a power transmission system. Clutch – Necessity of clutch in a tractor, essential features of good clutch, principal working of clutch, clutch repairs and maintenance.

UNIT-III

Types of clutch – Friction clutch, dog clutch and fluid coupling, friction clutch – Single plate clutch or single disc clutch, multiple plate clutch or multiple disc clutch, coneclutch. Single plate clutch or single disc clutch – Constructional details and principle of working mechanism. Multiple plate clutch, splinted sleeve clutch type – Constructional details and principle of working mechanism ratchet and pawl arrangement

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mechanism –Constructional details and principle of working mechanism. Gears– Necessity for providing gear box, Selective sliding type, constant mesh type, Mechanical advantage in gears, torque ratio in gears, working of gear box. Differential unit and final drive–Differential, functions of crown wheel, differential lock, functions, final drive– functions of final drive.

UNIT-IV

Fluid coupling and torque connector, brake mechanism, requirements of good braking systems, classification of brakes, Mechanical brake and hydraulic brake– Workingmechanism.Steeringmechanism–Qualitiesofsteeringmechanism, main parts of steering mechanism types of steering boxes, working of hydraulic steering. Hydraulic control system – Working principals, basic components of hydraulic system – Types of hydraulic system, position control, draft control, mixed control, precautions for hydraulic system.

UNIT-V

Tractor power outlets – P.T.O., construction details; Belt pulley constructional details, tractor power outlet, drawbar, construction details. Traction-Traction efficiency, method for improving traction, coefficient of traction, rolling resistance, wheel slip or track slip, Rimpul - crawler tractor. Tractor testing – Preparation for tests, types of tests, test at the main power take off, test at varying speeds at full load, test at varying load, belt or pulley shaft test, drawbar test, tractor engine performance. Determination of centre of gravity, Suspension method, balancing method, weighing method. Tractor chassis machines, functions of chassis frame. Tractor chassis – Mechanics of tractor chassis.

TEXTBOOKS

1. Farm Tractor Maintenance and Repair. Jain. S.C. and Roy C.R.1984. TMH Publishing Co.Ltd., New Delhi.
2. Tractors and their power units. Lijedhal J.B.Carleton W.M.Turnquist P.K. and Smith D.W.1984.AVI PublishingCo. Inc., Westport, Connecticut.

REFERENCES

1. Farm Gas Engines and Tractors. Fred J.R.1963.AlliedPublisherPvt. Ltd., Bombay.
2. Farm Machines and their Equipment. Nakra C.P., 1986. Dhanpet RaiandSons.1982 Nai Sarak, New Delhi.

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L	T	P	C
3	0	0	3

II Year - I Semester

ENGINEERING MECHANICS

Objectives: The students completing this course are expected to understand the concepts of forces and its resolution in different planes, resultant of force system, Forces acting on a body, their free body diagrams using graphical methods. They are required to understand the concepts of centre of gravity and moments of inertia and their application, Analysis of frames and trusses, different types of motion, friction and application of work - energy method.

Course outcomes:

1. The student should be able to draw free body diagrams for FBDs for particles and rigid bodies in plane and space and problems to solve the unknown forces, orientations and geometric parameters.
2. The student should be able to determine centroid for lines, areas and center of gravity for volumes and their composites.
3. The student should be able to determine area and mass movement of inertia for composite sections
4. The student should be able to analyze motion of particles and rigid bodies and apply the principles of motion, work energy and impulse – momentum.

UNIT – I

Objectives: The students are to be exposed to the concepts of force and friction, direction and its application.

Introduction to Engg. Mechanics – Basic Concepts.

Systems of Forces: Coplanar Concurrent Forces – Components in Space – Resultant – Moment of Force and its Application – Couples and Resultant of Force Systems.

Friction: Introduction**,** limiting friction and impending motion, coulomb's laws of dry friction, coefficient of friction, cone of friction

UNIT II

Objectives: The students are to be exposed to application of free body diagrams. Solution to problems using graphical methods and law of triangle of forces.

Equilibrium of Systems of Forces: Free Body Diagrams, Lami's Theorem, Equations of Equilibrium of Coplanar Systems, Graphical method for the equilibrium, Triangle law of forces, converse of the law of polygon of forces condition of equilibrium, Equations of Equilibrium for Spatial System of forces, Numerical examples on spatial system of forces using vector approach, Analysis of plane trusses.

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UNIT – III

Objectives: The students are to be exposed to concepts of centre of gravity. The students are to be exposed to concepts of moment of inertia and polar moment of inertia including transfer methods and their applications.

Centroid: Centroids of simple figures (from basic principles) – Centroids of Composite Figures **Centre of Gravity:** Centre of gravity of simple body (from basic principles), centre of gravity of composite bodies, Pappus theorems.

Area moments of Inertia: Definition – Polar Moment of Inertia, Transfer Theorem, Moments of Inertia of Composite Figures, Products of Inertia, Transfer Formula for Product of Inertia. **Mass Moment of Inertia:** Moment of Inertia of Masses, Transfer Formula for Mass Moments of Inertia, mass moment of inertia of composite bodies.

UNIT – IV

Objectives: The students are to be exposed to motion in straight line and in curvilinear paths, its velocity and acceleration computation and methods of representing plane motion.

Rectilinear and Curvilinear motion of a particle: Kinematics and Kinetics- Work Energy method and applications to particle motion- Impulse momentum method.

