

Faculty of Agriculture Science & Technology
Department of Agricultural Engineering

Study and Evaluation Scheme

Of

Bachelor of Technology (Agril. Engineering)
B.Tech (Ag Engg.)

(Applicable w.e.f Academic Session 2013-17, till revised)



AKS UNIVERSITY, SATNA

Study and Evaluation Scheme

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AKS University, Satna

Sherganj, Panna Road, Satna (MP) 485001

Study & Evaluation Scheme of Bachelor of Technology (Agril. Engg.) SUMMARY

Programme : B.Tech (Ag. Engg.)
Duration : Four year full time (Eight Semesters)
Medium : English
Minimum Required Attendance : 75 %

Maximum Credits:

Evaluation Assessment :	Internal	External	Total
	50	100	150

Internal Evaluation (Theory/ Practical Papers)

	Sessional-I	Sessional-II	Continuous Assessment & attendance
	10	10	10+20= 30
Duration of Examination :	External	Internal	
	3 hrs.	2 hrs	

To qualify the course a student is required to secure a minimum of 36% marks in aggregate including the semester end examination, internal assessment evaluation (Both theory & Practical Papers)

A candidate who secures less than 36% or Grade 'D' of marks in a Subject/Paper(s) shall be deemed to have failed in that Subject/Paper(s). In case a student has secured less than 36% or Grade 'R' in Subject/Paper(s), he/she shall be deemed to re-appear (ATKT Examination) in Subject/Paper(s) to achieve the required percentage (Min. 36%) or grade (Min. D) in the Subject/Paper(s).

Question Paper Structure

- 1. The question paper shall consist of 26 questions in three Sections. Out of which Section-A shall be of Objective type 10 questions and will be compulsory. (weightage 2 marks each).*
- 2. Section-B shall contain 10 Short answer type questions and students shall have to answer any eight (weightage 5marks each).*
- 3. Out of the remaining six question s are long answer type questions, student shall be required to attempt any four questions. The weightage of Questions shall be 10 marks each.*

Faculty of Agriculture Science & Technology

Department of Agriculture Engineering

B.Tech (Ag. Engg.)

Semester-I

Teaching & Examination Scheme

S. No.	Subject Code (Theory)	Subject (Theory)	Periods (Per Hour)			Credits
			L	T	P	
1	22MS101	Engineering Mathematics-I	2	1		3
2	22PH102	Engineering Physics	2			2
3	22CH103	Engineering Chemistry	2			2
4	22ME104	Workshop Practice & Technology	1			1
5	22CE105	Surveying and Leveling	2			2
6	22EV106	Environmental Science	2	1		3
7	22AS107	Agriculture for Engineers	2			2
8	22SD108	SSD – Functional English I	2			2
Total			15	2		17

S. No.	Subject Code (Practical)	Subject (Practical)	Periods(Per Hour)			Credits
			L	T	P	
1	22PH151	Engineering Physics			2	1
2	22CH152	Engineering Chemistry			2	1
3	22ME153	Workshop Practice & Technology			4	2
4	22CE154	Surveying and Leveling			2	1
5	22ME155	Engineering Drawing			4	2
6	22AS156	Agriculture for Engineers			2	1
Total					16	8

Faculty of Agriculture Science & Technology

Department of Agriculture Engineering

B.Tech (Ag. Engg.)

Semester-II

Teaching & Examination Scheme

S. No.	Subject Code (Theory)	Subject (Theory)	Periods (Per Hour)			Credits
			L	T	P	
1	22MS201	Engineering Mathematics-I I	2	1		3
2	22CA202	Computers Programming and Data Structures	1			1
3	22EE203	Applied Electronics and Instrumentation	2			2
4	22EE204	Electrical Circuits	2			2
5	22ME205	Thermodynamics and Heat Engines	2	1		3
6	22ME206	Engineering Mechanics	2			2
7	22SS207-H/I	Spiritual Study (H/I)	2			2
8	22SD208	SSD – Functional English II	2			2
Total			15	2		16

S. No.	Subject Code (Practical)	Subject (Practical)	Periods(Per Hour)			Credits
			L	T	P	
1	22CA251	Computers Programming and Data Structures			4	2
2	22EE252	Applied Electronics and Instrumentation			2	1
3	22EE253	Electrical Circuits			2	1
4	22ME254	Thermodynamics and Heat Engines			2	1
5	22ME255	Engineering Mechanics			2	1
6	22AE256	Operation & Maintenance of Tractor and Farm Machinery			2	1
Total					16	8

Faculty of Agriculture Science & Technology

Department of Agriculture Engineering

B.Tech (Ag. Engg.)

Semester-III

Teaching & Examination Scheme

S. No.	Subject Code (Theory)	Subject (Theory)	Periods (Per Hour)			Credits
			L	T	P	
1	22MS301	Engineering Mathematics-III	2	1		3
2	22CE302	Soil Mechanics	2			2
3	22ME303	Strength of Materials	2			2
4	22AE304	Farm Machinery and Equipment-I	2			2
5	22AE305	Farm Power	2			2
6	22ME306	Fluid Mechanics	2			2
7	22AE307	Engg. Properties of Biological Materials and Food Quality	2			2
8	22ME308	Heat and Mass Transfer	2	1		3
Total			16	2		18

S. No.	Subject Code (Practical)	Subject (Practical)	Periods(Per Hour)			Credits
			L	T	P	
1	22CE351	Soil Mechanics			2	1
2	22ME352	Strength of Materials			2	1
3	22AE353	Farm Machinery and Equipment-I			2	1
4	22AE354	Farm Power			2	1
5	22ME355	Fluid Mechanics			2	1
6	22AE356	Engg. Properties of Biological Materials and Food Quality			2	1
7	22SD357	SSD			2	1
Total			5		14	7

Faculty of Agriculture Science & Technology

Department of Agriculture Engineering

B.Tech (Ag. Engg.)

Semester-IV

Teaching & Examination Scheme

S. No.	Subject Code (Theory)	Subject (Theory)	Periods (Per Hour)			Credits
			L	T	P	
1	22AE401	Farm Machinery and Equipment-II	2			2
2	22AE402	Renewable Energy Sources	2			2
3	22AE403	Irrigation Engineering	2	1		3
4	22AE404	Crop Process Engineering	2			2
5	22CE405	Engineering Hydrology	2			2
6	22ME406	Theory of Machines	2			2
7	22MT407	Agribusiness Management and Trade	3			3
8	22MS408	Agril. Statistics	2			2
Total			17	1		18

S. No.	Subject Code (Practical)	Subject (Practical)	Periods(Per Hour)			Credits
			L	T	P	
1	22AE451	Farm Machinery and Equipment-II			2	1
2	22AE452	Renewable Energy Sources			2	1
3	22AE453	Irrigation Engineering			2	1
4	22AE454	Crop Process Engineering			2	1
5	22CE455	Engineering Hydrology			2	1
6	22ME456	Theory of Machines			2	1
7	22SD457	SSD			2	1
Total					14	7

Faculty of Agriculture Science & Technology

Department of Agriculture Engineering

B.Tech (Ag. Engg.)

Semester-V

Teaching & Examination Scheme

S. No.	Subject Code (Theory)	Subject (Theory)	Periods (Per Hour)			Credits
			L	T	P	
1	22ME501	CAD/CAM-M/c Drawing & Computer Graphics	1			1
2	22ME502	Machine Design	2			2
3	22AE503	Dairy and Food Engineering	2			2
4	22AE504	Tractor Systems and Controls	1			1
5	22EE505	Electrical Machines and Power Utilization	2			2
6	22AE506	Soil and Water Conservation Engineering	2			2
7	22CE507	Drainage Engineering	2			2
Total			12	1		12

S. No.	Subject Code (Practical)	Subject (Practical)	Periods(Per Hour)			Credits
			L	T	P	
1	22CA551	Database Management and Internet Applications			4	2
2	22ME552	CAD/CAM-M/c Drawing & Computer Graphics			4	2
3	22ME553	Machine Design			2	1
4	22AE554	Dairy and Food Engineering			2	1
5	22AE555	Tractor Systems and Controls			4	2
6	22EE556	Electrical Machines and Power Utilization			2	1
7	22AE557	Soil and Water Conservation Engineering			2	1
8	22CE558	Drainage Engineering			2	1
Total					22	11

Faculty of Agriculture Science & Technology

Department of Agriculture Engineering

B.Tech (Ag. Engg.)

Semester-VI

Teaching & Examination Scheme

S. No.	Subject Code (Theory)	Subject (Theory)	Periods (Per Hour)			Credits
			L	T	P	
1	22AE601	Agril. Structures and Environmental Control	2			2
2	22AE602	Drying and Storage Engineering	2	1		3
3	22CE603	Design of Structures	2			2
4	22CE604	Groundwater, Wells and Pumps	2			2
5	22AE605	Soil and Water Conservation Structures	2			2
6	22ME606	Refrigeration and Air Conditioning	2			2
7	22EN607	Entrepreneur. Develop. & Technical Report Writing	2			2
8	22AE608	Micro Irrigation System Deign	2			2
Total			16	1		17

S. No.	Subject Code (Practical)	Subject (Practical)	Periods(Per Hour)			Credits
			L	T	P	
1	22AE651	Agril. Structures and Environmental Control			2	1
2	22AE652	Drying and Storage Engineering			2	1
3	22CE653	Design of Structures			2	1
4	22CE654	Groundwater, Wells and Pumps			2	1
5	22AE655	Soil and Water Conservation Structures			2	1
6	22ME656	Refrigeration and Air Conditioning			2	1
7	22AE657	Micro Irrigation System Deign			2	1
Total					14	7

Faculty of Agriculture Science & Technology
Department of Agriculture Engineering
B.Tech (Ag. Engg.)
Semester-VII
Teaching & Examination Scheme

S. No.	Subject Code (Theory)	Subject (Theory)	Periods (Per Hour)			Credits
			L	T	P	
1	22AE701	Watershed Management	2			2
2	22AE702	Remote Sensing & GIS Applications	2			2
3	22MT703	System Engineering (Operation Research)	2	1		3
4	22AE704	Food Packaging Technology	1			1
5		Elective-1	3			3
Total			10	1		11

List of Elective Subjects (Choose any one Group)

Subject Code Subject Name

Group A (Farm Machinery & Power)

22AE705A Human Safety & Engineering

Group B (Soil & Water Engineering)

22AE705B Water Harvesting & Ground Water Recharge

Group C (Food Process Engineering)

22AE705C Advance Techniques in Food Processing

S. No.	Subject Code (Practical)	Subject (Practical)	Periods(Per Hour)			Credits
			L	T	P	
1	22AE751	Watershed Management			2	1
2	22AE752	Remote Sensing & GIS Applications			2	1
3	22AE753	Food Packaging Technology			2	1
4	22AE754	Seminar			2	1
5	22AE755	Dissertation/ Project-I			16	8
Total					24	12

Faculty of Agriculture Science & Technology
Department of Agriculture Engineering
B.Tech (Ag. Engg.)
Semester-VIII
Teaching & Examination Scheme

S. No.	Subject Code (Theory)	Subject (Theory)	Periods (Per Hour)			Credits
			L	T	P	
1	22AE801	Minor Irrigation and Command Area Development	2			2
2	22AE802	Food Process Plant Design & Layout	2			2
3	22AE803	Mechanics of Tillage and Traction	2			2
4		Elective-II	3			3
Total			10	1		11

List of Elective-II Subjects

Subject Code

Subject Name

Group A (Farm Machinery & Power)

22AE804A

Manufacturing Process of Agricultural Machinery

Group B (Soil & Water Engineering)

22AE804B

Operation, Maintenance & Economic evaluation of water Resource Projects

Group C (Food Process Engineering)

22AE804C

Food Law & Legislation

S. No.	Subject Code (Practical)	Subject (Practical)	Periods(Per Hour)			Credits
			L	T	P	
1	22AE851	Minor Irrigation and Command Area Development			2	1
2	22AE852	Food Process Plant Design & Layout			2	1
3	22AE853	Mechanics of Tillage and Traction			2	1
4	22AE754	Dissertation/ Project-II				12
5	22AE755	Seminar			2	1
6	22AE756	Comprehensive Viva-voce 10			2	1
Total					10	17

B Tech (Agril Engg) + MBA (Integrated) Degree Programme

B-Tech + MBA is a dual degree programme. To earn the B.Tech Degree a student is supposed to secure the required minimum number of credits of the same. MBA courses would be taught along with the B.Tech. Curriculum from II Year onwards i.e III Semester. A student during the B.Tech.Programme shall cover the MBA curriculum as per the details given under.

To qualify for the award of MBA Degree along with the B.Tech. degree,a student is supposed to study and qualify the subjects as per the list attached:

S.No.	Subject	Credit	Year	Semester
1	Computer Programming & Data Structure	3	EXEMPTED	II
2	Agriculture Business Management and Trade	3	EXEMPTED	IV
3	Database Management & Internet Applications	3	EXEMPTED	V
4	System Engineering (Operation Research)	3	EXEMPTED	VII
5	Principle of Management	4	Second Year	III
6	Business Communication	3	Second Year	IV
7	Managerial Economics	4	Third Year	V
8	Accounting for Managers	4	Third Year	VI
9	Business Environment	4	Fourth Year	VII
10	Marketing Management	4	Fourth Year	VII
11	Human Resource Management	4	Fourth Year	VIII
12	Production and Operation Management	4	Fourth Year	VIII
13	Financial Management	4	After 4 th Year	After VIII
14	Corporate Governance and Business Ethics	4	5th	IX
15	Supply Chain and Logistics Management	4	5th	IX
16	Technology Management	4	5th	IX
17	Quality Management	4	5th	IX
18	Strategic Management	4	5th	IX
19	Enterprise Resource Planning	4	5th	IX
20	Summer Training	4	5th	IX
21	Entrepreneurship	4	5th	X
22	Electives	8	5th	X
23	Project Management	4	5th	X
24	Business Research	4	5th	X
25	International Business Management	4	5th	X
26	Project Work	8	5th	X

List of exempted subjects as being covered during the B. Tech.

1. Agriculture Business Management and Trade
2. Computer Programming & Data Structure
3. Database Management & Internet Applications
4. System Engineering (Operation Research)

B.Tech. (Ag Engg.)

Semester- I

ENGINEERING MATHEMATICS-I [3 (3+0)]

Objective: *The prime objective of Engineering Mathematics is to provide Knowledge on Mathematical concepts and application of Mathematical concepts to the engineering calculations and analytical task.*

UNIT-I: Differential Calculus-I

Concept of function, Limit, Continuity. Differentiability of a function , Differentiation by first principal, chain rule, Differentiation of sum, product and quotient of different functions.

UNIT-II : Differential calculus-II

Successive differentiation, Leibnitz's theorem (without proof), Nth derivatives, Maclaurin's series expansion, Taylor's series expansion, partial differentiation, homogeneous functions , Euler's theorem, maxima and minima of one variable and two variable, curvature, Radius of curvature.

UNIT-III : Integral Calculus

Methods of Simple integration: Integration by substitution, by parts and Integration by partial fractions. Evaluation of definite integrals (elementary) by explaining the general properties of definite integrals, Integration as inverse operation of differentiation.

UNIT-IV

Determinant: Definition, properties, minors.

Matrix: Definition, types, addition and subtraction of matrix, multiplication of matrix, rank of matrix, nullity of matrix, Echelon form, Normal form, , Consistency of linear system and its Solution ,Eigen value and Eigen vectors, Cayley-Hamilton theorem.

UNIT-V: Differential equations

Ordinary differential equations of first order and first degree : variable separable, linear differential equation, homogeneous differential equation,, Exact differential equation.

Text Book:

- D. K. Jain., Engineering Mathematics-I
- Gorakh Prasad, Differential calculus,Pothisala Pvt. Ltd.Allahabad
- Gorakh Prasad, Integral calculus,Pothisala Pvt. Ltd. Allahabad,
- H.K. Das Engineering Mathematics-I, S.Chand & company Ltd.
- D.C. Agrawal, Engineering Mathematics-I,Sai prakasan

Reference:

- B.S.Grewal, Engineering Mathematics, Khanna Publishers, 2004.
- B.S.Grewal, Higher Engineering Mathematics, Khanna Publishers, 2005.
- Chandrika Prasad, Mathematic for Engineers, Prasad Mudranalaya,1996.
- H.K.Das, Basic Engineering Mathematics, S.Chand & company Ltd.
- B.V.Ramana,Higher Engineering mathematics,Tata Mcgraw-Hills Publishing Company Limited.

B.Tech. (Ag Engg.)

Semester- I

ENGINEERING PHYSICS [3 (2+1)]

Objective: Engineering physics forms the backbone of engineering discipline. It aims to give an understanding of this world both by observation and prediction of the way in which objects will behave.

Unit-I Magnetic Properties of Materials

Introduction, Magnetic Materials, Bar Magnet, Magnetic field lines, Earth Magnetism, Magnetisation and Magnetic Intensity. Dia, Para and ferromagnetism-classification. Langevin theory of dia and paramagnetism. Adiabatic demagnetization, Weiss molecular field theory and ferromagnetism. Curie-Weiss law.

Unit- II Wave Optics

Principle of superposition, coherent and non-coherent sources, Concept of Interference, interference of thin film and Newton's rings, Diffraction-single slit diffraction and gratings, Introduction of Polarisation, plane polarization, nicol prism, polaroids, production of plane, circularly and elliptically polarised light, Specific rotation, Half shade polarimeter.

