



**INTERNATIONAL SCHOOL OF  
TECHNOLOGY AND SCIENCES FOR WOMEN**  
( An Autonomous Institution )

(Approved by AICTE New Delhi, Affiliated to JNTUK Kakinada, Accredited by NBA and NAAC with A+ Grade)

NH-16, East Gonagudem (V), Rajanagaram (M), Rajamahendravaram, East Godavari -533294  
Mobile : 9505506119 / 9505506101 | Email ID : [istswomens101@gmail.com](mailto:istswomens101@gmail.com) | website : [www.ists.ac.in](http://www.ists.ac.in)



**DEPARTMENT OF AGRICULTURAL ENGINEERING**

**B.Tech–II Year I Semester**

S.No.	Subject Code	Title	L	T	P	Credits
1	23BS2103H	StatisticalMethodsandNumerical Analysis	3	0	0	3
2	23BS2104H	Universalhumanvalues– understandingharmonyand Ethicalhumanconduct	2	1	0	3
3	23ES2101A	FluidMechanicsandOpenChannel Hydraulics	2	0	0	2
4	23PC2102A	FarmPowerandTractorSystems	3	0	0	3
5	23PC2101A	EngineeringMechanics	3	0	0	3
6	23ES2102A	FluidMechanicsandOpenChannel HydraulicsLab	0	0	2	1
7	23PC2104A	FieldOperationandMaintenanceof TractorsLab	0	0	3	1.5
8	23PC2103A	EngineeringMechanicsLab	0	0	3	1.5
9	23SE2101A	MachineandProductionDrawing	0	1	2	2
10	23AC2101B	EnvironmentalScience	2	0	0	-
<b>Total</b>			<b>15</b>	<b>2</b>	<b>10</b>	<b>20</b>



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**B.Tech–IIYearIISemester**

S.No.	Subject Code	Title	L	T	P	Credits
1	23MC2201M	ManagerialEconomicsand FinancialAnalysis	2	0	0	2
2	23ES2201A	PropertiesandStrengthof Materials	3	0	0	3
3	23PC2201A	GroundWaterHydrology,Wells andPumps	3	0	0	3
4	23PC2202A	SurveyingandLeveling	3	0	0	3
5	23PC2203A	HeatandMassTransfer	3	0	0	3
6	23PC2204A	GroundWaterHydrology,Wells andPumpsLab	0	0	2	1
7	23PC2205A	SurveyingandLevelingLab	0	0	3	1.5
8	23PC2206A	HeatandMassTransferLab	0	0	3	1.5
9	23SE2201A	Analysis/Simulationusing MATLAB	0	1	2	2
10	23HS2203H	DesignThinkingandInnovation	1	0	2	2
<b>Total</b>			<b>15</b>	<b>1</b>	<b>12</b>	<b>22</b>
<b>Honors(Pool-1)/MinorCourses</b>			<b>3</b>	<b>1</b>	<b>0</b>	<b>4</b>
MandatoryCommunityServiceProjectInternshipof8WeeksDurationDuringSummer Vacation...TobeevaluatedinIIYearI Semester						



**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 transform 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.



**II Year-I Semester**

<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
<b>2</b>	<b>1</b>	<b>0</b>	<b>3</b>

**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 (8Hrs)**

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 fulfill 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 an arbitrary choice based on liking-disliking.

**UNIT – II:**

**Understanding Harmony in the Human Being - Harmony in Myself!**

**(12Hrs)**

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  
 Program 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.



### **UNIT-III:**

**(8Hrs)**

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

**(10Hrs)**

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 session to discuss human being as a 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: socially and ecologically responsible engineers, technologists and managers
- b. At the level of society: a mutually enriching institutions and organizations Sumup.



Include practice Exercises and Case Studies will be taken up in Practice (tutorial) Session seg. 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: Ek Parichaya, A Nagaraj, Jeevan Vidya Prakashan, Amarkantak, 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 every day 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



<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
<b>2</b>	<b>0</b>	<b>0</b>	<b>2</b>

**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 devices, 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, piezometer tube manometry, types of manometers. Mechanical gauges-Bourdon's tube pressure gauge, diaphragm pressure gauge, deadweight 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.

**UNIT-II**

Boundary layer theory-Thickness of boundary layer, Thickness of boundary layer in laminar 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, venturimeter, orificemeter.

**UNIT-III**

Flow through orifices (measurement of discharge) – Types of orifices, jet of water, vena contracta, hydraulic coefficients, experimental method for hydraulic Coefficients, discharge through rectangular orifice.



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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, 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 branched pipes from one reservoir to another. Dimensional analysis and similitude –

Rayleigh's method and Buckingham's theorem. Types of similarities, dimensional analysis, dimensionless numbers, introduction to fluid machinery.