UNIT – V

Objectives: The students are to be exposed to rigid motion kinematics and kinetics

Rigid body Motion: Kinematics and kinetics of translation, Rotation about fixed axis and plane motion, Work Energy method and Impulse momentum method.

TEXTBOOK:

1. Engg. Mechanics - S.Timoshenko &D.H.Young., 4thEdn - , Mc Graw Hill Publications.

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II Year - I Semester **B. TECH AGRICULTURAL ENGINEERING**
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L	T	P	C
0	0	2	1

FLUID MECHANICS AND OPEN CHANNEL HYDRAULICS LAB

OUTCOMES

1. Imparting practical skills on determination of metacentric height and Bernoulli's theorem.
2. Exposure to practical skills on measurement of discharge with venture meter and pilot tubes.
3. Acquiring practical skills on determining discharge coefficient to rectangular, triangular and trapezoidal weir and orifices.
4. Imposing practical skills on flow measurement……. Broad crested weirs and open channels.
5. Imposing practical skills on determination of head losses in pipes, roughness coefficient of open channels.
6. Practical exposes on determination of velocity and pressure in open channels, construction of flow-net problems on flow-nets.

PRACTICAL

1. Determination of metacentric height
2. Verification of Bernoulli's theorem
3. Measurement of discharge with a venture meter
4. Measurement of velocity with a pilot tube
5. Determination of coefficient of discharge of rectangular weir
6. Determination of coefficient of discharge of triangular weir
7. Determination of coefficient of discharge of trapezoidal weir
8. Determination of hydraulic coefficient of orifices
9. Experiment on broad crested weir
10. Determination of head losses in pipes
11. Experiments on open channels
12. Determination of roughness coefficients of open channels
13. Measurement of velocity and pressure profiles in open channels
14. Construction of flow net
15. Problems on construction off low net

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L	T	P	C
0	0	3	1.5

FIELD OPERATIONS AND MAINTENANCE OF TRACTORS LAB

OBJECTIVES: To enable the students for acquiring the knowledge pertaining to maintenance of tractors like periodical maintenance (50 to 100 hours, 200 to 250 hours,480 to 500 engine working hours, 960 to 1000 hours) and trouble shooting and remedial measures of all systems - fuel system, lubrication system, cooling system and ignition system.

OUTCOMES

1. Improved practical skills on air kind fuel filtration systems, lubrication system and their maintenance in tractors.
2. Practical skills improvement on maintenance of transmission and radiators cooling systems in tractor.
3. Practical skills development on maintenance of tractor ignition and hydraulic systems.
4. Practical knowledge on periodical maintenance of tractors, emission of smoke, clutch and brake system maintenance.
5. Practical skill development on maintenance of train machinery and implements.
6. Practical knowledge on tractor on-off practice of tractors.

Practical

1. Tractor Systems - maintenance of air fuel system – cleaning of air cleaners – frequent troubles and Remedies – process to remove air lock in the diesel engine – precautions in handling diesel fuels in dieselengine.
2. Maintenance of lubrication system – frequent troubles and remedies – troubles in lubrication system excessive oil consumption–care and maintenance of lubrication system.
3. Maintenance of transmission system–general maintenance–differential trouble shooting–Frequent troubles and Remedies.
4. Maintenance of cooling system and cleaning of radiators-frequent troubles and remedies Cooling system troubles–overheating–slow warm up of the engine–care and maintenance of cooling system.
5. Maintenance of ignition system – care and maintenance of batteries – Frequent troubles and remedies–causes of ignition failure in battery system.
6. Maintenanceofhydraulicsystem–workingprinciple–basiccomponentsofhydraulic system – types of hydraulic system – frequent troubles and remedies –repairs and maintenance of hydraulic system–precautions of hydraulic system.

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– Periodical maintenance of tractors – at 8-10 engine working hours – at 50-60engine workinghoursandat100-120engine working hours Periodical maintenance of tractors – at 200-250 engine working hours, at 480-500engineworkinghoursandat960-1000engineworkinghours. Emission of smoke– over heating of engines-maintenance of clutch brakes hydraulic problems.

7. Maintenance of agricultural machinery before and after use like primary till age implements,
8. M.B. plough, disc plough and secondary tillage implements - harrows, seed drills, weeders, cultivators.
9. Starting and stopping practice of the tractor and familiarization with instrumentation panel and controls
10. Driving in forward and reverse gears, driving safety sales and study bean trepanned.

TEXTBOOKS

1. Farm Tractor Maintenance and Repair. Jain S.C. and Roy C.R. 1984. Tata McGraw-Hill Publishing Co. Ltd., New Delhi.
2. Farm Machines and their Equipment. NakraC.P.1986DhanpetRaiandSons.NewDelhi.

REFERENCES

1. ElementsofAgriculturalEngineering.JasgishwaraSahay1992.AgroBookAgency,Patna.
2. TractorsandtheirPowerunits.LiledahiJ.B.CarletonW.M.TurnquistP.K.andSmithD.W.1984.AVIPublishingCo.,Inc.,Westport,Connecticut.

