

Syllabus of  
UNDERGRADUATE DEGREE COURSE

**B.Tech. V Semester**

**Agriculture Engineering**



Rajasthan Technical University, Kota  
Effective from session: 2019-20



# RAJASTHAN TECHNICAL UNIVERSITY, KOTA

## Syllabus

3<sup>rd</sup> Year - V Semester: B.Tech. (Agriculture Engineering)

### 5AG3-01: Theory and Design of Machines

**Credit: 2**

**2L+0T+0P**

**Max. Marks: 100(IA:20, ETE:80)**

**End Term Exam: 2 Hours**

SN	Contents	Hours
1	Introduction: Objective, scope and outcome of the course.	01
2	Mechanisms: Elements, links, pairs, kinematic chain, and mechanisms. Classification of pairs and mechanisms. Lower and higher pairs. Four bar chain, slider crank chain and their inversions. Gear: types of gears. Law of gearing, Involute and cycloidal profile for gear teeth. Spur gear, nomenclature. Interference and undercutting. Introduction to helical, spiral, bevel and worm gear. Gear Trains: simple, compound, reverted, and epicyclic trains. Determining velocity ratio by tabular method.	06
3	Power Transmission: 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. Flywheel: Turning moment diagrams, co-efficient of fluctuation of speed and energy, weight of flywheel, flywheel applications. Friction: Types of friction, laws of dry friction. Friction of pivots and collars. Single disc, multiple disc, and cone clutches. Rolling friction, anti friction bearings.	06
4	Meaning of design, Phases of design, design considerations. Common engineering materials and their mechanical properties. Types of loads and stresses, theories of failure, factor of safety, selection of allowable stress. Stress concentration. Design of joints: Cotter joints, knuckle joint and pinned joints, turnbuckle. Design of threaded fasteners subjected to direct static loads, bolted joints loaded in shear (eccentric loading not included).	06
5	Design of shafts, keys and couplings: Design of shafts under torsion and combined bending and torsion. Design of keys. Design of muff or sleeve, and rigid flange couplings. Design of flat belt drives. Design of brackets, levers. Design of helical and leaf springs.	07
	<b>Total</b>	<b>26</b>



# RAJASTHAN TECHNICAL UNIVERSITY, KOTA

## Syllabus

3<sup>rd</sup> Year - V Semester: B.Tech. (Agriculture Engineering)

### 5AG4-02: Irrigation Engineering

**Credit: 3**

**Max. Marks: 150(IA:30, ETE:120)**

**3L+0T+0P**

**End Term Exam: 3 Hours**

SN	Contents	Hours
1	Introduction: Objective, scope and outcome of the course.	01
2	Water resources development and utilization, terminology and basic concepts in water resources, Physical properties of soil, Infiltration, Soil water potential. Soil moisture constants and characteristics curves. Measurement of soil moisture. Rooting characteristics and moisture use of crops.	08
3	Consumptive use- terminology and determination by direct method ,determination of consumptive use by climatologically methods, , determination of reference crop Evapotranspiration by climatologically methods, selection of crop coefficients and irrigation requirements ,irrigation efficiencies, effective rainfall	10
4	Irrigation scheduling and water management procedures for principal crops, Measurement of irrigation water by volumetric, velocity area and tracer methods, measurement of irrigation water by weir, orifices, flumes. Open channels – designs, Lining materials, precast concrete channels, water control and diversion structures	10
5	Border method-Adaptability, limitations, design and evaluation. Furrow method- adaptability, limitations, design and evaluation. Basin method-adaptability, limitations, design and evaluation. Sprinkler method-adaptability, limitations, design and evaluation. Drip method-adaptability, limitations, design and evaluation	12
	<b>Total</b>	<b>41</b>



# RAJASTHAN TECHNICAL UNIVERSITY, KOTA

## Syllabus

3<sup>rd</sup> Year - V Semester: B.Tech. (Agriculture Engineering)