#### **UNIT-V**

Open channel hydraulics- classification of open channel and definitions. Chezy's formula for discharge through an open channel. Bazin's formula for discharge through an 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.

#### **TEXTBOOKS**

1. Hydraulics and Fluid Mechanics, Modi P M and Seth S. M. 1973. Standard Book House, Delhi.
2. Open Channel Hydraulics, Chow V T, 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.



**II Year-I Semester**

L	T	P	C
3	0	0	3

**FARMPowerANDTRACTORSYSTEMS**

**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 outlets 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 hydraulics system in factors.
- Skill development on tractor power 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 systems, cooling and lubricating systems, electrical and ignition systems, I.C engine fuels and their properties, detonation and knocking in IC Engines, Study of properties of coolants, anti-freeze and anti-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, cone clutch. Single plate clutch or single disc clutch – Constructional details and principle of working mechanism. Multiple plate clutch, splined sleeve clutch type – Constructional details and principle of working mechanism ratchet and pawl arrangement



mechanism–Constructionaldetailsandprincipleofworking mechanism. Gears–Necessity for providing gear box, Selective sliding type, constant mesh type, Mechanicaladvantage in gears, torque ratio in gears, working of gear box. Differential unit and finaldrive– Differential,functionsofcrownwheel,differentiallock,function,finaldrive– functionsoffinaldrive.

#### **UNIT-IV**

Fluid coupling and torque connector, brake mechanism, requirements of good brakingsystems,classificationofbrakes,Mechanicalbrakeandhydraulicbrake–

Workingmechanism.Steeringmechanism–

Qualitiesofsteeringmechanism,mainpartsofsteering mechanism types ofsteering boxes, working of hydraulicsteering.Hydrauliccontrol system – Working principals, basic components of hydraulic system – Types ofhydraulic system, position control, draft control, mixed control, precautions for hydraulicsystem.

#### **UNIT-V**

Tractor power outlets – P.T.O., construction details; Belt pulley constructional details,tractorpoweroutlet,drawbar,constructiondetails.Traction-

Tractionefficiency,methodfor 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 themainpowertakeoff,testatvaryingspeedsatfullload,testatvaryingload,beltorpulley shafttest, drawbar test, tractor engine performance. Determination of centre ofgravity,Suspensionmethod,balancingmethod,weighingmethod.Tractorchassis machines, functions ofchassisframe.Tractorchassis–Mechanics oftractorchassis.

#### **TEXTBOOKS**

1. FarmTractorMaintenanceandRepair.Jain.S.C.andRoyC.R.1984.TMHPublishingCo. Ltd.,NewDelhi.
2. Tractorsandtheirpowerunits.LijedhalJ.B.CarletonW.M.TurnquistP.K.andSmithD.W. 1984.AVIPublishingCo.Inc.,Westport,Connecticut.

#### **REFERENCES**

1. FarmGasEnginesandTractors.FredJ.R.1963.AlliedPublisherPvt.Ltd.,Bombay.
2. Farm Machines and their Equipment. Nakra C.P., 1986. DhanpetRaiandSons.1982NaiSarak,NewDelhi.



<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
<b>3</b>	<b>0</b>	<b>0</b>	<b>3</b>

## IIYear-ISemester

### **PRINCIPLES OF SOIL SCIENCE AND AGRONOMY**

**OBJECTIVE:** To enable the student to understand the farming principles to grow agricultural and orchard crops and farming practices for higher crop production. To impart knowledge on soil genesis, soil forming process, structure, soil organic matter, soil chemical properties, which give a comprehensive idea to students how to design farm implements in relation to soils and also how to treat the soil for soil health and structural improvement, soil conservation, irrigation and drainage applications.

**UNIT – I:** Nature and origin of soil - soil definition, branches of soil science - difference between surface soil and sub surface soil. Soil forming rocks - classification of rocks - Igneous, Sedimentary and metamorphic rocks. Minerals- definition -classification - Primary minerals – Secondary minerals; Silicate and non silicate minerals - Light and heavy minerals. Soil formation- soil forming factors Soil forming processes: Elluviation – Illuviation – Humification – Calcification-Laterization – Podzolization – Salinization – Alkalization and Gleization . Classification of soils – Soil taxonomy – Soil orders and their characteristics.

**UNIT- II:**Soil organic matter- its composition and decomposition its importance effect on soil fertility. Soil reaction, factors affecting pH of soil- influence of soil reaction on nutrient availability. Acid soils- Formation – characteristics & nutrient availability- reclamation-Lime requirement Saline soils – sodic/alkali soils – characteristics - formation and nutrient availability Reclamation- gypsum requirement for reclamation of sodic/alkali soils.