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L	T	P	C
0	0	3	1.5

II Year - I Semester

ENGINEERING MECHANICS LAB

1. To verify the polygon law forces with the help of force polygon apparatus
2. To determine law of machine for single purchase crab
3. To determine law of machine for double purchase crab
4. To determine law of machine for differential axle and wheel
5. Determination of reactions at the supports of a simply supported beam with the help of parallel forces apparatus
6. Determination of coefficient of friction using inclined plane set-up
7. Determination of coefficient of friction using coil friction set-up
8. To find forces in jib and tie with the help of jib crane apparatus
9. Determination of forces in members of jib crane (co-planer concurrent force system)
10. To determine the efficiency of a simple screw jack apparatus
11. To determine the efficiency of a simple wheel and axle apparatus
12. To determine efficiency of a worm and worm wheel apparatus
13. To calculate the forces in the members of member truss apparatus
14. To determine the principle of moments with the help of bell crank lever apparatus
15. To determine efficiency of a differential wheel and axle apparatus
16. Determination of moment of inertia of a fly wheel

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L	T	P	C
0	1	2	2

II Year - I Semester

MACHINE AND PRODUCTION DRAWING

Course Objectives

1. To understand and apply national and international standards while drawing machine components.
2. To understand the concept of various tolerances and fits used for component design
3. To familiarize in drawing assembly, orthographic and sectional views of various machine components.

Course Outcomes

CO1 Identify the national and international standards pertaining to machine drawing.
CO2 Apply limits and tolerances to assemblies and choose appropriate fits.
CO3 Recognize machining and surface finish symbols.
CO4 Explain the functional and manufacturing datum.
CO5 Illustrate various machine components through drawings.

Tutorial

Machine Drawing Conventions

Need for drawing conventions – introduction to IS conventions- Standardization- Interchangeability Selective assembly- Tolerance

a) Conventional representation of materials, common machine elements and parts such as screws, nuts, bolts, keys, gears, webs, ribs.
b) Types of sections – selection of section planes and drawing of sections and auxiliary sectional views. Parts not usually sectioned.
c) Methods of dimensioning, general rules for sizes and placement of dimensions for holes, centers, curved tapered features and surface finish indication
d) Title boxes, their size, location and details – common abbreviations & their liberal usage
e) Types of Drawings – working drawings for machine parts.

Drawing of Machine Elements and simple parts

Selection of Views, additional views for the following machine elements and parts with every drawing proportions.

a) Popular forms of Screw threads, bolts, nuts, stud bolts, tap bolts, set screws.
b) Keys, cotter joints, knuckle joint, Hook's joint
c) Riveted joints for plates
d) Shaft couplings.
e) Journal, pivot and collar and foot step bearings.

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Assembly Drawings

Drawings of assembled views for the part drawings of the following using conventions and easy drawing proportions.

a) Engine parts –Gear pump, Fuel pump, petrol Engine connecting rod, piston, stuffing box and eccentric assembly.
b) Other machine parts – Screws jack, Machine swivel vice, Plummer block, Tailstock and Tool post.

Manufacturing Drawing

a) Introduction of Limits and fits, fundamental deviations for Hole based and Shaft based systems, alpha numeric designation of limits & fits. Types of Fits. Form and positional tolerances.
b) Conventional practices of indicating limits and fits, geometrical form and position tolerances, surface finish and surface treatments requirements. Study of Examples involving selection of fits and calculation of limits. Suggestion of suitable fits for mating parts.
c) Representation of limits fits and tolerances for mating parts. Use any four parts of above assembly drawings and prepare manufacturing drawing with dimensional and geometric tolerances.

Practical

1. Classification of Machine Drawings
2. Principles of Drawings
3. Sectioning
4. IS/ISO codes
5. Dimensioning
6. Limits, tolerances and fits
7. Surface finish
8. Important symbols and conventional representation in machine drawing
9. Assembly and part drawings of simple assemblies and sub-assemblies of machine parts viz., couplings and its types, clutches, bearings, gear assemblies, I.C. Engine components, valves, machine tools, screw fasteners, key joints, coupling, riveted joints, welded joints, etc.
10. Structural applications, assembly drawings, production drawings, reproduction of Drawing
11. Introduction to computer aided drafting
12. Introduction of Solid 3Dmodeling

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TEXTBOOKS

1. R.K. Dhawan. Machine Drawing. S.Chand Publications
2. K.L.Narayana, P.Kannaiah & K. Venkata Reddy. A textbook on Production Drawing. PHI Publishers

REFERENCES

1. N. D. Bhatt, Machine Drawing, Charotar Publishing House Pvt Ltd, 2016.
2. N. Sidheswar, P. Kanniah and V.V.S. Sastry, Machine Drawing, Tata McGraw Hill, 2001
3. SP 46: 1988 Engineering Drawing Practice for School & Colleges. Bureau of Indian Standards
4. K. R. Gopalakrishna, Machine Drawing, 9th Ed., Subhas Stores, Bangalore, 2005.
5. K.L.Narayana, P.Kannaiah& K. Venkata Reddy. Machine Drawing. New Age Publishers
6. P.S.Gill “Machine Drawing” S.K. Kataria & Sons
7. K. Venkata Reddy. Production Drawing.
8. N. Siddeswar. Machine Drawing.

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B. TECH AGRICULTURAL ENGINEERING
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II Year - I Semester

ENVIRONMENTAL SCIENCE

COURSEOBJECTIVES:

L	T	P	C
2	0	0	0

The objectives of the course are to impart:

- Over all understanding of the natural resources.
- Basic understanding of the eco system and its diversity.
- Acquaintance on various environmental challenges induced due to unplanned anthropogenic activities.
- An understanding of the environmental impact of developmental activities.
- Awareness on the social issues, environmental legislation and global treaties.