### 5AG4-03: Drying and Storage Engineering

**Credit: 2**

**2L+0T+0P**

**Max. Marks: 100(IA:20, ETE:80)**

**End Term Exam: 2 Hours**

SN	Contents	Hours
1	Introduction: Objective, scope and outcome of the course.	01
2	Moisture and its removal, utilities of drying, moisture content representation, various methods for moisture content measurement, EMC, importance of EMC and methods of its determination, EMC curve and EMC model.	05
3	Principle of drying, theory of diffusion, various drying rate periods - falling rate and constant rate period of drying, critical moisture content, heat transfer in grain drying, dryer performance, drying methods, classification of dryers and operation.	06
4	Importance of storage, types and causes of spoilage in storage, insect/pest of stored grains, changes occurring in food grains during storage Fundamental requirements of storage, traditional storage structures such as Morai, Bukhari, Kothar, mud Kothi etc., bag storage.	06
5	Improved storage structures such as Pusa bin and CAP, temperature and moisture change in storage structures, Deep and Shallow bin, Introduction to grain storage design theories such as Jansen and Rankine, fumigations, controlled and modified atmosphere storage.	08
	<b>Total</b>	<b>26</b>



# RAJASTHAN TECHNICAL UNIVERSITY, KOTA

## Syllabus

3<sup>rd</sup> Year - V Semester: B.Tech. (Agriculture Engineering)

### 5AG4-04: Dairy and Food Engineering

**Credit: 2**

**2L+0T+0P**

**Max. Marks: 100(IA:20, ETE:80)**

**End Term Exam: 2 Hours**

SN	Contents	Hours
1	Introduction: Objective, scope and outcome of the course.	01
2	Composition and properties: Dairy development in India, composition, thermal and chemical properties of milk and milk products. Cream Separation and Homogenization: centrifugal cream separator, effect of homogenization of milk, homogenization valve and pump, theory of homogenization, energy requirements, efficiency of homogenization.	06
3	Pasteurization: Definition of pasteurization, vat pasteurization; agitation and control in vat pasteurizers, advantages and disadvantages, plate Heat exchanger, HTST pasteurization and controls, UHT processing and sterilization. Butter Handling Equipment: principle of churning, churn construction; types of churn. Thermal processing of foods: Decimal reduction time, thermal death time, spoilage probability.	06
4	Evaporation: Atmospheric concentrators, vacuum pan, condenser, single and multiple effect evaporators, properties of liquid foods in evaporation, calculation of energy consumption in evaporators, performance evaluation of evaporators, vapour recompression systems. Drying: Milk dryer, drum or roller dryer, spray dryer, atomization system, cyclone separator, bag filters, heat balance of drying equipment, equipments for instantizing milk powder.	06
5	Freezing of foods: Freezing of foods, freezing point depression, calculation of freezing rate using plank's equation, freezing equipments viz. air blast freezer, plate freezer, immersion freezer. Freeze drying: Freeze drying of foods, freeze dryer, calculation of freeze drying time. Water activity: Role of water and water activity of foods, methods of determination of water activity, control of water activity by addition of solutes and dehydration.	07
	<b>Total</b>	<b>26</b>



# RAJASTHAN TECHNICAL UNIVERSITY, KOTA

## Syllabus

3<sup>rd</sup> Year - V Semester: B.Tech. (Agriculture Engineering)

### 5AG4-05: Tractor Systems and Control

**Credit: 2**

**2L+0T+0P**

**Max. Marks: 100(IA:20, ETE:80)**

**End Term Exam: 2 Hours**

SN	Contents	Hours
1	Introduction: Objective, scope and outcome of the course.	01
2	Study of transmission system: Clutch: single and multiple clutches and their functions, gear box: sliding and constant mesh, differential and final drive mechanism. Simple numerical problems on clutch and gear speed ratios.	06
3	Familiarization of brake mechanism: Mechanical and hydraulic. Steering: Ackerman and hydraulic. Hydraulic system of tractor: Automatic position and draft control.	05
4	Tractor power outlets: P.T.O., belt pulley, drawbar. Introduction to traction mechanics. Tractor chassis mechanics: C.G. determination and weight transfer. Simple numerical problems on tractor chassis mechanics.	06
5	Tractor stability: Grade and non-parallel pull, turning at high speed. Simple numerical problems on tractor stability. Introduction to ergonomic considerations: Anthropometry and physiological cost measurements and tractor safety. Introduction to advances in tractor systems and controls.	08
	<b>Total</b>	<b>26</b>



