

DETAILED LECTURE OUTLINES

DIPLOMA IN AGRICULTURAL ENGINEERING

Polytechnic of Agricultural Engineering
Diploma in Agricultural Engineering – Course Curriculum

S.No	Course No.	Title of the course	Credits	Department
I Year Semester - I				
1.	DE-161	Workshop Technology – I	3 (1+2)	Agril. Engg.
2.	DE-162	Engineering Drawing	2(0+2)	Agril. Engg.
3.	DE-171	Engineering Mathematics – I	2 (2+0)	Statistics & Mathematics
4.	DE-172	Engineering Physics	2 (1+1)	Soil Science & Agricultural Chemistry
5.	DE-173	Engineering Chemistry	2 (1+1)	
6.	DE-174	Communication Skills (English)	1(0+1)	English
7.	DE-175	Principles and Practices of Crop Production (Agronomy)	3(1+2)	Agronomy
	COCA-100	NCC	1(0+1)NC	NCC Officer
		Total	15 (6+9)	
I Year Semester - II				
1.	DE-163	Computer Applications	2 (1+1)	Statistics & Mathematics
2.	DE-164	Principles of fluid mechanics	2 (1+1)	Agril. Engg.
3.	DE-165	Workshop Technology – II	3(1+2)	Agril. Engg.
4.	DE-166	Principles of thermodynamics and Heat Engines	2 (1+1)	Agril. Engg.
5.	DE-167	Surveying and leveling – I	3(1+2)	Agril. Engg.
6.	DE-168	Engineering Mechanics & Material Testing	2 (1+1)	Agril. Engg.
7.	DE-176	Principles and Practices of Soil Science and Management (Soil Science).	3(2+1)	Soil Science & Agricultural Chemistry
8.	DE-177	Engineering Mathematics -II	2(2+0)	Statistics & Mathematics
	COCA-200	Physical Education	1(0+1)NC	NSS Physical Education
		Total	19 (10+9)	
II Year Semester - I				
1.	DE-211	Engineering Properties and Processing of Seeds	3 (1+2)	Agril. Engg.
2.	DE-212	Agricultural Process Engineering-I	3 (1+2)	Agril. Engg.
3.	DE-241	Agricultural Implements	3 (2+1)	Agril. Engg.
4.	DE-251	Soil and Water Conservation Engineering & Practices	2 (1+1)	Agril. Engg.
5.	DE-261	Workshop Technology-III	3 (1+2)	Agril. Engg.
6.	DE-262	Green house Technology	2 (1+1)	Agril. Engg.
7.	DE-263	Surveying and Leveling-II	3 (1+2)	Agril. Engg.
	COCA-300	NSS	1(0+1)NC	NSS Programme Officer
		Total	19 (8+11)	

II Year Semester - II				
1.	DE-213	Agricultural Process Engineering - II	2 (1+1)	Agril. Engg.
2.	DE-221	Estimating and Costing of Farm Buildings and Structures	2 (1+1)	Agril. Engg.
3.	DE-222	Principles of Electrical Engineering & Farm Electricity	2 (1+1)	Agril. Engg.
4.	DE-231	Farm Power, Solar and Wind Energy	2 (1+1)	Agril. Engg.
5.	DE-242	Agricultural Machinery	3 (2+1)	Agril. Engg.
6.	DE-253	On-Farm Irrigation and Drainage Practices	3 (1+2)	Agril. Engg.
7.	DE-254	Hydrology and Management of Watersheds	2 (1+1)	Agril. Engg.
		Total	16 (8+8)	
III Year Semester - I				
1.	DE-331	Solid Waste Utilization and Bio-Energy	2 (1+1)	Agril. Engg.
2.	DE-341	Tractor systems, Operation and Maintenance	3 (2+1)	Agril. Engg.
3.	DE-342	Operation and Maintenance of Farm Machinery	2 (0+2)	Agril. Engg.
4.	DE-351	Micro Irrigation Principles and Practices	3 (1+2)	Agril. Engg.
5.	DE-352	Wells and Pumps Operation and Maintenance	1 (0+1)	Agril. Engg.
6.	DE-371	Principles of Agricultural Economics and Business Management (Agril Economics)	2 (1+1)	Agril. Economics
7.	DE-372	Agricultural Engineering Extension Methods (Agricultural Extension)	1 (0+1)	Agril. Extension Education
		Total	14 (5+9)	
III Year Semester - II				
1.	DE-301	Participatory Technology Training Program (2months)	12 (0+12)	Agril. Engg.
2.	DE-302	Project Work (2 months)	5 (0+5)	Agril. Engg.
		Total	17 (0+17)	
		Grand Total	100 (37+63)	

Department wise distribution of courses

Department of Basic Sciences

S.No	Course No.	Title of the course	Credits
1.	DE-171	Engineering Mathematics	2 (2+0)
2.	DE-163	Computer Applications	2 (1+1)
3.	DE-172	Engineering Physics	2 (1+1)
4.	DE-173	Engineering Chemistry	2 (1+1)
5.	DE-174	Communication Skills (English)	1(0+1)
6.	DE-177	Engineering Mathematics -II	2(2+0)
		Total	11 (7+4)

Department of Agricultural Sciences

S.No	Course No.	Title of the course	Credits
1	DE-175	Principles and Practices of Crop Production (Agronomy)	3(1+2)
2.	DE-176	Principles and Practices of Soil Science and Management (Soil Science).	3(2+1)
3.	DE-371	Principles of Agricultural Economics and Business Management (Agril Economics)	2 (1+1)
4.	DE-372	Agricultural Engineering Extension Methods (Agricultural Extension)	1 (0+1)
		Total	9 (4+5)

Department of Farm Machinery and Power

S.No	Course No.	Title of the course	Credits
1	DE-161	Workshop Technology – I	3 (1+2)
2	DE-162	Engineering Drawing	2(0+2)
3	DE-165	Workshop Technology – II	3(1+2)
4	DE-166	Principles of thermodynamics and Heat Engines	2 (1+1)
5	DE-222	Principles of Electrical Engineering & Farm Electricity	2 (1+1)
6	DE-241	Agricultural Implements	3 (2+1)
7	DE-242	Agricultural Machinery	3 (2+1)
8	DE-261	Workshop Technology-III	3 (1+2)
9	DE-341	Tractor systems, Operation and Maintenance	3 (2+1)
10	DE-342	Operation and Maintenance of Farm Machinery	2 (0+2)
		Total	26 (11+15)

Department of Soil and water Engineering

S.No	Course No.	Title of the course	Credits
1	DE-164	Principles of Fluid Mechanics	2(1+1)
2	DE-167	Surveying and leveling – I	3(1+2)
3	DE-168	Engineering Mechanics & Material Testing	2 (1+1)
4	DE-221	Estimating and Costing of Farm Buildings and Structures	2 (1+1)
5	DE-251	Soil and Water Conservation Engineering & Practices	2 (1+1)
6	DE-253	On-Farm Irrigation and Drainage Practices	3 (1+2)
7	DE-254	Hydrology and Management of Watersheds	2 (1+1)
8	DE-263	Surveying and Leveling-II	3 (1+2)
9	DE-351	Micro Irrigation Principles and Practices	3 (1+2)
10	DE-352	Wells and Pumps Operation and Maintenance	1 (0+1)
		Total	23 (9+14)

Department of Agricultural Process Engineering

S.No	Course No.	Title of the course	Credits
1.	DE-211	Engineering Properties and Processing of Seeds	3 (1+2)
2.	DE-212	Agricultural Process Engineering-I	3 (1+2)
3.	DE-213	Agricultural Process Engineering - II	2 (1+1)
4.	DE-262	Green house Technology	2 (1+1)
		Total	10 (4+6)

Department of Renewable Energy Sources

S.No	Course No.	Title of the course	Credits
1.	DE-231	Farm Power, Solar and Wind Energy	2 (1+1)
2.	DE-331	Solid Waste Utilization and Bio-Energy	2 (1+1)
		Total	4 (2+2)

Internship and Project Work

1.	DE-301	Participatory Technology Training Program (2months)	12 (0+12)
2.	DE-302	Project Work (2 months)	5 (0+5)
		Total	17 (0+17)

Department of Physical Education

S.No	Course No.	Title of the course	Credits
1	COCA-100	NCC	1(0+1)NC
2	COCA-200	Physical Education	1(0+1)NC
3	COCA-300	NSS	1(0+1)NC
		Total	3 (0+3)

I Year I Semester

WORKSHOP TECHNOLOGY – I

DE – 161

3(1+2)

Objective: To impart knowledge and skills to students in manufacturing processes of machines, tools and equipment and hands-on training on various aspects of machine shop for encouraging entrepreneur development for engineering enterprises in general and farm mechanization in particular

THEORY

1. Introduction to workshop technology - Manufacturing process – Classification of Manufacturing process –Basic workshop process – Carpentry, Bench work and fitting – Smithy and forging – sheet metal – mechanical working of metals.
2. Carpentry – tools, marking and measuring tools - cutting tools.
3. Planning tools – Jack plain- types, Boring tools- types-striking tools, holding tool.
4. Carpentry process- Marking – sawing -planning-chiseling- Boring –Grooving – Rebating – Moulding carpentry joints
5. Wood working machines – types- components of different machines – and working principle -sanding machine, Carpentry and pattern layout - safety precautions
6. Fitting – Introduction- tools-holding tools-striking tools.
7. Cutting tools-chisel-parts-files-parts-classification, scrapers – types, Hacksaw- parts-power hacksaw.
- 8&9 Drill bits – types of drills; Reamer –application – types; Taps – types – application, Dies and die stocks – types – marking tools commonly used in fitting shop.
10. Gauges – types – caliper – types – micrometer types – application – miscellaneous tools - safety precautions
11. Fitting operations
12. Sheet metal work – introduction – metals used – Measuring tools – dividers- punches – chisels – hammers – snips or shears - types
13. Stakes – types – pliers – groovers- Rivet set – soldering iron
- 14&15. Sheet metal operations – shearing – Bending , Drawing-Squeezing –Sheet metal joints – types- seam joints
16. Fastening Methods –Laying out a pattern, safety precautions in sheet metal work.

PRACTICALS

1. Practice on planning, sawing and chiseling
2. Prepare a Half Lap joint
3. Prepare a Dovetail joint
4. Prepare a Mortise joint
5. Prepare a drill joint

- 6&7. Prepare a 20cm x 15cm Teakwood Switch board with hinges and bottom hook
 8. Fix the laminate sheet to the above box and cut suitable holes to mount one flush type switch, socket.
- 9&10. Jobs on sawing, filing and right angle fitting of MS Flat
 11&12. Jobs on sawing, filing and right angle fitting of MS Flat
 13&14. Practical in more complex fitting job
- 15&16. Jobs on Drawing, Punching, Bending, Shaping etc.
17. Cut a metal conduit, G.I. pipe and solid using hack saw
 18. Thread cutting G.I. pipe, metal conduit and solid rod using Die set
 19. Internal thread cutting using Tap set reamers
 20. Thread Cleaning
- 21&22. Make a hexagonal nut from a round rod
- 23&24. Prepare a job and make a spot weld
25. Prepare a job and make a seam weld
 26&27. Prepare a job and make a butt weld
28. Prepare a job and make a lap joint and finish it using grinder
 29. Prepare the job and make T joint
- 30&31. Jobs on ARC welding Oxyacetylene gas welding
32. Practical exam

REFERENCE

- | | |
|---|---|
| 1. Elements of workshop technology, (Volume I & II) | HajraChoudhury,S.K.,HajraChoudhury, A.K. and Nirjhar Roy, 2010. MediaPromoters and Publishers Pvt. Ltd. Mumbai |
| 2. Workshop technology (Part I & II) | Chapman, W.A.J. 1989. Arnold Publishers (India) Pvt. Ltd. AB/Safdarjung Enclave, New Delhi. |
| 3. A course in workshop technology (Volume I & II) | Raghuwansi, B.S. 2003. DhanpatRai and Co. (P) Ltd. Educational and technical publishers. 1710, NaiSarak, New Delhi – 110006 |
| 4. Manufacturing technology- I | Pakirappa and Kumar V.N. 2010. Radiant Publishing House, Hyderabad. |
| 5. Workshop technology | M. Anitha. Falcon Publishers, Hyderabad |

Objective: To impart the knowledge and skills on visualization of objects, equipments, machines through drawings, plans, sectional and isometric views and orthographic projections.

PRACTICALS

1. Understanding the importance of Engineering Drawing in Diploma course
2. Use of Engineering Drawing Instruments
3. Write Free Hand Lettering and Numbers as per B.S.I
4. Understand Dimensioning– Practice
5. Dimension a given drawing using standard notations and desired system of dimensioning.
6. Dimension standard features and applying necessary rules.
7. Identify the departures if any made in the given dimensioned drawing with reference to SP-46-1988.
8. Divide a given line into desired number of equal parts internally.
9. Draw tangent lines and arcs
10. Construct a Hexagon from the given data.
11. Construct ellipse by concentric circles method and using a paper trammel.
12. Construct parabola, rectangular hyperbola involute, cycloid and helix from the given data.
13. Projection of a point with respect to reference planes (HP & VP)
14. Projections of straight lines with respect to two reference planes.
15. Projections of perpendicular planes.
16. Principles of Orthographic projection with simple sketches
17. Orthographic view of an object, given its pictorial drawing
18. Minimum number of views needed to represent a given object fully.
19. The section plane for a given component to reveal maximum information and sectional view.
20. Applying conventional practices and identify the parts, which should not be shown in section while drawing sectional views.
21. Applying principles of hatching.
22. Drawing simple sections (full, half, revolved and removed part) for a range of simple Engineering objects.
23. The auxiliary views of a given Engineering component to indicate the true shape and size of component
24. Drawing the auxiliary views of a given engineering drawing
25. Objects, draw their orthographic views
26. Isometric projections for the given orthographic drawings.
27. Oblique drawing cavalier, cabinet of simple Engineering objects from the given data.
28. The correct pictorial views from a set of Orthographic drawings.
29. The need for preparing developing drawing
30. Development of simple Engineering objects using parallel line and radial line method.
31. Development of Surface of Engineering components like trays, funnel, 90° elbow &

rectangular duct.
32 Practical examination

REFERENCES

- 1 Engineering Drawing
S.R. Manchu,
Falcon's Publications
Shop. No. 4-5-61, Beside Andhra Bank,
Women College Road, Kothi, Hyderabad.
- 2 Engineering Drawing
M. Subbarayudu
Falcon's Publications
Shop. No. 4-5-61, Beside Andhra Bank,
Women College Road, Kothi, Hyderabad.

ENGINEERING MATHEMATICS - I

DE – 171

2(2+0)

Objective: To impart the knowledge on advanced aspects of matrices, trigonometry, engineering calculus to enable students to apply for solving the engineering problems in the courses of agricultural, civil and mechanical engineering.

THEORY

LOGARITHMS

- 1 Define logarithm and list the its properties, Distinguish natural logarithms and common logarithms
- 2 Explain the meaning of e and exponential functions

POLYNOMIALS

- 3 Define rational, proper and improper fractions of polynomials
- 4 Explain the procedure of resolving rational fractions of the type mentioned below into partial fractions

- 5 Solve i) $\frac{f(x)}{(x+a)(x+b)(x+c)}$ ii) $\frac{f(x)}{(x+a)^2(x+b)(x+c)}$ iii) $\frac{f(x)}{(x^2+a)(x+b)}$ iv)

$$\frac{f(x)}{(x+a)(x^2+b)^2}$$

Matrices

- 6 Define a Matrix and order of matrix; State various types of matrices with examples. (Emphasis on 3 rd order square matrices).
- 7 Compute sum, Scalar multiplication and product of matrices, Define the transpose of a matrix and write its properties, define symmetric and skew-symmetric matrices.
- 8 Define minor, co-factor of an element of a 3×3 square matrix with example, expand the determinant of a 3×3 matrix using Laplace expansion formula
- 9 Distinguish singular and non-singular matrices, apply the properties of determinant to solve problems
- 10 Solve system of linear equations in 3 unknowns using Cramer's rules
- 11 Define multiplicative inverse of a matrix and list properties of adjoint and inverse, Compute adjoint and multiplicative inverse of a square matrix.
- 12 Solve system of 3 linear equations in 3 unknowns by matrix inversion method
- 13 State elementary row operations, Solve a system of 3 linear equations in 3 unknowns by Gauss-Jordan method

Trigonometry

- 14 Define trigonometric ratios of any angle, List the values of trigonometric ratios at specified values, Define compound angles and state the formulae of $\sin(A\pm B)$, $\cos(A\pm B)$, $\tan(A\pm B)$, and $\cot(A\pm B)$,
- 15 Give the simple examples on compound angles to derive the values of $\sin 15^\circ$, $\cos 15^\circ$, $\sin 75^\circ$, $\tan 15^\circ$, $\tan 75^\circ$ etc.
- 16 Derive identities like $\sin(A+B)\sin(A-B) = \sin^2 A - \sin^2 B$ etc, Solve simple problems on compound angles.
- 17 Derive the formulae of multiple angles $2A$, $3A$ etc and sub multiple angles $A/2$ in terms of angle of A of trigonometric functions
- 18 Derive the formulae on transforming sum or difference of two trigonometric ratio in to a product and vice versa-examples on these formulae, Solve problems by applying these formulae to sum or difference or product of three or more terms.
- 19 State various properties of inverse trigonometric functions and identities like $\sin^{-1} x + \cos^{-1} x = \frac{\pi}{2}$ etc, Derive formulae like $\tan^{-1} x + \tan^{-1} y = \tan^{-1} \left(\frac{x+y}{1-xy} \right)$, where $x \geq 0, y \geq 0, xy < 1$ etc and solve simple problems
- 20 State sine rule, cosine rule, tangent rule and projection rule, Explain the formulae for $\sin A/2$, $\cos A/2$, $\tan A/2$ and $\cot A/2$ in terms of semi-perimeter and sides a, b, c and solve problems.
- 21 List various formulae for the area of a triangle, Solve problems using the above formulae.