UNIT-I

Multidisciplinary nature of Environmental Studies: Definition, Scope and Importance – Sustainability: Stockholm and Rio Summit–Global Environmental Challenges: Global warming and climate change, acid rains, ozone layer depletion, population growth and explosion, effects; Role of information technology in environment and human health.

Ecosystems: Concept of an ecosystem. - Structure and function of an ecosystem; Producers, consumer sand decomposers. - Energy flow in the ecosystem - Ecological succession. - Food chains, food webs and ecological pyramids; Introduction, types, characteristic features, structure and function of Forest ecosystem, Grassl and ecosystem, Desert ecosystem, Aquatic ecosystems.

UNIT-II

Natural Resources: Natural resources and associated problems.

Forest resources: Use and over – exploitation, deforestation – Timber extraction – Mining, dams and other effects on forest and tribal people. Water resources: Use and over utilization of surface and ground water–Floods, drought, conflicts over water, dams –benefits and problems. Mineral resources: Use and exploitation, environmental effects of extracting and using mineral resources. Food resources: World food problems, changes caused by non- agriculture activities-effects of modern agriculture, fertilizer-pesticide problems, water logging, salinity. Energy resources: Growing energy needs, renewable and non-renewable energy sources use of alternate energy sources. Land resources: Land as a resource, land degradation, Wasteland reclamation, man induced landslides, soil erosion and desertification; Role of an individual in conservation of natural resources; Equitable use of resources for sustainable life styles.

UNIT-III

Biodiversity and its conservation: Definition: genetic, species and ecosystem diversity-classification -Value of biodiversity: consumptive use, productive use, social-Biodiversity at national and local levels. India as a mega-diversity nation - Hot-sports of biodiversity - Threats to biodiversity: habitat loss, man-wildlife conflicts. - Endangered and endemic species

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of India – Conservation of biodiversity: conservation of biodiversity.

UNIT – IV

Environmental Pollution: Definition, Cause, effects and control measures of Air pollution, Water pollution, Soil pollution, Noise pollution, Nuclear hazards. Role of an individual in prevention of pollution. - Pollution case studies, Sustainable Life Studies. Impact of Fire Crackers on Men and his well being.

Solid Waste Management: Sources, Classification, effects and control measures of urban and industrial solid wastes. Consumerism and waste products, Biomedical, Hazardous and e–waste management.

UNIT–V

Social Issues and the Environment: Urban problems related to energy-Water conservation, rain water harvesting–Resettlement and rehabilitation of people;its problems and concerns. Environmental ethics: Issues and possible solutions. Environmental Protection Act- Air (Prevention and Control of Pollution)Act.–Water (Prevention and control of Pollution)Act-Wild life Protection Act-Forest Conservation Act-Issues involved in enforcement of environmental legislation. -Public awareness.

Environmental Management: Impact Assessment and its significance various stages of EIA, preparation of EMP and EIS, Environmental audit. Ecotourism, Green Campus –Green business and Green politics.

The student should Visit an Industry/Ecosystem and submit a report individually on any issues related to Environmental Studies course and make a power point presentation.

TEXTBOOKS

1. Environmental Studies, K.V.S.G. Murali Krishna, VGS Publishers, Vijayawada
2. Environmental Studies, R. Rajagopalan, 2ndEdition,2011, Oxford University Press.

REFERENCES

1. EnvironmentalStudies,P.N.Palanisamy,P.Manikandan,A.Geetha,andK.ManjulaRani;P earsonEducation,Chennai
2. Text Book of Environmental Studies, Deeshita Dave & P.UdayaBhaskar, Cengage Learning.
3. A Text book of Environmental Studies, Shaashi Chawla, TMH, New Delhi
4. Environmental Studies, Benny Joseph,Tata McGraw HillCo, New Delhi
5. Perspectives in Environment Studies, Anubha Kaushik, C P Kaushik, New Age InternationalPublishers,2014

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B. TECH AGRICULTURAL ENGINEERING
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II Year - II Semester

L	T	P	C
2	0	0	2

MANAGERIAL ECONOMICS AND FINANCIAL ANALYSIS

Course Objectives:

- To inculcate the basic knowledge of microeconomics and financial accounting
- To make the students learn how demand is estimated for different products, input-output relationship for optimizing production and cost
- To Know the Various types of market structure and pricing methods and strategy
- To give an overview on investment appraisal methods to promote the students to learn how to plan long-term investment decisions.
- To provide fundamental skills on accounting and to explain the process of preparing financial statements.

Course Outcomes:

- Define the concepts related to Managerial Economics, financial accounting and management(L2)
- Understand the fundamentals of Economics viz., Demand, Production, cost, revenue and markets (L2)
- Apply the Concept of Production cost and revenues for effective Business decision (L3)
- Analyze how to invest their capital and maximize returns (L4)
- Evaluate the capital budgeting techniques. (L5)
- Develop the accounting statements and evaluate the financial performance of business entity (L5)

UNIT - I Managerial Economics

Introduction – Nature, meaning, significance, functions, and advantages. Demand-Concept, Function, Law of Demand - Demand Elasticity- Types – Measurement. Demand Forecasting-Factors governing Forecasting, Methods. Managerial Economics and Financial Accounting and Management.