# RAJASTHAN TECHNICAL UNIVERSITY, KOTA

## Syllabus

3<sup>rd</sup> Year - V Semester: B.Tech. (Agriculture Engineering)

### 5AG4-06: Renewable Energy Sources

**Credit: 3**

**Max. Marks: 150(IA:30, ETE:120)**

**3L+0T+0P**

**End Term Exam: 3 Hours**

SN	Contents	Hours
1	Introduction: Objective, scope and outcome of the course.	01
2	Energy consumption pattern & energy resources in India. Renewable energy options, potential and utilization.	10
3	Biogas technology and mechanisms, generation of power from biogas, Power generation from urban, municipal and industrial waste	10
4	Solar thermal and Photovoltaic. System for power generation. Central receiver (Chimney) type solar plant, OTEC, MHD, hydrogen and fuel cell technology.	10
5	Wind farms. Aerogenerators. Wind power generation system. Power generation from biomass (gasification & Dendro thermal), mini and micro small hydel plants.	10
	<b>Total</b>	<b>41</b>



# RAJASTHAN TECHNICAL UNIVERSITY, KOTA

## Syllabus

3<sup>rd</sup> Year - V Semester: B.Tech. (Agriculture Engineering)

### 5AG5-11: Food Packaging Technology

**Credit: 2**

**2L+0T+0P**

**Max. Marks: 100(IA:20, ETE:80)**

**End Term Exam: 2 Hours**

SN	Contents	Hours
1	Introduction: Objective, scope and outcome of the course.	01
2	Significance of packaging, Spoilage mechanism during storage: environmental conditions favouring microbial growth, moisture sorption isotherm and water activity of foods; Food Packaging: definition, functions, importance and scope of packaging of foods, types and classification of packaging.	06
3	Packaging forms; Packaging materials: Plastic films, paper and papers boards, types and characteristics of papers, metal containers, feature of metal containers, three piece can, soldered side can, welded side can, two piece can. aluminium, advantages and disadvantages of aluminium.	06
4	Glass containers, properties of glass, types of glasses and glass containers, properties of glass containers; Printing processes: Letter press, offset, litho and gravure printing.	06
5	Disposal methods of waste packaging materials; Vacuum and gas packaging-process and machines, packaging materials, gas barriers property, water vapour barrier property, applications in some foods; Active packaging, Estimation of shelf life of packaged foods.	07
	<b>Total</b>	<b>26</b>





# RAJASTHAN TECHNICAL UNIVERSITY, KOTA

## Syllabus

3<sup>rd</sup> Year - V Semester: B.Tech. (Agriculture Engineering)

### 5AG5-12: Pesticides Applications and Equipment

**Credit: 2**  
**2L+0T+0P**

**Max. Marks: 100(IA:20, ETE:80)**  
**End Term Exam: 2 Hours**

SN	Contents	Hours
1	Introduction: Objective, scope and outcome of the course.	01
2	Fundamentals of Pesticide application: Sprayers- manually and power operated, types, construction operations, calibration, introduction to electrostatic and ULV sprayers.	06
3	Air assisted sprayers, High clearing sprayers, dusters: manually and power operated – types- construction, operation, calibration.	05
4	Atomizing devices, nozzles, types, flow rates, spray angles, droplet size, agitations of spray material, Arial spray application- Limitation and advances, air craft's spraying and dusting equipment. Measurement of efficiency of pesticide application- collection and measurement of droplets- determination of vmd.	08
5	Factors for selection of sprayer/duster and planning pesticide application. Safety in pesticide application- selection of pesticide – storage and handling of protective devices.	06
	<b>Total</b>	<b>26</b>



# RAJASTHAN TECHNICAL UNIVERSITY, KOTA

## Syllabus

3<sup>rd</sup> Year - V Semester: B.Tech. (Agriculture Engineering)