LIMITS

- 22 Explain the concept of limit and meaning of $\lim_{x \rightarrow a} f(x) = 1$ and state the properties of limits
- 23 Mention the Standard limits

$$\lim_{x \rightarrow a} \frac{x^n - a^n}{x - a}, \quad \lim_{x \rightarrow 0} \frac{\sin x}{x}, \quad \lim_{x \rightarrow 0} \frac{\tan x}{x}, \quad \lim_{x \rightarrow 0} \frac{a^x - 1}{x}, \quad \lim_{x \rightarrow 0} \frac{e^x - 1}{x},$$

$$\lim_{x \rightarrow 0} (1+x)^{\frac{1}{x}} \lim_{x \rightarrow 0} \left(1 + \frac{1}{x}\right)^{\frac{1}{x}}$$

problems using the above standard limits.

Derivatives

- 24 State the concept of derivative of a function $y=f(x)$ – definition, first principle as

$$\lim_{h \rightarrow 0} \frac{f(x+h) - f(x)}{h} \quad \text{and also provide standard notations to denote the derivative of a function,}$$

Find the derivatives of elementary functions like x^n , a^x , e^x , $\log x$, $\sin x$, $\cos x$, $\tan x$, $\sec x$, $\operatorname{cosec} x$ and $\cot x$ using the first principles.

- 25 State the rules of differentiation of sum, difference, scalar multiplication, product and quotient of functions with illustrative and simple examples.
- 26 Explain the method of differentiation of a function of a function (Chain rule) with illustrative examples such as

i) $\sqrt{t^2 + \frac{2}{t}}$ ii) $x^2 \sin 2x$ (iii) $\frac{x}{\sqrt{x^2+1}}$ (iv) $\log(\sin(\cos x))$.

- 27 Find the derivatives of Inverse Trigonometric functions and examples using the Trigonometric transformations, Explain the method of differentiation of a function with respect to another function and also differentiation of parametric functions with examples
- 28 Explain the procedures for finding the derivatives of implicit function with examples, Explain the need of taking logarithms for differentiating some functions with examples like $[f(x)]^{g(x)}$
- 29 Explain the concept of finding the higher order derivatives of second and third order with examples.
- 30 Explain the concept of functions of several variables, partial derivatives and difference between the ordinary and partial derivatives with simple examples.
- 31 Explain the definition of Homogenous function of degree n , Explain Euler's theorem for homogeneous functions with application to simple problems.
- 32 Maxima and Minima

Main Text Book: A Text Book of Engineering Mathematics – I by MVSLDN Raju and Dr. KV Ramana, VGS Book Links

Reference Books:

1. Elementary Trigonometry , S. L. Loney ,
2. Higher Algebra, Hall & Knight
3. Integral Calculus Vol - I, M. Pillai, Shanti Narayan,
4. A text book of Matrices, Shanti Narayan

Objective: To give insight to students about elements, kinematics and optics required for engineering studies related to instrumentation, operation of equipment and controls

THEORY

1. **Units and Dimensions**
Introduction – Physical quantity – fundamental and derived physical quantities-unit. Fundamental and derived units – SI units with symbols-Rules of writing SI units-Advantages-Dimensions and Dimension formula-principle of Homogeneity of Dimensions.
2. **Elements of Vectors:**
Introduction - Scalar-Vector-Definitions-Examples-Graphical representation of Vectors-types of vectors-Addition and subtraction of vectors-representation of vector in space Resolution of vectors - Resultant of the vectors by component method. (Parallelogram Law of vectors-Triangle Law of vectors to be covered in practical class). Dot product of two vectors - properties – Cross product of two vectors – properties.
- 3&4. **Kinematics:**
Equations of motion in straight line – Acceleration due to gravity- expression for max. height –time of ascent-time of descent and velocity on reaching the point of projection. Derivation for height of a tower when a body is projected upwardly from the top-projectile motion-Horizontal projection –Derivation for the path of horizontal projection-Derivation for maximum height. Time of flight and horizontal range maximum range of a projectile in oblique projection. Derivation for magnitude and direction of resultant velocity in oblique projection.
5. **Friction**
Introduction: Definition- Types of friction-laws of friction (static and kinetic) coefficient of friction –Angle of friction with respect to rough horizontal surface-Derivations for displacement and time taken to come to rest over a rough horizontal surface-work done by frictional force-Advantage and disadvantages of friction-methods of minimizing friction.
6. **Work-Power-Energy**
Definitions of work-Power-Energy-concept of power - Definition of potential energy. Expression for potential energy - Definition of kinetic energy-expression for kinetic energy – workenergy theorem –law of conservation of energy and its verification in the case of falling body and simple pendulum. Conventional and non-conventional energy sources.
7. **Simple Harmonic Motion:**
Definition-conditions of SHM-Equation for SHM as projection of particle executing uniform circular motion. Expression for displacement-velocity and acceleration.
- 8&9. **Heat and thermodynamics:**
Introduction -Expansion of gases-Boyle's Law (its verification practical class) Charles Law-Absolute scale of temperature - Ideal gas equation-gas constant – universal gas constant - gas equation in terms of density. Difference between r and R -concept of internal energy- External work done by a gas. Isothermal process and

Adiabatic process-law of thermodynamics-specific heats of gas - Relation $C_p - C_v = R$.

10. **Sound**

Introduction – Musical sound and noise and difference between them – noise pollution-causes for noise pollution - effects of noise pollution - methods to minimize noise pollution - beats - application – Doppler effect- formula for apparent frequency (a) source in motion-observer at rest (b) observer in motion – source at rest- Applications reverberation- reverberation time echoes

11. **Properties of Matter**

Introduction to Elasticity – Definitions of stress-Strain - Hooke's Law- types of stress –types of strain - Types of moduli of elasticity.

- i) Definition of surface tension – Explanation of surface tension with the help of molecular theory-definition of angle of contact and capillarity- formula for surface tension – Determination of surface tension by capillary rise method.
- ii) Definition of viscosity - coefficient of viscosity-Newton's formula for viscous force. Effect of temperature on viscosity. Poiseuille's equation and determination of coefficient of viscosity by Poiseuille's method.

12&13 **Electricity and Magnetism**

Introduction to electricity- Ohm's Law and explanation - specific resistance-conductance- Kirchhoff's Laws and explanation-Wheatstone's bridge. i) Meter bridge and its use to determine specific resistance - Introduction to magnetism (To be covered in practical class) coulomb's inverse square law

Magnetic field and magnetic lines of force

Magnetic induction field strength – units

Moment of couple on bar magnet placed in a uniform magnetic field-Derivation for magnetic induction field strength at a point on the axial line.

14,15 & 16. **Modern physics**

Photo-electric effect-Einstein's photo electric equation - Laws of photoelectric effect working of photoelectric cell - photomultiplier – Applications of photoelectric effect. Recapitulation of refraction of light and its law's - critical angle- total internal reflection. Principle and working of optical fiber- Types of optical fibers-Applications of optical fibers - super conductor-super conductivity – properties of super conductors – Applications of super conductors.

PRACTICALS

1. Determination of volume of a cylindrical body with vernier caliper
2. Determination of thickness of the given body with screw gauge
3. Determination of the weight of given body corrected up to milligram using physical balance.
4. To determine thickness and radius of curvature of convex or concave lense with spherometer.
5. To verify parallelogram law of forces and triangular law of forces.
6. To verify the laws of simple pendulum and to determine the acceleration due to gravity.
7. To determine the velocity of sound in air using resonance apparatus at room temperature.
8. To find the focal length and power of convex lense by U-V method.
9. To determine the refractive index of a given solid using Travelling microscope.
10. To find out the surface tension of water by capillary rise method
11. To determine the coefficient of viscosity of a liquid by poiseullies method.
12. To verify Boyle's law in air using Boyle's apparatus
13. To determine resistance and specific resistance of the material (wire) using meter bridge.
- 14 & 15 To map magnetic lines of force around a bar magnet.
16. Practical Examination

REFERENCES

- | | | |
|---|---------------------|---------------------------------|
| 1 | Engineering Physics | M. Raghavendra |
| . | | Falcon's Publications |
| | | Shop. No. 4-5-61, Beside Andhra |
| | | Bank, Women College Road, |
| | | Kothi, Hyderabad. |
| 2 | Engineering Physics | S. B. Singh |
| . | | Falcon's Publications |
| | | Shop. No. 4-5-61, Beside Andhra |
| | | Bank, Women College Road, |
| | | Kothi, Hyderabad. |

Objective: To study the chemical aspects of engineering materials and processes such as phase rule, ionisation, corrosion, lubricantsetc., which will give good insight to the students to go for engineering applications in agricultural engineering industries.

THEORY

1. Fundamentals of chemistry – fundamental particles of atom – atomic number, mass number.
2. Chemical bonds – types of bonds – properties of ionic, covalent and coordinate compounds.
3. Fundamentals of organic chemistry – features of organic compounds – difference between organic and inorganic compounds
4. Sources of organic compounds – role of organic compounds in agriculture
5. Common ion effect – Applications – solubility product – Ionization – factors influencing ionization – ionic equilibrium.
- 6,7&8. Electrolysis – electrolytes – classification of electrolytes - mechanism of electrolysis – Ohm’s law - conductance of electrolytes – measurement of electrolyte conductance – measurement of specific conductivity by wheatstone bridge
9. Water – sources – impurities – Hardness of water – types of hardness – degree of hardness – units of hardness – disadvantages of hardwater for industrial and agricultural use.
10. Water softening methods –zeolik process – ion exchange or deionization process - mixed bed deionizer.
11. Lubricants – functions – mechanisms of lubrication – classification of lubricants
12. Important properties of lubricants
13. Polymers – basic concepts of polymerization – plastics – characteristics of plastics – advantages and disadvantages of plastics.
14. Important plastics – polythene – PVC – Bakelite.
15. Fuel – definition – classification – characteristics of good fuel – petroleum – gaseous fuels.
16. Rubbers – compounding of rubber – vulcanization of rubber – silicone rubber – properties and uses.

PRACTICALS

1. Glass ware and chemicals used in laboratory
2. Care, maintenance, dos and donts in laboratory
3. Types of expressing solution concentration – equivalent weight, normality, molarity, %, ppm
4. Preparation of standard solution (normal, molar, %, ppm solutions).
5. Standardization of H₂SO₄
6. Collection of irrigation water sample
7. Determination of pH and EC of irrigation water.
8. Determination of CO₃²⁻ and HCO₃⁻ in irrigation water.
9. Standardization of NO₃
10. Determination of chlorides in irrigation water.
- .
11. Determination of Na content in irrigation water.
12. Standardization of EDTA
- .
13. Determination of total hardness (Ca+Mg) in water
- .
14. Irrigation water quality – Rating for EC, SAR and RSC
- .
15. Interpretation of irrigation water quality for agriculture.
- .
16. Saponification value for fat and oils
- .

REFERENCES:

- | | | |
|---|---|--|
| 1 | Intermediate Chemistry Vol 1 & 2 | Telugu academy, Board of Intermediate Education, Andhra Pradesh, Hyderabad |
| . | . | . |
| 2 | Engineering chemistry & Environmental studies | Dr. G. Venkatanarayana, Falcon's Publications
Shop. No. 4-5-61, Beside Andhra Bank, Women College Road, Kothi, Hyderabad. |
| . | . | . |

TECHNICAL WRITING AND COMMUNICATION SKILLS IN ENGLISH

DAE – 174

1 (0+1)

Objective: To impart the knowledge to students on technical writing and communication skills and presentation skills

PRACTICALS

1. Letter writing, Personal, Official, covering letters, Preparation of bio-data – resume or curriculum –vitae and Job application letter.
2. Non-Verbal Communication
Report: Writing a Massage, Correspondence: Language and Grammar: a) Parts of Speech, b) Tense, c) Sentence
3. Voice: a) Active voice-with examples, b) Passive Voice –with examples, c) Direct and Indirect speech examples, d) Subject – Verb Agreement.
4. Basic Sentence Structures.
5. Articles: a) Definite, b) Indefinite articles and their usage in a sentence
6. List out some important Antonyms and Synonyms
7. Terminology of Agriculture in English
8. Essay writing or creative writing
9. Dictionary: uses of dictionary and effective utilization.
10. Dialogue delivery: Conversation dialogues.
11. Prepositions – Important prepositions in daily English conversation
12. Verb and its forms or be forms and infinitive
13. The Tense – the Present Tense – the Past Tense – the Future Tense.
14. The Tense –Present Perfect Tense
15. Practical Examination

REFERENCES

- | | | |
|---|--|---|
| 1 | Enhancing English and Employability Skills – 1 | English faculty of Government Polytechnics, Andhra Pradesh
State Board of Technical Education & Training, AP, Near Tank Bund, Hyderabad-63 |
| 2 | Enhancing English and Employability Skills – 2 | English faculty of Government Polytechnics, Andhra Pradesh
State Board of Technical Education & Training, AP, Near Tank Bund, Hyderabad-63 |
| 3 | Enhancing English and Employability Skills – 3 | English faculty of Government Polytechnics, Andhra Pradesh
State Board of Technical Education & Training, AP, Near Tank Bund, Hyderabad-63 |
| 4 | Enhancing English and Employability Skills – 4 | English faculty of Government Polytechnics, Andhra Pradesh
State Board of Technical Education & Training, AP, Near Tank Bund, Hyderabad-63 |

PRINCIPLES AND PRACTICES OF CROP PRODUCTION

DE – 175 3(1+2)

Objective: To enable the students to understand the farming principles to grow agricultural field and horticultural crops and all farming practices.

THEORY

1. Development of Agriculture in India.
2. Agro climatic zones of Andhra Pradesh.
3. Monsoons – seasons-seasonal crops. Classification of crop.
4. Tillage-tilth-objectives of tillage – types of tillage (Primary, secondary and – seed bed preparation – puddling).
5. Seeds-seed material – characteristics of seed/seed material. Sowing – methods of sowing, time of sowing – depth of sowing –seed rates of important crops.
6. Crop stand establishment – factors affecting crop stand establishment – plant population.
7. Soil fertility – soil productivity – soil fertility losses – maintenance of soil fertility – soil organic matter.
8. Mineral Nutrition – Essential Elements-Deficiency Symptoms – Toxicity Symptoms.
9. Manures – Bulky Organic Manures – Concentrated Organic manures – soil amendments.
10. Fertilizers – Classification – Nitrogenous, Phosphatic and Potassic Fertilizers-Fertilizer dose – Method of Fertilizer Application – Time of Fertilizer Application – Biofertilizers.
11. Irrigation water management.
12. Weed Management.
13. Dryland Agriculture.
14. Cropping systems – Crop Rotation.
15. Harvesting – Storage and Post-harvest Processing (Rice, Groundnut and Sugarcane).
16. Sustainable Agriculture and organic farming.

PRACTICALS

1. Visit to Agricultural Information Centre.
2. Identification of crops, seeds, manures, oil seed cakes and fertilizers.
3. Study of tillage implements.
4. Practice of Primary tillage.
5. Practice of Secondary tillage.
6. Practice of seed bed preparation.
7. Preparation of Rice Nurseries/Vegetable Nurseries.
8. Selection of seed, Seed treatment and germination test.
9. Study of methods of sowing.
10. Practice of sowing of ID crops.
11. Nursery pulling in rice (or any operation related to rice).
12. Transplanting of rice (or any operation related to rice).
13. Thinning and gap filling.
14. Study of Intercultivation implements.
15. Practice of intercultivation.
16. Identification of weeds.
17. Study of different weed control methods.
18. Practice of hand weeding.
19. Practice of spraying of herbicides.
20. Use of bio control agents and IWM.
21. Identification of plant diseases.