Unit- III

Quantum Mechanics: Wave particle duality, de-Broglie concept, uncertainty principle, Time dependent and time independent Schrodinger wave equation, Qualitative explanation of Zeeman effect and Stark effect.

Nanotechnology: Introduction, Nano particles, Carbon nano tube, nano clay, nano mud, Preparation techniques of nanomaterials and their characterizations by X-ray Diffraction, Scanning electron microscopy, Transmission electron microscopy, Infra-Red & conductivity measurements(qualitative only), Application and future.

Unit- IV

Semiconductors: Distinction between conductors, semiconductors and insulators on the basis of energy band theory, classification of semiconductors, P and N type of semiconductors, Determination of energy gap in semiconductors, formation of P-N junction, Hall effect.

Superconductivity: Introduction, critical magnetic field, Meissner effect, Isotope effect, Type-I and II superconductors and its applications.

Unit-V

Laser: Introduction, Spontaneous and stimulated emission, Einstein's coefficients, Pumping, Population inversion, Principle, He-Ne and Ruby lasers its applications, Introduction of Masers and Holography.

Optical fiber: Introduction, construction and its types, principle, input and output characteristics of optical fiber and applications.

Text Books:

- Text book of Engineering Physics by M.N. Avadhanulu and. P.G. Kshirsagar (S. Chand & Co.) 2010.
- Text book of Engineering Physics by Navneet Gupta & S.K. Tiwary (Dhanpat Rai & Co.)
- Text book of Optics by Brijlal & Subramanian (S. Chand) 2010.
- Optics by Ajoy Ghatak (TMH) New edition, 2011.

Reference Books:

- Concepts of Modern Physics - Aurthur Beiser (Mc-Graw Hill).
- Optical Fibre & Laser - Anuradha De. (New Age).
- Nanotechnology - Rechard Booker and Earl Boysen (Wiley Publishing).
- Solid State Physics - S.O. Pillai, 5th edition (New Age International).

B.Tech. (Ag Engg.)

Semester- I

ENGINEERING CHEMISTRY [3 (2+1)]

Objective: *The objective of Engineering Chemistry is to provide basic knowledge of chemistry applied in engineering problems.*

UNIT-I

Phase rule and its application to one and two component systems. Water: temporary and permanent hardness, disadvantages of hard water, scale and sludge formation in boilers and boiler erosion. Corrosion: Causes, types and methods of prevention.

UNIT-II

Fuels:- Classification, calorific values, Advantages of solid, liquid and gaseous fuels. Lubricants: Properties, mechanism, classification and tests. Viscosity and Viscosity index, Flash and fire point, cloud point and pour point.

UNIT-III

Enzymes and their use in the manufacturing of ethanol and acetic acid by fermentation methods. Principles of food Chemistry:- Introduction to lipids, proteins, carbohydrates, vitamins, food preservations, colouring and flavouring reagents of food.

UNIT-IV

Polymers, types of polymerization, properties, uses and method for the determination of molecular weight of polymers. Introduction to IR spectroscopy.

Colloids: classification & properties.

UNIT-V

Analytical methods like thermo gravimetric, Polarographic analyses, nuclear radiation, detectors and analytical application of radioactive materials.

Practical:

- Determination of temporary and permanent hardness of water by EDTA method.
- Estimation of chloride in water. Estimation of dissolved oxygen in water.
- Determination of BOD in water sample.
- Determination of COD in water sample.
- Determination of viscosity of oil.
- Estimation of activity of water sample; Estimation of alkalinity of water sample.
- Determination of carbonate and non-carbonate hardness by soda reagent.
- Determination of coagulation of water and chloride ion content.
- Determination of specific rotation of an optically active compound; Determination of λ -max and verification of Beer Lambert Law.
- Determination of calorific value of fuel.
- Identification of functional groups (alcohol aldehyde, ketone, carboxylic acid and amide) by IR.

Text Book:

- Jain, P.C. and Jain, M. 1998. Engineering Chemistry, Dhanpatrai Publication, Delhi.

Reference:

- Agarwal, C.V. 1969 or recent edition Chemistry of Engineering Materials. Tara Publication Varanasi.
- Gyngeell, E.S. 1989. Applied chemistry for Engineers B.I. Publications Bombay.
- Richards, W.C. 1992. Engineering materials Science. Printice-Hall of India, New Delhi.

B.Tech. (Ag Engg.)

Semester- I

WORKSHOP PRACTICE & TECHNOLOGY [3 (1+2)]

***Objective:** The objective of subject is to familiar with the primary task required in engineering workshop.*

Unit I

Introduction to workshop practice, safety, care and precautions in workshop. Wood working tools and their use, Carpentry and pattern making. Timber, definition, engineering applications, seasoning and preservation, plywood and ply boards.

Unit II

Mould material and their applications. Heat treatment processes: hardening, tempering, annealing, normalizing

Role of gate, runner, riser, core and chaplets. Causes and remedies of some common casting defects like blow holes, cavities, inclusions.

Unit III

Soldering & Brazing, Electric arc welding, Gas welding, Smithy and forging operations, bench: Flat surface filing, Chipping, Scraping Marking out, Drilling and Screwing. Use of jigs and fixtures in production.

Unit IV

Machine Shop: Drilling and Screwing. Use of jigs and fixtures in production. Introduction to following machine tools: (a) Lathe (b) Milling machine (c) Shaper and planer (d) Drilling and boring machines (e) Grinder (f) CNC machines.

Text Book:

- Gupta, K.N. and Kaushik, J.P. 1998. Workshop Technology, Vol. I and II New Heights, Daryaganj, New Delhi.

Reference:

- Chapman, W.A.J., 1962. Workshop Technology, Part I, II, III, E.I.B.S. and Edward Arnold Publishers Ltd., London.
- Chapman, W.A.J. 1965. Applied Workshop Calculations, Low Priced Textbook. The English Language Book Society and Edward Arnold (Publishers) Ltd.

B.Tech. (Ag Engg.)

Semester- I

SURVEYING AND LEVELLING [3 (1+2)]

Objective: An agricultural engineer must have knowledge about different methods of Land survey.

UNIT-I

Surveying – Introduction, classification and basic principles. Linear measurements, Chain surveying – definition, selection of survey station and lines, types of ranging & chaining. Types of chains, recording the measurement, offset measurement, cross staff optical square, prism square, obstacles in chaining and ranging – chain and tape errors & corrections.

UNIT-II

Methods of traversing prismatic and surveyors compass angle and bearing, quadrantal system, local attraction magnetic declination dip traversing plotting bow ditch rule, transit rule, errors in compass survey, their elimination and correction.

UNIT-III

Plane table surveying – instruments, accessories, methods, principle two points, three points problems, errors in plane tabling, minor instruments, band level, abney level, elinometer, sextant, planimeter, penetrometer.

UNIT-IV

Levelling : Basic definitions, principles and methods of leveling,

Contouring : Introduction and importance of contouring

UNIT-V

Advance surveying technology: Theodolite traversing. Theodolite surveying, Ranging by theodolite, temporary and permanent adjustment of theodolite. Introduction to setting of curves. Introduction to GIS & Remote sensing.

Practical:

- Chain survey of an area and preparation of map.
- Compass survey of an area and plotting of compass survey.
- Plane table surveying; Leveling. L-section and Xsections and its plotting.
- Contour survey of an area and preparation of contour map.
- Theodolite surveying; Ranging by theodolite, Height of object by using theodolite.
- Minor instruments.

Text Book:

- B.C.Punamia,; Surveying & Levelling Vol.-I;Lakshmi Publication, New Delhi.
- Kanetkar, T.P. and Kulkarni, S.P. 1965. Surveying and Levelling. A.V. Griha Prakashan, Pune-4.

Reference:

- Agor, R. 1998. Surveying and Levelling, Khanna Publishers, New Delhi.
- Kochher, C.L. 1986. A Text book of Surveying. Vol. I and Vol. II. Katson Publishing House, Ludhiana.

**B.Tech. (Ag Engg.)
Semester- I**

AGRICULTURE FOR ENGINEERS [4 (3+1)]

Objective: *The objective of Subject is to provide Basic Principles of Crop Production and Soil Classification.*

UNIT-1 Soils

Nature, origin, Classification & composition soil forming process, soil taxonomy orders, soil physical properties & their importance, soil particle distribution, soil inorganic Colloids- origin, composition and their properties, ion exchange in soil & nutrient availability.

UNIT-2

Soil organic matter- its composition and decomposition, effect in soil fertility, soil reaction- acid, saline and sodic soils, Irrigation water, essential plant nutrients – their function and deficiency symptoms in plants, important inorganic fertilizers and their reaction in soils.

UNIT-3

Agronomy: - Definition and scope of Agronomy. Classification of crops, Effect of different weather parameters on crop growth and development principles of tillage, tilth and its characteristics. Soils water plant relationship and water requirement of crops, weed & its control, Crop rotation, cropping system, Relay cropping Inter cropping and mixed cropping.

UNIT-4

Horticulture: Definition and scope of horticultural and vegetable crops. Soil condition and climatic requirements for fruits, Vegetables and floriculture crops, improved varieties.

UNIT-5

Criteria for site selection, layout and planting methods, nursery raising, macro and micro propagation method, Plant growing Structure, Pruning and training, fertilizer application, fertigation, Irrigation methods, Harvesting, grading and packaging, post harvest practices, Garden tools, management of orchard, Extraction and storage of vegetable seeds.

Practical:

- Identification of rocks and minerals; Examination of soil profile in the field.
- Determination of bulk density; particle density and porosity of soil.
- Identification of crops and their varieties seeds and weeds.
- Fertilizer application methods.
- Different weed control methods.
- Judging maturity time for harvesting of crop.
- Identification and description of important fruit; flowers and vegetables crops.
- Study of different garden tools.
- Preparation of nursery bed.

Text Book:

- Arun Katyayan; Fundamental of Agriculture; Kushal Publications and Distributers.
- ICAR, 1997. Hand Book of Agriculture, ICAR Pub. New Delhi.

Reference:

- Martin, J.M., Leonard, W.H. and Stamp, D.L. 1976. Principles of Field crop production. Macmillon Publishing Co. Inc. New York.
- Singh, Chidda, 2001. Modern Techniques of raising field crops. Oxford and IBH Publishing Co. Pvt. Ltd., New Delhi.
- Rai, M.M. 1998. Principles of Soil Science. Macmillon India Ltd., New Delhi.

B.Tech. (Ag Engg.)

Semester- I

ENVIRONMENTAL SCIENCE [3 (3+0)]

Objective: The objective of this subject is to explore the basic concepts of Environment Science and its relation with Engineering and Agriculture.

UNIT-I

Definition, scope & importance. Ecosystems: type, structure and functions. Bio-diversity: value, threats and conservation.

UNIT-II

Natural resources: forest, mineral, soil and water- their uses and abuses. Material cycles – carbon, nitrogen and sulphur cycles, energy – conventional and non- conventional sources – hydro electric, fossil fuel based, nuclear, solar, biomass and bio-gas. Hydrogen as an alternative future source of energy.

UNIT-III

Environmental pollution- causes, effects and control measures of air, water, soil, marine, thermal and noise pollution.

UNIT-IV

Nuclear hazards. Bio-safety and risk management. Global warming & climate change.

UNIT-V

Environment protection – environmental act and related issues, role of government, legal aspects, initiatives by Non-Governmental Organizations (NGO's). Human population, health and social welfare.

Text Book:

- G.N.Pandey and G.C.Carney,;Environmental Engineering; Tata McGraw Hill Publication Co. Ltd. New Delhi.

References:

- Environmental Engineering. Pandey, G.N. and Carney, G.C. 1997. Tata McGraw Hill Publishing Co. Ltd., New Delhi.
- Environmental Pollution Control Engineering. Rao, C.S.1994. Wiley Eastern Ltd., New Age International Ltd., New Delhi.
- Environmental Biotechnology, Michael, A.M. and Ojha, T.P. 1997. Principles of Agricultural Engineering, Vol. I, Vikas Publishing House P. Ltd. New Delhi.

B.Tech. (Ag Engg.)
Semester- I
Engineering Drawing [2 (0+2)]

Practical:

- Introduction of drawing scales;
- Principles of orthographic projections;
- Reference planes; Points and lines in space and traces of lines and planes; Auxiliary planes and true shapes of oblique plain surface;
- True length and inclination of lines; Projections of solids (Change of position method, alteration of ground lines);
- Section of solids and Interpenetration of solid-surfaces;
- Development of surfaces of geometrical solids; Isometric projection of geometrical solids.

Text Book:

- N.D.Bhatt,;Elementary Engineering Drawing;Charotar Book Stall,Anand
- Narayana, K.L. and Kannaiah, P. "Engineering Graphics.", Tata McGraw Hill, New Delhi, 1988.
- Chandra, A.M. and Chandra Satish, "Engineering Graphics", Narosa, 1998.

1st Semester

B.Tech (Engg.)/B.Tech (Ag.)/B.Tech (BT)/B.Sc.(Hons) Ag./B.Sc
(BT)/B.Pharm/BBA/B.Com/B.com(Hons)/BCA(Hons)/Diploma (Engg.)

INTRODUCTION: Grammar is vital for the efficient use of language in academic as well as social environment. You already know that our speech is made up of sentences. A sentence is the basic unit of the written and spoken language. In this unit we will learn about various structural and functional parts of the sentence, their types ,subtypes and their usage.

Objectives:

- To enable the students to use verbs in appropriate contexts.
- To improve students' command of spoken English by practicing the functional language needed in different situations
- To familiarize the students with the concept of Functional English as a multi-focal discipline.
- To enable the students to use English correctly and confidently

UNIT-1

- a. Articles: Definite, Indefinite and Zero, Noun: numbers (singular and plural) and Personal Pronouns
- b. Introduction to verb :Ordinary and Auxiliary verbs, Regular and Irregular verbs
- c.**The Present Tense:** Present Continuous, Simple Present (Form and Use)

UNIT-2

The Past and Perfect Tenses: Simple Past, The Past Continuous, The Present Perfect, The Present Perfect Continuous, The Past Perfect and The Past Perfect Continuous. (Form and Use)

UNIT-3

The Future Tense: Future Simple, The future Continuous (Form and Use),Causative Verbs,The Sequence of Tenses.

UNIT-4

Introduction to Modal Auxiliaries (Form and Use)
May and can for Permission and Possibility.
Could for permission in the Past
May ,Might for Possibility.
Can and be able for Ability.
Ought, Should, Must, have to,had to, Need for Obligation.

UNIT-5

The Conditional Sentences, The Passive Voice; Active Tenses and their Passive Equivalents including Modals, Use of Passive Structure.

NOTE: Coverage of 1220 Regular (600) and Irregular Verbs (620) with their meaning and uses.

1. (Teachers are required to Introduce 25 verbs from the given verb list in every lecture)

B.Tech. (Ag Engg.)

Semester- II

Engineering Mathematics-II 3 (3+0)

UNIT-1 Functions of a Complex variable:

Introduction, Algebra of Complex variable, derivative of complex functions, analytic function, Cauchy Riemann equations (Cartesian and polar form), Conjugate functions, Conjugate-Harmonic functions, Methods for finding the analytic function. Cauchy's integral theorem, Cauchy's integral formula (without proof) for analytic function, Residue theorem (without proof) and related problems.

UNIT-2 Vector Calculus:

Definition of vectors and Scalars, Differentiation of vectors and Scalars, vector point function and Scalar point function, Vector differential operator Del, Gradient of a scalar point function, Divergence and curl of a vector point function, identities involving Del, Second order differential operator, line integral, surface integral and volume integrals, Applications of Stoke's theorem (without proof), Gauss's divergence theorem (without proof) and Green's theorems (without proof).

UNIT-3 Multiple Integrals :

Definite integrals: Introduction, its properties, Definite integrals as the limit of a sum, Its Application in summation of a series, Gamma and Beta functions, Double and triple integrals, change of order of integration, applications of double and triple integrals to find area, surface and volume.

UNIT-4 Differential Equations:

Cauchy's Homogeneous linear differential equations, simultaneous linear differential equations with constant coefficients, Second order linear differential equation : Method of variation of parameters, Method of series solution.

UNIT-5 Partial differential Equation :

Partial differential equations: Formation of partial differential equations, Lagrange's linear equation, Higher order linear partial differential equations with constant coefficients, solution of non-linear partial differential equations, Charpit's method, Clairaut's equation.

Text Books :

1. D.C. Agrawal, Engineering Mathematics-II, Sai prakasan.
2. H.K. Das, Basic Engineering Mathematics-II, S.Chand & company Ltd.
3. D. K. Jain., Engineering Mathematics-II
4. Sonendra Gupta, Engineering Mathematics-II, Dhanpat Rai Publishing Company(P) Ltd.

Reference Books:-

- B.S.Grewal, Engineering Mathematics, Khanna Publishers, 2004.
- B.S.Grewal, Higher Engineering Mathematics, Khanna Publishers, 2005.
- B.V.Ramana, Higher Engineering mathematics, Tata Mcgraw-Hills Publishing Company Limited.
- Chandrika Prasad, Advanced Mathematic for Engineers, Prasad Mudranalaya, 1996.

B.Tech. (Ag Engg.)