### 5AG5-13: Gully and Ravine Control Structures

**Credit: 2**

**2L+0T+0P**

**Max. Marks: 100(IA:20, ETE:80)**

**End Term Exam: 2 Hours**

SN	Contents	Hours
1	Introduction: Objective, scope and outcome of the course.	01
2	Introduction; floods - causes of occurrence, flood classification - probable maximum flood, standard project flood, design flood, flood estimation - methods of estimation; estimation of flood peak - Rational method, empirical methods, Unit hydrograph method	07
3	Statistics in hydrology, flood frequency methods - Log normal, Gumbel's extreme value, Log-Pearson type-III distribution; depth-area-duration analysis; flood forecasting, flood routing - channel routing, Muskingum method, reservoir routing, modified Pul's method.	06
4	Flood control - history of flood control, structural and non-structural methods of flood control measures, storage and detention reservoirs, levees, channel improvement.	06
5	Gully erosion and its control; soil erosion and sediment control measures; river training works, planning of flood control projects and their economics.	06
	<b>Total</b>	<b>26</b>



# BIKANER TECHNICAL UNIVERSITY, BIKANER

## बीकानेर तकनीकी विश्वविद्यालय, बीकानेर

University College of Engineering & Technology, Bikaner Campus Karni Industrial Area.  
Pugal Road, Bikaner Pin Code: 334004 Ph. 0151-2250948

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### **5AG5-14: Understanding the Human Being Comprehensively – Human Aspirations and its Fulfillment (Professional Elective Course)**

**Prerequisites:** Universal Human Values and Professional Ethics

**Course Objectives:**

1. To help the students having the clarity about human aspirations, goal, activities and purpose of life.
2. To facilitate the competence to understand the harmony in nature/existence and participation of human being in the nature/existence.
3. To help the students to develop the understanding of human tradition and its various components.

**Course Methodology:**

1. The methodology of this course is explorational and thus universally adaptable. It involves a systematic and rational study of the human being vis-a-vis the rest of existence.
2. It is free from any dogma or set of dos and don'ts related to values.
3. It is a process of self-investigation and self-exploration, and not of giving sermons. Whatever is found as truth or reality is stated as a proposal and the students are facilitated and encouraged to verify it in their own right, based on their Natural Acceptance and subsequent Experiential Validation.
4. This process of self-exploration takes the form of a dialogue between the teacher and the students to begin with, and then to continue within the student leading to continuous self-evolution.
5. This self-exploration also enables them to critically evaluate their pre-conditionings and present beliefs.

**Course Content**

**Unit 1: Introduction** - The basic human aspirations and their fulfillment through Right understanding and Resolution; All-encompassing Resolution for a Human Being, its details and solution of problems in the light of Resolution

**Unit 2: Understanding Human Being and its Expansion** -The domain of right understanding starts from understanding the human being (the knower, the experiencer and the doer).; and extends up to understanding nature/existence – its interconnectedness and co-existence; and finally understanding the role of human being in existence (human conduct).

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# BIKANER TECHNICAL UNIVERSITY, BIKANER

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**Unit 3: Activities of the Self** -Understanding the human being comprehensively is the first step and the core theme of this course; human being as co-existence of the self and the body; the activities and potentialities of the self; Reasons for harmony/contradiction in the self

**Unit 4: Understanding Co-existence with other orders** -The need and the process of inner evolution (through self-exploration, self-awareness and self-evaluation)- particularly awakening to activities of the Self: Realization, Understanding and Contemplation in the Self (Realization of Co-Existence, Understanding of Harmony in Nature and Contemplation of Participation of Human in this harmony/ order leading to comprehensive knowledge about the existence).

**Unit 5: Expansion of harmony from self to entire existence** -Understanding different aspects of All-encompassing Resolution (understanding, wisdom, science etc.), Holistic way of living for Human Being with All-encompassing Resolution covering all four dimensions of human endeavour viz., realization, thought, behavior and work (participation in the larger order) leading to harmony at all levels from self to Nature and entire Existence