**UNIT-III:** Soil fertility and productivity – definition and concepts –factors influencing availability of nutrients – deficiency symptoms of nutrients. Inorganic chemical fertilizers-classification- and their reactions in soils. Liquid fertilizers- and their solubility and compatibility. Beneficial soil micro organisms – Bio fertilizers and their use.Meaning and scope of Agronomy-History of Agriculture development in Ancient IndiaAgriculture in civilization Era. National and International Agricultural Research Institutes in India. Classification of crops: Classification of field crops-according to origin, botanical, commercial, economical, seasonal, ontogeny, agronomic, leaf morphology and special purpose crops.

**UNIT-IV:**Essential resources for crop production-factors influencing plant growth-Biotic and Abiotic factors. Agro-climatic zones of Andhra Pradesh and India. Crop seasons – Kharif, Rabi and summer seasons in Andhra Pradesh. Tillage and Tilth. Sowing – methods, time and depth of sowing of major field crops. Methods and time of application of manures and fertilizers. Weeds – influence of weeds on crop production, principles and practices of weed management. Basics on soil plant-water relationship- Effective root zone depth, critical stages of irrigation, moisture extraction pattern. Crop coefficients, water requirement of crops and critical stages for irrigation. Crop rotation, cropping systems, Relay cropping and mixed cropping.



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**UNIT-V:** Dryland agriculture – problems of crop production in dry farming – agronomic measure in reducing evapo- transpiration losses. Crop Husbandry practices of Rice, Maize, cotton and Groundnut. Organic farming – definition – need – scope – principles – characteristics - relevance to modern agriculture. Sustainable Agriculture-Definition and concepts. Organic nutrient sources and its fortification – organic manures- methods of composting Green manures- bio fertilizers – Types, methods of application – Benefits and limitations. Nutrient management in organic farming. Inspection – certification - labelling and accreditation procedures for organic products.

**TEXT BOOKS:**

1. Principles of Agronomy, Yella Manda Reddy T & Shankar Reddy, Publications.
2. Nature and Properties of soils. Brady Nyle C and Ray R Well 2002. Pearson Education Inc., New Delhi.
3. Fundamental of Soil Science. Indian Society of Soil Science 1988. IARI, New Delhi.

**REFERENCES:**

1. Brady Nyle C. and Ray R. Well. 2002. Nature and properties of soil. Pearson Education Inc., New Delhi.
2. Indian Society of Soil Science. 1998. Fundamentals of Soil Science. IARI, New Delhi.
3. T. Yellamanda Reddy and G. H. Sankara Reddy. 2015. Principles of Agronomy, Kalyani Publishers, Ludhiana.
4. V. T. S. Mudaliar. 1956. Principles of Agronomy, The Bangalore printing.
5. K. Arun Sharma. 2002. A Hand book of organic farming, Agrobios, India.
6. S. P. Palaniappan, and K. Annadurai. 2010. Organic farming-Theory and Practice, Scientific publishers, Jodhpur, India.



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**KAKINADA–533003,AndhraPradesh,India**  
**AGRICULTURALENGINEERING(R23-II<sup>nd</sup>YEARCOURSESTRUCTURE&SYLLABUS)**

**IIYear-ISEmester**

<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
<b>0</b>	<b>0</b>	<b>2</b>	<b>1</b>

**FLUIDMECHANICSANDOPENCHANNELHYDRAULICSLAB**

**OUTCOMES**

1. ImpartingpracticalskillsondeterminationofmetacentricheightandBernoulli'stheorem.
2. Exposuretopracticalskillsonmeasurementofdischargewithventuremeterandpilottubes.
3. Acquiringpracticalskillsondeterminingdischargecoefficienttorectangular,triangulardantrapezoidalweirandorifices.
4. Imposingpracticalskillsonflowmeasurement.....Broadcrestedweirsandopenchannels.
5. Imposingpracticalskillsondeterminationofheadlossesinpipes,roughnesscoefficientofopenchannels.
6. Practicalexposesondeterminationofvelocityandpressureinopenchannels,constructionofflow-netproblemsonflow-nets.

**PRACTICAL**

1. Determinationofmetacentricheight
2. VerificationofBernoulli'stheorem
3. Measurementofdischargewithaventuremeter
4. Measurementofvelocitywithapilottube
5. Determinationofcoefficientofdischargeofrectangularweir
6. Determinationofcoefficientofdischargeoftriangularweir
7. Determinationofcoefficientofdischargeoftrapezoidalweir
8. Determinationofhydrauliccoefficientoforifices
9. Experimentonbroadcrestedweir
10. Determinationofheadlossesinpipes
11. Experimentsonopenchannels
12. Determinationofroughnesscoefficientsofopenchannels
13. Measurementofvelocityandpressureprofilesinopenchannels
14. Constructionofflownet
15. Problemsonconstructionofflownet



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**AGRICULTURALENGINEERING(R23-II<sup>nd</sup>YEARCOURSESTRUCTURE&SYLLABUS)**

**IIYear-ISEmester**

<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
<b>0</b>	<b>0</b>	<b>3</b>	<b>1.5</b>

**FIELDOPERATIONSANDMAINTENANCEOFTRACTORSLAB**

**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 radiator 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 diesel engine.
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 troubleshooting – 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. Maintenance of hydraulic system – working principle – basic components of hydraulic system – types of hydraulic system – frequent troubles and remedies – repairs and maintenance of hydraulic system – precautions of hydraulic system.