UNIT - II Production and Cost Analysis

Introduction – Nature, meaning, significance, functions and advantages. Production Function– Least- cost combination– Short run and long run Production Function- Isoquants and Is costs, Cost & Break-Even Analysis - Cost concepts and Cost behaviour- Break-Even Analysis (BEA) - Determination of Break-Even Point (Simple Problems).

UNIT - III Business Organizations and Markets

Introduction – Forms of Business Organizations- Sole Proprietary - Partnership - Joint Stock Companies - Public Sector Enterprises. Types of Markets - Perfect and Imperfect

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Competition - Features of Perfect Competition Monopoly- Monopolistic Competition– Oligopoly-Price-Output Determination - Pricing Methods and Strategies

UNIT - IV Capital Budgeting

Introduction – Nature, meaning, significance. Types of Working Capital, Components, Sources of Short-term and Long-term Capital, Estimating Working capital requirements. Capital Budgeting– Features, Proposals, Methods and Evaluation. Projects – Pay Back Method, Accounting Rate of Return (ARR) Net Present Value (NPV) Internal Rate Return (IRR) Method (sample problems)

UNIT - V Financial Accounting and Analysis

Introduction – Concepts and Conventions- Double-Entry Bookkeeping, Journal, Ledger, Trial Balance- Final Accounts (Trading Account, Profit and Loss Account and Balance Sheet with simple adjustments). Introduction to Financial Analysis - Analysis and Interpretation of Liquidity Ratios, Activity Ratios, and Capital structure Ratios and Profitability.

Textbooks:

1. Varshney & Maheswari: Managerial Economics, Sultan Chand.
2. Aryasri: Business Economics and Financial Analysis, 4/e, MGH.

Reference Books:

1. Ahuja Hl Managerial economics Schand.
2. S.A. Siddiqui and A.S. Siddiqui: Managerial Economics and Financial Analysis, New Age International.
3. Joseph G. Nellis and David Parker: Principles of Business Economics, Pearson, 2/e, New Delhi.
4. Domnick Salvatore: Managerial Economics in a Global Economy, Cengage.

Online Learning Resources:

https://www.slideshare.net/123ps/managerial-economics-ppt
https://www.slideshare.net/rossanz/production-and-cost-45827016
https://www.slideshare.net/darkyla/business-organizations-19917607
https://www.slideshare.net/balarajbl/market-and-classification-of-market
https://www.slideshare.net/ruchi101/capital-budgeting-ppt-59565396
https://www.slideshare.net/ashu1983/financial-accounting

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II Year - II Semester

L	T	P	C
3	0	0	3

PROPERTIES AND STRENGTH OF MATERIALS

OBJECTIVE: To enable the students to know about different materials used for engineering constructions like buildings, roads, farm structures and metals and other materials for manufacturing farm equipment, implements, dairy and food processing equipment.

OUTCOMES:

- Skill development on basic properties of engineering materials and their uses, testing of materials.
- Knowledge development on properties and application of difference of concrete,varieties,distempers,glass,rubberandplywood,plastics,iron-basedmaterials,alloysetc., Development of skill on stress – strain analysis of beams under different types of loading patterns.
- Acquaintance of skill on Euler's theory and buckling load, analysis on columns & different types of columns.
- Skill development on different types of joints (Riveting), welding analysis cantilever, fixed, continuous beams, theory of moments and their analysis.

UNIT-I

Properties of engineering materials, classifications of rocks, sources of stones and natural bed of stones, properties, varieties and uses of stones, properties, composition and uses of bricks, classification and tests of bricks, properties, varieties and uses of tiles, properties, varieties and uses of Lime, Properties, varieties and uses of Cement, Properties, varieties and uses of cement mortar, properties.

UNIT-II

Varieties and uses of concrete, properties, varieties and uses of sand, properties, varieties and uses of paints, properties, varieties and uses of varnishes, properties, varieties and uses of distempers. Characteristics and uses of glass, rubber, plywood, plastics. Characteristic sand uses of wrought iron, cast iron, steel, aluminium, copper, nickel; Alloys of Aluminium and its properties, Alloys of Copper and its properties, Alloys of Nickel and its properties; Definition and types of timber, seasoning of timber, industrial timber and uses of timber, Methods of heat treatment of steel.

UNIT-III

Introduction – Stresses, tensile, compressive and shear-strains, units-elastic curve - ElasticlimitPoisonsratio,stressesinuniformitytaperedcircularsections,stressesinbarsofcom posite, sections, thermal stresses and strains in simple bars and composite bars; Elastic constants- Young's modulus, bulk modulus and shear modulus - relation between them;

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Stresses on oblique planes, Mohr's circle method; Direct stresses in one plane, direct stresses in two planes- accompanied by shear stress. Deflection of beams, relation between slope, deflection and radios of curvature. Methods of finding out slopes and deflections of beams, double integration method. Slope and deflection equations of a simply supported beam with a central point load, simply supported beam with eccentric point load. Simply supported beam with a uniformly distributed load, Columns and struts.