Semester- II

Applied Electronics and Instrumentation 3 (2+1)

UNIT-I

Digital Fundamentals: Number System- Decimal, Binary, octal, hexadecimal, their complements, operation and conversion, floating point and signed numbers.

UNIT-II

Basic theorem of Boolean algebra, Combinational Logic Circuits (basic gates (AND, OR, NOR), SOP rule and Kmap), binary ladder D/A converter, successive approximation A/D converter, half and full adder circuits, R-S flip flop, J-K flip flop.

UNIT-III

Passive Components: Resistors- Inductors and Capacitors and their types. Introduction to semiconductors, Diodes, V-I characteristics, Diode as rectifier, various type of rectifier (half wave, full wave and bridge) Bipolar junction Transistor and their working, introduction to CC, CB & CE transistor configurations, different configuration and modes of operation of BJT, DC biasing of BJT (fixed, self, potential divider, direct coupling).

UNIT-IV

Voltage regulator using zener diode, Series and shunt regulator using transistor (Transistor series regulator, controlled transistor series regulator, shunt Transistor voltage regulator, Transistor current regulator.) Phase shift oscillator, analysis of differential amplifier using transistor, ideal OP-AMP characteristics, linear and non-linear application of OP-AMP (adder, subtractor, integrator , active filter, comparator , differentiator, differential instrumentation amplifier and oscillator) OP- Amp as voltage regulator.

UNIT - V

Generalized instrumentation, measurement of displacement, temperature, velocity, force and pressure using potentiometer, resistance thermometer, thermocouples, bourden tube, LVDT, strain gauge and tacho-generator.

Practical

1. To study V-I characteristics of p-n junction diode;
2. To study half wave, full wave and bridge rectifier;
3. To study transistor characteristics in CE configurations;
4. To study about AND, NOT, and OR gates.
5. To study a OP-AMP IC 741 as inverting and noninverting amplifier;
6. To study a OP-AMP IC 741 as differentiator amplifier;
7. To study a differential amplifier using two transistor;
8. To study a OP-AMP IC 741 as differential amplifier;
9. To study a OP-AMP IC 741 as a comparator;
10. To familiarize with various types of transducers.

Textbook:

- Principles of Electronics – V.K. Mehta - S.Chand.
- Applied Electronics – R. S. Sendha, S.Chand.
- Basic Electronics – B. L. Thareja, S.Chand.

B.Tech. (Ag Engg.)

Semester- II

Electrical Circuits 3 (2+1)

Unit-1

DC circuit: Introduction to circuit elements R,L,C and their characteristics in terms of linearity & time dependant nature, voltage & current sources controlled & uncontrolled sources KCL and KVL analysis, Nodal & mesh analysis, analysis of magnetically coupled circuits, Transient analysis :- Transients in RL, RC & RLC Circuits, initial conditions, time constants. Steady state analysis- Concept of phasor & vector, impedance & admittance.

Unit-2

Magnetic Circuits: Magnetic flux, flux density, field intensity, B-H Curve, difference between magnetic and electric circuit, Faraday's law, Fleming right hand, left hand rule, Lenz law, self and mutual, inductance, induced emf, energy stored in magnetic circuit. AC CIRCUIT:-Concept of alternating current and voltage, Equation of instantaneous values. Average, rules, R.M.S. value, Form Factor and peak factor of sinusoidal waveform. Simple R-L-C Series circuit, concept of three phase A.C.), star-delta connection, star-delta conversion.

UNIT-3

Network Theorems for AC & DC circuits- Thevenins & Norton's, Superpositions, Reciprocity, Compensation, Substitution, Maximum power transfer, and Millman's theorem, Tellegen's theorem, problems with dependent & independent sources.

UNIT-4

Classification of filter, constant-k, m-derived, terminating half network and composite filter.

UNIT-5

Network function & Two port networks: Concept of complex frequency, Network & Transfer functions for one port & two ports, poles and zeros, Necessary condition for driving point & transfer function. Two port parameters – Z, Y, ABCD, Hybrid parameters, their inverse & image parameters, relationship between parameters, Interconnection of two ports networks, Terminated two port network.

Practical:

1. To familiarize with the components and equipments used in Laboratory;
2. To verify Kirchoff's current laws and Kirchoff's voltage laws;
3. To verify Thevenin theorems;
4. To verify Norton's theorems;
5. To verify Superposition theorem;
6. To study the sinusoidal response of RL series circuit & RC series circuit;
7. To study the step response of RL series circuit;
8. To study the step response of RC series circuit;
9. To study the response of constant L, T, π - filters;
10. To study power consumed in a three phase circuit.

References:

- Theraja, B.L. Fundamentals of Electrical Engineering and Electronics, Publication Div. of Niraja Construction, Dev. Co. New Delhi.
- Del, V. Electrical Engineering Fundamentals Toro, Prentice Hall of India, New Delhi.

B.Tech. (Ag Engg.)

Semester- II

Computer Programming and Data Structure 3 (1+2)

UNIT-1

Program, Programming languages. Types of programming languages. Overview of Compiler and Interpreter. Data types-Primary data types and user defined data types. Variables type casting. Operators. Managing input and output. Standard library functions.

UNIT-2

Control Statements: Decision making statements-if, else if, switch. Looping statements for, while, do...while, branching statements-break, continue Functions: Built-in functions. User defined functions. Passing arguments to functions and returning values. Recursion. Scope and visibility of a variable. String functions.

UNIT-3

Arrays: One and Two dimensional array. Pointers. Introduction, features, declaration, initialization. Structure and union.

UNIT-4

Data Structure: Definition of data structure, primitive operations on data structure. Types of data structure. Stack: Push and Pop operations. Infix, prefix and postfix expression. Conversion from infix to postfix. Queue: Definition, insertion and deletion operations in Queue.

UNIT-5

Linked List: Static vs. dynamic data structure. Types of linked list. Insertion and deletion in linked list.

Practical

1. Building an executable version of C program;
2. Developing and executing simple programs;
3. Creating programs using decision making statements such as if, go to & switch;
4. Developing program using loop statements while, do & for;
5. Using nested control structures;
6. Familiarizing with one and two dimensional arrays;
7. Using string functions;
8. Developing structures and union;
9. Creating user defined functions;
10. Using local, global & external variables;
11. Using pointers;
12. Implementing Stacks; Implementing push/pop functions;
13. Creating queues;

Suggested Text Books & References

- Balagurusamy, E. 1999. Programming in BASIC. BPB Publications, New Delhi.
- Balagurusamy, E. 1999. FORTRAN for Beginners. BPB Publications, New Delhi.
- Bedi, J.S. 1998. Computer and Microprocessor. Khanna Publishers, New Delhi.
- Singh, Sadhu, 1998. Computer Aided Design and Manufacturing. Khanna Publishers, New Delhi.

B.Tech. (Ag Engg.)
Semester- II
Engineering Mechanics 3 (2+1)

Unit – I

Introduction to condition of equilibrium: Force and system of force. Moment and couples: Moment and parallel forces, couples, General conditions of equilibrium. Centre of Gravity: Centre of parallel forces, C.G in some simple cases, C.G. of solids. Moment of Inertia: Moment of Inertia, Radius of Gyration and perpendicular axis. Determination of moment of inertia of simple sections.

Unit –II

Friction: Introduction, critical angle of friction, friction on horizontal planes, friction on inclined planes, Screw jacks, rolling friction.

Unit – III

Machines: Introduction , effects of friction, loss of work, reversible and irreversible machine, law of machine, wheel and axle, Differential wheel and axle, Pulley block, screw jack, Single and double purchase crab, worm and worm wheel, system of pulleys. Frames; Method of joints, Method of sections.

Unit – IV

Rectilinear motion, motion under gravity, projectiles equation of the path, maximum height attained, Time of flight, Horizontal range. Angle of projection, projectile from a given height, projectile on an inclined plane. Work , Power and Energy: Work , Power, Work done by torque, Energy , Law of conservation.

Unit-V

Centripetal and centrifugal forces, Laws of Motion: Newton's Law of motion and their explanation, collision of elastic bodies; Impulse and impulsive force, Principle of Conservation of momentum, Loss of kinetic energy during impact.

Practical:

- To determine the moment of inertia of a flywheel about its axis of rotation.
- To verify the conditions of equilibrium of forces by parallel force apparatus.
- To verify the principal of moments by crank lever.
- To find the compression in the rafters and tension in ties of simple roof truss models and to verify graphically.
- To determine the dry friction between inclined plane and slide boxes of different materials.
- To determine the coefficient of friction between the belt and rope and the fixed pulley.
- To determine the velocity ratio of a simple screw jack and to plot graph between (a) Effort-Load. (b) Friction-Load. (c) Efficiency-Load.

Textbook:

- Khurmi, R.S. , Engineering Mechanics, S.Chand Publication.
- S. S. Bhavikatti, K. G. Rajashekarappa,, Engineering Mechanics, New Age International.
- Shames,I.H., " Engineering Mechanics", Prentice Hall of India

B.Tech. (Ag Engg.)

Semester- II

Thermodynamics and Heat Engines 4 (3+1)

Unit I

Fundamentals and Definitions: System (closed and open system), Control Volume, properties, state, state change, and diagram, Dimensions and units. Thermodynamics properties, flow and non-flow processes, gas laws, Laws of thermodynamics.

Unit II

Application of first law in heating and expansion of gases in non-flow processes. First law applied to steady flow processes. Kelvin-Planck and Clausius statements. Reversible processes, Carnot cycle, Carnot theorem. Entropy, physical concept of entropy, change of entropy of gases in thermodynamics processes. Difference between gas and vapour, change of phase during constant pressure process.

Unit III

Generation of steam, triple point and critical point. Internal energy and entropy of steam. Use of steam tables and Mollier chart, heating and expansion of vapour in non-flow processes, measurement of dryness fraction. Classification of steam boilers, Cochran, Lancashire, locomotive and Babcock-Wilcox boilers. Boiler mountings and accessories.

Unit IV

Desirable properties of working fluid used for power plants. Rankine cycle. Expansive and non expansive working. Saturation curve and missing quantity, governing. Calculations of cylinder dimensions.

Unit V

Air Standard efficiency, other engine efficiencies and terms. Otto, diesel and dual cycles. Calculation of efficiency, mean effective pressure and their comparison. Measurement of IP, BP and heat balance calculations (not involving combustion). Engine efficiencies and performance.

Practical:

- ❖ Comparison of different temperature measuring methods;
- ❖ Study of boilers; Study of various mountings and accessories of boilers; Study of steam engine;
- ❖ To measure dryness fraction of steam & Performance test of steam engine;
- ❖ Study of I.C. engines;
- ❖ Study of valve timing diagram of 2-stroke engines;
- ❖ Study of valve timing diagram of 4-stroke engines;
- ❖ Study the performance test on 2- cylinder diesel engines;
- ❖ Study the performance test and heat balance test on a four cylinder horizontal diesel engine;

Suggested Text Books & References

- Thermal engineering (R.K. Rajput) Laxmi Publication.
- Engineering Thermodynamics by T. P. Roy & Choudhary
- Thermal engineering (Domkundwar, Kothandaraman and Khajuria) Dhanatrai Publication
- Van Wylen, G. J. and Sonntag, R.E., "Fundamentals of Classical Thermodynamics", John Wiley and Sons, 4th edition, 1997.

B.Tech. (Ag Engg.)

Semester- II

Field Operation & Maintenance of Tractor & Farm Machinery – I 1 (0+1)

Practical:

- Introduction to Fuel system of Tractor.
- Introduction to Lubrication system of Tractor.
- Introduction to cooling system of Tractor.
- Introduction to Electrical system of Tractor
- Introduction to Transmission system of Tractor.
- Introduction to Hydraulic system of Tractor.
- Introduction to Final drive system of Tractor.
- Introduction to Steering system of Tractor.
- Familiarisation with different makes & models of 4- wheeled tractors.
- Familiarisation with instrumentations panel & controls: Road signs, traffic rules, road safety, driving & parking of tractor.
- Tractor driving practice in forward and reverse gears.
- Tractor driving practice with 2-wheeled trailer forward & reverse.
- Study and practicing the hitching & dehitching of implements.
- Study operation field adjustments of MB plough and disk plough.

Textbooks:

- Michel A.M. & Ojha T.P. , Principles of Agricultural Engineering, Vol-I. Jain Brothers, New Delhi.
- Jain S.C & Rai C.M., Farm Tractors Repair 7 Maintenance, Standard Publisher Distributors, New Delhi
- Sahay Jagdishwar, Elements of agricultural Engineering, Standard Publishers Distributors.

Reference Books:

- E.L. Barger, J.B. Liljedahl, W.M. Carleton, E.G. Mokibben Tractors and their Power units, Wiley Eastern Private Ltd. New Delhi.

SSD- CSEP(COMMUNICATION SKILLS ENHANCEMENT PROGRAM)

FUNCTIONAL ENGLISH-II

2nd Semester

B.Tech (Engg.)/B.Tech (Ag.)/B.Tech (BT)/B.Sc.(Hons) Ag./B.Sc (BT)/B.Pharm/BBA/B.Com/B.com(Hons)/BCA(Hons)/Diploma (Engg.)

Unit-1

Subject verb Agreement, Adjectives and Comparison of Adjectives, Determiners

Unit-2

Introduction to Prepositions (Use and omission), Preposition of travel and movement, Preposition of Date and Time, Relations expressed by Preposition, Words followed by preposition, Finite and Non Finite Clauses& Uses of Let.

Unit-3

Conjunction: Co-ordinating and Subordinating, Sentences :Simple, Compound and Complex

Unit-4

Statement : Direct & Indirect, Phrasal Verb, Antonyms, Synonyms, Letter Writing: Formal (Parts& Layout)

Unit-5

Communication: Definition & Meaning of Communication, Importance & Process, Types: Verbal & Non-Verbal, Barriers, and how to overcome these barriers.

Reference:

Thomson, A.J and A.V. Martinet. *A Practical English Grammar*. Oxford University Press: New York.

Wren and Martin. *High School English Grammar and Composition*. S.Chand& Company Pvt. Ltd. : New Delhi

Greenbaum, Sidney. *Oxford English Grammar*. Oxford University Press: New York.

Rudzka-Ostyn, Brygida. (2003) *Word Power: Phrasal Verbs and Compounds*. Mouton de Gruyter, Berlin: New York

Chambers Dictionary of Antonyms & Synonyms

Hudson, Richard. *English Grammar*. Routledge: New York.

Rodrigues, M.V. *Effective Business Communication*. Concept Publishing Company: New Delhi.

Raman, Meenakshi&Sangeeta Sharma. *Communication Skills*. Oxford University Press

SPIRITUAL STUDIES (HINDUISM)
SRIMADBHAGWADGITA
Compulsory for All Programme/ Courses
श्रीमद्भगवद्गीता

UNIT-I

अध्याय—एक

अर्जुन की मोहग्रस्तता,

अध्याय—दो

अर्जुन का नैराश्य, शरीर और आत्मा का विश्लेषण, कर्तव्यपालन, निष्काम कर्मयोग, स्थितप्रज्ञ एवं तापत्रय

अध्याय—तीन

कर्मयोग, षट्ठिकार

UNIT-II

अध्याय—चार

गीता का इतिहास, भगवान के प्राकट्य का कारण एवं उनकी सर्वज्ञता

अध्याय—पांच

ईश्वरभावनाभावित कर्म

अध्याय—छः

ध्यान योग या सांख्य योग, सिद्धि या समाधियोग

अध्याय—सात

परा और अपरा शक्ति, पुण्यात्मा मनुष्य के लक्षण

UNIT-III

अध्याय—आठ

ब्रह्मा, आत्मा, अधिभूत, अधिदैव, अधियक्ष, मुक्तिलाभ की विधि

अध्याय—नौ

परमगुहाज्ञान

अध्याय—दस

श्रीभगवान का ऐश्वर्य

UNIT-IV

अध्याय—ग्यारह

श्रीभगवान का विराटस्वरूप

अध्याय—बारह

भक्तियोग का वर्णन, अव्यक्त की उपासना में क्लेश, शुद्ध भक्त के लक्षण

अध्याय—तेरह

क्षेत्र, क्षेत्रज्ञ एवं कर्मक्षेत्र की परिभाषा, ज्ञान, ज्ञेय, प्रकृति एवं परमात्मा, चेतना

अध्याय—चौदह

त्रिगुण स्वरूप

अध्याय—पंद्रह

परम पुरुष का स्वरूप, जीव का स्वरूप

UNIT-V

अध्याय—सोलह

दैवीय स्वभाव, आसुरी स्वभाव

अध्याय—सत्रह

श्रद्धा के तीन प्रकार, भोजन के प्रकार, यज्ञ के प्रकार, तप के प्रकार, दान के प्रकार, ऊँ कार का प्रतिपादन, सत्, असत् का प्रतिपादन

अध्याय—अठारह

सन्यास एवं त्याग में अंतर, त्याग के प्रकार, कर्म के कारण, कर्म के प्रेरक तत्व, कर्म के प्रकार, कर्ता के प्रकार, चार वर्णों के स्वाभाविक गुण, प्रभु के प्रति समर्पण भाव

Recommended books

संदर्भ ग्रंथ सूची

1. श्रीमद्भगवद्गीता—गीताप्रेस, गोरखपुर।
2. श्रीमद्भगवद्गीता—मधुसूदनसरस्वती, चौखम्भा संस्कृत संस्थान, वाराणसी, 1994।
3. श्रीमद्भगवद्गीता—एस.राधाकृष्णन् कृत व्याख्या का हिन्दी अनुवाद, राजपाल एण्ड सन्स, दिल्ली, 1969।
4. श्रीमद्भगवद्गीता—श्रीमद् भक्तिवेदांत स्वामी प्रभुपाद, भक्तिदांत बुक ट्रस्ट, मुंबई, 1996।
5. Srimadbhagawadgita-English commentary by Jaydayal Goyandaka, Gita Press, Gorakhpur, 1997.