22. Spraying of fungicides.
23. Study of different irrigation methods.
24. Study of sprinkler and drip irrigation methods.
25. Identification of beneficial and harmful insects and IPM.
26. Study of maturity symptoms in crops.
27. Harvesting of crops.
28. Threshing and Winnowing.
29. Visit to Biological Control Lab (ARI).
30. Visit to Farm Implements and Machinery Scheme (ARI).
31. Visit to Rice Section and STCR scheme (ARI).
32. Visit to National Seed Project.

REFERENCES

- 1 Principles of Agronomy T. Yellamanda Reddy and G.H. SankaraReddi,
. Kalyani Publishers, Ludhiana
- 2 Fundamentals of Agriculture ArunKatyayam
. Kushal Publications, Varanasi

I Year II Semester

COMPUTER APPLICATIONS

DE- 163

2(1+1)

Objective: To enable the students to apply the computer applications for finding analytical solutions to engineering problems and presentations

THEORY

- 1 Introduction to Computer Uses, Advantages and disadvantages
- 2 Study of a computer system component and their uses. Measurement of Memory
- 3 Introduction to Windows Operating System and utilities of Desktop, Task Bar , Right Click Utilities on Desktop. Opening programs, Searching of files, Copy, Paste, Move
- 4 Introduction to MS Word- opening, creation of document, formatting the document Page Setup.
- 5 Use of different facilities from the menu bars- Spell check, change of Fonts, size of fonts, Bold, Italic and Underline,
- 6 Creation Tables, Formatting, Change of Row and Column Width and Height, Merging of Cells, Word Wrap, Borders
- 7 Use of Mail Merge and printing a document
- 8 Introduction to MS Excel- Opening a workbook / Work sheet, Rows and columns in a work

sheet, a Cell

- 9 Entering data in cells Changing the Type of Data Using Tool bar options
- 10 Sorting of Data, Usage of Formulas, Simple Mathematical Calculations
- 11 Creation of Charts and formatting a chart
- 12 Printing a worksheet- Page setup, Page breaks
- 13 Introduction to Power Point- Creation of Slides, Templets, Animation Effects
- 14 Back up of Data to CD / DVD using a Writer Software
- 15 Internet – World Wide Web, Opening of a Home Page, Search Engines
- 16 Creation of user accounts, E-mail ID and using of emails with attachments, downloading

PRACTICALS

1.15 Tutorials on the theory Lectures from 3 to 16

16 Practical exam

REFERENCES

S.No	Author & Title	Publisher
1.	Firstlook 2007 MS office by Katherine Murray	Micorsoft Press, A Division of Microsoft Corporation One Microsoft Way, Redmond, Washington 98052-6399
2.	Windows 7 for Seniors for Dummies by Mark Justice Hinton	Wiley Publishing, Inc. 111 River Street, Hoboken, NJ 07030-5774
3.	Word 2010 All-in-one for Dummies by Doug Lowe with Ryan Williams	Wiley Publishing, Inc. 111 River Street, Hoboken, NJ 07030-5774
4.	Excel 2010 All-in-One for Dummies by Greg Harvey	Wiley Publishing, Inc. 111 River Street, Hoboken, NJ 07030-5774

E-Books

Microsoft Office 2007 Series of E-Books

www.msoffice-tutorial-training.com

[www.GoComputer Training.com](http://www.GoComputerTraining.com)

Office 2007 Quick Reference Guide

The Ultimate Guide to Excel 2007 Ebook

The Ultimate Guide to PowerPoint 2007 Ebook

The Keyboard Shortcut Magic (Updated 2009 version)

Principles of Fluid Mechanics

DE-164

2 (1+1)

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

THEORY

1. Fluid –definitions – classification – properties, dimensions
2. Fluid pressure-Introduction-Measurement of fluid pressure-piezometer tube - manometry- types of manometers
3. Mechanical gauges-Bourdon's Tube - Pressure gauge - Diaphragm pressure gauge - Dead weight pressure gauge
4. Kinematics of fluid flow-introduction-continuity of fluid flow – Types of flow lines.
5. Dynamics of fluid flow-Variation of energy in fluid flow, frictional loss, general equation
6. Bernoulli's theorem, Euler's equation of motion
7. Practical applications of Bernoulli's theorem, Venturimeter, Pitot tube, Orifice meter

8. Flow through orifices (Measurement of Discharge) – Types of orifices, Jet of water, vena, contracta, Hydraulic coefficients
9. Experimental Method for Hydraulic Coefficients, Discharge through a rectangular orifice
10. Flow through mouth pieces - Types of Mouth pieces - Loss of Head of a liquid flowing in a pipe, Discharge through a Mouth piece
11. Flow over Notches - Types of Notches, Discharge over a Rectangular Notch, Triangular Notch.
12. Flow over weirs - Types of weirs, Discharge over a weir, Francis's formula for Discharge over a Rectangular weir
13. Bazin's formula for discharge over a rectangular weir, velocity of approach, Discharge through a Trapezoidal weir
14. 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
15. Flow through open channels -Manning's formula, current meter
16. Pumps – Classification of pumps – Principle of working

PRACTICALS

- 1 Numericals on properties of fluid
- 2 Numericals on measurement of pressure
- 3 Experimental determination of pressure with Manometer
- 4 Verification of Bernoulli's theorem
- 5 Measurement of discharge with a venturimeter
- 6 Measurement of velocity with pitot tube
- 7 Numericals on Bernoulli's theorem and continuity equation
- 8 Determination of coefficient of discharge of rectangular weir
- 9 Determination of coefficient of discharge of triangular weir
- 10 Determination of coefficient of discharge of trapezoidal weir
- 11 Determination of hydraulic coefficient of orifices
- 12 Experiment on broad crested weir
- 13 Numericals on weirs
- 14 Determination of head losses in pipes
- 15 Numericals on flow through pipes and open channels
- 16 Practical Examination

REFERENCES

S.N	Author & Title	Publisher
1.	A Text Book of Hydraulics, V.V. Reya& D.S.P. Rao	Radiant Publishing House Book house, # 4-5-62, Women's College Road, Beside Andhra Bank, Kothi, Hyderabad-95
2.	Hydraulics and Fluid Power Systems, G. AppaRao	Radiant Publishing House Kothi, Hyderabad
3.	Hydraulics and Fluid Mechanics, Modi P M and Seth S.M. 1973	Standard Book House, Delhi

WORKSHOP TECHNOLOGY – II

DE-165

3(1+2)

Objective: To impart knowledge and skills to students in manufacturing processes of machines, tool sand equipment and hands on training on various aspects of milling grinding and drilling and foundry shop for encouraging entrepreneur development for engineering enterprises in general and farm mechanization in particular

THEORY

1. Introduction to foundry - Advantages and disadvantages of foundry – process of producing castings, hand moulding tools.
2. Pattern making – pattern materials, types of patterns.
3. Pattern allowances, colour codes for patterns, sequence in pattern making, moulding materials.
4. Classification of moulding sand – Natural moulding sands, synthetic sands, special sands; sand Binders – Clay type binders, organic type binders, inorganic type binders; sand additives.
5. Properties of moulding sand – porosity, flowability, collapsibility, Adhesiveness, cohesiveness, Refractoriness.
6. Cores – Core requirements, core sands, types of cores, core making.
7. Moulding procedure, Moulding processes, Bench moulding, floor moulding, pit moulding, machine moulding, Green sand moulding, Dry sand moulding, Skin dried sand moulding, Loam moulding, Cement Bonded moulding, carbon dioxide moulding, shell moulding, ceramic moulding.
8. Defects in castings, safety precautions in foundry shop
9. Introduction to Drilling, Working Principle of drill work, Types of drilling machines – Sensitive drilling machine, Radial drilling machine; specification of drilling machine.
10. Work holding devices – Drill press vice, parallels, V-blocks, angle plate, T-bolts, straps and step blocks. Tool holding devices –Drill chucks, Drilling machine spindle, sleeves and sockets
11. Types of drills – Flat drill, straight fluted drill, twist drill, core drill, oil tube drill and center drill. Drilling machine operations – Drilling, Reaming, Boring counter boring, counter sinking, tapping, spot facing and trepanning.
12. Introduction to lathe, functions of lathe, types of lathes and constructions details of lathe.
13. Description and functions of lathe parts, main accessories and attachments and mechanism used in lathes.
14. Main operations and tools used in centre lathes
15. Introduction to sawing – Methods of sawing – Hand sawing, power sawing, sawing machines – Reciprocating saw, circular saw, Band saw, reciprocating saw, circular saw, Band saw.

16. Specification of power hack saw – Types of saw Blades, set patterns for saw blade teeth.

PRACTICALS

- 1&2 Demonstration on casting equipment and tools
- 3&4 Demonstration on pattern making
- 5&6 Mould making using one piece pattern
- 7&8 Mould making using two pieces pattern.
- 9&10 Plane turning on lathe machine
- 11&12 Step turning on lathe machine
- 13&14 Taper turning on lathe machine
- 15&16 Knurling operation on lathe
- 17 Drilling on lathe machine
- 18 Boring on lathe machine
- 19&20 External thread cutting on lathe machine
- 21&22 Internal thread cutting on lathe machine
- 23&24 Working on sensitive drilling machine
- 25 Working on drilling machine reaming, boring and counter boring
- 26 Working on drilling machine counter shinking, Tapping, spot facing and
trepanning.
- 27 Working on power saw
- 28 Working on band saw
- 29 Working on circular saw (cold saw)
- 30 Visiting of local implements manufacturing units
- 31 Visiting of a moulding unit.
- 32 Final practical examination

REFERENCES

S.N	Author & Title	Publisher
1.	Elements of workshop technology, (Volume I & II)	HajraChoudhury,S.K.,HajraChoudhury, A.K. and Nirjhar Roy, 2010. MediaPromoters and Publishers Pvt. Ltd. Mumbai
2.	Workshop technology (Part I & II)	Chapman, W.A.J. 1989. Arnold Publishers (India) Pvt. Ltd. AB/Safdarjung Enclave, New Delhi.
3.	A course in workshop technology (Volume I & II)	Raghuwansi, B.S. 2003. DhanpatRai and Co. (P) Ltd. Educational and technical publishers. 1710, NaiSarak, New Delhi – 110006
4.	Manufacturing technology- I	Pakirappa and Kumar V.N. 2010. Radiant Publishing House, Hyderabad.
5.	Workshop technology	M. Anitha. Falcon Publishers, Hyderabad

Principles of Thermodynamics and Heat Engines

DE 166

2 (1+1)

Objective: To enable the students to know about the thermodynamic laws and principles, different cycles, cooling systems, fuel supply systems, lubrication systems of heat engines in general and tractors and other farm engines in particular.

THEORY

1. Thermodynamics – Thermodynamic system – Classification of thermodynamic systems-
Closed system – Open system - Isolated system
2. Properties of a system – Extensive and Intensive properties – State of a system – Path of a system
3. Thermodynamic process- Quasistatic process – Reversible process- Thermodynamic cycle
4. Pressure – Atmospheric pressure – Gauge pressure – Vacuum – Absolute pressure
-Temperature – Absolute temperature – Standard conditions - Volume
5. Energy forms – Energy – Stored Energy and Transit energy – Types of stored Energy –
Potential energy – Kinetic energy – Internal energy – Heat – Specific heat – Work – Power
– Enthalpy – Entropy.
6. Laws of thermodynamics - thermal equilibrium – Zeroth law of thermodynamics – First
law of thermodynamics – Second law of thermodynamics
7. Fuels – Classification – Liquid fuels – Gaseous fuels – Properties
8. Heat engines – Types – External Combustion Engines – Internal Combustion Engines-
Classification of Internal Combustion Engines based on various factors.
9. Internal Combustion Engines – Different Components – Material Construction and its
functions.
10. Working cycle of 4- stroke cycle Diesel Engine - Diesel cycle
11. Working cycle of 4-stroke cycle Petrol Engine - Otto cycle

12. Working cycle of 2-stroke cycle Diesel Engine and Petrol Engine-Comparison between 4-stroke cycle Engines and 2-stroke cycle Engines-Comparison between Diesel Engines and Petrol Engines
13. Fuel Sypply System of IC Engines - Types – Components and their functions
14. Ignition system of IC Engine SI Engine - Components and their functions – Working principle of battery and Magnetic Ignition System.
15. Cooling System of IC Engine - Components and their functions – Working Principle of forced circulation cooling system
16. Lubrication System of IC Engine -Types – Components and their functions – Working principle of forced feed lubrication system.

PRACTICALS

1. Study of different components of IC engine
- 2&3 Dismantling of IC Engine components
- 4&5 Assembling of IC engine components
- 6 Study the working of four stroke petrol engine
- 7 Study the working of four stroke diesel engine
- 8 Study the working of two stroke petrol engine and diesel engine
- 9&10 Terminology related to Engine power and its problems
- 11 Study the working principle of forced feed fuel supply and Ignition system
- 12 Study the working principle of forced feed cooling and lubrication system
- 13 Study the different type of Dynamometers – Rope brake Test – Prony break test
- 14&1 Repairs and maintenance of IC Engines
- 5 Practical examination
- 16

REFERENCES

S.N	Author & Title	Publisher
1.	JagadishwarSahay, 1992. Elements of Agricultural Engineering	Agro Book Agency, Patna
2.	Kepner, R.A., RoyBainer and Barger, E.L., Principles of Farm Machinery	CBS Publishers and Distributors, New Delhi
3.	Michal, A.M. and Ojha, T.P. 208. Principles of	Jain Brothers, New Delhi

- | | | |
|----|--|---|
| 4. | Agricultural Engineering (vol.I)
Pakirappa& V. Naresh, Thermal Engineering –I | Radiant Publishing House, 4-5-64
Book Basement, Beside Andhra
Bank, Kothi, Hyderabad-95 |
| 5. | Pakirappa& V. Naresh, Thermal Engineering –II | Radiant Publishing House, 4-5-64
Book Basement, Beside Andhra
Bank, Kothi, Hyderabad-95 |

SURVEYING-I

DE-167

3 (1+2)

Objective:To enable student to acquire skills in the measurement of land, preparation of plans and find out their areas(regular or irregular) either for civil engineering or Agriculture Engineering related works, in general, and Land and water management works in particular by Various methods and instruments (chain,tapes,compasses plane table etc.)available commercially. Further to enable the student to take and calculate the reduced levels with the help of various leveling instruments and prepare contour maps and further estimate the cuts and fill quantities while Land leveling or grading work is take up in any agricultural field.

THEORY

1. Concept of Surveying-purpose of Surveying, Linear and angular measurements, Fundamental principles of surveying.
2. Classification of Survey based on instruments and purpose of field work – Engineering Surveys
Instruments used for taking Linear and angular measurements
3. Chain Surveying-Purpose and Principle of Chain Survey - equipment used and their functions, Chains and arrows. Metallic tapes and Steel tapes, ranging rods, offset rods, pegs, plumb bob, Optical square, Line ranger.
4. Errors in ordinary chaining -Correction due to incorrect length of Chain or tape- problems
5. Different operations in Chain Surveying- Direct ranging and Indirect ranging Chaining on sloping ground –Setting out right angles with open cross staff and tape – Guidelines for Chain triangulation.
6. Recording field notes – field book-Conventional signs, Obstacles in chaining-methods to overcome obstacles.Calculations of area – different methods –Average ordinate, Trapezoidal and Simpson’s rules.