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- Periodicalmaintenanceoftractors–at8-10engineworkinghours–at50-60engineworkinghoursandat100-120engineworkinghoursPeriodicalmaintenanceoftractors–at200-250engineworkinghours,at480-500engineworkinghoursandat960-1000engineworkinghours.Emissionofsmoke–overheatingofengines-maintenanceofclutchbrakeshydraulicproblems.
7. Maintenanceofagriculturalmachinerybeforeandafteruselikeprimarytillageimplements,
  8. M.B.plough,discloughandsecondarytillageimplements-harrows,seeddrills,weeders,cultivators.
  9. Startingandstoppingpracticeofthetractorandfamiliarizationwithinstrumentationpanelandcontrols
  10. Drivinginforwardandreversegears,drivingsafetysalesandstudybeantrepanned.

**TEXTBOOKS**

1. FarmTractorMaintenanceandRepair.JainS.C.andRoyC.R.1984.TataMcGraw-HillPublishingCo.Ltd.,NewDelhi.
2. FarmMachinesandtheirEquipment.NakraC.P.1986DhanpetRaiandSons.NewDelhi.

**REFERENCES**

1. ElementsofAgriculturalEngineering.JagdishwaraSahay1992.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

**IIYear-ISemester**

**SOIL AGRONOMY LAB**

**Objectives:** To enable students to understand farming principles, to grow agricultural field and orchard crop and farming practices.

1. Visit to college farm Study of soil profile and collection of soil samples
2. Identification of crops and seeds
3. Identification of manures and fertilizers
4. Seed bed preparation for nursery
5. Practice of sowing
6. Practice of fertilizer application
7. Practice of inter cultivation
8. Practice of ploughing
9. Determination of bulk density and particle density of soils
10. Determination of infiltration rate of soil
11. Determination of organic carbon content in soils
12. Estimation of available P & K of soils
13. Study of soil profile and collection of soil samples
14. Study of meteorological instruments
15. Practice of weeding
16. Practice of harvesting

**REFERENCES:**

1. Brady Nyle C. and Ray R. Well. 2002. Nature and properties of soil. Pearson Education Inc., New Delhi.
2. Indian Society of Soil Science. 1998. Fundamentals of Soil Science. IARI, New Delhi.



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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 the very drawing proportions.

- a) Popular forms of Screw threads, bolts, nuts, stud bolts, tap bolts, setscrews.
- 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, Machines wive vice, Plummer block, Tail stock 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 treatment 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 3D modeling



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**TEXTBOOKS**

1. R.K.Dhawan.MachineDrawing.S.ChandPublications
2. K.L.Narayana,P.Kannaiah&K.VenkataReddy.AtextbookonProductionDrawing.PHIPublishers

**REFERENCES**

1. N.D.Bhatt,MachineDrawing,CharotarPublishingHousePvtLtd,2016.
2. N.Sidheswar,P.KanniahandV.V.S.Sastry,MachineDrawing,TataMcGrawHill,2001
3. SP46:1988EngineeringDrawingPracticeforSchool&Colleges.BureauofIndianStandards
4. K.R.Gopalakrishna,MachineDrawing,9thEd.,SubhasStores,Bangalore,2005.
5. K.L.Narayana,P.Kannaiah&K.VenkataReddy.MachineDrawing.NewAgePublishers
6. P.S.Gill“MachineDrawing”S.K.Kataria&Sons
7. K.VenkataReddy.ProductionDrawing.
8. N.Siddeswar.MachineDrawing.



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**II Year-I Semester**

L	T	P	C
2	0	0	0

**ENVIRONMENTAL SCIENCE**

**COURSE OBJECTIVES:**

**The objectives of the course are to impart:**

- Overall understanding of the natural resources.
- Basic understanding of the ecosystem 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 and 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, Grassland 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 overutilization of surface and groundwater – Floods, drought, conflict 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 lifestyles.

**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-spots of biodiversity - Threats to biodiversity: habitat loss, man-wildlife conflicts. - Endangered and endemic species of India – Conservation of biodiversity: conservation of biodiversity.



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#### **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 Cracker on Man and his wellbeing.

**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-Wildlife 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 students 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, VGSPublishers, Vijayawada
2. Environmental Studies, R. Rajagopalan, 2<sup>nd</sup> Edition, 2011, Oxford University Press.