SULLABUS
SPIRITUAL STUDIES (ISLAM)
Compulsory for All Programme/ Courses

UNIT-I

इस्लाम धर्म:- 6वीं शताब्दी में अरब की (राजनैतिक, धार्मिक, सामाजिक, आर्थिक परिस्थितियां व कबीलाई व्यवस्था)

मोहम्मद साहब का जीवन परिचय, संघर्ष व शिक्षाएं, इस्लाम का प्रारम्भ, इस्लाम क्या है और क्या सिखाता है, ईमान-ईमाने मोजम्मल, ईमाने मोफस्सल।

UNIT-II

इस्लाम धर्म की आधारभूत बातें:-

तोहीद, कल्मा-कल्मा-ऐ-शहादत, कल्मा-ऐ-तैय्यबा, नमाज, रोजा, जकात और हज का विस्तारपूर्वक अध्ययन

UNIT-III

खुदा-तआला की किताबें (आसमानी किताबें):-

“वही” की परिभाषा, तौरत, जुबूर, इंजील का परिचय, पवित्र कुरान का संकलन, पवित्र कुरान का महत्व, कुरान की मुख्य आयतें, पवित्र कुरान और हाफिजा

UNIT-IV

पवित्र हदीसों और सुन्नतों:-

हदीस और सुन्नत क्या है, हदीस और सुन्नत का महत्व, कुछ प्रमुख सुन्नतों और हदीसों का अध्ययन, सोकर उठने की सुन्नतें, लेबास की सुन्नतें, बीमारी और अयादत की सुन्नतें, सफर की सुन्नतें

UNIT-V

इस्लाम धर्म की अन्य प्रमुख बातें:-

मलाऐका या फरिशते (देवदूत), खुदा के रसूल, खुदा के पैगम्बर, नबी और रसूल में अन्तर, कयामत, सहाबा, खलीफा, मोजिजा और करामात, एबादत, गुनाह (कुफ्र और शिर्फ), माता-पिता, रिश्तेदार व पड़ोसी के अधिकार, इस्लाम में औरत के अधिकार, इस्लाम में सब्र और शुक्र, इस्लाम में समानता और भाईचारा

ADDITIONAL KNOWLEDGE:-

IN THE LIGHT OF ‘QURAN’ AND ‘HADEES’, TEN POINTS WILL BE DELIVERED TO THE STUDENTS DAILY, IN A SECULAR COUNTRY THE STUDENTS SHOULD KNOW THE PHILOSOPHY OF OTHER RELIGION ALSO SUCH AS “JAINISM”, “BUDHISM” AND “SANATAN DHARMA”.

B.Tech. (Ag Engg.)

Semester- III

Engineering Mathematics-III 3 (3+0)

UNIT-I

Fourier series: Infinite series and its convergence, periodic functions, Fourier series, Euler's formulae, Dirichlet's conditions, functions having arbitrary period, even and odd functions, half range series.

UNIT-II

Laplace transforms: Definition of Laplace transform, Laplace transforms of elementary functions, properties of Laplace transforms, inverse Laplace transforms, transforms of derivatives, integrals, transform of function multiplied by t^n , transform of function divided by t , convolution theorem; application of Laplace transforms to solve ordinary differential equations and simultaneous differential equations, Laplace transforms of unit step function, unit impulse function, periodic function.

UNIT-III

Numerical analysis - I: Finite differences: Difference table (Forward difference operators, Backward difference operators, Central difference operators), factorial notation, interpolation with equal intervals: Newton's forward and backward interpolation formulae, Gauss's (forward and backward), Bessel's and Stirling's formulae for central interpolation, interpolation with unequal intervals: Newton's divided difference formula, Lagrange's interpolation formula. **Numerical differentiation:** differentiation based on equal interval interpolation, first and second order derivatives by using Newton's forward and backward.

UNIT-IV

Numerical analysis - II: Numerical integration: Numerical integration by Trapezoidal, Simpson's and Weddle's rules; Difference equations (Numerical solution of algebraic and transcendental): Bisection method, Secant method, regular falsi method, Newton-Raphson method and Graffe's root squaring method.

UNIT-V

Numerical solution of ordinary differential equations by Picard's method, Taylor's series method, Euler's method, modified Euler's method, Runge - Kutta method. Solution of simultaneous algebraic equation: Gauss-Seidal method.

Text Book:

- Grewal, B.S. 1983. Higher Engineering Mathematics, Khanna Publishing House, New Delhi.
- D. K. Jain. Engg. Mathematics III
- H.K.Das, Engg. Mathematics III

References:

- Love, C.E. and Rainville, E.D. 1968. Differential and Integral calculus. The Mcmillon Co. New York.

B.Tech. (Ag Engg.)

Semester- III

Soil Mechanics 3 (2+1)

UNIT-I

Introduction of soil mechanics, field of soil mechanics, phase diagram physical and index properties of soil classification of soils, general classification based on particles size, textural classification and I.S. soil classification system stress condition in soils, effective and neutral stress,

Elementary concept of Bousinesque and Westergaard analysis, newmark influence chart.

UNIT-II

Shear strength mohr stress circle, theoretical relationship between principle stress circle, theoretical relationship between principal stress mohr-coulomb failure theory, effective stress principle. Determination of shear parameters by direct shear to be circle, theoretical test. Numerical exercise based on various types of tests.

UNIT-III

Compaction composition of soils standard and modified protector test, abbot compaction and Jodhpur mini compaction text field compaction method and control.

UNIT-IV

Consolidation of soil: Consolidation of soils, one dimensional consolidation spring analogy, Terzaghi' s theory Laboratory consolidation text, calculation of void ratio and coefficient of volume change, Taylor' s and Casagrand' s method, determination of coefficient of consolidation.

UNIT-V

Earth pressure: Plastic equilibrium in soils, active and passive states, Rankine' s theory of earth pressure active and passive earth pressure for cohesive soils, simple numerical exercise. Stability of slopes: Introduction to stability analysis of infinite and finite slopes friction circles method Taylor' s stability number.

Practical:

- Determination of water content of soil.
- Determination of specific gravity of soil.
- Determination of field density of soil by core cutter method.
- Grain size analysis by sieving (Dry sieve analysis).
- Grain size analysis by hydrometer method.
- Determination of liquid limit by Casagrande' s method.
- Determination of shrinkage limit.
- Determination of permeability by constant head method.
- Determination of permeability by variable head method.
- Determination of compaction properties by standard proctor test.
- Determination of shear parameters by Direct shear test.
- Determination of consolidation properties of soils.

Text Book:

- Punamia B.C.;Fundamentals Soil Mechanics;Laxmi Publication,New Delhi.
- Arora, K.R. 2000. Soil Mechanics and Foundation Engineering. Standard Publishers and Distributors, New Delhi.

References:

- Capper, P.L. and Cassie, W.F. 1961.The Mechanics of Engineering soils. Asia Publishing House, Bombay.
- Verma, B.P. 1996. Problems in Soil Mechanics and Foundation Engineering.Khanna Publishers, New Delhi.

B.Tech. (Ag Engg.)

Semester- III

Fluid Mechanics 3 (2+1)

UNIT-I

Properties of fluids: Ideal and real fluid. Pressure and its measurement, Pascal's law, pressure forces on plane and curved surfaces, centre of pressure, buoyancy, metacentre and metacentric height, condition of floatation and stability of submerged and floating bodies.

UNIT-II

Kinematics of fluid flow: Lagrangian and Eulerian description of fluid motion, continuity equation, path lines, streak lines and stream lines, stream function, velocity potential and flow net. Types of fluid flow, translation, rotation, circulation and vorticity, Vortex motion

UNIT-III

Dynamics of fluid flow, Bernoulli's theorem, venturimeter, orifice-meter and nozzle, siphon; Laminar flow: Stress-strain relationships, flow between infinite parallel plates - both plates fixed, one plate moving, discharge, average velocity, shear stress and pressure gradient.

UNIT-IV

Dimensional analysis and similitude: Rayleigh's method and Buckingham's 'Pi' theorem, types of similarities, dimensional analysis, dimensionless numbers. Laminar and turbulent flow in pipes, general equation for head loss-Darcy, Equation, Moody's diagram, Minor and major hydraulic losses through pipes and fittings, flow through network of pipes, hydraulic gradient and energy gradient, power transmission through pipe.

UNIT-V:

Introduction to Fluid Machinery (Turbines & Pumps), Applications of Fluid Machineries.

Practical:

- Study of different pressure gauges.
- Study of Bernoulli's theorem.
- Determination of coefficient of discharge of venturimeter and orifice meter.
- Study of coefficient of discharge for rectangular and triangular notch.
- Study of coefficient of discharge, coefficient of velocity and coefficient of contraction for flow through orifice.
- Study of metacentric height.
- Study of efficiency of hydraulic ram.
- Study of current meter.
- Velocity distribution in open channels and determination of Manning's coefficient of rigidity.

Text Book:

- Dr. D S Kumar, Fluid Mechanics & Fluid Power Engg. S. K. Kataria & Sons, New Delhi

References:

- Fox, R.W. and McDonald, A.T. 1995. Introduction to Fluid Mechanics, John Willey and Sons.
- Garde, R.J. 1992. Fluid Mechanics through Problems. Willey Eastern Ltd., New Delhi.
- Lal, Jagdish. 1997 Fluid Mechanics and Hydraulics. Metropolitan Book Co. Pvt. Ltd., New Delhi

B.Tech. (Ag Engg.)

Semester- III

Strength of Materials 3 (2+1)

UNIT-I

Concept of simple stress, strain, direct stress, shear strain, free body diagram, concept of uniform and non-uniform sections, strain in uniform tapering section, Lateral strain Poisson's ratio and change in dimensions of different shapes.

UNIT-II

Elastic constants, their relationship and volume changes. Thermal stresses, composite section and their equation formulations.

UNIT-III

Use of energy principle in solving problems stress and strain due to gradual, sudden application of forces, impact and shock loading, resilience, modulus of resilience complex stress, derivation of formulas for different cases. Mohr circle and its application in solving complex stress problem. Comparison of analytical and graphical solution of complex stress problem.

UNIT-IV

Slope and deflection of beams using integration techniques, moment area theorems and conjugate beam method.

UNIT-V

Columns and Struts. Riveted and welded connections. Stability of masonry dams. Introduction to intermediate beams, Propped beams. Fixed and continuous beams.

Practical:

- To study the tension test on metal specimen (M.S., C.I.).
- To observe the behavior of materials under load, to calculate the value of E, ultimate stress, permissible stress, percentage elongation etc. and its fracture.
- To determine Young's modulus of elasticity of beam with the help of deflection produced at centre due to loads placed at centre & quarter points.
- To study load deflection and other physical properties of closely coiled helical spring in tension and compression.
- To study the Brinell's Hardness tests on the given specimens.
- To determine fatigue strength of a given specimen.
- To write detail report emphasizing engineering importance of performing tension, compression, bending, torsion, impact and hardness tests on the materials.

Text Book:

- Khurmi, R.S. 1998 Strength of Materials and Mechanics of Structures,. Vol. I & II Khanna Publishers, New Delhi.
- Bansal R.K.;A Textbook of Strength of Materials; Laxmi Publications,New Delhi.

References:

- Singh Gurubaksh. 1998 Strength of Materials and Structures,. Vol. I & II Khanna Publishers, New Delhi.
- Timoshenko, S.P. and Young, D.H. 1968.Strength of Materials. Affiliated East- West Press Pvt. Ltd., New Delhi.

B.Tech. (Ag Engg.)

Semester- III

Heat and Mass Transfer 3 (3+0)

UNIT-I

Introductory concepts, modes of heat transfer, thermal conductivity of materials, measurement. General differential equation of conduction. One dimensional steady state conduction through plane and composite walls, tubes and spheres with and without heat generation. Electrical analogy. Insulation materials, critical thickness of insulation. Fins Free and forced convection.

UNIT-II

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

UNIT-III

Equation of laminar boundary layer on flat plate and in a tube. Laminar forced convection on a flat plate and in a tube. Combined free and forced convection.

UNIT-IV

Introduction. Absorptivity, reflectivity and transmissivity of radiation. Black body and monochromatic radiation, Planck's law, Stefan-Boltzman law, Kirchoff's law, grey bodies and emissive power, solid angle, intensity of radiation. Radiation exchange between black surfaces, geometric configuration factor.

UNIT-V

Heat transfer analysis involving conduction, convection and radiation by networks. Types of heat exchangers, fouling factor, log mean temperature difference, heat exchanger performance, transfer units. Heat exchanger analysis restricted to parallel and counter flow heat exchangers. Steady state molecular diffusion in fluids at rest and in laminar flow, Flick's law, mass transfer coefficients. Reynold's analogy.

Text Book:

- Kumar D.S.; Heat and Mass Transfer; Kataria & Sons, New Delhi
- Rajput R.K.; Heat and Mass Transfer; S.Chand & Company Ltd, New Delhi
- Domkundwar; Heat & Mass Transfer Dhanpat Rai and Sons. New Delhi.

References:

- Arora, N. 1972. Engineering Thermodynamics Problems, Dhanpat Rai and Sons. New Delhi.
- Ballancy, P.L. 1984 Thermal Engineering. Khanna Publishers, New Delhi.
- Jones, F.R. 1970 Farm Gas Engines and Tractors, Mc Graw. Hill Book Co. New York and London.
- Rai, G.D. 1998 Practical Thermodynamics. Khanna Publishers, New Delhi.

B.Tech. (Ag Engg.)

Semester- III

Farm Machinery & Equipment-I 3 (2+1)

UNIT-I

Objectives of farm mechanization. Classification of farm machines. Materials of construction & heat treatment.

UNIT-II

Principles of operation and selection of machines used for production of crops. Field capacities & economics.

UNIT-III

Tillage; primary and secondary tillage equipment. Forces acting on tillage tools. Hitching systems and controls. Draft measurement of tillage equipment : Earth moving equipment - their construction & working principles viz Bulldozer, Trencher, Elevators etc.

UNIT-IV

Sowing, planting & transplanting equipment – their calibration and adjustments. Fertilizer application equipment.

UNIT-V

Weed control and Plant protection equipment - sprayers and dusters, their calibration, selection, constructional features of different components and adjustments.

Practical:

- Introduction to various farm machines, visit to implements shed and research hall;
- Field capacity and field efficiency measurement for at least two machines/implements.
- Draft & fuel consumption measurement for different implements under different soil conditions.
- Construction details, adjustments and working of M.B. plow, disc plow and disc harrow and secondary tillage tools.
- Construction and working of rotavators and other rotary tillers, measurement of speed & working width.
- Working of seed-cum-fertilizer drills, planters and their calibration in field.
- Working of trans-planters and operation; Weeding equipments and their use.
- Study of sprayers, dusters, measurement of nozzle discharge, field capacity etc.

Text Book:

- Sahay J.;Elements of Agricultural Engineering;Jain Brothers,New Delhi
- Ojha, T.P. and Michael, A.M. 2001. Principals of Agricultural Engineering, Vol. -I., Jain Brothers, New Delhi.
- Kepner, R.A., Bainer, R. and Barger, E.L. 1987. Principles of Farm Machinery.C.S.B. Publishers and distributors, New Delhi.

References:

- Culpin, C. 1978. Farm Machinery. Granada Publishing Ltd., London.
- Smith, H.P. and Wilkes, L.H. 1979. Farm Machinery and Equipment. Tata McGraw-Hill Publishing Co. Ltd., New Delhi.

B.Tech. (Ag Engg.)

Semester- III

Farm Power 3 (2+1)

UNIT-I

Sources of farm power - conventional & non-conventional energy sources. Classification of tractors and IC engines.

UNIT-II

Review of thermodynamic principles of IC (CI & SI) engines and deviation from ideal cycle.]

UNIT-III

Study of engine components their construction, operating principles and functions. Engine systems: valves & valve mechanism.

UNIT-IV

Fuel & air supply, cooling, lubricating, ignition, starting and electrical systems. Study of constructional details, adjustments & operating principles of these systems.

UNIT-V

IC engine fuels - their properties & combustion of fuels, gasoline tests and their significance, diesel fuel tests and their significance, detonation and knocking in IC engines, study of properties of coolants, anti-freeze and anti-corrosion materials, lubricant types & study of their properties. Engine governing systems.

Practical:

- Engine parts and functions, working principles etc.
- Valve system – study, construction and adjustments.
- Oil & Fuel - determination of physical properties.
- Air cleaning system; Fuel supply system of SI engine.
- Diesel injection system & timing; Cooling system, and fan performance, thermostat and radiator performance evaluation.
- Part load efficiencies & governing.
- Lubricating system & adjustments.
- Starting and electrical system; Ignition system.
- Tractor engine performance curves.