### Reference Books:

1. A Foundation Course in Human Values and Profession Ethics (Text Book and Teachers Manual), R. R. Gaur, R. Sangal, G. P. Bagaria (2010), Excel Books, New Delhi [ISBN 978-8-174-46781-2]
  2. Avartansheel Arthshastra, A. Nagraj, Divya Path Sansthan, Amarkantak, India
  3. Economy of Permanence – (a quest for social order based on non-violence), J. C. Kumarappa (2010), Sarva-Seva-Sangh-Prakashan, Varansi, India
  4. Energy and Equity, Ivan Illich (1974), The Trinity Press, Worcester & Harper Collins, USA
  5. IshandiNauUpnishad, Shankaracharya, Geeta press, Gorakhpur,
  6. Manav Vyavahar Darshan, A. Nagraj, Divya Path Sansthan, Amarkantak, India
  7. Manaviya Sanvidhan, A. Nagraj, Divya Path Sansthan, Amarkantak, India
  8. MahasatipatthanSutta , S N Goenka, Vipassana Research Institute, First Edition, 1996
  9. Small Is Beautiful: A Study of Economics as if People Mattered, E. F. Schumacher, 1973, Blond & Briggs, UK
  10. Slow is Beautiful, Cecile Andrews <http://www.newsociety.com/Books/S/Slow-is-Beautiful>)
  11. Science & Humanism – towards a unified worldview, P. L. Dhar & R. R. Gaur (1990), Commonwealth Publishers, New Delhi
  12. Sanchian Sri Guru Granth Sahib Ji ,Shiromani GurdwaraParbhandhak Committee, 2001
  13. SamanSuttam, JinendraVami ,1974.
  14. Vyavaharvadi Samajshastra, A. Nagraj, Divya Path Sansthan, Amarkantak, India
  15. Vyavahatmak Janvad, A. Nagraj, Divya Path Sansthan, Amarkantak, India.
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# RAJASTHAN TECHNICAL UNIVERSITY, KOTA

## Syllabus

3<sup>rd</sup> Year - V Semester: B.Tech. (Agriculture Engineering)

### 5AG4-21: Irrigation Engineering Lab

**Credit: 1**

**0L+0T+2P**

**Max. Marks: 50(IA:30, ETE:20)**

**End Term Exam: 2 Hours**

SN	Contents	Hours
1	Determination of Soil Moisture by Different Methods	01
2	Determination of physical properties of soil related to irrigation	01
3	Study of infiltration characteristics of soils	01
4	Estimation of evapotranspiration by empirical methods	01
5	Study of various farm irrigation structures	01
6	Measurement of discharge through weirs, orifices and flumes,	01
7	Fabrication of precast concrete channels	01
8	Determination of water conveyer efficiency in case of an unlined channel method	01
9	Design and evaluation of border irrigation	02
10	Design and evaluation of furrow irrigation, sprinkler irrigation and drip irrigation	02
11	Design and evaluation of sprinkler irrigation system	02
12	Design and evaluation of drip irrigation system	02
	<b>Total</b>	<b>16</b>



# RAJASTHAN TECHNICAL UNIVERSITY, KOTA

## Syllabus

3<sup>rd</sup> Year - V Semester: B.Tech. (Agriculture Engineering)

### 5AG4-22: Drying and Storage Engineering Lab

**Credit: 1**  
**OL+OT+2P**

**Max. Marks: 50(IA:30, ETE:20)**  
**End Term Exam: 2 Hours**

SN	Contents	Hours
1	Measurement of moisture content	01
2	Determination of EMC for grains.	01
3	Determination of ERH	01
4	Study the effect of temperature on stored grains	01
5	Study of solar dryer	01
7	Study of tray dryer	01
8	Study of fluid bed dryer	01
9	Measurement of relative humidity during drying	01
10	Study of drying rate period	02
11	Design and layout of commercial bag storage facilities	01
12	Design and layout of commercial bulk storage facilities	01
13	Study of different traditional storage structures	01
14	Study of different improved storage structures	01
15	Visits to commercial handling and storage facilities	01
	<b>Total</b>	<b>16</b>



# RAJASTHAN TECHNICAL UNIVERSITY, KOTA

## Syllabus

3<sup>rd</sup> Year - V Semester: B.Tech. (Agriculture Engineering)

### 5AG4-23: Dairy and Food Engineering Lab

**Credit: 1**

**OL+OT+2P**

**Max. Marks: 50(IA:30, ETE:20)**

**End Term Exam: 2 Hours**

SN	Contents	Hours
1	Study of a milk processing plant & equipments;	01
2	Study of pasteurizers	01
3	Study of homogenizers	01
4	Study of separators and butter churns	01
5	Study of evaporator	01
7	Study of milk dryer	01
8	Study of freezers	01
9	Determination of D and z value.	01
10	Determination of fat in milk.	01
11	Calculation of freezing time.	01
12	Determination of physical properties of food products	01
13	Estimation of steam requirements	02
14	Estimation of refrigeration requirements in dairy & food plant	01
15	Visit to Food industry	01
	<b>Total</b>	<b>16</b>