#### **REFERENCES**

1. Environmental Studies, P. N. Palanisamy, P. Manikandan, A. Geetha, and K. Manjula Rani; Pearson Education, Chennai
2. Text Book of Environmental Studies, Deeshita Dave & P. Udaya Bhaskar, Cengage Learning.
3. A Textbook of Environmental Studies, Shaashi Chawla, TMH, New Delhi
4. Environmental Studies, Benny Joseph, Tata McGraw Hill Co, New Delhi
5. Perspectives in Environment Studies, Anubha Kaushik, CPKaushik, New Age International Publishers, 2014



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**IIYear-IISemester**

L	T	P	C
2	0	0	2

**MANAGERIALECONOMICSANDFINANCIALANALYSIS**

**CourseObjectives:**

- Toinculcatethebasicknowledgeofmicroeconomicsandfinancialaccounting
- Tomakethestudentslearnhowdemandisestimatedfordifferentproducts,input-outputrelationshipforoptimizingproductionandcost
- ToKnowtheVarioustypesofmarketstructureandpricingmethodsandstrategy
- Togiveanoverviewoninvestmentappraisalmethodstopromotethestudentstolearnhowtoplan long-terminvestmentdecisions.
- Toprovidefundamentalskillsonaccountingandtoexplaintheprocessofpreparingfinancialstatements.

**CourseOutcomes:**

- DefinetheconceptsrelatedtoManagerialEconomics,financialaccountingandmanagement(L2)
- UnderstandthefundamentalsofEconomicsviz.,Demand,Production,cost,revenueandmarkets(L2)
- ApplytheConceptofProductioncostandrevenuesforeffectiveBusinessdecision(L3)
- Analyzehowtoinvesttheircapitalandmaximizereturns(L4)
- Evaluatethecapitalbudgetingtechniques.(L5)
- Developtheaccountingstatementsandevaluatethefinancialperformanceofbusinessentity(L5)

**UNIT-I ManagerialEconomics**

Introduction –Nature, meaning,significance,functions, and advantages.Demand-Concept,Function, Law of Demand - Demand Elasticity- Types – Measurement. Demand Forecasting-Factors governing Forecasting,Methods.ManagerialEconomics andFinancialAccountingandManagement.

**UNIT-II ProductionandCostAnalysis**

Introduction–Nature,meaning,significance,functionsandadvantages.ProductionFunction–Least-cost combination– Shortrun andlong runProductionFunction- Isoquantsand Is costs, Cost & Break-Even Analysis - Cost concepts and Cost behaviour- Break-EvenAnalysis(BEA)- DeterminationofBreak-EvenPoint(SimpleProblems).

**UNIT-III BusinessOrganizationsandMarkets**

Introduction – Forms of Business Organizations- Sole Proprietary - Partnership - Joint StockCompanies-PublicSectorEnterprises.TypesofMarkets-PerfectandImperfect



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Competition-FeaturesofPerfectCompetitionMonopoly-MonopolisticCompetition–Oligopoly-  
Price-OutputDetermination-PricingMethodsandStrategies

#### **UNIT-IV CapitalBudgeting**

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 FinancialAccountingandAnalysis**

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.

#### **ReferenceBooks:**

1. Ahuja H I 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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**IIYear-IISemester**

L	T	P	C
3	0	0	3

**PROPERTIESANDSTRENGTHOFMATERIALS**

**OBJECTIVE:**Toenablethestudentstoknowaboutdifferentmaterialsusedforengineeringconstructionslikebuildings,roads,farmstructuresandmetalsandothermaterialsformanufacturingfarm equipment,implements,dairyandfoodprocessingequipment.

**OUTCOMES:**

- Skilldevelopmentonbasicpropertiesofengineeringmaterialsandtheiruses,testingofmaterials.
- Knowledgedevelopmentonpropertiesandapplicationofdifferenceofconcrete,varieties, distempers,glass,rubberandplywood,plastics,iron-basedmaterials,alloysetc.,Developmentofskillonstress– strainanalysisofbeamsunderdifferenttypesofloadingpatterns.
- Acquaintanceofskill on Euler’s theory and buckling load,analysis oncolumns &differenttypesofcolumns.
- Skilldevelopmentondifferenttypesofjoints(Riveting),weldinganalysiscantilever,fixed ,continuousbeams,theoryofmomentsandtheiranalysis.

**UNIT-I**

Properties of engineering materials, classifications of rocks, sources of stones and naturalbedofstones,properties,varietiesandusesofstones,properties,compositionandusesofbricks,classificationandtestsofbricks,properties,varietiesanduses of tiles,properties,varietiesandusesofLime,Properties,varietiesand uses of Cement,Properties,varieties andusesofcementmortar,properties.