7. Compass Surveying- Purpose and principle of compass Survey-description, working and uses of prismatic compass, Concept of true meridian, magnetic meridian, designation of bearings - whole Circle bearing, Quadrantal bearing - conversion of whole circle bearing to Quadrantal bearing.
8. Compass Survey –field notes - Traversing using prismatic compass.Local attraction-detection and correction.
9. Declination- conversion of magnetic bearings to true bearings- problems -calculation of included angles.
10. Plotting of Closed traverse-closing error and adjustments by Bowditch method.Errors in Compass Surveying-Personal, Instrumental and Natural.
11. Levelling- Definitions of important terms in levelling. Component parts, operations involved in levelling-Temporary adjustments of a dumpy level.Types of levelling staves.
12. Determination of reduced levels by Height of Instrument and Rise and Fall methods – Comparison – Problems.
13. Errors in levelling-Personal, instrumental and natural - Precautions
14. Classification of Levelling- Profile levelling, Reciprocal levelling-detailed description of each method – problems on reciprocal levelling.
15. Contouring – uses and Characteristics, Methods of contouring - Block contouring, Radial contouring. Interpolation of contours-tracing contour gradient- use of Contour maps
16. Uses and working principles of minor instruments- Abney level, Electronic Planimeter, Pentagraph

PRACTICALS

1. Acquaintance with the survey instruments
2. Study of a plan and map
3. Folding, unfolding of the chain and ranging a chain line
4. Measurement of distances by pace method
5. Chain triangulation survey
6. Plotting of chain triangulation

7. Chain triangulation by offset method
8. Plotting of chain triangulation by off set method
9. Cross staff survey
10. Plotting of cross staff survey
- 11 & 12. Tutorial class dealing the problems on errors in chaining
13. Different methods for dealing with obstacles in chaining operation
- 14 & 15. Study of planimeter and Computation of areas using planimeter
- 16 Computation of areas of irregular fields by different methods like trapezoidal and Simpson's rule
- 17 Study of prismatic compass and surveyor compass and accessories
- 18 Compass survey by intersection method and
- 19 Plotting of compass survey by intersection method
- 20 & 21. Compass survey by traverse method & Plotting of compass survey by traverse method
- 22 & 23. Tutorial class on bearings and its related problems
- 24 Acquaintance with levelling equipment
- 25 Booking level staff readings
- 26 Temporary adjustments for a leveling instrument
- 27 & 28. Tutorial class on reduction of levels by HI method andby Rise & Fall method
- 29 Study of Survey of India Toposheet
- 30 Grid survey
- 31 Study of contour map

REFERENCES

S.N	Author & Title	Publisher
0		
1.	Surveying and levelling Vol –1	KULKARNI and KANETKAR, Pune VidyarthiGrihaPrakashan, 1786, Sadasivpeth, Pune, 411030
2.	Surveying and Levelling Vol – 1	B.C. PUNMIA, Laxmi Publications (p) Ltd, 113, Golden house, Daryaganj, New Delhi-110002
3.	Surveying – 1	A.KAMALA, Radiant – Book house, # 4-5-62, Women’s College Road, Beside Andhra Bank, Kothi, Hyderabad-95
4.	Surveying (McGrawhill)	N. N. BASAK, Tata McGraw – Hill Publishing Company Ltd, 7 West Patel Nagar, New Delhi - 110008
5.	Text Book of Surveying	C.Venkatramaiah, Universities Press (India) Limited 3-5-820, Hyderguda, Hyderabad-500 029

Engineering Mechanics and Material Testing

DE 168

2 (1+1)

Objective: To impart the knowledge and training to students on the basic principles of physical and engineering mechanics of solid systems involving forces, moments, stresses and shear forces for applications in designs of engineering structures and to acquire the skills in testing the engineering materials

THEORY

1. Definition of mechanics, application of mechanics in Engineering, system of units, basic concept of force system.
2. Composition and Resolution of forces, resultant of two concurrent forces
3. Resultant of a concurrent coplanar forces, couples, classification and characteristics of a couple
4. Equilibrium and equilibrant, triangle law of forces, polygon law of forces, Lami's theorem
5. Lifting machines, definition, input and output of a machine, velocity ratio, mechanical advantage, efficiency of a machine and related problems.
6. Common lifting machines -inclined plane, lever, pulley block
7. System of pulleys – first system of pulley, second system of pulley, third system of pulley, differential pulley block.
8. Ideal machine, reversible and irreversible machine, conditions for self-locking, frictional loss in machine, law of machine, maximum mechanical advantage, maximum efficiency
9. Centre of gravity, location of C.G. of plane geometrical shapes
10. Moment of inertia, radius of gyration, moment of inertia of plane figures
11. Mechanism, links or elements, classification of links, constrained motion and its types
12. Kinematic pair, classification, kinematic chain, difference between machine and mechanism
13. Classification of Engineering materials, importance of materials, selection of material
- 14-15 Testing of Engineering materials, types of tests and its classification
16. Flow diagram for extraction of iron and steel, raw material of iron, general survey of iron and steel making in India.

PRACTICALS

1. Problems/tutorials on composition and resolution of forces movement of a force, couples
2. Problems related to resolution of forces, resultant of concurrent forces.
3. Problems related to resultant of a concurrent coplanar forces
4. Problems related to Lami's theorem, equilibrant
5. Problems related to lifting machines

6. Analysis of wheel and axle
7. Analysis of screw jack, rack and pinion
8. Problem related to frictional effort, load and efficiency of a machine
9. Problems related to centroids of composite areas
10. Problems related to moment of inertia, radius of gyration
11. Study of steering gear mechanism
12. Crank and slotted lever mechanism
13. Mechanical properties of engineering material
14. Destructive tests of a material
15. Non destructive tests of a material
16. Practical exam

REFERENCES

S.No	Author & Title	Publisher
1.	Construction Materials, N. Sreenivasulu	Radiant Publishing House, 4-5-64, Book Basement, Beside Andhra Bank, Kothi, Hyderabad-95
2.	Engineering Mechanics, Pakirappa and V.N. Kumar	Radiant Publishing House, 4-5-64, Book Basement, Beside Andhra Bank, Kothi, Hyderabad-95
3.	Engineering Materials, Pakirappa and V.N. Kumar	Radiant Publishing House, 4-5-64, Book Basement, Beside Andhra Bank, Kothi, Hyderabad-95
4.	Strength of Materials, Pakirappa and V.N. Kumar	Radiant Publishing House, 4-5-64, Book Basement, Beside Andhra Bank, Kothi, Hyderabad-95

Principles of Soil Science and Management

DE 176

3 (2+1)

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

THEORY

- 1 Introduction – Evolution and origin of earth – Spheres of earth – their characteristics
- 2 Soil components – Mineral matter, organic matter, water and air – Pedological and edaphological concepts of soils – Branches of soil science
- 3 Rocks – Igneous rocks – Their classification based on mode of origin and silica content – Sedimentary rocks – Formation of sedimentary rocks – Metamorphic rocks – Agents causing metamorphosis.
- 4-5 Minerals – Classification based on origin, Quantity, specific gravity and chemical composition-Primary minerals – Quartz, feldspars, micas, amphiboles-pyroxenes – Weatherability of primary minerals
- 6 -7 Weathering – Types of weathering – Physical, chemical and biological weathering – Agents and processes of weathering – Role of flora and fauna in weathering
- 8 Parent materials – Classification based on their mode of transport and deposition
- 9 Soil formation – Soil forming factors – Active and passive factors - their role in soil formation.
- 10 Soil forming or pedogenic processes – Basic or fundamental processes – Eluviation, Illuviation, Humification.
- 11 Specific pedogenic processes – Calcification, Podzolization, laterization, salinization, alkalization, Pedoturbation
- 12 Definition of soil – Soil profile – Description of a theoretical soil profile – Master horizons and subordinate horizons – Differences between surface soil and subsurface soil
- 13 Soil as three phase system – Mechanical Analysis – Classification of soil solids – Size – Shape – Density – Specific surface – Chemical nature - Texture – Classification of texture – Importance of Texture.
- 14 Soil structure – Definition – Classification based on type – Class and grades – Factors influencing formation of aggregates – Importance and management of soil structure.
- 15 Soil consistency – Definition – Forms of consistency – Atterberg's limits of soil consistency – Importance of soil consistency
- 16 Bulk density – Particle density – Factors influencing and importance – Porosity – Types – Calculation – Importance
- 17 Soil water – Structure of water molecule and the effect of H-bonding on properties of water – Retention of water in soils- soil moisture tension – Soil moisture potential – Soil moisture constants and determination of soil moisture content.
- 18 Soil water movement – Saturated, Unsaturated and vapour flows – Darcy's law and Poiseuille's law – Infiltration – Factors affecting Infiltration – Importance – Percolation and permeability – Distribution of water in soil profile – Drainage and its importance –

- Soil mulch organic mulch
- 19 Soil Air- Composition of soil air – Gaseous exchange – Soil aeration indices and their importance – Oxygen content – ODR - Aeration porosity – Redox potential – Management of soil air
- 20 Soil temperature – Influence of soil temperature on plant growth – Factors influencing soil temperature, management of soil temperature.
- 21 Soil color – Its determination – Munsell description – importance of soil color
- 22-23 Soil colloids – General properties of soil colloids – Shape, surface area, electrical charge, adsorption, flocculation, deflocculation, plasticity, cohesion, swelling, shrinkage, tyndal effect, Brownian movement.
- 24-25 Ion exchange in soils – Cation exchange and anion exchange – Cation exchange capacity, Base saturation – Calculations of CEC and Base saturation.
- 26 Soil biology – Types of organisms in soil and their important characters – Benefits of soil organisms – Harmful activities of soil organisms
- 27 Soil organic matter – Decomposition of organic matter – Mineralization and immobilization – Humus
- 28 Importance of soil organic matter – C:N ratio – Significance of C:N ratio
- 29-30 Problem soils and their management - acid soils, saline soils and sodic soils – Causes for formation and reclamation
- 31-32 Physical problems of soils – Their management

PRACTICALS

1. Collection and processing of soil sample
2. Determination of soil pH and EC.
3. Determination of organic carbon content of soil
4. Determination of gypsum requirement of sodic soils
5. Determination of lime requirement of acid soils
6. Management of problem soils
- 7-8. Determination of mechanical composition of soil
9. Determination of bulk density of soil
10. Determination of particle density of soil
11. Determination of maximum water holding capacity of soil using keen cups
12. Determination of moisture content by gravimetric method
13. Determination of soil colour using Munsellcolour chart
14. Determination of infiltration rate
15. Determination of soil strength using cone penetrometer
16. Aggregate analysis by wet sieving method

REFERENCES

S. No.	Author & Title	Publisher
1.	Biswas, T.D. and Mukherjee, S.K. (1987) Text book of Soil Science	Tata McGraw-Hill Publisher Co. Ltd, New Delhi

2. Dilip Kumar Das (2004) Introductory Soil Science Kalyani Publishers, New Delhi
3. Ghildyal, B.P. and Tripathi, R.P. (1987) Soil Physics Wiley Eastern Ltd. New Delhi
4. Dhyan Singh, Chonkar, P.K. and Pandey, R.N. (2010). Soil Testing Manual IARI, New Delhi
5. Singh, R.A. (1990) Soil Physical Analysis Kalyani Publishers, Ludhiana

Objective: To impart the knowledge on advanced aspects of integration, differential equations and coordinate geometry to enable students to apply for solving the engineering problems in the courses of agricultural, civil and mechanical engineering.

THEORY**VECTOR ALGEBRA**

- 1 Vector Algebra :Definition, Addition and Subtraction of Vectors
- 2 Scalar and Vector of two Vectors
- 3 Scalar Triple Product and Vector Triple Product

INTEGRATIONS

- 4 Introduction of Integration and standard formulae
- 5 Explain the concept of indefinite integral as an anti-derivative, State the indefinite integral of standard function and properties of integrals $\int (u+v)dx$ and $\int k u dx$ where k is constant and u,v are function of x.
- 6 Solve integration problems involving standard functions using the above rules.
- 7 Evaluate integrals involving simple functions of the following type by the method of substitution.
- 8 (i) $\int f(ax+b)dx$ where f(x) dx is in standard form
 (ii) $\int f(x)^n f^1(x) dx$
 (iii) $\int f^1(x) dx$
 (iv) $\int f\{g(x)\}g^1(x) dx$
- 9 Find the integrals of tan x, cot x, sec x and cosec x using the above, Evaluate the integrals of the form $\int \sin^m \theta \cos^n \theta d\theta$, where m and n are positive integers
- 10 Evaluate the standard integrals of the function of the type
- 11 (i) $\frac{1}{a^2+x^2}, \frac{1}{a^2-x^2}, \frac{1}{x^2-a^2}$.
 (ii) $\frac{1}{\sqrt{a^2+x^2}}, \frac{1}{\sqrt{a^2-x^2}}, \frac{1}{\sqrt{x^2-a^2}}$
 (iii) $\sqrt{a^2+x^2}, \sqrt{x^2-a^2}, \sqrt{a^2-x^2}$

- 12 Evaluate the integrals of the type
 (i) $\int \frac{1}{a \pm b \sin \theta} d\theta$, $\int \frac{1}{a \pm b \cos \theta} d\theta$ and $\int \frac{1}{a \cos \theta \pm b \sin \theta \pm c} d\theta$
- 13
- 14 Evaluate integrals using integration by parts with examples
- 15 State the Bernoulli's rule for evaluating the integrals of the form $\int uv \, dx$, Evaluate the integrals of the form $\int e^x [f(x) + f'(x)] dx$.
- 16 State the fundamental theorem of integral calculus, Explain the concept of definite integral, calculate the definite integral over an interval,
- 17 State various properties of definite integrals
- 18 Evaluate simple problems on definite integrals using the above properties
- 19 Find the areas under plane curves and area enclosed between two curves using integration

DIFFERENTIAL EQUATIONS

- 20 Definition of differential equation, order and formation of differential equations
- 21 Solutions of differential equations, separation of variables, Homogeneous differential equations
- 22 Exact differential equations, Linear differential equations
- 23 Bernoulli differential equations

Coordinate Geometry

- 24 Write the different forms of a straight line-point slope form, two point form, intercept form, normal form and general form, Solve simple problems on the above forms.
- 25 Find distance of a point from a line, acute angle between two lines, intersection of two non parallel lines and distance between two parallel lines
- 26 Define locus of a point – circle and its equation
- 27 Find the equation of a circle given (i) center and radius, (ii) two ends of a diameter (iii) Centre and a point on the circumference
- 28 Find the equation of a circle given (i) three non collinear points and (ii) centre and tangent
- 29 Write the general equation of a circle and find the centre and radius
- 30 Write the equation of tangent and normal at a point on the circle, Solve the problems to find the equations of tangent and normal
- 31 Parabola, Ellipse and problems
- 32 Hyperbola and problems.

Main Text Book: A Text Book of Engineering Mathematics –II by MVSLDN Raju and Dr KV Ramana, VGS Book Links

Reference Books :

1. Vector Algebra, Shanti Narayan
2. Integral Calculus Vol - II, M. Pillai, Shanti Narayan
3. Co-ordinate Geometry Vol -I (2D), Shanti Narayan

II Year I Semester

ENGINEERING PROPERTIES AND PROCESSING OF SEEDS

DE-211

3 (1+2)

Objective: To enable the students to understand the principles and concepts of various properties of biological materials to design various processing equipments to insure food quality and safety. They are the basis for measuring instruments and sensors.

Theory

17. Physical characteristics of different food grains – Shape, size, roundness, sphericity, porosity and surface area.
18. Rheology – Basic concepts, ASTM standard definition of terms, and rheological properties – Force deformation behaviour, stress and strain behaviour.
19. Friction – Concept, effect of load sliding velocity, friction in agricultural materials – measurement – rolling resistance, angle of internal friction and angle of repose.
20. Flow of bulk granular materials – gravity flow in bins and hoppers, Aerodynamics of agricultural products – drag coefficient frictional drag and profile drag or pressure drag and terminal velocity.
21. Application of engineering properties in handling and processing machines and in storage structures. p
22. Seed processing – Introduction, services of seed processor, contaminants of seed, physical characteristics used to separate seed.
23. Basic flow pattern in seed processing – Preparing seed for processing, Scalper- two screen single air blast scalper, Reel screen scalper and Debearder.

24. Air screen cleaner – Installation, separating action, adjustments, Innovations to improving efficiency screen dams, screen brushes, oil cloth cover, Blanking the lower end of the top screen, combination screens, clay crushing rolls, hopper feed.
25. Length separations – Disc separator, operation and adjustments, Indented cylinder separator – Variables effect the separation, cylinder speed, size of indent, trough setting, tilt of the cylinder, Adjustable retarder.
26. &11 Gravity or weight separations – Specific gravity separator, the separating action, preparation of seed for processing, parts of the machine, Adjustment of feed rate, air control, end slope, side slope and deck oscillation speed- Destoner.
12. Aspirators and pneumatic separators – Fractionating aspirator, scalping aspirator, pneumatic separator.
13. Surface texture separations – Roll mill, separating action, finite for liquids separation, magnetic separator, buck horn separator, width and thickness separations (precision grader).
14. Shape and roundness separations – spiral separator, inclined draper belt, horizontal disc separator, colour separations – electronic colour sorter.
15. Seed blending – Types- Numerical
16. Importance of material handling devices –types of conveying equipments

Practicals

1. To find shape of food grains.
2. To find size of food grains.
3. To determine bulk density of grains
4. To determine angle of repose of grains.
5. To determine particle density, true density of solid grains

- 6 To determine porosity of solid grains.
- 7&8. Study of Rheological models – Kelvin and maxwell model.
9. Study of creep – stress relaxation.
- 10&11. To find the coefficients of friction (internal and external) of different crops.
- 12&13. To study separating behavior of grain sample in a vertical wind tunnel.
14. Field visit
- 15&16. To find the thermal conductivity of different powders.
- 17&18. To determine specific heat of some food grains.
- 19&20. To determine impurities and invisible stress cracks in grains.
21. Fractionating aspirators.
22. To determine milling quality of paddy.
23. Study of airscreen cleaner.
24. Study of disc separator and treaters.
25. Study of indented cylinder separator.
26. Study of specific gravity separator and Destoner.
27. Study of pneumatic separator.
28. Study of roll mill and precision grader.
29. Study of spiral separator and inclined draper.
30. Study of horizontal disc separator.
31. Study of electronic colour sorter.
32. Practical examination.