Text Book:

- S.C.Jain, and C.R.Rai; Farm Tractor Maintenance. Granada Publishing Ltd., London.
- Ojha, T.P. and Michael, A.M. 2001. Principles of Agricultural Engineering, Vol. I., Jain Brothers, New Delhi.
- Sahay, J. 2001. Elements of Agricultural Engineering, Jain Brothers, New Delhi.

References:

- Culpin, C. 1978. Farm Machinery. Granada Publishing Ltd., London.
- Kepner, R.A., Bainer, R. and Barger, E.L. 1987. Principles of Farm Machinery. C.S.B Publishers and distributors, New Delhi.
- Smith, H.P. and Wilkes, L.H. 1979. Farm Machinery and Equipment. Tata McGraw-Hill Publishing Co. Ltd., New Delhi.

B.Tech. (Ag Engg.)

Semester- III

Engineering Properties of Biological Materials & Food Quality 3 (2+1)

UNIT-I

Importance of engineering properties of biological materials, Study of different physical and thermal characteristics of important biological materials like shape, size, volume, density, roundness, sphericity, surface area, specific heat, thermal conductivity, thermal diffusivity, etc.

UNIT-II

Measurement of colour, flavour, consistency, viscosity, texture and their relationship with food quality and composition. Rheological characteristics like stress, strain time effects, rheological models and their equations. Aerodynamic characteristics and frictional properties.

UNIT-III

Application of engineering properties in handling processing machines and storage structures. Concept, objectives and need of quality, quality control, methods of quality control, sampling; purpose, sampling techniques, requirements and sampling procedures for liquid, powdered and granular materials.

UNIT-IV

Sensory quality control, panel selection methods, interpretation of sensory results in statistical quality control, TQM and TQC, consumer preferences and acceptance.

UNIT-V

Food Laws and Regulations in India. Food grades and standards BIS, AGMARK, PFA, FPO, CAC (Codex Alimentarius Commission), sanitation in food industry, GMP, HACCP (Hazard analysis and critical control point) and ISO 9000 Series.

Practical:

- To find the shape and size of grains and fruits and vegetables.
- To determine bulk density and angle of repose of grains.
- To determine the particle density/true density and porosity of solid grains.
- To find out the co-efficient of external and internal friction of different crops.
- To determine specific heat of some food grains.
- To study the cooking quality of rice.
- To determine impurities and invisible stress cracks in grains.
- Milling quality of paddy.
- Detection of adulteration in food products viz. milk, ghee, honey etc.

Text Book:

- K .M.Sahay & K.K.Singh,;Unit Operations of Agricultural Processing,2nd ,Vikash Publication House Pvt Ltd.
- Mohesin, N.N. 1978. Physical Properties of Plants & Animals. Gordon & Breach Science Publishers , New York.

Reference:

- Prentice, J.H. 1984. Measurement in Rheological Properties of Food Stuffs. Elsevier Applied science Pub.Co. Inc. New York.
- Rao, M.A. and Rizvi, S.H., 1995. Engineering Properties of Foods. Marcel Dekker Inc. New York.

B.Tech. (Ag Engg.)
Semester- IV
Farm Machinery & Equipment – II 3 (2+1)

Unit -I

Hay harvesting: - Principles and types of cutting, crop harvesting machineries, construction and adjustments of conventional mower and its parts. Principles of conditioning , types of conditioners. Principles and methods of windrowing , types of windrowers. Introduction to bailing , types of balers and their working.

Unit – II

Forage chopping :- Introduction to chopping, shear type field choppers, energy requirements and capacities of choppers. Handling of chopped forage, energy requirement and efficiencies.

Threshing:- Principles and threshing mechanisms, performance parameters of threshing cylinders, adjustments. Combines – Grain combines and Seed combines, working, adjustments and performance.

Unit – III

Cotton harvesting:- Introduction ,working and adjustments of mechanical pickers and strippers. Factors affecting mechanical harvesting of cotton. Handling and storage of seed cotton.

Unit –IV

Root crop harvesting:- Sugar beet, groundnut, potato, sweet potato, onion harvesting.

Fruit & Vegetable harvesting :- Harvesting methods, handling of grape, strawberry, tree – fruits, bush fruits, tomato,sweet corn, vine crops.

Unit -V

Testing of farm machine:- Test codes and procedure.

Practical :

- Familiarisation with various farm machines related to harvesting and threshing.
- Study of various parts of mowers, constructional details, materials and working.
- Study of various parts of reapers, constructional details, materials and working.
- Study of various parts of forage choppers, constructional details, materials and working.
- Study of various parts of maize sheller, constructional details, materials and working.
- Study of various parts of paddy threshers, constructional details, materials and working.
- Study of various parts of combine, constructional details, materials and working.
- Study of various parts of straw combine, constructional details, materials and working.
- Study of various parts of reapers, constructional details, materials and working.

Textbook:

- Ojha, T.P. and Michael, A.M. 2001. Principals of Agricultural Engineering, Vol. I.,Jain Brothers, New Delhi.
- S.C. Jain and C.r. Rai; Farm Tractor Maintenance, Granada Publishing Ltd.,London.
- Sahay, J. 2001. Elements of Agricultural Engineering, Jain Brothers, New Delhi.

References:

- Kepner, R.A., Bainer. Roy,and Barger, E.L., Principles of Farm Machinery, CBS Publishers & Distributors Pvt. Ltd., Chennai

B.Tech. (Ag Engg.)

Semester- IV

Renewable Energy Resources 3 (2+1)

Unit –I

Energy sources – Nature, Quality, Characteristics and classification of energy sources on the basis of nature, use and disappearance, regeneration. Introduction to renewable energy resources. Conventional and non conventional energy resources.

Unit – II

Solar Energy – introduction, solar radiation and its measurement, characteristics of solar spectrum, solar energy collection, Application of solar energy. **Wind Energy** – Introduction, harnessing of wind energy, types of wind mill and their applications.

Unit-III

Energy from biomass – Introduction to biomass, characterization of biomass, thermochemical conversion of biomass, direct combustion, pyrolysis, gasification, carbonization, briquetting, pelletization and densification of biomass. Types of bio-gas plants.

Unit-IV

Alternate fuels – Introduction to various alternate fuels. Bio-conversion into alcohols, methyl and ethyl esters, solvents of amino acids.

Unit-V

Energy requirement in agricultural production systems, energy ratio and specific energy value, inflow and outflow of energy in unit agricultural operation.

Practical:

- Preparation of biomass sample;
- Determination of calorific value;
- Estimation of ash content of biomass;
- Estimation of moisture content of biomass;
- Demonstration of Gasifier.
- Demonstration of Bio gas plant.
- Measurement of solar radiation;
- Determination of fuel properties.

Textbook:

- Rai, G.D. , Non- Conventional Energy Resources, Dhanpat Rai Publication

B.Tech. (Ag Engg.)
Semester- IV
Crop Process Engineering 3 (2+1)

Unit I

Scope and importance of food processing, principles and methods of food processing. Processing of farm crops; cereals, pulses, oil seeds, fruits and vegetables and their products for food and feed. Processing of animal products,

Unit II

Theory and Principles of Drying - Methods, Grain Dryers, working principle and classifications.

Unit III

Principle of size reduction, grain shape, size reduction machines; crushers, grinders, cutting machines etc. - operation, efficiency and power requirement – Rittinger's, Kick's and Bond's equation, fineness modulus.

Unit IV

Theory of mixing, types of mixtures for dry and paste materials, rate of mixing and power requirement, mixing index. Theory of separation, size and un sized separation, types of separators, size of screens, sieve analysis, capacity and effectiveness of screens, pneumatic separation. Theory of filtration, study of different types of filters, rate of filtration, pressure drop during filtration.

Unit V

Scope & importance of material handling devices, study of different types of material handling systems; belt, chain and screw conveyor, bucket elevator, pneumatic conveying, gravity conveyor- design consideration, capacity and power requirement.

Practical:

- Preparation of flow and layout charts of a food processing plant.
- Determination of moisture content of crop produces.
- Determination of fineness modulus and uniformity index.
- Study of various size reduction equipment; Hammer mill, Attrition mill, Ball mill
- Mixing index and study of mixers;
- Study of grading equipment;
- Study of separation equipment; (a) Cleaner and grader (b) Cyclone separator
- Evaluation of performance of indented cylinder and screen pre-cleaner;
- Study design of conveying equipments; Belt, Chain, Screw, Bucket elevator

Suggested Text Books & References

- Chakraverty, A. "Post Harvest Technology of Cereals, Pulses and Oil Seeds".5th Ed., Oxford & IBR 2008
- Sahai, K.M. and Singh, K.K. "Unit operation in Agricultural Engineering", Vikas Publishing House Pvt. Ltd" 1994
- Henderson, S.M, and Perry, R.A "Agricultural Process Engineering", John Wiley and Son, 1955
- McCabe, W.L. and Smith, J.C. "Unit Operations in Chemical. Engineering", Tata McGraw Hill, 1976

B.Tech. (Ag Engg.)
Semester- IV
Engineering Hydrology 3 (2+1)

UNIT -I Introduction-Hydrological cycle; schematic diagram and component of hydrological cycle; Classification of hydrology; Water budget equation; world water balance; Evaporation- types of evoprimeters; Evapotranspiration- measurement and equation; application of hydrology in engineering.

UNIT-II Precipitation-form of precipitation; measurement; type of rain gauge; rain gauge network; preparation of data; estimation of missing rainfall data; presentation rainfall data- mass curve of rainfall , hytograph, mean precipitation – arithmetical mean, thiessen mean and isohyetal method; infiltration – initial loss, infiltration indices, W-index and ϕ Index based numerical problems.

UNIT-III Runoff and Stream Flow measurement Introduction; factor affecting the runoff direct runoff; base flow; drought classification – meteorological drought, hydrological drought and agricultural drought; measurement of stage; measurement of velocity; type of stream flow; runoff characteristics of stream ; flow duration curve and flow mass curve ; direct and indirect measurement of stream.

UNIT-IV Hydrograph-factor affecting flood hydrograph; physiographic and climate; component of hydrograph; base flow separation; effective rainfall; unit hydrograph; s-curve; use and limitation of unit hydrograph; synthetic unit hydrograph; dimensionless hydrograph; instantaneous unite hydrograph.

UNIT-V Floods and Flood routing estimation of magnitude of flood pea; rational method-time of concentration, rainfall intensity, runoff coefficient; empirical formula; flood hydrograph; frequency distribution function; flood routing- channel and reservoir routing ; flood control; flood forecasting.

Practical

1. Visit to meteorological observatory.
2. Study of different types of rain gauges.
3. Exercise on analysis of rainfall data.
4. Double mass curve technique.
5. Determination of average depth of rainfall and frequency analysis.
6. Study of stage recorders and current meters.
7. Exercise on estimation of peak runoff rate and runoff volume.
8. Exercises on hydrograph and unit hydrograph.
9. Exercises on design and location of retards for channel improvement.
10. Exercises on flood routing problems.

Text References book:

- Engg. Hydrology by K. Subhramanya - Tata Mc Graw Hills Publ. Co.
- Engg. Hydrology by H.M. Raghunath
- Hydrology for Engineers Linsley, Kohler, Paulnus - Tata Mc.Graw Hill.
- Applied Hydrology by V.T. chow, D.R.Maidment and L.W. Mays-Mc.Graw Hill.
- Hydrology and Soil Water Conservation Engineering, by Ghanshyam Das-PHI publication.

B.Tech. (Ag Engg.)
Semester- IV
Theory of Machines 3 (2+1)

Unit -I

Elements, links, pairs, kinematics chain, and mechanisms. Classification of pairs and mechanisms. Lower and higher pairs. Four bar chain, slider crank chain and their inversions. Determination of velocity and acceleration using graphical (relative velocity and acceleration) method. Instantaneous centers.

Unit – II

Types of gears. Law of gearing, velocity of sliding between two teeth in mesh. Involute and cycloidal profile for gear teeth. Spur gear, nomenclature, interference and undercutting. Introduction to helical, spiral, bevel and worm gear. Simple, compound, reverted, and epicyclic trains. Determining velocity ratio by tabular method.

Unit – III

Turning moment diagrams, co-efficient of fluctuation of speed and energy, weight of flywheel, flywheel applications

Unit – IV

Belt drives, types of drives, belt materials. Length of belt, power transmitted, velocity ratio, belt size for flat and V belts. Effect of centrifugal tension, creep and slip on power transmission, Chain drives.

Unit -V

Types of friction, laws of dry friction. Friction of pivots and collars. Single disc, multiple disc, and cone clutches. Rolling friction, anti friction bearings.

Types of governors. constructional details and analysis of Watt, Porter, Proell governors. Effect of friction, controlling force curves. Sensitiveness, stability, hunting, isochronisms, power and effort of a governor.

Static and dynamic balancing. Balancing of rotating masses in one and different planes. Partial primary balancing of reciprocating masses.

Practical :

- Analysis of 4-bar mechanism, slider crank mechanism and their inversions;
- Complete velocity and acceleration analysis (Graphical or Analytical) of few practical linkage mechanisms;
- To study of gears and gear trains and motion analysis of some practical complex compound gear train; Motion analysis Epicyclic gear trains using tabular and formula methods;
- To design a compound gear train and epicyclic gear train for a desired speed ratio;
- Practical test; To study the flywheel and governor action in laboratory;
- Demonstration of static and dynamic balancing in the laboratory.
- Calculations on balancing a multi rotor unbalanced system by putting masses in two different planes.

Textbooks and References:

- Theory of Machines, R. S. Khurmi, J.K. Gupta, Eurasia Publishing House.
- Theory of Machines: Kinematics and Dynamics by B.V.R. Gupta, IK International Publication House.

B.Tech. (Ag Engg.)

Semester- IV

Agriculture Statistics (2+0)

UNIT-I

Fundamental of statistics: Measures of Central Tendency: Arithmetic mean ,methods of calculating Arithmetic mean from raw data and frequency distribution, properties, Median, Computation of median, properties of median, mode, methods of computing mode, properties of mode. Relationship between mean, median and mode. Types of graph and Types of Frequency curves.

UNIT-II

Random Variable: Discrete random variable, Continuous random variable, Probability function of a discrete random variable, Probability distribution of a discrete random variable.

Sampling : Introduction ,Types of sampling , random sampling, simple sampling, sample mean, Sampling distribution, Sampling distribution of mean.

UNIT-III

Measures of Dispersion: Calculation of Mean Deviation, Calculation of standard deviation, calculation of variation.

Probability: Elementary probability theory, various types of events, Definition of Probability, Compound probability, conditional probability.

UNIT-IV

Probability distribution: Binomial distribution, Constants of Binomial distribution and Poisson distribution ,Constants of Poisson distribution and their properties.

Unit-V

Correlation and Regression: Karl Pearson's coefficient of correlation form paired observation. Regression lines, Coefficient of regression, fitting of the equation to the line of regression.

Test of Significance: chi- square tests, student t-test, Anova tests.

Text and Reference Books:

- Practicals in Statistics, H.L.Sharma, Agrotech Publishing Academy, Udaipur.
- Fundamentals of Applied Statistics, S. C. Gupta, V. K. Kapoor, Sultan Chand & Sons, 1996
- Applied Statistics, M.Ray and Har Swarup Sharma, Ram Prasad & Sons.

B.Tech. (Ag Engg.)

Semester- IV

Irrigation Engineering 4 (3+1)

UNIT-I Introduction-Irrigation; impact of irrigation on human environment; purpose of irrigation; source of irrigation water; India water budget; river system of India; advantage and disadvantage of irrigation.

UNIT-II Saturation point; field capacity; moisture equivalent; wilting point; permanent wilting point; Evaporation; transpiration ; evapotranspiration ; evaporation measurement; surface irrigation method and design; wind speed; crop growth stage and crop coefficient ; modified penman equation; crop water requirement; net irrigation requirement ; gross irrigation requirement; irrigation frequency; irrigation period; irrigation management; irrigation efficiency and based numerical problem.

UNIT-III Water Lift and Pumps- classification of pumps; performance and adaptability of common type indigenous water lift; application of non-conventional energy in pumping; positive displacement pumps; variable displacement pumps; specific speed of pumps; pump characteristics; terminology; effective speed and impeller diameter on pump performance; centrifugal pump- principle of operation, classification ; type of impeller; operation, maintenance and trouble shooting; submersible pump; selection of pump; power requirement; efficiency and economy of pumping plant.

UNIT-IV Measurements of irrigation water- unit of measurement of water; method of water measurement ; weirs and flume; orifices and water gate; open channel; design of open channels; terminology; estimating velocity of flow in open channels; drop structure.

UNIT-V Sprinkler irrigation-adaptability; types; component; uniformity coefficient; design of sprinkler irrigation system; cost estimation; operation and maintenance of sprinkler system; **Drip irrigation**-component; installation; emitter selection; emitter selection; emission uniformity; design and layout of drip irrigation.

Practical

- Measurement of soil moisture by different soil moisture measuring instruments.
- Measurement of irrigation water.
- Measurement of infiltration rate.
- Computation of evaporation and transpiration.
- Measurement of uniformity coefficient of sprinkler irrigation method.
- Measurement of uniformity coefficient of drip irrigation method.