# RAJASTHAN TECHNICAL UNIVERSITY, KOTA

## Syllabus

3<sup>rd</sup> Year - V Semester: B.Tech. (Agriculture Engineering)

### 5AG4-24: Tractor Systems and Control Lab

**Credit: 1**

**Max. Marks: 50(IA:30, ETE:20)**

**OL+OT+2P**

**End Term Exam: 2 Hours**

SN	Contents	Hours
1	Introduction to transmission systems and components..	01
2	Study of clutch system.	01
3	Study of different types of gear box and calculation of speed ratios.	01
4	Study on differential and final drive of a tractor.	01
5	Study of brake system of a tractor.	01
7	Study of hydraulic system in a tractor.	02
8	Study of traction performance of a tractor wheel.	02
9	Anthropometric measurements of a farm worker.	02
10	Measurement of physiological cost of tractor operator during farm operation.	02
11	Study of advances in tractor systems and controls.	02
	<b>Total</b>	<b>15</b>



Syllabus of  
UNDERGRADUATE DEGREE COURSE

**B.Tech. VI Semester**

**Agriculture Engineering**



Rajasthan Technical University, Kota  
Effective from session: 2019-20



# RAJASTHAN TECHNICAL UNIVERSITY, KOTA

## Syllabus

3<sup>rd</sup> Year - VI Semester: B.Tech. (Agriculture Engineering)

### 6AG3-01: Design of Structures

**Credit: 2**

**Max. Marks: 100(IA:20, ETE:80)**

**2L+0T+0P**

**End Term Exam: 2 Hours**

SN	Contents	Hours
1	Introduction: Objective, scope and outcome of the course.	1
2	Reinforced cement concrete structures: Grade of concrete and characteristics strength, permissible stress in concrete and steel reinforcement. modular ratio.  Singly Reinforced Beams: Fundamental assumptions, equivalent area of sections, neutral axis and moment of resistance; balanced, under-reinforced, over-reinforced sections. types of problems in singly reinforced beams. shear stress in R. C. beams, effect of shear, reinforcement for shear. I.S. recommendations; bond, anchorage, development length.  Doubly Reinforced Beam: Neutral axis, Moment of resistance. Type of problems.  T-Beams: Dimensions, Neutral axis. lever arm, moment of resistance with or without web compression, type of problems in t-beams.	7
3	Cantilever: Design of simple cantilever. Slabs spanning in one direction.  Two way slabs: Supported on four edges with corners not held down and carrying U.D.L.  Axially loaded columns: Long and short columns; Types of columns.  Load carrying capacity, I. S. recommendations; Design of columns with lateral and spiral reinforcement.	6
4	Steel structures: common steel sections, selection criterion for beams and columns.  Design of Beams: Assumptions in the theory of bending; design of laterally restrained beams, with checks for shear, deflection; web buckling and crippling, design steps, problems	6
5	Columns: classification of columns, types of sections, strength of column; design of axially loaded columns, compound columns. Design of compound column.  Lacing and Battening: Design of lacing, design of battening, column bases, slab bases; design of slab with concrete block, problems	6
	<b>Total</b>	<b>26</b>



# RAJASTHAN TECHNICAL UNIVERSITY, KOTA

## Syllabus

3<sup>rd</sup> Year - VI Semester: B.Tech. (Agriculture Engineering)

### 6AG4-02: Drainage Engineering

**Credit: 3**

**Max. Marks: 150(IA:30, ETE:120)**

**3L+0T+0P**

**End Term Exam: 3 Hours**

SN	Contents	Hours
1	Introduction: Objective, scope and outcome of the course.	1
2	Drainage, objectives of drainage, familiarization with the drainage problems of the state, Surface drainage, drainage coefficient, types of surface drainage, sub-surface drainage purpose and benefits of drainage	8
3	Design of open channel, investigations of design parameters, hydraulic conductivity, drainable porosity, water table etc., types and use of subsurface drainage system.	10
4	Design of sub-surface drainage system, interceptor and relief drains. Derivation of ellipse (Hooghoudt's) and Ernst's drain spacing equations. types of sub-surface drainage system	10
5	Drainage materials, drainage pipes, drain envelope. Layout, construction and installation of drains. Drainage structures. Vertical drainage. Bio-drainage. Tile Drains. 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.	12
	<b>Total</b>	<b>41</b>