References

- 1 Physical properties of plant and animal materials Mohsenin NN 1986. Gordon and Breach Science publishers, New York.

- 2 Seed processing B.R. Greeg, A.G. Law, S.S. Viridi, and B.S. Balls. National Seed Corportions, US aid Publications.

- 3 Unit operations of Agricultural Produce KM Sahay and KK Singh

Objective: To impart knowledge and skills related to various aspects of crop processing like, cleaning, grading, sorting, drying milling including size reduction, extraction, distillation, centrifugal separation of various crops; cereals, pulses, oilseeds, etc., to minimize post harvest losses by value addition to the agricultural produce.

Theory

- 1 Scope and importance of crop processing – principles and methods of crop processing.
- 2 Cleaning and grading-definitions– principles
- 3 Theory of separation, types screens-screen openings, cyclone separator
- 4 Separator based on length, width, and shape of the grains
- 5 Drying- definitions- principles- psychrometry.
- 6 Moisture content measurement-Methods of drying –Classification-thin layer drying- deep bed drying-numericals on Moisture Content
- 7 Sun drying- Mechanical Drying- types of driers
- 8 Continuous flow driers- non-mixing column dryer- mixing (Baffle and L.S.U drier)
- 9 Size reduction - principles – laws – and theory – fineness modulus
- 10 Crushers, grinders, cutting machines
- 11 Study of hammer mill and attrition mill
- 12 Filtration equipment; plate and frame filter press , rotary filters, centrifugal filters and air filters
- 13 Importance of material handling devices – belt conveyor- capacity and power requirement
- 14 Screw conveyors – capacity and power requirement
- 15 Bucket elevator - capacity and power requirement-pneumatic conveyor
- 16 Grain storage structures- traditional structures-modern storage structures

Practicals

1. Introduction to Agricultural processing engineering Laboratory
2. Study of different types of screens
3. Measurement of different screens size, length & shape
4. Study of Cyclone separator
5. & 6. Tutorial on use of Psychrometry chart
7. Measurement of moisture content by direct method
8. Measurement of moisture content by indirect method
9. Performance evaluation of sack driers
10. Performance evaluation of Rotary driers
11. Performance evaluation of continuous flow non-mixing column driers
12. Performance evaluation of continuous flow Baffle Dryer
- 13&14. Performance evaluation of continuous flow mixing type driers (L.S.U)
15. Visit to local industry
- 16&17. Evaluation of size reduction/grinding equipment

- 18&19. Performance evaluation of hammer mill
- 20& 21. Performance evaluation of attrition mill
- 22 &23. Study of different mixing equipments (pasty material)
- 24& 25. Study of filtration equipments
- 26. Performance evaluation Belt conveyer
- 27. Performance evaluation Screw conveyer
- 28. Performance evaluation pneumatic conveyer
- 29. Performance evaluation Bucket elevator
- 30& 31. Performance evaluation grinding equipments
- 32. Practical Examination

References

- | | | |
|----|--|--|
| 1. | Transport Processes and Unit Operations | Geankoplis C J 1978. Aliyn and Bacon Inc., Newton, Massachusetts |
| 2. | Unit operations in Food Processing | Earle R L 1983. Pergamon Press, New York |
| 3. | Post Harvest Technology of Cereals, Pulses and Oil seeds | Chakravarthy A and De D S 1988. Oxford and IBH Publishing Co. Ltd., Calcutta |
| 4. | Unit Operations of Chemical Engineering | McCabe W L and Smith J C 1993. McGraw Hill Book Co., New Delhi |
| 5. | Unit Operations of Agricultural Processing | Sahay K M and Singh K K 1994. Vikas Publishing House PVt. Ltd., New Delhi |

AGRICULTURAL PROCESS ENGINEERING –II

DE 213

2 (1+1)

Objective: This course provides knowledge on threshing, winnowing, rice milling equipments and various process technologies for cereals, pulses, oilseeds to enable the students to acquire skills and to understand the various processing operations.

Theory

- 1 Threshing – Introduction, definition, types of threshing based on feeding, components
- 2 Types of threshing cylinders, principle of threshing, types of threshers based on design- manual operated and mechanical operated threshers.
- 3 Precaution and care in operation of a thresher, terminology of thresher testing, reasons for different troubles of thresher
- 4 Castor Sheller and Sun flower thresher - working principle
- 5 Winnowing – definition, principles of winnowing, types of winnowers, winnowing fans
- 6 Rice Milling – definition- Rice processing – modern rice milling flowchart, layout of modern rice mill.
- 7 Parboiling of paddy – Introduction, advantages, disadvantages, process variables, changes in chemical constituents,
- 8 Rice milling – Terminology. Milling equipment – Engelberg huller, centrifugal sheller
- 9 Rice milling – Under-runner disk husker, rubber roll sheller, husking action of rubber rolls
- 10 Rice milling – Paddy separator (Satake type, Schule type), whiteners (Schele type, satake type), rice grader
- 11 Wheat Milling – Introduction, dry milling, unit operations (selection, blending, cleaning, conditioning/tempering, grinding/milling),
- 12 Maize shelling and milling – Maize shellers (spring type, cylinder type)
- 13 Milling of pulses – introduction– cleaning, conditioning, dehusking and splitting, polishing of dhal and grading of dhal - red gram – process technology (methods) flow charts – equipment
- 14 Oilseed processing - Importance – Concepts – oil expression and oil extraction
- 15 Processing of oilseeds – mechanical expression devices – hydraulic press - flow chart, screw press – expeller – configuration, radial and axial pressure in a barrel
- 16 Groundnut stripping, decortications principle, separation of kernels from shells

Practicals

- 1 Determination of shelling efficiency of Groundnut thresher
- 2 Performance evaluation of power thresher,
- 3 Determination of shelling efficiency of Sunflower thresher
- 4 Determination of shelling efficiency of Castor Sheller
- 5 Determination of winnowing efficiency of Winnower
- 6 Performance evaluation of rubber roll Sheller
- 7 Visit to modern rice mill
- 8 Determination of oil content of rice bran
- 9 Visit to rice bran oil extraction plant
- 10 Determination of bulk density and porosity of grains
- 11 Measurement of physical properties of Wheat
- 12 Measurement of physical properties of Redgram
- 13 Determination of drying rate of grains
- 14 Performance evaluation of Maize Sheller
- 15 Performance evaluation of Groundnut decorticator
- 16 Practical examination

References

- 1 Rice Post Harvest Technology Araullo E V De Padna D B and Graham 1976. IDRC, Canada
- 2 Processing Equipment for Agricultural Products Hall C W and Davis C V 1979. AVI Publishing Co. Inc., Westport, Connecticut
- 3 Unit Operations of Agricultural Processing Sahay K M and Singh K K 1994. Vikas Publishing House Pvt. Ltd., New Delhi
- 4 Post Harvest Technology Cereals, Pulses and Oilseeds Chakravarthy A 1988. Oxford and IBH Publishing Co. Ltd. Calcutta
- 5 Seed Technology Agrawal R L 1989. Oxford and IBH Publishing Co. Ltd. New Delhi

AGRICULTURAL IMPLEMENTS

DE-241

3 (2+1)

Objective: Primary and secondary tillage implements, along with planting and Fertilizing implements will be discussed to get awareness on the mechanical part of the Agricultural Engineering.

Theory

1. Tillage – definition, objectives; classification and types of Tillage
2. Primary tillage Implements-classification indigenous plough
- 3&4. Animal drawn Implements and Tractor drawn Implements - Classification
5. Study of animal drawn and Tractor drawn mould board plough
6. Study of animal drawn and Tractor drawn disc plough
7. Study the methods of ploughing – Gathering and casting etc.
- 8&9. Terminology related to implements – draft, unit draft, side draft, centre of power, centre of resistance, pull, line of pull, field capacity and field efficiency.
10. Secondary tillage implements – classification
11. Study of animal drawn implements – guntake (Blade harrow), cultivator, spike tooth harrow and spring tyne harrow
12. Study of tractor drawn implements – cultivators – rigid and spring type cultivators
13. Study of Disc harrow – types, constructional details
14. Study of spike and spring tooth harrows – constructional details
- 15&16. Study of puddlers, power tiller and Tractor cage wheels puddling – objectives, types, constructional details.
17. Study of land development implements such as levellers, bund former, Ridger, constructional details.
18. Green manure trampler – constructional details
- 19&20. Planting and Fertilizing equipment – Methods of sowing, classification – Animal drawn and Tractor Drawn implements
- 21&22. Seed metering mechanism – types, constructional details - furrow openers-types.
23. Study of Animal drawn seed cum ferti drills
- 24&25. Study of Tractor drawn seed cum ferti drills.
26. Calibration of seed drill-seed uniformity tests.
27. Study of zero till seed drill and paddy seeder
28. Planters – Potato planter, sugarcane planter – construction details, functions and seed metering mechanism.
29. Study of Inter cultivation implements – manual, bullock and tractor drawn.
30. Study of wet land and dry land weeders – star weeder, push hoes etc.
- 31&32. Study of Harvesting implements – Groundnut and turmeric harvesters – principle of cutting of a crop, types of impact cutters.

Practicals

1. Study the performance of indigenous plough and mould board plough
2. Study the performance of Guntaka, cultivator and spike tooth harrow.
3. Study the constructional details and performance Testing of Mould board plough

4. Study the constructional details and performance Testing of Disc plough
5. Maintaince and adjustments of primary and secondary tillage implements.
6. Maintenance of primary and secondary tillage implements.
7. Study the constructional details of Disc harrows and cultivators.
- 8&9 Numerical problems related to tillage implements – Field capacity field efficiency and size of Tractor etc.
- 10 Study the constructional details of different types of seed drills.
11. Calibration and performance testing of seed cum fertilizer drill.
12. Operation and maintenance of seed cum fertilizer drills.
13. Numerical problems on seed cum fertilizer drills – calibration, cost of operation and field capacity etc.
14. Study the constructional details and performance testing of groundnut digger.
15. Study the constructional details and the performance testing of inter cultivation implements.
16. Final practical examination.

References

S.N	Title	Author & Publisher
1.	Elements of Agricultural Engineering	JagdishwarSahay Standard publshers distributors 1705-B, NAISARAK P.Box No.1066, Newdelhi-6
2.	Principles of Agricultural Engineering- Volume I	A.M. Michael & T.P. Ojha Jain Brothers, Ratnada Road Jodhpur-342001
3.	Agricultural Engineering	O.P. Singhal Aman Publishing House Meerut-250002, U.P.

SOIL AND WATER CONSERVATION ENGINEERING AND PRACTICES

DE-251

2(1+1)

Objective:To acquaint and equip the students with the subject of soil erosion, erosion control and water conservation measures.

Theory

1. Hydrologic cycle – Precipitation – Formation types and forms of precipitation, Measurement of rainfall and rainfall intensity.
2. Average depth of rainfall over an area – Arithmetic mean, Thiessen polygon and Isohyetal methods – Intensity, duration and return period relation.
3. Soil erosion – geological erosion, accelerated erosion – Agents of erosion – erosion by water, erosion by wind, and erosion by gravity.
4. Soil erosion by water – Various types of erosion by water – raindrop splash, sheet, rill, gully and stream channel erosion, Wind erosion – process description.
5. Rainfall – runoff relation – Volume and peak rate of runoff – Rational method, Hydrologic soil cover complex method – Measurement of runoff – Velocity area method, stage level recorder, hydrograph.
6. Computation of velocity of water in open channels – Manning’s formula, cross section and hydraulic radius of various channel shapes – Permissible velocities.
7. Estimation of soil loss – Universal soil loss equation – Erosion control measures – agronomic measures, importance of contour farming.
8. Level and channel terraces – Design and construction of contour bunds.
9. Level and channel terraces – Design and construction of graded bunds.
- 10 Design of grassed waterways and diversion drains
- .
11. Conservation structures on hill slopes- bench terraces – Design of bench terraces.
- 12 Conservation structures on hill slopes – Contour trenches and contour stone walls.
- .
- 13 Grade stabilization structures – Design of drop spillways, drop-inlet spillways and chute spillways.
- .
- 14 Water harvesting – Dugout and embankment type ponds – Design and construction of embankments for reservoirs.
- .
- 15 Land capability classification.
- .
- 16 Watershed – Definition, delineation, management of agricultural watersheds – brief coverage.
- .

Practicals

1. Hydrologic cycle.
2. Problems on average depth of rainfall.
3. Problems on return period, intensity and duration.
4. Problems on rational formula.
5. Problems on hydrologic soil cover complex method.
6. Problems on contour bunds.
7. Problems on graded bunds.
8. Problems on bench terraces.
9. Problems on contour trenches and stone walls.
10. Visit to Research Farm.
11. Dugout ponds – computation of storage.
12. Embankment ponds – computation of earthwork, brief coverage on stability of embankment.
13. Land capability classification.
- 14&15. Design procedures for drop, drop inlet and chute spillways.
16. Visit to soil conservation works.

References

1. Hydrology and Soil Conservation Engineering
Ghanshyam Das,
PHI Learning Pvt, LTD, New Delhi.
2. Land and Water Management Engineering
V.V.N. Murthy and Madan K. Jha,
Kalyani Publishers, New Delhi.
Manual on Soil and Water
USDA, Oxford Book Company.
3. Conservation
Watershed Management – Guidelines
for Indian Conditions
E M Tideman,
Omega Scientific Publishers, New Delhi.
- 4.

WORKSHOP TECHNOLOGY - III

DE-261

3 (1+2)

Objective: To impart knowledge and skills to students in manufacturing processes of machines, tools and equipment and hands on training on various aspects of production lathe, milling, shaping and planning for encouraging entrepreneur development for engineering enterprises in general and farm mechanization in particular operations.

Theory

1. Production lathes-Introduction, Difference between centre lathe and turret lathe, Types of turret lathes – Capstan lathe, saddle type lathe.
2. Work holding and tool holding devices used in turret lathe.
3. Capstan and turret lathe operations.
4. Automatic machine lathes-Automatic and semi automatic lathe, Difference between automatic and semi automatic lathe.
5. Classification of semi automatic lathes - Single spindle lathe, single spindle automatic screw machine, swiss type automatic screw machine, multi spindle lathes.
6. Shaping machine-Introduction, working principle of shaper.
7. Types of shapers-Horizontal shaper, vertical shaper and travelling head shaper, construction features, size of shaper.
8. Shaper driving mechanism-Crank and slotted lever mechanism, whit worth quick return mechanism, principle of whit worth mechanism.
9. Shaper operations and shaper tools.
10. Planning machines - Working principle, types of planers, constructional features of a standard planer, feed mechanism.
11. Work holding devices used in planer, planer operations.
12. Introduction to milling machine and types of milling machines.
- 13&14
4
15&16
6
- Constructional details of column and knee types universal milling machine and principles of operation.
- Main operations of milling machine.

Practicals

- 1&2 Study of turret lathe.
- 3,4&5 Study of automatic and semi automatic lathe.
6. Study of shaper machine.
- 7&8 Changing a round rod into square section.
- 9&10 Preparing V block.
- 11&12 Study of different types of planers.
13. Study of feed mechanism of planer.
- 14&15. Construction features of planer.
- 16&17. Study of different operations of planning.
18. Study of standard planer.
19. Demonstration of important operations on a milling machine.

- 20&21. Plane milling.
- 22&23. Study of column type universal milling machine.
- 24&25. Study of knee type milling machine.
- 26&27. Study of single spindle lathe.
- 28&29. Study of Swiss type lathe and screw type lathe.
- 30. Study of multi-spindle lathe.
- 31. Different operations on production lathe.
- 32. Practical test.

References

S.N	Title	Author & Publisher
1.	Manufacturing Technology – I&II	Pakirappa and V.N. Kumar, 2 nd Revised and updated edition Radiant Publishing House.
2.	Workshop Technology Part-2	Chapman W.A.J. 4 th edition, Elsevier Butterworth-Heinemann Publications
3.	Elements of Workshop Technology (Vol. I & II)	HazraChoudari SK and Bose SK 1982, media promoters and publishers Pvt. Ltd., Mumbai.
4.	A course in workshop Technology (Vol. I & II)	Raghuwamsi BS 1996. DhanpatRai and Sons, 1682 NaiDarak, New Delhi.