Text book

- Irrigation Theory and practice by A.M. Michael, new Delhi vikas publication
- Principles of Agril. Engg. Vol-II by A.M. Michale and T.P. Ojha, Jain brother, New Delhi

Reference book

- Soil and water conservation by Schwob, G.O. frevert, R.K. Edminister, T.W. barnes, K.K., John wiley and Sons Inc. New York
- Sprinkler and trickle irrigation by Keller Jack 1990, Van Nastrund Reinhold 115 fifth avenue new York

B.Tech. (Ag Engg.)
Semester- IV
Agribusiness Management and Trade 3 (3+0)

Unit-I

Agribusiness meaning, definition, structure of Agribusiness (Input, Farm, Product and Sectors). Importance of Agribusiness in Indian Economy. Agribusiness Management features. Importance of Management.

Unit-II

Management concepts and principles, process of management, Functions of management. Planning (Type, Goal and Objective). Strategic Policy, Procedure, Rules, Programme, Budget, Staffing, Directing, Motivation, Ordering, Leading, Supervision and Communication.

Unit-III

Capital Management- Meaning, Definition, financial management of Agribusiness management. Importance of financial statement, balance sheet, profit/Loss Statement, Ratio-Profitability Ratio, Liquidity ratio, agro based industry, importance and need.

Unit-IV

Agribusiness and application of management principles to agribusiness, production, consumption, and marketing of agricultural products, Agricultural processing. Cooperative Marketing. State Trading. Warehousing Corporation; Central and State, Objectives, Functions, Advantages, Setup of Agro-based Industry, constraints in setup of agro based industries.

Unit-V

Meaning and theories of international trade: Domestic Trade, Free trade, International Trade, GATT, WTO, , WTO provisions for trade in agricultural and food commodities, India's contribution to international trade in food and agri – commodities.

Text and Reference books:

- Mondy R. Waghe and Premeaux Shahe, R. 1995. Management Concepts, Practices and Skills. Prentice Hall, Inc. Englewood Cliffs, New Jersey.
- Shukla, M.C. 2001. Business Organization and Management. S. Chand and Co., New Delhi.

B.Tech. (Ag Engg.)

Semester- V

DAIRY AND FOOD ENGINEERING 3 (2+1)

Unit I

Importance of food processing and preservation, major characteristics of food raw materials and their interaction with processing. Present scenario of Dairy development in India.

Unit II

Engineering, thermal and chemical properties of milk and milk products. Unit operation of various dairy and food processing systems, process flow charts for product manufacture, working principles of equipment for receiving, pasteurization sterilization, homogenisation, filling & packaging, butter manufacture, dairy plant design and layout, composition and proximate analysis of food products.

Unit III

Deterioration in products and their controls. Physical, chemical and biological methods of food preservation,

Unit IV

Changes undergone by the food components during processing, evaporation, freezing juice extraction, filtration, and membrane separation, thermal processing, plant utilities requirement.

Unit V

Principles of dehydration, various drying systems- tray belt, drum, spray, freeze, osmotic and microwave, performance characteristics of various drying systems and their selection.

Practical:

- Study of a composite pilot milk processing plant & equipments;
- Study of pasteurisers, sterilizers & homogenisers;
- Study of separators & butter churners;
- Study of evaporators & milk dryers;
- Study of freezers.
- Design of food processing plants & preparation of layout;
- Visit to multiproduct dairy product;
- Determination of physical properties of food products;
- Estimation of steam requirements;
- Estimation of refrigeration requirements in dairy & food plant;
- Visit to Food industry.

Reference Books

- Ahmed, Tufail "Dairy Plant Engineering and Management", Kitab Mahal, Allahabad, 2007.
- Teledo, R.M. "Fundamentals of Food Process Engineering", 5TH Ed. Van Nostrand Reinhold, New York, 2011.
- Kessler, H.G. "Food Engineering and Dairy Technology", V.A. Kessler, Frcising. Germany, 1981.

B.Tech. (Ag Engg.)

Semester- V

Tractor Systems and Controls 3 (2+1)

UNIT I

Transmission Systems- Study of clutch, gear box, differential and final drive mechanism-function, Principle of Working, Types, Engine governing, Mechanisms involved, Repair and Inspection.

UNIT II

Steering Systems - Ackerman and hydraulic steering and hydraulic systems, brake mechanism – Functions, Principle of Working, Types, Mechanisms involved, Repair and Inspection.

UNIT III

Tractor Power - Study of Tractor power outlets such as P.T.O., belt pulley, drawbar, etc.

UNIT IV

Tractor Chassis –Traction Theory, Traction model, Lvs placing, ply rating, tyre size, load air pressure relationship. Traction aids and their selection, mechanics of tractor chassis, Location of C.G., forces acting on tractor body, tractor stability, Static equilibrium force analysis weight transfer.

UNIT V

Ergonomics - Ergonomic considerations- Anthropometric measurements in sitting and standing position, operator's workplace, control panel, operator's vision, noise and vibration measurement and effects , operational safety.

Practical:

- Introduction to transmission systems and components;
- Study of clutch functioning, parts and design problem on clutch system;
- Study of different types of gear box, calculation of speed ratios, design problems on gear box;
- Study on differential and final drive and planetary gears;
- Study of brake systems and some design problems;
- Steering geometry and adjustments;
- Study of hydraulic systems in a tractor, hydraulic trailer and some design problems;
- Traction performance of a tractor wheel;
- Finding C.G. of a tractor by weighing technique; Finding CG of a tractor using suspension/balancing techniques; Finding moment of Inertia of a tractor;
- Appraisal of various controls in different makes tractors in relation to anthropometric measurements.

Reference Books:

- Barger, E.L; Liljedehl, J.B. Carleton, W.M. and Me Kibben, E.G. "Tractors and their Power Units".
- Michael, A.M. and Ojha, T.P. "Principles of Agril.Engg", Vol.I.
- Nakra, C.P. "Farm Machines and Equipments".
- Mosses and Frost, "Farm Power", 631. 37 M 85.

B.Tech. (Ag Engg.)
Semester- V
Drainage Engineering 2 (1+1)

Unit I

Introduction of Drainage, objectives of drainage, drainage problems, Surface drainage, drainage coefficient, types of surface drainage, design of open channel

Unit II

Sub-surface drainage purpose and benefits, investigations of design parameters, hydraulic conductivity, drainable porosity, water table, types and use of subsurface drainage system, Design of surface drains,

Unit III

Derivation of ellipse (Hooghoudt's) and Ernst's drain spacing equations, Design of subsurface drainage system. Drainage materials, drainage pipes, drain envelope.

Unit IV

Layout, construction and installation of drains, Drainage structures, Vertical drainage, Bio-drainage, Tile Drains, interceptor and relief drains.

Unit V

Drainage of irrigated and humid areas, Salt balance, reclamation of saline and alkaline soils. Leaching requirements, conjunctive use of fresh and saline waters, Economic aspects of drainage

Practical

- In-situ measurement of hydraulic conductivity;
- Determination of drainage coefficients;
- Preparation of isobaths and isobar maps;
- Measurement of hydraulic conductivity and drainable porosity;
- Design of surface drainage and subsurface drainage systems;
- Fabrication of drainage tiles;
- Installation of subsurface drainage system;
- Cost analysis of surface and sub-surface drainage system.

Reference Books

- Land and water management: Principles and Practices, By: V.V.N. Murthy
- Horizontal Drainage System design, By: Dr. Cheddi Lal
- Principles of Agricultural Engineering Vol-II, By: A.M. Michael & T.P. Ojha
- Agriculture drainage, By: Dr. A.K. Bhattacharya

B.Tech. (Ag Engg.)

Semester- V

Soil and Water Conservation Engineering 3 (2+1)

Unit I

Soil Erosion-causes, type and agent of soil erosion, water erosion-form of water erosion, mechanics of erosion, gullies and their classification, stages of gully development.

Unit II

Soil loss estimation – universal soil loss equation and modified soil loss equation, determination of various parameter, Land use capability classification and sub classes, wind erosion - factors affecting wind erosion, mechanics of wind erosion

Unit III Agronomical measures- contour cropping, strip cropping, mulching, conservation tillage's: grass water way and its design: water harvesting structure, characteristics of contours and preparation of contour maps

Unit IV

Mechanical measures for erosion control: terrace-level and graded, broad base terraces and their design, bench terraces and their design: bunds- Contour bunds, graded bunds their design.

Unit V

Gully and ravine reclamation- principle of gully control, vegetative and temporary structure: design details of permanent gully control structure drop spillway, chute spillway and drop inlet spillway, sedimentation - sedimentation in reservoirs and streams, estimation and measurement, sediment delivery ratio, trap efficiency

Practical:

- Study of soil loss measurement techniques,
- Problems on Universal Soil Loss Equation;
- Preparation of contour map of an area and its analysis;
- Design of vegetative waterways;
- Design of contour bunding system and graded bunding system;
- Design of various types of bench terracing systems;
- Determination of rate of sedimentation and storage loss in reservoir;
- Design of Shelter belts and wind breaks

REFERENCES BOOKS

- Soil & Water Conservation Engg. By R. Suresh :
- Water resources & Hydrology By S.K. Garg :
- Principles of Agril. Engg. Vol-II By Michael & Ojha:
- Soil ConservationBy Norman Hudson:
- Hydrology and Soil and water conservation engineering By Ghanshyam Das

B.Tech. (Ag Engg.)

Semester- V

CAD/CAM Computer Graphics and Machine Drawing 3 (1+2)

Unit I

First and third angle methods of projection. Preparation of working drawing from models and isometric views. Drawing of missing views. Different methods of dimensioning. Concept of sectioning. Revolved and oblique section. Sectional drawing of simple machine parts. Types of rivet heads and riveted joints. Processes for producing leak proof joints. Symbols for different types of welded joints. Nomenclature, thread profiles, multi-start threads, left and right hand thread. Square headed and hexagonal nuts and bolts. Conventional representation of threads. Different types of lock nuts, studs, machine screws, cap screws and wood screws. Foundation bolts.

Unit II

Design process, application of computers for design, definition of CAD, benefits of CAD, CAD system components. Computer hardware for CAD. Display, input and output devices. Graphic primitives, display file, frame buffer, display control, display processors,

Unit III

Line generation, graphics software. Points and lines, Polygons, filling of polygons. Text primitive. Other primitives. Windowing and clipping, view port. Homogeneous coordinates. Transformations. Planar and space curves design. Analytical and synthetic approaches.

Unit IV

Parametric and implicit equations. B-spline and Beizer curves. Geometric modeling techniques. Wire frames. Introduction to solid modeling.

Unit V

Introduction to numerical control, basic components of NC system, NC coordinates and motion control systems. Computer numerical control, direct numerical control, combined CNC/DNC. NC machine tools and control units. Tooling for NC machines, part programming, punched tape, tape coding and format, manual and computer assisted part programming.

Practical:

- Preparation of manual drawings with dimensions from Models and Isometric drawings of objects and machine components;
- Preparation of sectional drawings of simple machine parts;
- Drawing of riveted joints and thread fasteners;
- Demonstration on computer graphics and computer aided drafting use of standard software;
- Practice in the use of basic and drawing commands on auto cad; Generating simple 2-D drawings with dimensioning using autocad;
- Practice in the use of modify and rebelling commands;
- Practice in graphics mathematics, curve fitting and transformations;
- Demonstration on CNC machine

Reference Books

- Quality in Design and Manufacturing (CAD/CAM), By: Dalela Suresh Mechatronics, By: K. Adinarayana
- CAD/CAM Robotics & factories of the future, By: S. Narayan, K.J. Reddy, P. Kuppan K.
- CAD/CAM, By: Rao P.N.
- CAD/CAM : Computer-Aided Design and Manufacturing, By: Groover, M, Zimmers, E
- CAD/CAM Theory and Practice, By: Zeid, Ibrahim

**B.Tech. (Ag Engg.)
Semester- V**

MACHINE DESIGN 3 (2+1)

Unit –I

Introduction: Introduction to design procedure, Meaning of design, Phases of design, properties of materials and their selection, manufacturing considerations in design, concept of interchangeability and types of fit.

Stresses in Machine Parts: Simple stresses : stress and strain (tensile, compressive and shear), modulus of elasticity, modulus of rigidity, bearing stress, thermal stress, stresses in composite bars, linear and lateral strain, Poisson's ratio, volumetric strain, bulk modulus, resilience.

Unit -II

Torsional & Bending Stresses: Torsional shear stress, bending stress in straight beams, principal stress, eccentric loading - direct & bending combined, introduction to theories of failure under static load.

Variable Stresses: Introduction to cyclic stresses, fatigue, endurance limit, stress concentration and notch sensitivity.

Unit -III

Design of Machine Elements: Threaded fasteners: Stresses due to screwing up forces. Stresses due to external forces, bolted joints under eccentric loading - acting parallel to the axis of bolt, acting perpendicular to the axis of bolt.

Unit -IV

Keys and Couplings: types of keys and couplings, force acting on sunk key, design of sunk key, sleeve (muff coupling) and flange coupling-empirical design and check for strength.

Unit-V

Shafts: Design of shafts for strength - torsional strength, bending strength, introduction to rigidity

Flat Belt Drives: Velocity ratio and power transmission.

Practical:

- Problems based on load and stress analysis of machine components;
- Problems based on practical application of theories of failure and fatigue and determination of factor of safety;
- Design and drawing of pin connections, Knuckle joint;
- Design of bolted joints cases of electric loading;
- Exercises on design of levers rockers arm for diesel engines;
- Problems on design of shafts, keys and coupling;
- Problems in selection/ design of belts;
- Selection of roller bearings use of catalogue;
- Problems on design of helical and leaf spring;
- Problems on gear design of spur gears.

Reference books

- Machine design by RS Khurmi, S. Chand Pub.
- Machine Design by J.E. Shigley
- Sharma, P.C. and Agarwal, D.K. "Machine Design".

B.Tech. (Ag Engg.)

Semester- V

ELECTRICAL MACHINES & POWER UTILIZATION 3 (2+1)

Unit I

Basic Principles of Machines:

Flux, flux density, magnetic field intensity, reluctance, laws of magnetic circuits, determination of ampere-turns for series and parallel magnetic circuits, various types of losses in machines, Electro motive force difference between mmf and emf, rotating magnetic field.

Unit II

Transformers

Construction, EMF equation, principle of operation, leakage reactance phasor diagram on no-load, effect of load, equivalent circuit, voltage regulation, losses and efficiency: simple numeric problems. Tests on transformer, prediction of efficiency and regulation, auto-transformers, instrument transformers, three -phase transformers.

Unit III

D.C. Machines

Constructional features and principles of operation of shunt, series and compound generators and motors including EMF equation: simple numeric problems, and armature reaction; performance characteristics of generators and motors; starting, speed control and braking of motors. Choice of D.C. motors for different applications; losses and efficiency.

Unit IV

Polyphase Induction Machine

Construction principle of operation, equivalent circuit, torque equation, torque-slip characteristic. starters for cage and wound rotor type induction motors, speed control and braking, fractional kilowatt motor, single phase induction motor: double revolving field theory, equivalent circuit, and methods of starting, Universal motor, Shaded pole motor. Power factor improvement, disadvantage of low power factor.

Unit V

Synchronous Machines

Construction, e.m.f. equation, effect of pitch and distribution factor, armature reaction and determination of regulation of synchronous generators; principle of motor operation, effect of excitation on line currents (V-curves), method of synchronisation; typical applications of A.C. motors in industry.

Practical (Any Ten):

- To get familiar with AC, DC machines and measuring instruments;
- To perform open circuit and short circuit tests on a single phase transformer and hence find equivalent circuit, voltage regulation and efficiency;
- To study the constructional details of D.C. machine and to draw sketches of different components;
- To obtain load characteristics of d.c. shunt/series /compound generator;
- To study d.c. motor starters;
- To Perform load-test on 3 ph. induction motor;
- To perform no-load & blocked –rotor tests on 3 ph. Induction motor to obtain equivalent ckt. parameters & to draw circle diagram;

- To study star- delta starters physically and (a) to draw electrical connection diagram (b) to start the 3 ph. induction motor using it. (c) to reverse the direction of 3 ph. I.M.;
- To start a 3-phase slip –ring induction motor by inserting different levels of resistance in the rotor ckt. and to plot torque –speed characteristics;
- To perform no load & blocked –rotor test on 1 ph. induction motor & to determine the parameters of equivalent ckt. drawn on the basis of double revolving field theory;
- To perform load –test on 1 ph. induction motor & plot torque –speed characteristics.

Reference Books

- Hughes, Edward "Electrical Technology", Addison Wesley Longman Ltd., 1995.
- Nagrath I.J. and Kothari, D.P. "Electrical Machines", Tata McGraw Hill Publishing Co.Ltd., 1992.
- Cotton, H. "Advanced Electrical Technology", Wheeler and Co., 1995.
- Fitzgerald, Kingsley, Kusko, "Dumas - Electrical Machines", McGraw Hill Pub., 4th Ed., 1994

B.Tech. (Ag Engg.)

Semester- V

Database Management and Internet Applications 2 (0+2)

Practical:

- Basic database concepts,
- Introduction to RDBMS,
- SQL Commands,
- Data constraints, Joins, set operations, working with forms,
- Basics of HTML,
- Developing web pages using meta tags,
- Dynamic pages using Java scripts,
- Connectivity with RDBMS,
- Project.