UNIT-IV

Euler's column theory. Assumptions of Euler's column theory; Buckling load-derivations, types of end conditions of columns, both ends hinged, both ends fixed, one end fixed and other hinged; Expression for buckling load of a column with one end fixed other free, with one end fixed and other hinged, expression for buckling load of a column with both end shinged, with both ends. Fixed types of end conditions of columns, both ends hinged, both ends fixed, one end fixed and other is hinged and one end fixed and other end is free. Types of end conditions of columns, both ends hinged, both ends fixed, one end fixed and other ishinged and one end fixed and other end is free. Limitations of Euler's formula Rankine's formula for columns.

Unit-V

Riveted joints, types of joint strength of a rivet and riveted joint, efficiency of a riveted joint. Design of riveted joints, eccentric riveted connections, Welded joist, types of welded joints, strength of welded joints, technical terms. Design of welded joints, eccentric welded joints. Dams, forces acting, stressed at the base of dam. Stability of dams, design of base width of dams. Propped cantilever and beams – Deflection and slope equations; Fixed and continuous beams – Deflection and slope equations, Super position theorem – Claypeyron's theorem of three moments, application of Clayperon's theorem of three moments, Moment distribution methods. Analysis of statistically –in determinate beams.

TEXTBOOKS

1. Engineering Materials, Rangwala, S.C.1994. Charotar Publishing House, Anand.
2. Strength of Materials by Ramamrutham S.2003. Dhanapathrai & Sons, NaiSarak, NewDelhi.

REFERENCES

1. Material of constructions Deshpande RS1977. United Book Corporation, Poona.
2. Manufacturing Process. Hazra Choudhury 1985. Media Promoters and Publishers Private Limited, Bombay.
3. Workshop Technology (Part-I) Chapman W.A.J. 1994.Aronold Publishers, New Delhi.
4. Engineering Materials. Rangwala S.C. 1994.Charotar Publishing House, Anand.
5. Mechanics of Structures (Vol.I) Junnarkar S.B.2001-Charotar Publishing House, Anand.

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II Year - II Semester

L	T	P	C
3	0	0	3

GROUND WATER HYDROLOGY, WELL AND PUMPS

OBJECTIVE: To enable the students to acquire knowledge on aquifers and estimation of their different properties like hydraulic conductivity, transmissibility, storage coefficient, specific yield, leakage factor, hydraulic resistance under steady and unsteady state conditions in wells dug under different aquifers, well drilling and development methods and equipment design of gravel pack in bore well. Further to make the students to acquire knowledge on various pumps available commercially, their selection, operation and maintenance with due importance to find out the cost of operation.

OUTCOMES:

- Skill development on principles of ground water resources development, different acquaintance and their principles.
- Imparting knowledge on theory of open well hydraulics and drilling methods.
- Skill development on aquifers characteristics under steady and unsteady state conditions, multiples well systems for coastal areas.
- Knowledge development to students on artificial ground water recharge classification of indigenous pumps, solar pumps, wind mill pumps etc.,
- Skill development on principles of Centrifugal pumps, principles &characteristics, High lift pumps, mixed flow pumps and vertical turbine pump sets.

UNIT–I

Water resources status of India-Occurrence and Movement of ground water and aquifers– Types of water bearing formations – Unconfined, confined, semi confined aquifers Perched water table condition–Diagramatic representation.

UNIT–II

Classification of wells – Design of open wells – Ground water replenishment – Ground water exploration – Methods of drilling of wells – Common well drilling difficulties Gravel packing – well screens – Development of well.

UNIT – III

Aquifer characteristics - Influencing yield of wells - Determination of aquifer parameters – Steady state and unsteady state conditions – Well interference and multiple well point systems in coastal areas.

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B. TECH AGRICULTURAL ENGINEERING
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UNIT – IV

Surface and subsurface exploitation and estimation of ground water potential –Artificial ground water recharge – Ground water project formulation–Classification of indigenous pumps – Wind powered water lifts – Solar powered and bio gas operated water lifts Reciprocating pumps.

UNIT – V

Centrifugal pumps – Terminology on horse power – Selection of pump installation and troubleshooting of pumps – Performance characteristic curves – Effect of change of impeller dimensions on performance characteristics. Hydraulic ram– Propeller pumps - Mixedflowpumps-Airliftpumps–Priming–Verticalturbinepumps–Submersiblepumps. Cost economics.

TEXTBOOKS

1. Ground Water and Tube Wells-Garg SP1985. Oxford and IBH publish in company limited, New Delhi.
2. Water Well land Pump Engineering–Michael AM and Khepar ST1989 Tata McGraw-Hill Publishing company limited, New Delhi.

REFERENCES

1. Irrigation Theory and Practice–Michael AM2008 Vikas Publishing House Pvt.Ltd, New Delhi.

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B. TECH AGRICULTURAL ENGINEERING
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II Year - II Semester

SURVEYING AND LEVELING

COURSEOBJECTIVES:

L	T	P	C
3	0	0	3

Surveying and leveling curriculum which is re-oriented to the needs of non-circuital branches of graduate engineering courses offered by JNT University: Kakinada that serves as a transit to understand the branch specific advanced topics. The course is designed to:

UNIT–I

INTRODUCTION: Overview of plane surveying (chain, compass and plane table), Objectives, Principles and classifications. Distance measurement conventions and methods; use of chain and tape, Electronic distance measurements, Meridians, Azimuths and Bearings, declination, computation of angle.