GREENHOUSE TECHNOLOGY

DE-262

2 (1+1)

Objective: Constructional and operational details of greenhouses will lead the students to grow crops with profits and also to use the greenhouses for offseason usage and also to manage them commercially.

Theory

1. Greenhouses – Introduction, history, definition, greenhouse effect, advantages of greenhouses.
2. Classification of greenhouses – Greenhouse types based on shape, utility, construction and covering material.
3. Plant response to greenhouse environment – light, temperature, relative humidity, ventilation and carbon dioxide.
4. Environmental requirement for crops – Temperature requirement of horticultural crops, light requirement of crops and lighting control methods, Greenhouse shading methods, Greenhouse supplemental lighting systems.
5. Environmental control inside greenhouse – Manual controlling, thermostats, microprocessors and computerized control systems.
6. Natural and forced ventilation summer and winter cooling systems, carbon dioxide enrichment method.
7. Planning of greenhouse facility – Site selection and orientation, structural design, covering materials.
8. Materials used for construction of greenhouses – Wood, Galvanised iron pipe and glass.
9. Greenhouse covering materials – Polyethylene film, PVC, Polyester, Tefzel T² film, Polyvinyl chloride rigid panel, fiber glass reinforced plastic rigid panel, Acrylic and polycarbonate rigid panel.
10. Design criteria and construction details of glass and pipe framed greenhouses – Material requirement and procedure for erection.
11. Greenhouse heating and energy storage – Type of heat loss, heating systems, heat distribution systems, water and rock storage, heat conservation practice.
12. Greenhouse irrigation systems – Rules of watering, Hand Watering, perimeter watering, overhead sprinklers, Boom watering, Drip irrigation.
13. Greenhouse utilization in off season – Drying of agricultural produce.

14. Protected Agriculture Techniques – row covers.
15. Economics of greenhouse production – Capital requirements.
16. Economics of production and conditions influencing returns.

Practical

1. Study of covering and construction materials for greenhouses.
2. Measurement of environmental parameters inside greenhouse.
3. Study of construction of pipe framed greenhouses.
4. Calculation of ventilation rates – Rate of air exchange in active summer cooling system – Problems on fan and pad cooling system.
5. Rate of air exchange in active winter cooling systems – problems on convection tube cooling.
- 6&7 Heat requirement calculation – Heat requirement of A-frame greenhouse and Heat requirement of quonset type greenhouse – problems.
8. Study of drip irrigation system in greenhouse.
9. Estimation of drying rate of agricultural produce inside greenhouse.
10. Study of different protected Agriculture Techniques.
11. Exercise on cost economics of greenhouses.
12. Field visit to glass greenhouses.
13. Field visit to polyhouses.
14. Field visit to semi control greenhouses.
15. Field visit to fully controlled greenhouses.
16. Practical examination.

References

1. Greenhouse Technology and Management RadhaManohar K and Igathinathane C 2000, B.S. Publication, Hyderabad
2. Greenhouse Technology Tiwari G.N and Goyal R.K. 1998, Narosa Publishing House, New Delhi
3. The complete Book of Greenhouse Gardening Cavendish M 1991, Marshal cavandish Books Ltd , London

SURVEYING AND LEVELING-II

DE-263

2 (1+1)

Objective: To enable the students to develop skills for taking up land grading and leveling of any agricultural field by plane, profile, contour adjustment, estimating the cuts and fills earthwork required to take up the work. Further to enable the students thorough with theodolite traversing, Calculation of volumes, Tacheometric surveying. To impart knowledge on electronic survey instruments for speedy and accurate survey.

Theory

1. **Contour:** Methods of contour, Interpolation of contours, tracing contour gradient marking alignments of road, Railway / canal on a contour map.
2. Capacity of reservoir using contour maps, Problems, Measurement of drainage basin area and land levelling designs.
3. **Theodolite survey:** Introduction, classification, Basic definitions.
4. Temporary adjustment of a theodolite.
5. Fundamental lines of theodolite and conditions of adjustment, Reading of vernier scales.
6. Traversing with theodolite, selection of traverse stations, Types of errors in theodolite surveying.
7. **Trigonometric levelling:** Reading of vertical angles, Measurement of vertical angles between two points A & B, Index error, Importance of reading with both faces.
8. Derivations for finding elevation and distances of the object when the object base is accessible and when the object base is inaccessible.
9. **Tacheometric surveying:** Introduction, purpose, instruments used in tacheometric systems.
10. Distance and elevation formula for horizontal line of sight in tacheometer survey, Different of tacheometric constants.
11. **Curves:** Introduction, classification, degree and radians of the curves.
12. Elements of curves, setting out circular curves by chain and Tape.
13. **Electronic survey instruments:** Principle and uses of EDM, Distomate.
14. Electronic theodolite
15. Global Position System (GPS), Digital planimeter.
16. Total station.

Practical

1. Land levelling design by plane method
2. Land levelling design by profile method
3. Land levelling design by plane inspection and contour adjustment methods.
4. Calculation of earth work volumes and reservoir capacity from contour plans.
5. Grid survey for developing a contour map.
6. Drawing of contour map (Grid method).
7. Study of transit theodolite.
8. Temporary adjustments of theodolite.
9. Measurement of horizontal angle by general method.
10. Measurement of horizontal angle by repetition method.
11. Measurement of horizontal angle by reiteration method.
12. Laying out angles in the field.
13. Traversing by the method of included angle.
14. Traversing by the method of deflection angles.
15. Theodolite traverse computations.
16. Plotting of traverse by independent co-ordinates method.
17. Calculation of areas of traverse method.
18. Reading vertical angles with transit theodolite.
19. Measurement of the height of an electrical pole.
20. Finding elevation and distance of an object.
21. Numerical problems on theodolite traverse.
22. Determination of tachometric constants.
23. Problems on tachometric survey.
24. Setting out a curve with chain/tape.
25. Study of digital theodolite.
26. Measurement of horizontal and vertical angles with digital theodolite.
27. Study and Practice with Global Position System in field.
28. Study of digital planimeter.
29. Measurement of a plan area using digital planimeter.
30. Study of total station.
31. Measurements with total station (distance, area and volume).
32. Final practical examination.

References

1. A text book of surveying-II H. Krishna Sarma, Radiant publishing houses, Hyd-95
2. Surveying – II A.KAMALA, Radiant – Book house, # 4-5-62, Women's College Road, Beside Andhra Bank, Kothi, Hyderabad-95
3. Surveying for civil Engineers S.MahaboobBasha, Anuradha Publications, Kumbakonam, Chennai
4. Surveying (McGrawhill) N. N. BASAK, Tata McGraw – Hill Publishing Company Ltd, 7 West Patel Nagar, New Delhi - 110008
5. Land and Water Management R. Suresh 2008. Standard Publishers Distributors,

6. Irrigation theory and practice
Delhi.
Michael A M 1992. Vikash publishing House Pvt. Ltd,
New Delhi.

II Year II Semester

Objective: This course provides knowledge on various process Technologies for cereals, pulses, oilseeds and their conveying and elevating equipment to enable the students to acquire skills and to understand the various processing operations

Theory

- 1 Threshing – Introduction, definition, types of threshing based on feeding, components
- 2 Types of threshing cylinders, principle of threshing, types of threshers based on design- manual operated and mechanical operated threshers.
- 3 Precaution and care in operation of a thresher, terminology of thresher testing, reasons for different troubles of thresher
- 4 Castor Sheller and Sun flower thresher - working principle
- 5 Winnowing – definition, principles of winnowing, types of winnowers, winnowing fans
- 6 Rice Milling – definition- Rice processing – modern rice milling flowchart, layout of modern rice mill.
- 7 Parboiling of paddy – Introduction, advantages, disadvantages, process variables, changes in chemical constituents,
- 8 Rice milling –Terminology. Milling equipment – Engelberg huller, centrifugal sheller
- 9 Rice milling – Under-runner disk husker, rubber roll sheller, husking action of rubber rolls
- 10 Rice milling – Paddy separator (Satake type, Schule type), whiteners (Schele type, satake type), rice grader
- 11 Wheat Milling – Introduction, dry milling, unit operations (selection, blending, cleaning, conditioning/tempering, grinding/milling),
- 12 Maize shelling and milling – Maize shellers (spring type, cylinder type)
- 13 Milling of pulses – introduction– cleaning, conditioning, dehusking and splitting, polishing of dhal and grading of dhal - red gram – process technology (methods) flow charts – equipment
- 14 Oilseed processing - Importance – Concepts – oil expression and oil extraction
- 15 Processing of oilseeds – mechanical expression devices – hydraulic press - flow chart, screw press – expeller – configuration, radial and axial pressure in a barrel
- 16 Groundnut stripping, decortication principle, separation of kernels from shells

Practical

- 1 Determination of shelling efficiency of Groundnut thresher
- 2 Performance evaluation of power thresher,
- 3 Determination of shelling efficiency of Sunflower thresher

- 4 Determination of shelling efficiency of Castor Sheller
- 5 Determination of winnowing efficiency of Winnower
- 6 Performance evaluation of rubber roll Sheller
- 7 Visit to modern rice mill
- 8 Determination of oil content of rice bran
- 9 Visit to rice bran oil extraction plant
- 10 Determination of bulk density and porosity of grains
- 11 Measurement of physical properties of Wheat
- 12 Measurement of physical properties of Redgram
- 13 Determination of drying rate of grains
- 14 Performance evaluation of Maize Sheller
- 15 Performance evaluation of Groundnut decorticator
- 16 Practical examination

References

- 1 Rice Post Harvest Technology Araullo E V De Padna D B and Graham 1976. IDRC, Canada
- 2 Processing Equipment for Agricultural Products Hall C W and Davis C V 1979. AVI Publishing Co. Inc., Westport, Connecticut
- 3 Unit Operations of Agricultural Processing Sahay K M and Singh K K 1994. Vikas Publishing House Pvt. Ltd., New Delhi
- 4 Post Harvest Technology Cereals, Pulses and Oilseeds Chakravarthy A 1988. Oxford and IBH Publishing Co. Ltd. Calcutta
- 5 Seed Technology Agrawal R L 1989. Oxford and IBH Publishing Co. Ltd. New Delhi

Estimating and Costing of Farm Buildings and Structures

DE-221

2(1+1)

Objective: To enable the student to understand the principles and acquire the knowledge on various aspects in farmstead design and construction and also design and construction of farm structures like dairy barns, barn for poultry, compost pit, fodder silos, farm fencing , implement shed, rural grain storage structures, silos, rural roads and septic tanks

Theory

- 1 Farmstead - definition and constitution – various types of buildings and structures in a farmstead.
- 2 Planning and layout of farmstead – location and arrangement of various farm buildings – factors effecting planning of farmstead
- 3 Design of animal shelters – dairy barns – stanchion barn, loose housing barn and milking parlour - equipment in dairy barns
- 4 Design of animal shelters – Poultry housing – Deep litter system, cage system and wire mesh floor system – brooder houses – equipment in poultry houses
- 5 Design of animal shelters – Sheep and goat housing – sheep and goat pens
- 6 Construction of farm buildings – foundation – basis for width of foundation – bearing pressure of soils –material used for foundation; Super structure – walls and columns, bearing and non-bearing walls – materials used for construction of walls and columns
- 7 Construction of farm buildings – roof – types of roofs , roof support structures - trusses, rafters, purlins – materials used for trusses - RCC roofs and beams ; flooring – requirements of flooring, types of floors
- 8 Building materials – cement – constitution of cement , properties; Lime – preparation of lime for construction – calcination and hydration, quick lime, slaked lime; sand – properties, importance of sand in construction
- 9 Building materials - concrete – constitution – plain and reinforced cement concrete – aggregates - Computation of quantities of constituents using Fuller’s formula –curing of concrete; use of steel as building material
- 10 Bricks – making of bricks – quality of bricks – treatment of bricks before using in construction; Timber - various types of timber used in building construction, properties and seasoning of timber,
- 11 Quantity survey – Estimation of quantities of various items of construction from a drawing of a structure – center line method – detailed estimate format
- 12 Quantity survey – costing of various items of construction – analysis of rates – requirement of material and labour for various items of construction - abstract estimate format
- 13 Design of storage structures – Estimating requirement of silage – process of ensiling – various types of silos – tower, pit and trench silos – design of silo
- 14 Design of storage structures – grain storage – requirements of storage of grain – types of storage – bulk storage and bag storage – design of godown based on the size of bags, material to be stored, spacing of stacks etc and structure of grain bins

- 15 Government Schemes on promotion of dairy and poultry enterprises, rural godowns and cold storages; Farm machinery sheds – components of machinery sheds and requirement and constitution of farm workshop based on size of the farming enterprise
- 16 Farm fencing, roads and threshing yard – various types of fences – wire fence and power fence – estimating cost of fencing; farm roads- requirement and types of roads – water bound macadam and tar bound macadam – construction of roads. Design and construction of threshing yard

Practical

- 1 Knowledge on requirement of building drawing – making a sketch based on requirements of space, ventilation etc.
- 2 Drawing to scale of the building – plan, elevation and sectional view depicting details of foundation, walls, roof etc.
- 3 Design of fencing - working out cost of fence for a given area
- 4 Design of feed storage structure - silo
- 5 Study of stanchion barn
- 6 Study of poultry housing
- 7 Estimating quantities of items of construction – problems on centerline method
- 8 Estimating quantities of items of construction – problems on centerline method
- 9 Preparation of detailed estimate for a farm building
- 10 Preparation of detailed estimate for a farm building
- 11 Preparation of abstract estimate – Analyses of rates - working out rates of various items of construction
- 12 Preparation of abstract estimate – Analyses of rates - working out rates of various items of construction
- 13 Understanding of grain store structure – problems on design of godown based on bag storage
- 14 Understanding grain storage structure – study of bulk storage – grain bins and grain silos
- 15 Visit to and study of dairy farm / poultry farm
- 16 Visit to and study of grain storage structures

References

- 1 Principles of Agricultural Engineering Volume I A M Michael and T P Ojha; (2004), Jain Brothers , New Delhi
- 2 Agricultural Buildings and Structures Whitaker J ; Reston, (2002), Publishing Home, Reston, Virginia
- 3 Farm Buildings Design Newbaver L W and Walker H B, (2003), Prentice Hall Inc., New Jersey

Principles of Electrical Engineering and Farm Electricity**DE-222 2 (1+1)****Objective:** To impart knowledge to students on the types of electrical machines and motors and generators and power utilization techniques for efficient energy utilization**Theory**

1. Introduction about course; conductor, insulator, semiconductor
2. Terminology related to electrical engineering-Resistance, current, conductance, capacitance, specific resistance- etc
3. Ohm's law and limitations of ohm's law
4. Resistance in series, parallel and series and parallel combination
5. Division of current in parallel circuits
6. Electric power and Energy-Definitions of fundamental units
7. Conducting materials - low resistivity and high resistivity and its properties – properties and applications of copper and Aluminium.
- 8&9. Heating effects of Electric current – Filament or Incandescent Lamp
Fluorescent lamp – Electric kettle – Electric Iron – Space heater
- 10&11. Capacitance –capacitance equation – Types of capacitors – Uses of capacitors-
 1. Capacitors in series and parallel
 2. Insulating materials – Properties – Classifications
 3. Farm Electricity – Use of electricity – Generation of Electricity
 4. Generator, motor and alternator
 5. Selection, Installation and maintenance of electric motors
 6. Transformer – Transmission and Distribution of electric power

Practical

- 1&2. Tutorial on Ohm's law, Resistance in series, parallel and combination
 3. Construction of two lights in series by one switch (PVC wiring)
 4. Construction of two lights in parallel by two switches (PVC wiring)
 5. Tutorial on Division of current in parallel circuits
- 6&7. Tutorial on electric work power and energy
- 8&9. Tutorial on capacitance in series and parallel
 10. Study the constructional details of D.C Generator
 11. Study the constructional details of Dynamo
 12. Study the installation and maintenance of electric motor
 13. Study the hostel wiring
 14. Study the godown wiring
 15. Study the Fluorescent lamp (Tube light) wiring
 16. Practical examination

References

1. Basic Electrical Engineering M. Raja Lingam, Radiant Publishing house, 4-5-64, Book Basement, Koti, Hyderabad -95
2. Elements of Agricultural Engineering Dr. JagdishwarSahay, Standard Publishers Distributors, 1705-B NAISARAK, PO. Box. No. 1066, Delhi -06
3. Basic Electrical Engineering I. Ravi Kumar, Radiant Publishing house, 4-5-64, Book Basement, Koti, Hyderabad -95

Farm Power, Solar and Wind Energy

DE-231

2 (1+1)

Objective: Concepts of utilization of non-conventional energy resources such as gasifiers, biogas, solar, wind, etc. with theoretical background will be taught to effectively utilize the energy for agricultural operations and agricultural processing activities

Theory

1. Farm power – Different Sources of Farm Power – Advantages and Disadvantages.
2. Renewable Sources of Energy – Introduction – Need of Renewable Sources of Energy – Types of Renewable Sources of Energy.
3. Solar Energy – Introduction – Solar Radiation – Solar Constant – Measurement of Solar Radiation.
4. Solar Energy Collection – Principle of conversion of solar radiation into heat – Solar collectors – Non concentrating types – Solar liquid flat plate collector – Solar air flat plate collector.
5. Concentrating collectors – Line focussing collectors – Point focussing collectors – Flat plate collector with adjustable mirrors – Advantages and limitations of concentrating collectors.
6. Solar energy storage – Methods of storing solar energy – Thermal energy storage – Sensible heat storage – Latent heat storage – Thermo chemical energy storage – Solar Pond – Working principle and description of solar pond – application of solar pond.
7. Solar Energy applications – Solar water heater – Natural circulation type – Forced circulation type – Analysis of collector and its problems.
8. Solar power generation – Low Temperature plant working on Rankine cycle – Solar space cooling – Solar Absorption Refrigeration system.
9. Solar space heating – Passive system – Active system.
10. Solar still (solar Distillation) Solar Dryer – Cabinet type dryer and convective type dryer.
11. Solar cooker – Box type cooker – Advantages and limitations.