**UNIT-II**

Varieties and uses of concrete, properties, varieties and uses of sand, properties, varietiesanduses ofpaints,properties,varieties and uses of varnishes, properties, varieties andusesofdistempers.Characteristicsandusesofglass,rubber,plywood,plastics.Characteristics andusesofwroughtiron,castiron,steel,aluminium, copper, nickel;Alloys of Aluminium and its properties, Alloys of Copper and its properties, Alloys ofNickel and its properties; Definition and types of timber, seasoning of timber, industrialtimberandusesoftimber, Methodsofheattreatmentofsteel.

**UNIT-III**

Introduction–Stresses,tensile,compressiveandhear-strains,units-elasticcurve-ElasticlimitPoisonsratio,stressesinuniformitytaperedcircularsections,stressesinbarsof composite,sections,thermalstressesandstrainsinsimplebarsandcompositebars;Elasticconstants- Young’smodulus,bulkmodulusandshear modulus-relationbetweenthem;



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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.

**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 ends hinged, with both ends fixed. Types of end conditions of columns, both ends hinged, both ends fixed, one end fixed and other 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 hinged 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 joint, 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.

**TEXTBOOKS**

1. Engineering Materials, Rangwala, S.C. 1994. Charotar Publishing House, Anand.
2. Strength of Materials by Ramamrutham S. 2003. Dhanapathrai & Sons, Nai Sarak, New Delhi.

**REFERENCES**

1. Materials of constructions Deshpande R.S. 1977. 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

**GROUNDWATER 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 borewell. 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 aquifer characteristics under steady and unsteady state conditions, multiple wells systems for coastal areas.
- Knowledge development to students on artificial ground water recharge classification of indigenous pumps, solar pumps, windmill pump sets.,
- 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 - Diagrammatic representation.

**UNIT-II**

Classification of wells - Design of open wells - Ground water replenishment - Groundwater 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 - Well interference and multiple well points systems in coastal areas.



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**UNIT–IV**

Artificial ground water recharge–Ground water project formulation–Classification of indigenous pumps–Wind powered water lifts–Solar powered and biogas 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 –Mixed flow pumps–Air lift pumps–Priming–Vertical turbine pumps–Submersible pumps.

**TEXTBOOKS**

1. Ground Water and Tube Wells-Garg SP 1985. Oxford and IBH publish in company limited, New Delhi.
2. Water Well and Pump Engineering–Michael A M and Khepar ST 1989 Tata McGraw-Hill Publishing company limited, New Delhi.

**REFERENCES**

1. Irrigation Theory and Practice–Michael A M 2008 Vikas Publishing House Pvt. Ltd, New Delhi.



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**IIYear-IISemester**

<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
<b>3</b>	<b>0</b>	<b>0</b>	<b>3</b>

**SURVEYINGANDLEVELING**

**COURSEOBJECTIVES:**

Surveyingandlevelingcurriculumwhichisre-orientedtotheneedsnon-circuitbranchesofgraduateengineeringcoursesofferedbyJNTUniversity:Kakinadathatservesasatransittounderstandthebranchspecificadvancedtopics.Thecourseisdesignedto:

**UNIT–I**

**INTRODUCTION:**Overviewofplanesurveying(chain,compassandplanetable),Objectives,Principlesandclassifications.Distancemeasurementconventionsandmethods; use of chain and tape, Meridians, Bearings, declination, computation of angle.

**UNIT–II**

**LEVELINGANDCONTOURING:**ConceptandTerminology, Temporaryandpermanentadjustments-methodofleveling.CharacteristicsandUses of contours-methodsofconductingcontoursurveysandtheirplotting.

**UNIT–III**

**COMPUTATIONOFFAREASANDVOLUMES:**Areafromfieldnotes,computationofarealongirregularboundariesandareaconsistingofregularboundaries.Embankments and cutting for a level section and two level sections with and withouttransverseslopes,determinationofthecapacityofreservoir,volumeofbarrowpits.

**UNIT-IV**

**THEODOLITE:**Theodolite,description,usesandadjustments–temporary andpermanent,measurementofhorizontalandverticalangles.Trigonometricalleveling,Traversing.

**UNIT–**

**VTACHEOMETRICSURVEYING:**

StadiaandtangentialmethodsofTacheometry. Distance and Elevation formulae forStaff vertical position. Types ofcurves,design and setting out–simpleand compoundcurves.

**INTRODUCTIONTOADVANCEDSURVEYING:**Introductiontogeodeticsurveying, Total Station and Global positioning system, Introduction to Geographicinformationsystem(GIS).



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**AGRICULTURALENGINEERING(R23-II<sup>nd</sup>YEARCOURSESTRUCTURE&SYLLABUS)**

**TEXTBOOKS**

1. Surveying(Vol–1,2&3),byB.C.Punmia,AshokKumarJainandArunKumarJain  
–LaxmiPublications(P)ltd.,NewDelhi
2. Duggal SK, Surveying (Vol–1&2),Tata Mc-GrawHill Publishing  
Co.Ltd.NewDelhi,2004.