UNIT–II

LEVELINGANDCONTOURING: Concept and Terminology, Temporary and permanent adjustments - method of leveling. Characteristics and Uses of contours- methods of conducting contour surveys and their plotting.

UNIT–III

COMPUTATION OF AREAS AND VOLUMES: Area from field notes, computation of areas along irregular boundaries and area consisting of regular boundaries. Embankments and cutting for a level section and two level sections with and without transverse slopes, determination of the capacity of reservoir, volume of barrow pits.

UNIT-IV

THEODOLITE: The odolite, description, uses and adjustments–temporary and permanent, measurement of horizontal and vertical angles. Principles of Electronic Theodolite.Trigonometrical leveling, Traversing.

UNIT–V

TACHEOMETRICSURVEYING:

Stadia and tangential methods of Tacheometry. Distance and Elevation formulae for Staff vertical position. Types of curves, design and setting out–simple and compound curves.

INDTRODUCTION TO ADVANCED SURVEYING: Introduction to geodetic surveying, Total Station and Global positioning system, Introduction to Geographic information system(GIS).

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TEXTBOOKS

1. Surveying (Vol – 1, 2 & 3), by B.C.Punmia, Ashok Kumar Jain and Arun Kumar Jain – Laxmi Publications (P)ltd., New Delhi
2. Duggal SK, Surveying (Vol–1&2),Tata Mc-GrawHill Publishing Co. Ltd.NewDelhi,2004.

REFERENCES

1. Text book of Surveying by C.Venkataramaiah, University Press.

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L	T	P	C
3	0	0	3

II Year - II Semester

HEAT AND MASS TRANSFER

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

OUTCOMES:

- Skill development on principles of heat and mass transfer, steady state heat transfer & its analysis, measurement of thermal conducting of pleasure & composite walls, tubes and spheres, multi layer tubes.
- Skill development on conduction principles of different materials in parallel, combined convection and conduction, concept of insulation.
- Skill development on conduction, convection and radiation analysis of heat and mass transfer, different Lawson radiation theory.
- Imparting skills on unsteady state analysis of heat transfer in fins, free & force convection, cooling theories and principles.
- Skill development on theory and principles of heat exchanges, their analysis, frick's law of mass transfer coefficients, Reynolds analogy.

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 - Onedimensionalsteadystateheatconductionequation.Thermalconductivityofdifferent 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 multi layer 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,

UNIT -III

Radiation heat transfer - Introduction, absorptivity, reflectivity and transmissivity. Blackbody and monochromatic radiation, Plank's law, Stefan-Boltzman law, Krichhoff'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.

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UNIT - IV

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, numerical, free and force &convection. Newton's law of cooling, heat transfer coefficient in convection. Dimensional analysis of free and forced convection. Useful non - dimensional numbers and empirical relationships for free and forced convection.

Unit- V

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

TEXTBOOKS

1. Transport processes and Unit Operations, Geankoplis C.J.1992. Allyn and Bacon Inc., Newton, Massachusetts.
2. Heat Transfer, Holman JP 1989.Mc Graw Hill Book Co., New Delhi.

REFERENCES

1. Fundamentals of Heat and Mass Transfer, Incropera FP and DeWitt DP1980John Wiley and Sons. New York.
2. Engineering Heat Transfer, Gupta CP and Prakash R 1994. Nem Chand and Bros., Roorkee.
3. Heat transfer, Rajput S. Chand & Co, New Delhi.

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II Year - II Semester

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L	T	P	C
0	0	2	1

GROUND WATER HYDROLOGY, WELL AND PUMPS LAB

1. Verification of Darcy's Law
2. Study of different drilling equipment
3. Sieve analysis for gravel and well screens design
4. Estimation of specific yield and specific retention
5. Testing of well screen
6. Estimation of aquifer parameters by Theis method, Coopers-Jacob method, Chow method; Theis Recovery method
7. Well design under confined and unconfined conditions
8. Well losses and well efficiency
9. Estimating ground water balance
10. Study of artificial ground water recharge structures
11. Study of radial flow and mixed flow centrifugal pumps, multistage centrifugal pumps, turbine, propeller and other pumps
12. Installation of centrifugal pump
13. Testing of centrifugal pump and study of cavitation
14. Study of hydraulic ram
15. Study and testing of submersible pump.
16. Estimation of different irrigation water quality parameter

TEXTBOOKS

1. Michael AM, Khepar SD. and SK Sondhi. 2008. Water Well and Pumps, 2nd Edition, Tata Mc-Graw Hill.
2. Todd David Keith and Larry W. Mays. 2004. Groundwater Hydrology, 3rd Edition, John Wiley & Sons, New York (International Book Distributing Company Lucknow).

REFERENCES

1. Michael AM. and Ojha TP. 2014. Principles of Agricultural Engineering Vol-II, 5th Edition. Jain Brothers Publication, New Delhi.

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L	T	P	C
0	0	3	1.5

SURVEYING AND LEVLEING LAB

(Any 10 of the following listed 15 experiments)

LISTOFEXPERIMENTS

1. Survey of an area by chain survey (closed traverse) & Plotting.
2. Determination of distance between two in accessible points with compass.
3. Surveying of a given area by prismatic compass (closed traverse) and plotting after adjustment.
4. Radiation method, intersection methods by plane Table survey.
5. Two point and three-point problems in planet able survey.
6. Fly levelling (differential leveling).
7. An exercise of L.S and C.S and plotting.
8. One exercise on contouring.
9. Study of the odolite in detail- practice for measurement of horizontal and vertical angles.
10. Measurement of horizontal angles by method of repetition and reiteration.
11. Trigonometric Leveling - Heights and distance problem (Two Exercises).
12. Heights and distance using Principles of tacheometric surveying(Two Exercises).
13. Area determination, traversing contouring using total station.
14. Determination of remote height and state out using total station.
15. Distance, gradient, Difference in height between two in accessible points using total station.