- 12 Photo voltaic conversion – Solar cell – Working principle – Applications – Advantages and limitations – Conversion efficiency and current voltage characteristics of a solar cell.
- 13 Photo voltaic cell for power generation – Solar photovoltaic water pumping system – Solar lantern – Solar street light – Solar fencing.
- 14 Wind energy – Introduction – Classification – Horizontal axis wind mill – Wind mill for water pumping (wind pump) – Wind mill for Electric power generation (wind turbine)
- 15 Vertical axis wind mill – Forces acting on the Blade
- 16 Wind Data and Energy Estimation – Site selection considerations – Power Coefficient – Electrical generation dry wind mill

Practical

1. The study of the instruments Pyrhelio meter and Pyranometer for the measurement of solar radiation.
2. The study of different types of solar non concentrating flat plate collectors-liquid collector and Air collector.
3. The study different types of solar concentrating collectors – Focusing and non-focusing type.
4. The study of solar pond and its applications.
5. The study of solar water heater – Natural circulation type and Forced circulation type.
6. The study of solar power generation – low temperature plant working on Rankine cycle.
7. The study of solar space cooling – Solar Absorption Refrigeration system.
8. The study of solar space heating – Passive system and Active system.
9. The study of solar still.
10. The study of solar dryers – Cabinet type dryer and convective type dryer.
11. The study of solar cooker.
12. The study of solar PV power generation and water pumping system.
13. The study of solar street light, solar lantern and solar fencing.
14. The study of Horizontal Axis wind mill for water pumping and power generation.
15. The study of vertical axis wind mills for power generations and water pumping.
16. Practical examination.

References

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|---|--|---|
| 1 | Energy sources and power plant Engineering | Pakirappa and V.Naresh Second Edition (2014), Radiant Publishing House, Hyderabad |
| 2 | Biotechnology and other Alternate Technology | Chakravarthy A (1989), Oxford and IBH Publishing Co. Ltd., New Delhi |
| 3 | Renewable Energy Sources and Conversion Technology | Bansal N K, Tata McGraw Hill (1990), Publishing Co. Ltd., New Delhi |

4	Solar Energy Utilization	Rai G.D. (1984) Khanna Publishers, New Delhi
5	Solar Energy	Sukatme SP, Tata McGraw Hill (1985)Publishing CO. Ltd., New Delhi
6	Non-Conventional Energy Sources	Rai, G.D. (1984) Khanna Publishers, New Delhi
7.	Energy Technology	Rao,S and Parulekar, B.B. Khanna Publishers New Delhi.
8.	Non Conventional Energy Resources	Dubey, S.K. and Bhargava S.K. DhanpatRai and Co. Delhi.

Agricultural Machinery

DE-242

3 (2+1)

Objective: To enable the students to understand the basic principles of cutting mechanisms and to know the various harvesting machines are available. To know the working and functions of various machine parts of mowers, reapers, windrowers, forage harvesters, threshers, corn harvesters, cotton strippers, cotton pickers, groundnut and potato harvesters, combines, sugarcane harvesters. Students can also understanding the importance of testing and evaluation of agricultural machines and different standard codes available for testing in India.

Theory

1. Transplanting machinery – Types – Functions – Principle of working
2. Paddy transplanters – Types – constructional details and working
3. Grain harvesting – Principles of cutting- Impact cutters – types- Harvesting – History of development, manual harvesting, sickle and its classification -
- 4&5 Mowers- Types – constructional details and working principles – Alignment – Registration
6. Reaper – Types – Construction details and working principles – Reaper binder working principle – factor affecting the performance of reaper
7. Combine harvester – Types – Functions – Advantages

8. Combine harvester – Constructional details working principles of paddy combine harvester
9. Corn harvesting equipment – harvesting and development – Types – Working principle
- 10&11 Root crop harvesting equipment – Groundnut Harvesting – Groundnut digger – shaker and windrowers – Constructional details and working principle
12. Potato harvesting machinery- Harvesting methods and equipment.
13. Groundnut pod stripper – Groundnut thresher – Constructional details – Working principles.
14. Cotton Harvesting machinery – Types of cotton strippers – Factors effecting – Performance of cotton strippers.
15. Sugar cane Harvesting Machinery – Self propelled cane Harvester – Working principles
- 16 Fruit Harvesters – Harvesting methods – Types – Working principle
- 16&17 Chaff cutters – Types – Flywheel type chaff cutter – Constructional details and working principles and related problems
18. Power operated chaff cutter – Constructional details and working principle – Terminology – Related to chaff cutter
19. Plant protection machinery – Sprayers – Applications – Functions – Methods of applying liquid chemicals
21. Sprayers – Classification of sprayers – Non-pressure type – Low pressure type – High pressure type – Components
- 22&23 Manually operated sprayers – Types, Hand operated sprayer – Knapsack sprayer, compression sprayer, Foot sprayer Rocker sprayer – Constructional details and working principle.
24. Power operated sprayers – Mist Blower – High pressure motorised knapsack sprayer – Constructional details and working principle
25. Tractor mounted Boom sprayer – Constructional details and working principle
26. Types of Nozzles – Working principle – Constructional details
- 27&28 Dusters – Principle of dusting – Classification of dusters – Hand operated dusters – Power operated dusters – Constructional details and working principle
29. Calibration of sprayers – Calibration of Nozzle flow rate – Methods to measure the uniformity of spray.
30. Testing of Agricultural machinery – Procedure – Types of testing system – National testing – Proto type testing
31. Confidential testing – Commercial testing, batch test, series test.
32. Test codes of different Agricultural Implements and Machinery

Practical

1. Study the performance constructional details of mowers
2. Study the performance of combine harvester (Paddy)
3. Study the performance of paddy reaper and reaper binder

4. Repair and maintenance of mowers
5. Repair and maintenance of reapers
6. Study the performance of paddy transplanter
7. Operation, repair, maintenance and safety precautions of chaff cutters
8. Study the performance of Groundnut digger shaker and windrower
9. Operation, Repair, maintenance and safety precaution of sprayer.
10. Operation, Repair, Maintenance and safety precautions and dusting machinery
11. Tutorial on chaff cutters
12. Tutorial on sprayers and dusters
13. Study the performance and repair and maintenance of post hole digger
14. Operation, repair and maintenance of self propelled sugar cane harvester
15. Study the performance of groundnut pod stripper and thresher
16. Final practical examination

References

1. Elements of Agricultural Engineering. JagadiswarSahay (1992), Agro Book Agency, Patna
2. Principles of Agricultural Engineering (Vol. I). Michal, .M. and Ojha, T.P. (2008), Jain Brothers, New Delhi.
3. Principles of Farm Machinery Kepner, R.A., Roy Bainer and Barger, E.L. (1987), CBS Publishers & Distributors, Delhi
4. Farm machinery and equipment Smith H.P Tata McGraw-Hill Publishing Co.Ltd, New Delhi

Objective: To impart the knowledge and skills on various concepts like duty, delta, soil-plant-water relationship, irrigation scheduling and to enable the students to design and execute proper surface and sub-surface drainage systems in salt affected and water logged areas in agricultural lands and to improve land productivity by controlling the twin problems of water logging and salinity and thereby to enhance the crop production and productivity

Theory

- 1 Irrigation - Introduction, Necessity and Development of irrigation in India.
- 2 Sources of irrigation water - Surface water sources, Ground water sources - Present status of development and utilization of different water sources of the country.
- 3 Irrigation applications - Surface irrigation methods, border, check basin
- 4 Furrow irrigation and sub surface irrigation
- 5 Sprinkler irrigation - advantages, limitations, types, components and functions
- 6 Sprinkler irrigation- Installation, operation and maintenance
- 7 Drip irrigation- advantages, limitations, types, components and functions
- 8 Drip irrigation- Installation, operation and maintenance
9. Drainage - Introduction, drainage problem of the state and country, causes and effect of water logging, prevention and control of water logging.
- 10 Objectives of drainage- Need, purpose and benefits, Drainage requirements of various crops.
- 11 Interrelationship of irrigation and drainage
- 12 Types of drainage systems, Surface drainage, sub surface drainage, vertical drainage
- 13 Surface drainage – Factors and drainage coefficient, different types and design considerations
- 14 Design of surface drainage system and components
- 15 Sub surface drainage system – different types and design considerations
- 16 Design of sub surface drainage system and components

Practical

1. Design of irrigation open channel
2. Design of underground pipe line system
3. Study of border and check basin irrigation systems
4. Study of furrow irrigation system
5. Demonstration of volumetric method and float method of water measurement
6. Study of determination of evapotranspiration by water balance method and lysimetry method
7. Study of determination of evapotranspiration by empirical methods : thornthwaite, Penman, Blaney-criddle formula
8. Study of crop requirements
9. Determination of evapotranspiration by empirical methods : radiation and pan evaporation method

10. Design of sprinkler irrigation system, selection and spacing of sprinklers
11. Study the different components of sprinkler irrigation system
12. Study of demonstration of uniform coefficient of sprinkler irrigation system
13. Selection of pumps, power units and cost estimation of sprinkler irrigation system
14. Study of installation of sprinkler irrigation system
15. Cost estimation of sprinkler irrigation system
16. Design of drip irrigation system
17. Study the different components of drip irrigation system
18. Cost estimation of drip irrigation system
19. Study of operation and trouble shooting of sprinkler irrigation
20. Study of operation and trouble shooting of drip irrigation
21. Study of installation of drip irrigation system
22. Study of surface drainage system for flat areas
23. Study of surface drainage system for slopping areas
24. Problems on design of surface drainage system
25. Study of Hooghoudts equation for spacing of drains
26. Problems on design of sub surface drainage system
27. Study the irrigation project management
28. Visit to surface and subsurface irrigation systems
29. Visit to drainage project
30. Visit to drip and sprinkler irrigation systems
31. Conducting of mock tests
32. Practical examination.

References

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|--|--|
| 1. Irrigation - Theory and Practice | A. M. Michael, 2008, Vikas publishing Private limited, New Delhi. |
| 2. Agriculture drainage - Principles and Practices | U. S. Kadam, R. T. Thokal, Sunil Gorantiwar and A. G. Power, 2008, Westville Publishing House, New Delhi |
| 3. Irrigation and drainage | D. Lenka, 2005, Kalyani Publishers, Ludhiana, |
| 4. Land and Water Management engineering | V.V.N. Murthy and Madan. K. Jha, Kalyani Publishers, Ludhiana |

DE-254

Hydrology and Management of Watersheds

2(1+1)

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 wells, 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.

Theory

1. Hydrology – definition, hydrologic cycle and its components, forms and types of formation of precipitation – Characteristics of rainfall in India (types of monsoon)
2. Measurement of precipitation – Recording and Non-recording rain gauges – Installation of rain gauges– Rain gauge network density for different topographic conditions.
3. Probability analysis of rainfall – Return period – Plotting position by Weibull’s method, rainfall events at different probability levels (20,40,60,80%)
4. Runoff – Definition – Components of runoff – direct runoff and base flow, over land flow and interflows, pictorial representation of different routes of runoff.
5. Runoff characteristics of streams – perennial, intermittent and ephemeral streams, measurement of stream flows, catchment characteristics.
6. Measurement of stage and velocities; area – velocity method; staff gauge, point gauge, automatic stage recorders, current meters (Horizontal and vertical axis), calibration.
7. Hydrographs – Definition and components, factors affecting flood hydrographs, hydrograph separation for simple and complex storms.
8. Unit hydrograph – Concept and definition and the basic assumptions (linear response and time invariance)
9. Application of Hydrology – flood control, regulation and mitigation, land and water management, watershed management.
10. Watershed - identification and delineation; Physiographic characteristics of watershed – Area, coefficient of compactness, slope, shape factor, Drainage density, Relief, Ruggedness and hypsometric curve.
11. History of watershed management in India – Damodar Valley Corporation – Watershed projects by ICAR and Agricultural Universities- HanumanthRao Committee guidelines
12. History of watershed management in India – Watershed projects by Ministry of Agriculture and Corporation – Watershed projects by Ministry of Rural Areas and Employment – Watershed development models by non-governmental organizations – Indo-German watershed development programme in Maharashtra and other states
13. Effective Resources Management in watersheds - Integrating soil and water conservation measures into watershed development
14. Participatory watershed development capacity building, social fencing, check on resources mismanagement – Principles underlying peoples participation in watershed development
15. Formulation of participatory watershed development project
16. Monitoring and evaluation of watershed projects

Practical

1. Hydrologic cycle
2. Study of recording rain gauge
3. Visit to meteorological station
4. Rainfall probability by Weibull's method
5. Study of current meter
6. Problems on stream flow measurement
7. Analysis of runoff hydrograph
8. Computation of peak rate of runoff
9. Computation of volume of runoff
10. Problems on hydrograph
11. Derivation of unit hydrograph
12. Delineation of watershed
13. Determination of watershed characteristics
14. Visit to watershed
15. Visit to watershed
16. Practical examination

References

1. Engineering Hydrology Subramanya K - 2013, Tata McGraw Hill Publishing Co. Ltd., New Delhi
2. Engineering Hydrology Raghunath H. M (1986), Wiley Eastern Edition, New Delhi
3. Hydrology and Soil Conservation Engineering Ghanashyam Das, 2012 PHI Learning Private Limited, New Delhi
4. Watershed Hydrology Suresh R – (1997), Standard Publishers and distributors, New Delhi
5. Watershed Management DhruvaNarayana V.V., Sastry G., Patnaik U.S. – (1997) ICAR, New Delhi
6. Watershed Management – Guidelines for Indian Conditions Tideman E.M, Omega Scientific Publishers, New Delhi.

III Year I Semester

DE-331

Solid Waste Utilization and Bio-Energy

2 (1+1)

Objective: To impart the knowledge on solid waste utilization management and bio-energy development process

Theory

1. Solid waste management (SWM) – common sources of waste – Different types of waste – Waste management and minimization – Recovery of energy from SWM.
2. Recycling – Recycling process – Waste Recycling management – Advantages and Disadvantages of Recycling of a product.
3. Land fill – Composting – Incineration
4. Bioenergy – Biomass – Importance of biomass – Classification of biomass - Properties of biomass sources and characteristics of biomass.
5. Biomass conversion technologies – principles of combustion, pyrolysis and gasification.
6. Briquetting of biomass – Briquetting machines – Types of briquetting machines – construction and working of briquetting machines – Screw type and piston crank type – uses – shredding machines.
7. Gasifiers – operating parameters for the gasifiers – processing of biomass for gasification – chemistry of gasification.
8. Gasifiers – types of gasifiers – producer gas and its utilization.
9. Construction and working of principle of fixed bed down draft, updraft, cross draft and open core gasifiers and fluidized bed gasifiers
10. Biogas – principle of biogas production – phases of anaerobic digestion – Advantages, disadvantages, utilization of biogas for cooking, lighting and running IC engines.
11. Biogas production – materials used for biogas production – Factors affecting the biogas production – site selection for biogas plant – Filling a biogas plant digester for starting.
12. Biogas plants – classification of biogas plants – Constructional details of biogas plant – KVIC and *Janatha* type biogas plants – Comparison between fixed dome and floating drum biogas plants.
13. Constructional details of *Deenabhandu* biogas plant – Maintenance of biogas plants
14. Bio fuels-raw materials – characteristics
15. Biodiesel production – Principles – Processes for production of biodiesel from *Jatropha* and *pongamia*.
16. Ethanol production from sugarcane and corn

Practical

1. Study the preparation of biomass and determine the proximate and ultimate analysis
2. Study of throat and throat less down draft gasifiers.
3. Study of updraft and cross draft gasifiers.
4. Study of fluidized bed gasifier.
5. Study of screw types of briquetting machines.
6. Study of piston crank type briquetting machines.
7. Study of constructional details and working of floating drum type biogas plant.
8. Study of constructional details and working of fixed dome type biogas plant.
9. Study of constructional details and working of *Dheenabhandu* biogas plant.
10. Study of biodiesel production from *Jatropha* and *pongamia*.
11. Study of ethanol production from sugarcane and corn.
12. Field visit to Biogas plants.
13. Field visit to gasifiers
14. Field visit to briquetting machines.
15. Filed visit to municipal solid waste management industry.
16. Final practical exam.