Reference Books:

- Mazumdar, A.K. and Bhattacharya, P. "Introduction to Data Base Management Systems", McGraw Hill, 1997
- Gillenson, Mark L "DATABASE: Step by Step", Wiley Eastern Ltd., Delhi, 1985

B.Tech. (Ag Engg.)

Semester- VI

AGRICULTURAL STRUCTURES AND ENVIRONMENTAL CONTROL 3 (2+1)

Unit I

Planning and layout of farm stead. Physiological reactions of livestock to solar radiation and other environmental factors, livestock production facilities, BIS. Standards for dairy, piggery, poultry and other farm structures.

Unit II

Design, construction and cost estimation of farm structures; animal shelters, compost pit, fodder silo, fencing and implement sheds, barn for cows, buffalo, poultry, etc.

UNIT III

Design and construction of rural grain storage system; Engineering for rural living and development, rural roads, their construction cost and repair and maintenance.

UNIT IV

Sources of water supply, norms of water supply for human being and animals, drinking water standards and water treatment suitable to rural community. Site and orientation of building in regard to sanitation, community sanitation system; sewage system its design, cost and maintenance, design of septic tank for small family. Estimation of power requirement for domestic and irrigation, source of power supply, use of alternate source of energy, electrification of rural housing.

UNIT V

Scope, importance and need for environmental control, renewable and non-renewable resources and their equitable use, concept of eco system, biodiversity of its conservation, environmental pollution and their control, solid waste management system, BOD and COD of food plant waste, primary and secondary treatment of food plant waste.

Practical:

- Instruments for measurements of environmental parameters.
- Environmental indices for your city.
- Harmonic analysis for sole-air temperature.
- Reflective and no reflective air space in buildings.
- Design and layout of a dairy farm.
- Design and layout of a poultry house.
- Design and layout of a sheep/goat house.
- Design of a biogas plant.
- Design of a farm fencing system.
- Design of ventilation system for dairy and poultry house.
- Design of a feed/fodder storage structures.
- Familiarization with local grain storage structures.
- Design of grain storage structures.
- Cost estimation of a farm building.

Reference Books:

- Barre, H.J. and Sammet, L.L. "Farm Structures". John Wiley and Sons Inc. 1950."
- Neubaur, L. W. and Walker, H.B. "Farm Buildings Design". Prentice Hall Inc., 1961.-
- Khanna, S.K. and Justo, C.E.G. "Highway Engineering". Nemchand and Bros., Roorkee, India.
- Dutta, B.N. "Estimating and Costing in Civil Engineering Theory and Practice". S. Dutta and Co.
- Bazirani, V.N. and Ratwani, M.M. "Steel Structures". Khanna Publishers, Delhi, 1981.

B.Tech. (Ag Engg.)
Semester- VI
Design of Structures 3 (2+1)

UNIT I

Loads and use of BIS Codes. Design of connections.

UNIT II

Design of structural steel members in tension, compression and bending.

UNIT III

Design of steel roof truss.

UNIT IV

Analysis and design of singly and doubly reinforced sections, Shear, Bond and Torsion.

UNIT V

Design of Flanged Beams, Slabs, Columns, Foundations, Retaining walls and Silos.

Practical:

- Design and drawing of steel roof truss;
- Design and drawing of RCC building;
- Design and drawing of Retaining wall.

Reference Books

- Design of steel structures Vol. I, By: Ram Chandra
- Steel structures, By: Vazirani and Ratwani
- Design of steel structures, By: Ramamrutham
- Concrete structures, By: Vazirani & Ratwani
- Plain and Reinforced concrete Vol. I, By: Jaikrishna and O.P. Jain
- Design of Plane and reinforced concrete structures, By: S. Ramamrutham
- IS: 800-1984 Code of Practice for General Construction in steel
- Indian Standard Code of Practice for use of structural steel in General Building Construction
- ISI Handbook for Structural Engineers. Structural Steel Section
- IS 456:2000 Indian Standard Code of Practice for Plain and Reinforced Concrete

B.Tech. (Ag Engg.)

Semester- VI

Drying and Storage Engineering 4(3+1)

UNIT I

Moisture content and methods for determination, importance of EMC and methods of its determination, EMC curve and EMC model, principle of drying, theory of diffusion, mechanism of drying- falling rate, constant rate, thin layer, deep bed and their analysis, critical moisture content, drying models, calculation of drying air temperature and air flow rate, air pressure within the grain bed, Shred' s and Hukill' s curve, different methods of drying including puff drying, foam mat drying, freeze drying, etc.

UNIT II

Study of different types of dryers- performance, energy utilization pattern and efficiency, study of drying and dehydration of agricultural products.

UNIT III

Types and causes of spoilage in storage, conditions for storage of perishable products, functional requirements of storage, control of temperature and relative humidities inside storage, calculation of refrigeration load;

UNIT IV

Modified atmospheric storage and control of its environment, air movement inside the storage, storage of grains: destructive agents, respiration of grains, moisture and temperature changes in stored grains; conditioning of environment inside storage through natural ventilation, mechanical ventilation, artificial drying, grain storage structures such as Bukhari, Morai, Kothar, silo, CAP, warehouse - design and control of environment.

UNIT V

Storage of cereal grains and their products, storage of seeds, hermetically sealed and air-cooled storages-refrigerated, controlled atmosphere, modified atmospheric and frozen storages. Storage condition for various fruits and vegetables under cold and CA storage system. Economic, aspects of storage.

Practical:

- Study of mechanics of bulk solids affecting cleaning, drying and storage of grains;
- Measurement of moisture content during drying and aeration;
- Measurement of relative humidity during drying and aeration using different techniques; Measurement of air velocity during drying and aeration;
- Drying characteristic and determination of drying constant;
- Determination of EMC and ERH;
- Study of various types of dryers;
- To study the effect of relative humidity and temperature on grains stored in gunny bags;
- Design and layout of commercial bag storage facilities;
- Design and layout of commercial bulk storage facilities;
- Study of different domestic storage structures;
- Visits to commercial handling and storage facilities for grains.

Reference Books

- Drying and storage of grains and oilseeds, By: Brooker D.B.F.W. Bakkee-Arkema and C.W. Hall.
- Unit operations of Agricultural Processing, By: Sahay, K.M. & K.K. Singh.
- Post harvest technology of cereals, pulses and oilseeds, By: Chakraverty, A.
- Handling and storage of food grains in tropical and subtropical area,By: FAO Pub.
- Preservation and storage of grains, seeds and their by-products,By: Multon, J. L.
- Grain storage Engineering and Technology, By: Vijayaraghavan, S.
- Dehydration of foods, By: Barbosacanvas and H., Vega. Mercado

B.Tech. (Ag Engg.)

Semester- VI

Refrigeration and Air Conditioning 3(2+1)

UNIT I

Principles of refrigeration, second law of thermodynamics applied to refrigeration, Carnot cycle, reversed Carnot cycle, coefficient of performance, and units of refrigeration.

UNIT II

Refrigeration in food industry, types of refrigeration system, mechanical vapour compression, vapour absorption system, components of mechanical refrigeration, refrigerant, desirable properties of ideal refrigerant.

UNIT III

Centrifugal and steam jet refrigeration systems, thermoelectric refrigeration systems, vortex tube and other refrigeration systems, ultra low temperature refrigeration, cold storages, insulation material, design of cold storages, defrosting.

UNIT IV

Thermodynamic properties of moist air, perfect gas relationship for approximate calculation, adiabatic saturation process, wet bulb temperature and its measurement, psychometric chart and its use, elementary psychometric process.

UNIT V

Air conditioning – principles- Type and functions of air conditioning, physiological principles in air conditioning, air distribution and duct design methods, fundamentals of design of complete air conditioning systems – humidifiers and dehumidifiers – cooling and calculations, types of air conditioners –applications.

Practical

- Study of vapour compression and vapour absorption systems;
- Study of Electrolux refrigerator;
- Solving problems on refrigeration on vapour absorption system;
- Experiments with the refrigeration tutor to study various components of refrigeration;
- Determination of the coefficient of performance of the refrigeration tutor;
- Experiment on humidifier for the determination of humidifying efficiency;
- Experiment on dehumidifier for the determination of dehumidifying efficiency;
- Experiment on the cooling efficiency of a domestic refrigerator;
- Experiments on working details of a cold storage plant and air conditioning unit;
- Experiments with air conditioning tutor to study various components;
- Determination of the coefficient of performance of air conditioning tutor;
- Estimation of refrigeration load;
- Estimation of cooling load for air conditioner;
- Estimation of humidification and dehumidification load;
- Design of complete cold storage system.

Reference Books

- Refrigeration & Air conditioning, By: R.S. Khurmi & J.K. Gupta
- Principles of refrigeration, By: Roy J. Dossat
- Refrigeration & Air conditioning, By: Dom Kundwar
- Refrigeration & Air conditioning, By: V.K. Jain
- A text book of Refrigeration and Air Conditioning, By: R.K. Gupta & Jain
- Food preservation by Refrigeration, By: Lorentze

B.Tech. (Ag Engg.)
Semester- VI
Soil and Water Conservation Structures 3 (2+1)

UNIT I

Introduction; classification of structures, functional requirements of soil erosion control structures; flow in open channels-types of flow, state of flow, regimes of flow, energy and momentum principles, specific energy and specific force;

UNIT II

Hydraulic jump and its application, type of hydraulic jump, energy dissipation due to jump, jump efficiency, relative loss of energy; runoff measuring structures-parshall flume, H - flume and weirs; straight drop spillway - general description, functional use, advantages and disadvantages, structural parts and functions; components of spillway,

UNIT III

Hydrologic and hydraulic design, free board and wave free board, aeration of weirs, concept of free and submerged flow, structural design of a drop spillway-loads on headwall, variables affecting equivalent fluid pressure, determination of saturation line for different flow conditions,

UNIT IV

Seepage under the structure, equivalent fluid pressure of triangular load diagram for various flow conditions, creep line theory, uplift pressure estimation, safety against sliding, overturning, crushing and tension; chute spillway general description and its components, hydraulic design, energy dissipaters,

UNIT V

Design criteria of a SAF stilling basin and its limitations, drop inlet spillway- general description, functional use, design criteria; design of diversions; small earth embankments-their types and design principles, farm ponds and reservoirs, cost estimation of structures.

Practical

- Study of H-flume and Parshall flume
- Construction of specific energy and specific force diagram;
- Measurement of hydraulic jump parameters and amount of energy dissipation;
- Hydraulic design of a straight drop spillway;
- Determination of loads on headwall and construction of triangular load diagram;
- Stability analysis of a straight drop spillway;
- Hydraulic design of a chute spillway;
- Design of a SAF energy dissipater;
- Design of water harvesting structures;
- Cost estimation of structures.
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Reference Books

- ❖ Land and water management; Principles and Practices, By: V.V.N. Murthy
- ❖ Soil and water Conservation Engineering, By: R. Suresh

B.Tech. (Ag Engg.)
Semester- VI
Groundwater, Wells and Pumps 3 (2+1)

UNIT I

Occurrence and movement of ground water, aquifer and its types, classification of wells, steady and transient flow into partially, fully and non-penetrating and open wells,

UNIT II

Familiarization of various types of bore wells common in the state, design of open well, groundwater exploration techniques, methods of drilling of wells, percussion, rotary, reverse rotary, design of assembly and gravel pack, installation of well screen, completion and development of well,

UNIT III

Groundwater hydraulics-determination of aquifer parameters by different method such as Theis, Jacob and Chow's, The is recovery method, well interference, multiple well systems, surface and subsurface exploitation and estimation of ground water potential, quality of ground water, artificial groundwater recharge planning, modeling, ground water project formulation.

UNIT IV

Pumping Systems: Water lifting devices; different types of pumping machinery, classification of pumps, component parts of centrifugal pumps; pump selection, installation and trouble-shooting; design of centrifugal pumps,

UNIT v

Pump performance curves, effect of speed on head capacity, power capacity and efficiency curves, effect of change of impeller dimensions on performance characteristics; Hydraulic ram, propeller pumps, mixed flow pumps and their performance characteristics; priming, self priming devices, roto-dynamic pumps for special purposes such as deep well turbine pump and submersible pump.

Practical

- Verification of Darcy's Law;
- Study of different drilling equipments;
- Sieve analysis for gravel and well screens design;
- Estimation of specific yield and specific retention;
- Drilling of a tube well;
- Measurement of water level and drawdown in pumped wells;
- Study of artificial ground water recharge structures

Reference Books

- ❖ Ground water Hydrology, By: H.M. Raghunath
- ❖ Wells and Pumps Engineering, By: S.D. Khepar and A.M. Michael
- ❖ Pump: Theory & Practices, By: V.K. Jain
- ❖ Irrigation Theory and Practicals, By: A.M. Michael
- ❖ Ground Water Engineering, By: D.K. Todd
- ❖ Assessment of Ground Water Resources, By: Karanth

B.Tech. (Ag Engg.)

Semester- VI

Micro Irrigation Systems Design 3 (2+1)

UNIT I

Past, present and future need of micro-irrigation systems, Role of Govt. for the promotion of micro-irrigation in India, Merits and demerits of micro-irrigation system.

UNIT II

Types and components of micro-irrigation system, Micro-irrigation system- design, design synthesis, installation, and maintenance.

UNIT III

Sprinkler irrigation - types, planning factors, uniformity and efficiency, laying pipeline, hydraulic lateral, sub-mains and main line design, pump and power unit selection. Drip irrigation – potential, automation, crops suitability.

UNIT IV

Fertigation – Fertilizer application criteria, suitability of fertilizer compounds, fertilizer mixing, injection duration, rate and frequency, capacity of fertilizer tank.

UNIT V

Quality control in micro-irrigation components, design and maintenance of polyhouse; prospects, waste land development – hills, semi-arid, coastal areas, water scarce areas, Benefit and Cost analysis.

Practical

- Study of different types of micro-irrigation systems and components;
- Field visit of micro-irrigation system;
- Study of water filtration unit;
- Discharge measurement study of different micro-irrigation systems;
- Study of water distribution and uniformity coefficient;
- Study of wetted front and moisture distribution under various sources of micro-irrigation system;
- Design of micro-irrigation system for an orchard;
- Design of micro-irrigation system for row crops design of spray type micro-irrigation system;
- Design of microirrigation system for hilly terraced land;
- Study of automation in micro-irrigation system;
- Study of micro climate inside a Polyhouse;
- Study of maintenance and cleaning of different components of various systems;
- Design of sprinkler irrigation system;
- Design of landscape irrigation system.

Reference Books

- Principles of Sprinkler Irrigation, By: M.S. Mane, B.L. Ayare,
- Principles of drip irrigation System, By: M.S. Mane, B.L. Ayare, S.S. Magar
- Text Book of Irrigation Engineering and Drainage, By: R.K. Sharma and T.K. Sharma
- Irrigation Engineering, By: R. Lal
- Sprinkler Irrigation, By: R.K. Sivanappan
- Irrigation Principles and Practices, By: O.W. Israelsen, V.T. Hansen and Stringhem
- Irrigation System : Design and Operation, By: D. Karmeli, G. Peri and M. Todes

B.Tech. (Ag Engg.)

Semester- VI

Entrepreneurship Development and Communication Skills 2 (2+0)

UNIT I

Entrepreneurship Development: Assessing overall business environment in the Indian economy. Overview of Indian social, political and economic systems and their implications for decision making by individual entrepreneurs.

UNIT II

Globalization and the emerging business/entrepreneurial environment. Concept of entrepreneurship; entrepreneurial and managerial characteristics; managing an enterprise; motivation and entrepreneurship development; importance of planning, monitoring, evaluation and follow up; managing competition; entrepreneurship development programs;

UNIT III

SWOT analysis, Generation, incubation and commercialization of ideas and innovations. Government schemes and incentives for promotion of entrepreneurship. Government policy on Small and Medium Enterprises (SMEs) / SSIs. Export and Import Policies relevant to horticulture sector. Venture capital. Contract farming and joint ventures, public-private partnerships. Characteristics of Indian farm machinery industry. Social Responsibility of Business.

UNIT IV

Communication Skills: Structural and functional grammar; meaning and process of communication, verbal and nonverbal communication; listening and note taking, writing skills, oral presentation skills; field diary and lab record; indexing, footnote and bibliographic procedures.

UNIT V

Reading and comprehension of general and technical articles precise writing, summarizing, abstracting; individual and group presentations, impromptu presentation, public speaking; Group discussion. Organizing seminars and conferences.

Practices

- Listening and note taking, writing skills, oral presentation skills;
- Field diary and lab record, indexing, footnote and bibliographic procedures.
- Reading and comprehension of general and technical articles, precise writing, summarizing, abstracting, individual and group presentations.

Reference Books

- Extension Communication and Management, By: G.L. Ray
- Communication and Instructional Technology, By: Indu Grover, Shusma
- Kaushik, Lali Yadav, Deepak Grover & Shashikanta Verma
- Extension Management, By: Indu Grover, Lali Yadav & Deepak Grover
- Communication through Farm Literature, By: G.K.
- Agricultural Extension, By: A.W. Van den Ban & H.S .Hawkins
- Education and Communication For Development, By: O.P.

- Trainers Manual on Developing Entrepreneurial Motivation, By: Akhouri, M.M.P., Mishra, S.P. and Sengupta, Rita
- Entrepreneurship, Playing to Win, By: Betty Gordan B
- The Entrepreneurs Handbook Vol.1 & 2, By: Mancuso
- Development of an Entrepreneur : A Behaviouristic Model, Technical paper
- Teaching Oral Communication, By: Donn Byrne
- Communicative Language Teaching - An Introduction, By: Francoise Grellet

B.Tech. (Ag Engg.)