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II Year - II Semester

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L	T	P	C
0	0	3	1.5

II Year - II Semester

HEAT AND MAS STRANSFER LAB

1. COP of VCR System with Capillary and thermal expansion valve.
2. Determination of overall heat transfer co- efficient of a composites lab
3. Determination of heat transfer rate through a lagged pipe.
4. Determination of heat transfer rate through a concentric sphere
5. Determination of thermal conductivity of a metal rod.
6. Determination of efficiency of a pin-fin
7. Determination of heat transfer coefficient in natural and forced convection
8. Determination of effectiveness of parallel and counter flow heat exchangers.
9. Determination of emissivity of a given surface.
10. Determination of Stefan Boltzman constant.
11. Determination of heat transfer rate in drop and film wise condensation.
12. Determination of critical heat flux.
13. Determination of Thermal conductivity of liquids and gases.
14. Investigation of Lambert's cosine law.

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II Year - II Semester

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L	T	P	C
0	1	2	2

II Year - II Semester

ANALYSIS / SIMULATION USING MATLAB

1. Development of soil monitoring systems
2. Analysis of harvesting equipment design parameters and performance
3. Assessment of disease management
4. Development and optimisation of smarter irrigation system
5. Analysis of safety storage of harvested crops
6. Analysis of effective usage of water resources
7. Tractor position tracking using MATLAB
8. Air and water quality monitoring system for healthy crop environment.
9. Development of real–time monitoring system of agricultural fields
10. Using wireless sensor network in an agricultural field also to develop a smart farming environment.
11. Monitoring the critical factor as water quality to enhance the growth of crops is develop using sensors
12. Stock management system at agricultural storages.

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II Year - II Semester

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II Year - II Semester

L	T	P	C
1	0	2	2

DESIGN THINKING AND INNOVATION

Course Objectives: The objectives of the course are to

- Bring awareness on innovative design and new product development.
- Explain the basics of design thinking.
- Familiarize the role of reverse engineering in product development.
- Train how to identify the needs of society and convert into demand.
- Introduce product planning and product development process.

UNIT – I Introduction to Design Thinking

Introduction to elements and principles of Design, basics of design-dot, line, shape, form as fundamental design components. Principles of design. Introduction to design thinking, history of Design Thinking, New materials in Industry.

UNIT - II Design Thinking Process

Design thinking process (empathize, analyze, idea & prototype), implementing the process in driving inventions, design thinking in social innovations. Tools of design thinking - person, costumer, journey map, brainstorming, product development

Activity: Every student presents their idea in three minutes, Every student can present design process in the form of flow diagram or flow chart etc. Every student should explain about product development.

UNIT - III Innovation

Art of innovation, Difference between innovation and creativity, role of creativity and innovation in organizations. Creativity to Innovation. Teams for innovation, Measuring the impact and value of creativity.

Activity: Debate on innovation and creativity, Flow and planning from idea to innovation, Debate on value-based innovation.

UNIT - IV Product Design

Problem formation, introduction to product design, Product strategies, Product value, Product planning, product specifications. Innovation towards product design Case studies.

Activity: Importance of modeling, how to set specifications, Explaining their own product design.

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II Year - II Semester

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UNIT – V Design Thinking in Business Processes

Design Thinking applied in Business & Strategic Innovation, Design Thinking principles that redefine business – Business challenges: Growth, Predictability, Change, Maintaining Relevance, Extreme competition, Standardization. Design thinking to meet corporate needs. Design thinking for Startups. Defining and testing Business Models and Business Cases. Developing & testing prototypes.

Activity: How to market our own product, about maintenance, Reliability and plan for startup.

Textbooks:

1. Tim Brown, Change by design, 1/e, Harper Bollins, 2009.
2. Idris Mootee, Design Thinking for Strategic Innovation, 1/e, Adams Media, 2014.

Reference Books:

1. David Lee, Design Thinking in the Classroom, Ulysses press, 2018.
2. Shrrutin N Shetty, Design the Future, 1/e, Norton Press, 2018.
3. William lidwell, Kritinaholden, &Jill butter, Universal principles of design, 2/e, Rockport Publishers, 2010.
4. Chesbrough.H, The era of open innovation, 2003.

Online Learning Resources:

- https://nptel.ac.in/courses/110/106/110106124/
- https://nptel.ac.in/courses/109/104/109104109/
- https://swayam.gov.in/nd1_noc19_mg60/preview
- https://onlinecourses.nptel.ac.in/noc22_de16/preview

Course Outcomes:

COs	Statements	Blooms Level
CO1	Define the concepts related to design thinking.	L1
CO2	Explain the fundamentals of Design Thinking and innovation.	L2
CO3	Apply the design thinking techniques for solving problems in various sectors.	L3
CO4	Analyse to work in a multidisciplinary environment.	L4
CO5	Evaluate the value of creativity.	L5