Reference

1. Energy sources and power plant Engineering Pakirappa and V.Naresh Second Edition 2014 – Radiant Publishing House, Hyderabad-95.
2. Non conventional Energy Resources Dubey S.K, and Bhargava S.K. DhanpatRai and Co. (p) Ltd., Delhi

3. Solid and Hazardous Waste Management Rao M.N, and Razia Sultana. B.S. Publication, Hyderabad.
4. Non Conventional Sources of Energy Rai GD 2004. Khanna Publishers, New Delhi
5. Alternate sources of energy Rathore NS 2005. ICAR Publications, New Delhi
6. Energy Technology Non conventional, Renewable and conventional Rao S and Parulekar, B.B. Khanna publishers, New Delhi.

TRACTOR SYSTEMS, OPERATIONS AND MAINTENANCE

Course No: DE – 341

LECTURE OUTLINES

Credits: ———

3(2+1)

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 pully pulley. drawbar, traction theory Rolling resistance, Rim pull, Crawler tractor.

THEORY

- 1 Introduction- history of tractor development- classification of tractors
- 2 Tractor components-selection of tractor
- 3&4 Tractor power transmission system-functions-clutch –types and its functions-necessity of clutch
- 5&6 Single plate clutch-multi plate clutch-dog clutch-fluid coupling clutch-constructional details- features
- 7&8 Tractor gear box-classification-selection and its constructional details- torque converter: components-functions
- 9 Differential unit and Final drive- functions of crown wheel,-differential lock-final drive
- 10 Tutorial related to power transmission
- 11 Tractor steering unit-types-working principle-components and constructional details
- 12&13 Tractor break systems-mechanical-hydraulic break systems- components-constructional details
- 14&15 Hydraulic system- functions-components-working principle-position control system-draft control systems-mixed control system-precautions, repairs and maintenance of hydraulic systems
- 16 Tractor hitching-hitch and control board of tractor- hitch types-drawbar hitch, three point hitch
- 17 Tractor control board-main switch-throttle lever-de compression lever-hour meter-light switch –temperature gauge etc and its functions
- 18&19 Terminology related to tractor tyre, chassis and front axle-toe in-toe out-caster angle-camber angle
- 20 Traction and traction theory-rolling resistance-soil pressure-wheel slip-cohesion of soil and its related problems
- 21&22 Mechanics of tractor chassis-forces acting on single point hitch - three point hitch -with implement and without implement-
- 23 Tractor centre of gravity-methods-suspension, balancing and weighing method
- 24 Starting and operating of a tractor-method of starting and stopping a tractor-precautions while starting and operating tractor
- 25 Repair, maintenance and storage of tractor
- 26 Periodical maintenance of tractors
- 27 Tools used in repair and maintenance of tractor-ring, open end spanner, sockets, rinces, pliers, hammers, punches etc
- 28 Tractor testing- preparation for tests-types of tests
- 29 Power tiller-components –power transmission- components- repair and maintenance of power tiller

- 30&3 Mechanical power transmission-method-belt drive, chain and sprocket drive-gear drive-
 1 types of gears-spur gear, worm gear, bevel gear, helical gear, spiral gear and its
 functions
 32 Numericals related to mechanical power transmission

PRACTICALS:

- 1 To study the power transmission system of tractor
- 2 To study the constructional details of single plate friction clutch
- 3 To study the constructional details of constant sliding gear box of tractor
- 4 To study the constructional details of differential, differential lock and final drive system in the tractor
- 5 To study the constructional details of steering system in the tractor
- 6 To measure the toe in , caster angle, camber angle of tractor
- 7 To measure the wheel slip of two wheel drive tractor under load and no load conditions
- 8 To study the constructional details of different break systems in the tractor
- 9 Tutorials on gear ratios in transmission system
- 10 To study the tractor chassis-measurement wheel base, hitch height of tractor
- 11 To study the engine trouble shooting, remedial measures
- 12 To study the electrical system in the tractor
- 13 To servicing of cooling system in the tractor
- 14 To study the procedure for radiator flushing in different tractors
- 15 To study the different types of gears in mechanical power transmission
- 16 Practical examination

REFERENCES:

S.N	Author & Title	Publisher
1.	JagdishwarSahay, 1992. Elements of Agricultural Engineering	Agro Book Agency, Patna
2.	S C Jain & C R Rai., Farm tractor maintenance and repair	A K Jain, standard Publishers and Distributors, New Delhi

Operation and maintenance of Farm Machinery

Course No: DE 342

Lecture outlines

2Credits: 2 (0+2)

Objectives: To impart knowledge and skill to students for attaining all important parts and working principles of all farm machinery.

PRACTICALS:

1. Dismantling of Mould board plough
2. Assembling of Mould board plough
3. Dismantling of Disc plough
4. Assembling of Disc plough
5. Dismantling Disc harrow
6. Assembling of Disc harrow
7. Dismantling of Mist blower
8. Assembling of Mist blower
9. Dismantling of Rotary tiller
10. Assembling of Rotary tiller
11. Dismantling of Knapsack sprayer
12. Assembling of Knapsack sprayer
13. Dismantling of Hand compression sprayer
14. Assembling of Hand compression sprayer
15. Dismantling of Rocking sprayer
16. Assembling of Rocking sprayer
17. Dismantling of Hand rotary duster
18. Assembling of Hand rotary duster
19. Dismantling of Mist blower cum duster
20. Assembling of Mist blower cum duster
21. Dismantling of Cono-weeder
22. Assembling of Cono-weeder

23. Dismantling of Taiwan sprayer
24. Assembling of Taiwan sprayer
25. Dismantling of Rocker sprayer
26. Assembling of Rocker sprayer
27. Dismantling of Blade harrow
28. Assembling of Blade harrow
29. Dismantling and Assembling of Bund former
30. Dismantling and assembling of Three tyne cultivator
31. Dismantling and assembling of Five tyne cultivator
32. Final Practical Examination

REFERENCES:

S.N	Author & Title	Publisher
0		
1.	JagdishwarSahay, 1992. Elements of Agricultural Engineering	Agro Book Agency, Patna
2.	S C Jain & C R Rai., Farm tractor maintenance and repair	A K Jain, standard Publishers and Distributors, New Delhi

Micro Irrigation Principles and Practices

DE-351

3(1+2)

Objective : To impart knowledge and skills to students to design sprinkler and drip irrigation systems in order to improve water productivity of different crops and to perform economic analysis and cost estimates of micro-irrigation systems.

Theory

1. Sprinkler irrigation – Historical developments, Scenario in the World, Country and State, Adoptability and Limitations
2. Different components and functions of the sprinkler system
3. Types of sprinkler irrigation systems - Based on sprinkling mechanism, Based on portability.
4. Moisture distribution patterns under sprinkler, Effect of wind speed on working of the systems, distribution uniformity, [Christiansen](#) Christiansen Uniformity coefficient
5. Design of sprinkler system layout, laterals and mains
6. Operation and maintenance of system, field evaluation of the system, Cost analysis.
7. Drip irrigation – Historical development, Scenario in the World, Country and State - Advantages and limitations.
8. Components of drip irrigation - Head control unit, Water carrier system, Water distribution system
9. Drip Hydraulics - Water flow in pipes, Friction and pressure losses, Coefficient of friction
10. Types of Emitters - Based on Flow regime (Reynolds number), Based on Lateral connection – Different types of fertigation equipment
11. Emitter flow Equation, Pressure variations (%) for different emitter flow variations, Emission uniformity, Distribution Uniformity and irrigation Efficiency
12. Planning and design of drip system – collection of preliminary data, Layout, crop water requirements, hydraulic design, Selection of components, Economic pipe size selection.
13. Pressure variation along pipe lines and design criteria of lateral, sub-main and main lines.
14. Installation, Operation and Maintenance of drip irrigation systems, Testing and field evaluation of the system
15. Cost estimation of drip irrigation system for row and orchards
16. Troubles and remedies in the sprinkler and drip irrigation systems

Practical

1. Study of components of sprinkler irrigation
2. Tutorial on irrigation scheduling of field crops under sprinkler irrigation
3. Study of layout of sprinkler irrigation
4. Design of sprinkler irrigation for groundnut
5. Selection of different components of sprinkler system for the layout
6. Tutorial class on design of sprinkler irrigation
7. Study of operation and maintenance of sprinkler irrigation system
8. Field visit to nearby places for studying sprinkler system
9. Field visit to nearby places for studying troubles of the sprinkler system and remedies
10. Field evaluation of distribution pattern
11. Field evaluation of uniformity coefficient

12. Cost estimation of sprinkler irrigation system for field crops
13. Economic analysis of sprinkler irrigation system
14. Study of different components of drip irrigation
15. Tutorial on irrigation scheduling of row crops under drip irrigation
16. Tutorial on irrigation scheduling for orchards under drip irrigation
17. Study of layout of drip irrigation
18. Design of drip irrigation system
19. Tutorial class on design of drip irrigation system for vegetables
20. Tutorial class on design of drip irrigation system for sugarcane
21. Tutorial class on design of drip irrigation system for Mango
22. Demonstration of fertigation using fertilizer tank
23. Demonstration of fertigation using venturi
24. Demonstration of acid treatment in maintaining the drip system
25. Demonstration of chlorine treatment in maintaining the drip system
26. Field visit to orchards under drip irrigation system
27. Field evaluation of drip irrigation system
28. Field visit to study various troubles and working out remedies in the drip irrigation system
29. Cost estimation of drip irrigation system for different crops
30. Economic analysis of drip irrigation system
31. Study of sub surface drip system
32. Practical Examination

Reference

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|----|---|---|
| 1. | Drip irrigation | Sivanappan RK, Padma Kumari O and Kumar V 1987. Keerthi Publishing House Pvt. Ltd, Coimbatore |
| 2. | Micro-Irrigation for Crop Production Design, Operation and Management | Freddie R. Lamm, James E. Ayars and Francis S Nakayama, 2006. Elsevier Publication, Singapore |
| 3. | Land and Water Management Principles | R. Suresh 2008. Standard Publishers Distributors, Delhi. |
| 4. | Principles of sprinkler irrigation | Dr. M.S. Mane and Er. B.L Ayare 2007 Jain Brother, New Delhi |

Wells and Pumps Operation and Maintenance

DE -352

1(0+1)

Objective: To acquire the knowledge on different irrigation wells and their maintenance. Further students get through knowledge on various pumpsets (CP, SP, Solar) Operation, construction, maintenance and installation with due importance to find out the trouble cost of operation.

1. Study of tube well
2. Study of open well
3. Maintenance of tube well and open well
4. Tutorial problems on cost analysis of pumping system
5. Visit to tube /bore well
6. Visit to open well
7. Study of different well development methods
8. Study of centrifugal pump construction and operation
9. Study of C.P troubles, remedies and maintenance
10. Study of submersible pump construction and operation.
11. Study of S.P troubles, remedies and maintenance.
12. Dismantling, assembling and installation of C.P
13. Dismantling, assembling and installation of S.P
14. Visit to pump sets servicing workshop
15. Study of solar pump set
16. Practical examination.

Reference

1. Water, Well & Pump Engineering Michael AM and Khepar ST 1989. Tata McGraw

Hill Publishing Co. Ltd., New Delhi

2. Irrigation Theory and Practice

Micheal AM 2008 Vikas Publishing House Pvt.
Ltd., New Delhi

Principles of Agricultural Economics and Business Management

DE-371

2(1+1)

Objective : Economic principles related to agriculture give the students emphasis on farm business management, analysis of budgeting, credit analysis, market management, export strategies. Confidence in students will be strengthened to start up their individual firm.

Theory

1. Agricultural economics – Meaning, nature and scope and importance of economics and agricultural economics, micro economics and macro economics, basic economic problems.
2. Agricultural production economics – Definition, nature and scope and subject matter of agricultural production economics, objectives of production economics, relationship with other sciences.
3. Farm management – Meaning, definition, nature and scope, relationship with other science, why study farm management, farm management decisions.
4. Economic principles applied to the organization of farm business – Principles of variable proportions, principles of factor substitution.
5. Farm budgeting – Meaning, types of budget, partial budgeting, enterprise budgeting and whole farm budgeting.
6. Agricultural credit – Meaning, definition, classification of credit based on various criteria, role of credit, capital in farm business
7. Credit analysis – Economic feasibility tests, 5 ‘C’s and 5 ‘R’s of credit analysis
8. Agricultural marketing – Definition, meaning, components of a market, importance of marketing in economic development, classification of markets
9. Market functions – Meaning, assembling, packing, grading & Standardization, transportation, storage, processing, distribution, buying and selling, market finance, market intelligence, market information, risk management
10. Management – Definition, decision management, importance of management, concepts, functions of management
11. Management – Management cycle, planning, organization, direction, control, coordination, communication
12. Agri-business management – Meaning, definition, concept, distinctive features of agribusiness management, application of management principles in agri-business
13. Agro-based industries – Importance, need, procedure to be followed to setup agro-based industries, constraints in establishing agro-based industries
14. Project analysis – Project meaning, project cycle, identification, formulation, appraisal, implementation, monitoring and evaluation
15. Project appraisal techniques – Undiscounted techniques, pay back method, rate of return/return on investment, etc.
16. Discounted techniques – NPV, BCR, IRR, sensitivity analysis

Practical

- 1-2 Farm holding survey using structured schedules

3. Methods of estimation of depreciation
- 4- 5 Economic principles applied to farm management
- 6- 8 Project formulation and Project evaluation techniques
9. Profit and loss statement
10. Balance sheet
11. Financial test ratios
12. Marketing channels
13. Break even analysis
- 14-16 Visit to Agri-business enterprises

Reference

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|--|--|
| 1. Agricultural Economics | Subba Reddy S, Raghu Ram P, NeelakanthaSastri T V and Bhavani Devi P 2004. Oxford and IBH Publishing Co. Pvt, Ltd, New Delhi |
| 2. Economics of Farm Production and Management | Raju V T and Rao D V S 1990. Oxford and IBH Publishing Co. Pvt. Ltd, New Delhi |
| 3. Essentials of Management | Joseph L Massie 1995. Prentice-Hall of India, New Delhi |
| 4. Agricultural Economics and Agri-business | Omri Rawlins N 1980. Prentice-Hall Inc., New Jersey. |
| 5. Economic Analysis of Agricultural Projects | Gittinger Price J 1989. World Bank, John Hopkins University Press, London. |

Objective To provide hands-on training and experience to students to organize meetings with farmers effectively using audio-visual aids and other extension methods and through effective communication skills for the transfer of technology from workshops to lands

Practical

1. Study of audio visual aids and its classification
2. Study of projected visual aids
3. Study of non projected visual aids
4. Visit to audio visual lab
5. Simulated exercise on communication methods
6. Planning and preparation of power point slides
7. Study of instructional aids
8. Planning and preparation of information materials namely Leaflet, folder, pamphlet
9. Planning a Extension programme
10. Organizing a group discussion
11. Conducting group discussion in class room
12. Preparation of a lesson plan
13. Preparation of lesson plan for teaching of skills
14. Handling of Over head Projector, Slide Projector, Public Address Equipment (PAE), Video Camera and LCD Projector
15. Visit to village for conducting survey
16. Practical examination

Reference

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|--|---|
| 1. Extension Education | Adivi Reddy A 1971. Sree Lakshmi Press, Bapatla |
| 2. Extension Communication and Management | Ray G L 1991. NayaPrakashan, Kolkatta |
| 3. Education and Communication for Development | Dhama O P and Bhanthnagar O P 1980 Oxford and IBH Publishing Co., New Delhi |
| 4. Audio Visual Aids in Teaching, Training and Extension | Yella Reddy N 1998. Haritha Publishing House, Hyderabad. |