**REFERENCES**

- 1.TextbookofSurveyingbyC.Venkataramaiah,UniversityPress.



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L	T	P	C
3	0	0	3

**IIYear-IISemester**

**FUNDAMENTALS OF HORTICULTURE**

**Course outcomes:**

Horticulture-Its definition and branches, Importance and scope of horticulture, Horticultural and botanical classification, Climate and soil for horticultural crops, Plant propagation-methods (sexual & asexual), propagating structures; separation, division, grafting, budding, layering), High density planting; Use of rootstocks; Orchard establishment; (Principles & Layout) Principles and methods of training and pruning, Juvenility and flower bud differentiation; Unfruitfulness; pollination, pollinizers and pollinators; fertilization and parthenocarpy; Vegetable gardens & ornamental garden types and parts; Lawn making, Use of plant bio-regulators in horticulture, Irrigation methods in horticulture crops, Fertilizers application-methods.

**UNIT-I**

Horticulture – Definition - Divisions of horticulture with suitable examples. Scope and importance of horticulture - Importance of horticulture in terms of income, employment generation, industry, religious, aesthetic, food & nutritive value and export. Horticultural classification based on soil, climate and botanical classification. Climate and soil for horticultural crops - Influence of environmental factors on horticultural crop production – Temperature, humidity, wind, rainfall and solar radiation – Influence of soil factors – Soil type, pH, EC.

**UNIT-II**

Propagating structures- Plant propagation- Methods - Sexual and asexual – Propagation by cuttings – Definition of cutting – Stem cuttings – Leaf cuttings – Root cuttings. Propagation by Layering - Types of layering (tip, simple, compound, mound, trench, air layering) - Natural modifications of layering (runners, suckers, stolon, offset)- Propagation by separation - Bulbs, corms; division (rhizome, stem tuber, tuberous roots). Grafting, budding -Rootstock and scion selection – Grafting methods – Attached scion methods of grafting, simple or approach grafting, detached scion methods 140 of grafting (side grafting - Veneer grafting, apical grafting- epicotyl grafting, double, soft wood grafting, cleft grafting, tongue grafting, whip grafting) - Graft incompatibility – Types – Translocated and localized incompatibility; Budding – Methods of budding – T-budding, inverted T-budding, patch budding and ring budding - Top working.

**UNIT-III**

Principles of orchard establishment – Points to be kept in mind while selecting site for the establishment of orchards - Principles and steps in orchard establishment - Layout of orchards – Systems of planting - Square, rectangle, quincunx, hexagonal and contour systems of planting-their merits and demerits. Principles and methods of training and pruning - Definition of training, objectives and training, principles and methods of training of fruit crops - Open centre, closed centre and modified leader systems their merits and demerits - Definition of pruning, objectives of pruning, principles and methods of pruning of fruit crops.



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**UNIT-IV**

Unfruitfulness, factors (physiological, phylogenical, management, parasitical, climatological) pollination - Self and Cross pollination, pollinizers and pollinators - Fertilization and parthenocarpy – Types. Types of vegetables Gardens – Kitchen Garden, market garden, truck garden, vegetable forcing, garden for processing, seed production garden and floating garden. Ornamental garden types – Formal – Informal – Wild Garden – Parts/features of an ornamental garden.

**UNIT-V**

Use of plant bio-regulators (PBR) in horticulture – Introduction – Applications of PBR in fruit crops. Irrigation methods in horticulture crops - Different methods followed in horticultural crops (check basin, furrow, ring basin, basin, flood, pitcher, funnel, drip and sprinkler). Fertilizer application- Different methods of application to horticultural crops Broad casting, top dressing, localized placement, contact placement Band placement, row placement, pellet, foliar application, starter solution, fertigation.

**References**

1. Chadha, K.L. 2001. Handbook of Horticulture. ICAR, New Delhi.
2. Jitendra Singh, 2012. Basic Horticulture. Kalyani Publishers. New Delhi.
3. Randhawa, G.S. and Mukhopadhyaya, A. 1994. Floriculture in India. Allied Publishers Pvt. Ltd., New Delhi
4. Kumar, N. 1997. Introduction to Horticulture. Rajyalakshmi Publications, Nagorcoil, Tamilnadu.