Semester- VII

Food Packaging Technology 3 (2+1)

UNIT I

Factors affecting shelf life of food material during storage; spoilage mechanism during storage; definition, requirement, importance and scope of packaging of foods;

UNIT II

Types and classification of packaging system; advantage of modern packaging system. Different types of packaging materials used.

UNIT III

Different forms of packaging, metal container, glass container, plastic container, flexible films, shrink packaging, vacuum & gas packaging.

UNIT IV

Packaging requirement & their selection for the raw & processed foods. Advantages & disadvantages of these packaging materials; effect of these materials on packed commodities, Package testing, Printing, labeling and lamination.

UNIT V

Economics of packaging; performance evaluation of different methods of packaging food products; their merits and demerits; scope for improvements; disposal and recycle of packaging waste.

Practical

- Identification of different types of packaging materials & determination of tensile strength of given material;
- Determination of compressive strength of given package;
- To perform different destructive tests for glass containers & to perform non-destructive tests for glass containers;
- Vacuum packaging of agricultural produces;
- Determination of tearing strength of paper board & measurement of thickness of packaging materials;
- To perform grease-resistance test in plastic pouches;
- Determination of bursting strength of packaging material;
- Determination of water-vapour transmission rate;
- Shrink wrapping of various horticultural produce;
- Testing of chemical resistance of packaging materials;
- Determination of drop test of food package; Visit to relevant industries.

Reference Books

- ❖ Handling and storage of food grains in tropical and subtropical areas , By: Hall, C. W.
- ❖ Preservation and storage of grains, seeds and their by-products, By: Multon J.L.
- ❖ Food packaging materials, By: Mahadeviah, M. and R. V .Gowramma.
- ❖ Post harvest physiology, handling and utilization of tropical and sub tropical fruits and vegetables, By: Pantastico, E.C.B.
- ❖ Agricultural process engineering, By: S. Handerson, and S.M. Perry

B.Tech. (Ag Engg.)

Semester- VII

Remote Sensing and GIS Application 3 (2+1)

UNIT I

Remote Sensing: Definition, stage in remote sensing, modern remote sensing technology versus conventional aerial photography; visual image interpretation, image interpretation, basic principles of image interpretation,

UNIT II

Factors governing the quality of an image; factors governing interpretability, visibility of objects, elements of image interpretation, techniques of image interpretation, digital image processing, digital image;

UNIT III

Remote sensing in agriculture progress and prospects, microwave radiometry for monitoring agriculture crops and hydrologic forecasting; aerial photo interpretation for water resources development and soil conservation survey

UNIT IV

GIS: History of development of GIS definition, basic components, and standard GIS packages; data-entry, storage and maintenance; data types-spatial-non-spatial (attribute data),

UNIT V

Data structure, data format- point line vector-raster – polygon-object structural model, files, files organization data base management systems (DBMS), entering data in computer digitizer-scanner data compression.

Practical:

- Familiarization with remote sensing and GIS hardware;
- Use of instruments for aerial photo interpretation;
- Interpretation of aerial photographs and satellite imagery;
- Basic GIS operations such as image display;
- Study the various features of GIS software package;
- Scanning and digitization of maps; data base query and map algebra;
- GIS supported case studies in water resources management.

Reference Books

- ❖ Remote Sensing GIS Principles, By: B.C. Pand
- ❖ Principles of Remote Sensing, By: A.N. Patel & Surendra Singh
- ❖ Advances in Remote Sensing & GIS Analysis, By: Atkinson P.M.
- ❖ Introduction to Remote Sensing, By: James B. Campbell
- ❖ Manual of Remote Sensing Vol. I & II, By: Colwell R.N.
- ❖ Remote Sensing : Principles and Interpretation, By: Sabins F.L.

B.Tech. (Ag Engg.)
Semester- VII
Systems Engineering 3 (3+0)

UNIT I

System concepts. Requirements for a Linear programming problems.

UNIT II

Mathematical formulation of Linear Programming problems and its Graphical solution. Response of systems.

UNIT III

Computer as a tool in system analysis. Simplex method. Degeneracy and Duality in linear programming. Artificial variable techniques, Big M method and two phase methods.

UNIT IV

Mathematical models of physical systems. Modelling of Agricultural Systems and operations. Cost analysis.

UNIT V

Transportation problems. Assignment problems. Waiting line problems. Project management by PERT/CPM. Resource scheduling.

Reference Books

- ❖ Operations research, By: P.K. Gupta & D.S. Hira
- ❖ Optimization-Theory & Applications, By: S.S. Rao
- ❖ Operations research, By: A.P. Verma
- ❖ Operations research, By: Kanti Swarup, P.K. Gupta and Man Mohan
- ❖ Operations research, By: Mittal and Goel
- ❖ Operations research: An Introduction, By: H.A. Taha

B.Tech. (Ag Engg.)
Semester- VII
Watershed Management 3 (2+1)

UNIT I

Watershed management - problems and prospects; watershed based land use planning, watershed characteristics – physical and geomorphologic, factors affecting watershed management,

UNIT II

Hydrologic data for watershed planning, watershed delineation, delineation of priority watershed, water yield assessment and measurement from a watershed; sediment yield estimation and measurement from a watershed and sediment yield models.

UNIT III

Rainwater conservation technologies - in-situ and storage, design of water harvesting tanks and ponds; water budgeting in a watershed; effect of cropping system, land management and cultural practices on watershed hydrology;

UNIT IV

Evaluations and monitoring of watershed programmes people's participation in watershed management programmes, Participatory rural appraisal (PRA)

UNIT V

Planning and formulation of project proposal; cost benefits analysis of watershed programmes; optimal land use models; case studies.

Practical

1. Study of watershed characteristic;
2. Analysis of hydrologic data for watershed management;
3. Delineation of watershed and measurement of area under different vegetative and topographic conditions;
4. Measurement of water and sediment yield from watershed;
5. Study of different watershed management structures;
6. Study of various water budget parameters;
7. Study of watershed management technologies;
8. Preparation of a techno-economically effective project proposal.

Reference Books

- ❖ Watershed Management (For Dryland Agriculture), By: Oswal M.C.
- ❖ Land and Water Management Engineering, By: V.V.N. Murthy
- ❖ River Basin Planning, Theory and Practices, By: Saha S.K. & Barrow C.J.
- ❖ Watershed planning and management, By: Rajvir Singh
- ❖ Soil and Water Conservation Engineering, By: R. Suresh

B.Tech. (Ag Engg.)
Semester- VII (Elective)
Human Engineering and Safety 3(3+0)

UNIT I

Human factors in system development – concept of systems; basic processes in system development, performance reliability, human performance. Information input process, visual displays, major types and use of displays, auditory and factual displays. Speech communications.

UNIT II

Biomechanics of motion, types of movements, Range of movements, strength and endurance, speed and accuracy, human control of systems.

UNIT III

Human motor activities, controls, tools and related devices. Anthropometry: arrangement and utilization of work space, atmospheric conditions, and heat exchange process and performance, air pollution.

UNIT IV

Dangerous machine (Regulation) act, Rehabilitation and compensation to accident victims,

UNIT V

Safety gadgets for spraying, threshing, Chaff cutting and tractor & trailer operation etc.

B.Tech. (Ag Engg.)
Semester- VII (Elective)
Advanced Techniques in Food Processing 3(3+0)

UNIT I

Aseptic canning and ohmic heating,

UNIT II

Extrusion cooking, effect of process variable of the physiochemical and nutritional characteristics of extruded foods.

UNIT III

Refrigerated storage of fresh and processed food. Advances methods of food freezing, indicators for quality of frozen foods.

UNIT IV

Fortification, synthetic nutrients, functional foods, use of radiation and microwave in food processing.

UNIT V

High-pressure processing, supercritical gas extraction, Flavour Encapsulation.

B.Tech. (Ag Engg.)
Semester- VII (Elective)
Water Harvesting & Ground Water Recharge 3 (3-0)

UNIT I

Water harvesting; Scope, need & types of water harvesting, long term & short term water harvesting techniques

UNIT II

Water harvesting structures, design of water harvesting structure & ponds, water harvesting techniques for hilly and arid region

UNIT III

Reservoir type storage structures; Definition and types, storage or conservation reservoirs, flood control reservoir, multipurpose reservoir & distribution reservoirs planning & site selection, water yields for catchments

UNIT VI

Estimation of runoff, reservoir components, capacity –elevation curves of reservoir, storage zones of reservoirs, design of reservoirs capacity, Bibliographical and analytical method; Stenz's table Barlow table, Lacy's formula, Inglis formula, Khosla formula

UNIT V

Determining reservoir capacity for a given demand & vice versa, Demand pattern of various reservoirs, Hydrologic reservoir routing method Sedimentation, Reservoir losses spillway

- Hand Book of Applied Hydrology, McGraw Hill Book Company, New York by Chow, V.T
- Ground Water, Wiley Eastern Ltd, India by Raghunath, H.M
- Ground Water Hydrology, 3rd Ed. John Wiley & Sons In by Todd, D.K and Mays, L.W

B.Tech. (Ag Engg.)

Semester- VIII

Minor Irrigation and Command Area Development 3 (2+1)

UNIT I

Major, medium and minor irrigation projects – their comparative performance; development and utilization of water resources through different minor irrigation schemes.

UNIT II

Basic concepts of command area – definition, need, scope, and development approaches: historical perspective, command area development authorities;

UNIT III

Interaction/collaboration of irrigation water use efficiency and agricultural production.

UNIT IV

Planning and execution of on farm development activities with in the scope of command area development;

UNIT V

Use of remote sensing techniques for command area development; case studies of some selected commands; Farmers participation in command area development.

Practical:

- Topographic survey and preparation of contour map;
- Preparation of command area development layout plan;
- Earthwork and cost estimation;
- Irrigation water requirement of crops;
- Preparation of irrigation schedules;
- Planning and layout of water conveyance system;
- Design of Irrigation systems;
- Conjunctive water use planning;
- Application of remote sensing for command area development;
- Study tour to minor irrigation and command area development projects.

Reference Books

- ❖ Principles of farm irrigation system design, L.G. James
- ❖ Irrigation Hydraulics R. Lal
- ❖ Hydrologic Modelling of small watersheds by Haan , C.T.
- ❖ Land and Water management Engineering By V. V. N. Murthy
- ❖ Design of small canal structure, Aisenbrey A.J. Hayes R. B. , Warren
- ❖ Textbook of Irrigation Engineering and Hydraulic Structure R.K. Sharma
- ❖ Studies in Irrigation and water management BY, B.D. Dhawan

B.Tech. (Ag Engg.)
Semester- VIII
Food Process Plant Design & Layout 3 (2+1)

UNIT I

Meaning and definition of plant layout. Objectives and principles of layout. Types of layout.

UNIT II

Salient features of processing plants for cereals, pulses oilseeds, horticultural and vegetable crops, poultry, fish and meat products, milk and milk products.

UNIT III

Location selection criteria, selection of processes, plant capacity, project design, flow diagrams, selection of equipments, process and controls, handling equipments, plant layout,

UNIT IV

Plant elevation, requirement of plant building and its components, labour requirement, plant installation, power and power transmission, sanitation.

UNIT V

Cost analysis, preparation of feasibility report.

Practical

- Planning, visit and layout of flour milling plant;
- Planning, visit and layout of rice milling plant;
- Planning, visit and layout of milk plant;
- Planning, visit and layout of bakery plant;
- Planning, visit and layout of fruits and vegetable dehydration plant;
- Planning, visit and layout of beverages industry;
- Planning, visit and layout of edible of extraction plant;
- Planning, visit and layout of ice-cream plant;
- Planning, visit and layout of sugar mill plant;
- Planning, visit and layout of honey/turmeric/chillies processing plant.

Reference Books

- ❖ Physical Properties of foods and food processing systems, By: Lewis, M.J. Dairy Technology and Engineering, By: Harper, W.J. and Hall, C.W.
- ❖ Process Modeling Simulation and Control for Chemical Engineers, By: Luyben, W.L.
- ❖ Mass Transfer Operations, By: Treybal, R.E.

B.Tech. (Ag Engg.)
Semester- VIII
Mechanics of Tillage and Traction 3 (2+1)

UNIT I

Introduction to mechanics of tillage tools, engineering properties of soil, principles and concepts, stress strain relationship,

UNIT II

Design of tillage tools principles of soil cutting, design equation, force analysis, application of dimensional analysis in soil dynamics performance of tillage tools.

UNIT III

Introduction to traction and mechanics, off road traction and mobility, traction model, traction improvement, traction prediction,

UNIT IV

Tyre size, tyre lug geometry and their effects, tyre testing,

UNIT V

Soil compaction and plant growth, variability and geo statistic, application of GIS in soil dynamics.

Practical

- Measurement of static and dynamic soil parameters related to tillage;
- Measurement of soil parameters related to puddling and floatation;
- Measurement of draft for passive rotary and oscillating tools;
- Measurement of slip and sinkage under dry and wet soil conditions;
- Measurement of load and fuel consumption for different farm operations;
- Economics of weight transfer and tractor loading including placement and traction aids;
- Studies on tyres, tracks and treads under different conditions;
- Studies on compaction and number of operations.

Reference Books

- ❖ Agricultural machines, By : N.I. Klenin, I.F. Popov & V.A. Sakum
- ❖ Tractors & their power units, By : J.B. Liljedahl, P.K. Turnquist, D.W. Smith & M. Hoki
- ❖ Tractor implement systems, By : Ralph Alcocl
- ❖ Farm machinery, By: S.C. Jain
- ❖ Design of Agril. Machinery, By : Garry Krutz
- ❖ Principles of Farm machinery, By : R.A. Kepner, Roy Bainer & E.L. Barger

B.Tech. (Ag Engg.)

Semester- VIII (Elective)

Operation, Maintenance & Economic Evaluation of Water Resource Projects 3 (3-0)

UNIT I

Guidelines for operational and maintenance and surface irrigation methods. operation and maintenance of sprinkler irrigation systems; efficiency evaluation. Suitability of drip irrigation system under Indian conditions; design of drip irrigation systems; Data requirements and survey, Topographical, geological, hydrological, socio-economic technological;

UNIT II

Market survey; Identification of alternate options and associated data requirements and survey, Project feasibility; Demand assessment; Planning period and time horizon, economic –demographic projections.

UNIT III

Demand resilience and consumer behavior, Basic economic concept: present worth, future worth, annuities, discounting techniques, depreciation, Production function and cost curves.

UNIT IV

Components of cost curves, learning curve, expansion path, long term and short term, Estimation of project benefits and costs, Pricing concepts; oligopolies kinked demand curve model, skimming price and penetration price, Economic of natural resources management, Financial analysis.

UNIT V

Economic and financial models, Analysis of water resources projects in real- world settings, Benefit cost analysis, Risk considerations, Project optimality, Mathematical models for multipurpose and multi objective projects, Capital budgeting and cost allocation.

Reference Books

- Systems Approach to Water Management. McGraw-Hill Book Co., New York by Biswas, Asit K
- Project Management with CPM and PERT by Moder, J. J. and Phillops, C. R.
- Construction Management and Planning Tata McGraw Hill, New Delhi by Sengupta, B. And Guha, H.

B.Tech. (Ag Engg.)
Semester- VIII (Elective)

Manufacturing Processes of Agricultural Machinery 3 (3+0)

UNIT I

Introduction to materials, cutting tools and manufacturing methods. Design of jigs and fixtures and their application in production of agricultural machinery components.

UNIT II

Surface finish and evaluation. Inspection and quality control of agricultural machines. Process planning analysis and production controls.

UNIT III

Work study & productivity method study. scope and aims of time & motion study. Activity sampling, operation analysis, resource scheduling & system optimization.

UNIT VI

Assembly of machines, assembly of methods, statistical quality control methods & Go/No-Go data. Preparing reports on manufacturing techniques of selected components of agricultural machines.

UNIT V

Reliability of machine system, maintenance schedule & replacement of machines.

Reference Books

- ❖ Operations research, By: P.K. Gupta & D.S. Hira
- ❖ Khurmi, R.S. 1998 Strength of Materials and Mechanics of Structures,. Vol. I & II Khanna Publishers, New Delhi.
- ❖ Kepner, R.A., Bainer, R. and Barger, E.L. 1987. Principles of Farm Machinery.C.S.B. Publishers and distributors, New Delhi.

B.Tech. (Ag Engg.)
Semester- VIII (Elective)
Food Laws & Legislation 3(3+0)

UNIT I

Concept and significance of Food Legislation, Indian Food Laws and Legislation,

UNIT II

Prevention of Food Adulteration (PFA), Beuro of Indian Standards (BIS), Agmark, Agricultural and Processed Food Products Export Development Authority (APEDA),

UNIT III

International Standardization and Organization (ISO), Codex Alimentarius Commission (CAC),

UNIT VI

Food Laws and legislation in EU, Middle East, SAARC and ASEAN.

Reference Books

- Mohesin, N.N. 1978. Physical Properties of Plants & Animals. Gordon & Breach Science Publishers , New York.
- Rao, M.A. and Rizvi, S.H., 1995. Engineering Properties of Foods. Marcel Dekker Inc. New York.