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**IIYear-IISemester**

<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
<b>0</b>	<b>0</b>	<b>2</b>	<b>1</b>

**GROUNDWATERHYDROLOGY,WELLANDPUMPSLAB**

1. VerificationofDarcy'sLaw
2. Studyofdifferentdrillingequipment
3. Sieveanalysisforgravelandwellscreensdesign
4. Estimationofspecificyieldandspecificretention
5. Testingofwellscreen
6. EstimationofaquiferparametersbyTheismethod,Coopers-Jacobmethod,Chowmethod;TheisRecoverymethod
7. Welldesignunderconfinedandunconfinedconditions
8. Welllossesandwellefficiency
9. Estimatinggroundwaterbalance
10. Studyofartificialgroundwaterrechargestructures
11. Studyofradialflowandmixedflowcentrifugalpumps,multistagecentrifugalpumps,turbine,propellerandotherpumps
12. Installationofcentrifugalpump
13. Testingofcentrifugalpumpandstudyofcavitation
14. Studyofhydraulicram
15. Studyandtestingofsubmersiblepump.
16. Estimationofdifferentirrigationwaterqualityparameter

**TEXTBOOKS**

1. Michael AM,Khepar SD. andSK Sondhi.2008. Water Well and Pumps,2nd Edition,TataMc-Graw Hill.
2. ToddDavidKeithandLarryW.Mays.2004.GroundwaterHydrology,3rdEdition,JohnWiley &Sons,NewYork(InternationalBookDistributingCompanyLucknow).

**REFERENCES**

- 1.MichaelAM.andOjhaTP.2014.PrinciplesofAgriculturalEngineeringVol-II,5thEdition.Jain Brothers Publication,NewDelhi.



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**IIYear-IISemester**

<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
<b>0</b>	<b>0</b>	<b>3</b>	<b>1.5</b>

**SURVEYINGANDLEVLEINGLAB**

**(Any10ofthefollowinglisted15experiments)LIS**

**TOFEXPERIMENTS**

1. Surveyofanareabychainsurvey(closedtraverse)&Plotting.
2. Determinationofdistancebetweentwoinaccessiblepointswithcompass.
3. Surveyingofagivenareabyprismaticcompass(closedtraverse)andplottingafter adjustment.
4. Radiationmethod,intersectionmethodsbyplaneTablesurvey.
5. Twopointandthree-pointproblemsinplanetablesurvey.
6. Flylevelling(differentialleveling).
7. AnexerciseofL.SandC.Sandplotting.
8. Oneexerciseoncontouring.
9. Studyoftheodoliteindetail-practiceformeasurementofhorizontalandverticalangles.
10. Measurementofhorizontalanglesbymethodofrepetitionandreiteration.
11. TrigonometricLeveling-Heightsanddistanceproblem(TwoExercises).
12. HeightsanddistanceusingPrinciplesoftacheometricsurveying(TwoExercises).
13. Areadetermination,traversingcontouringusingsotalstation.
14. Determinationofremoteheightandstateoutusingsotalstation.
15. Distance,gradient,Differenceinheightbetweentwoinaccessiblepointsusingsotalstation.



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<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
<b>0</b>	<b>0</b>	<b>3</b>	<b>1.5</b>

**IIYear-IISemester**

**HORTICULTURELAB**

1. Identification of garden tools.
2. Layout of kitchen garden.
3. Identification of horticultural crops.
4. Layout of different planting systems.
5. Preparation of nursery bed (raised and flat beds) and sowing of seeds.
6. Practice of different asexual methods by divisions.
7. Practice of different asexual methods by layering.
8. Practice of different asexual methods by cuttings.
9. Practice of different asexual methods by grafting.
10. Practice of different asexual methods by budding.



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<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
<b>0</b>	<b>1</b>	<b>2</b>	<b>2</b>

**IYear-IISemester**

**ANALYSIS/SIMULATIONUSINGMATLAB**

1. Developmentofsoilmonitoringsystems
2. Analysisofharvestingequipmentdesignparametersandperformance
3. Assessmentofdiseasemanagement
4. Developmentandoptimisationofsmarterirrigationsystem
5. Analysisofsafetystorageofharvestedcrops
6. Analysisofeffectiveusageofwaterresources
7. TractorpositiontrackingusingMATLAB
8. Airandwaterqualitymonitoringsystemforhealthycropenvironment.
9. Developmentofreal–timemonitoringsystemofagriculturalfields
10. Usingwirelessornetworkinagriculturalfieldalsotodevelopasmartfarmingenvironment.
11. Monitoringthecriticalfactoraswaterqualitytoenhancethegrowthofcropsisdevelopingsensors
12. Stockmanagementsystematagriculturalstorages.



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**IIYear-IISemester**

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, customer, 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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**UNIT–V      DesignThinkinginBusinessProcesses**

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, HarperCollins, 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. Shrutin N Shetty, Design the Future, 1/e, Norton Press, 2018.
3. William Lidwell, Kritina Holden, & Jill Butcher, 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://swayam.gov.in/nd1_noc19_mg60/preview)
- [https://onlinecourses.nptel.ac.in/noc22\\_de16/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	Analyze to work in a multidisciplinary environment.	L4
CO5	Evaluate the value of creativity.	L5