# RAJASTHAN TECHNICAL UNIVERSITY, KOTA

## Syllabus

3<sup>rd</sup> Year - VI Semester: B.Tech. (Agriculture Engineering)

### 6AG4-03: Hydraulic Drive and Control

**Credit: 2**

**2L+0T+0P**

**Max. Marks: 100(IA:20, ETE:80)**

**End Term Exam: 2 Hours**

SN	Contents	Hours
1	Introduction: Objective, scope and outcome of the course.	1
2	Principles of Hydraulics: Hydraulic basics: Pascal's law, flow, energy, work, and power. Working of hydraulic systems, open centre and close centre hydraulic systems, reservoirs, strainers and filters, filtering material. types of hydraulic fluid and their properties	6
3	Pumps: Pump classifications, selection, performance, displacement, gear pumps, vane pumps, piston pumps, pump operation. hydraulic actuators: cylinders-displacement, construction and applications, semi rotary actuators. simple numerical problems on pumps	6
4	Hydraulic Motors, accumulators, types and working. Fittings and connectors. hydraulic valves: pressure-control valves, directional-control valves, flow-control valves, valve failures and remedies, valve assembly.	7
5	Hydraulic Troubleshooting. Tractor hydraulics, nudging system, ADDC. Use of Hydraulics and pneumatics drives in agricultural systems. Maintenance of hydraulic system.	6
	<b>Total</b>	<b>26</b>



# RAJASTHAN TECHNICAL UNIVERSITY, KOTA

## Syllabus

3<sup>rd</sup> Year - VI Semester: B.Tech. (Agriculture Engineering)

### 6AG4-04: Post Harvest Engineering

**Credit: 3**

**Max. Marks: 150(IA:30, ETE:120)**

**3L+0T+0P**

**End Term Exam: 3Hours**

SN	Contents	Hours
1	Introduction: Objective, scope and outcome of the course.	1
2	Importance of engineering of properties of biological materials, study of different physical and thermal characteristics of important biological living materials like shape, size volume density, roundness, sphericity, angel of repose, surface area, sp. Heat, thermal conductivity, colour, thermal velocity, chemical composition of grain	10
3	Cleaning and separation, effectiveness of separation, husking of grain, factors affecting and effectiveness of husking, traditional rice milling machine, modern rice milling machinery, general principles of cleaning, open double sieve cleaner and single scraper, drum cleaner, paddy cleaner with destoner, rubber roll husker (Japan type), whitening of grain.	10
4	Post harvest engineering of cereals and millets, milling of corn, introduction corn dry milling, tempering, degerming method, corn wet milling method, wheat milling, modern flour milling.	10
5	Milling of pulses and oil seeds, introduction to pulse milling, traditional pulse milling, commercial pulse milling processes, introduction to oil milling, traditional methods for oil milling such as village Ghanis, mechanical oil expeller, pre-treatments for oil milling.	10
	<b>Total</b>	<b>41</b>



# RAJASTHAN TECHNICAL UNIVERSITY, KOTA

## Syllabus

3<sup>rd</sup> Year - VI Semester: B.Tech. (Agriculture Engineering)

### 6AG4-05: Land Development and Grading

**Credit: 3**

**Max. Marks: 150(IA:30, ETE:120)**

**3L+0T+0P**

**End Term Exam: 3 Hours**

SN	Contents	Hours
1	Introduction: Objective, scope and outcome of the course.	1
2	Land levelling-Criteria for land levelling, plane profile, plane inspection and contour adjustment methods, land levelling design problems related to land levelling design and earth work calculation. Engineering fundamentals related to earth-moving machinery.	8
3	Earth moving and excavation machines: Classification and application of bulldozers, advantage and disadvantage, straight and angle bulldozers, moving earth with bulldozers and estimation of output of a bulldozer numerical problems. Land clearing equipments, Power shovel: Construction and operation of power shovel size selection of power shovel factors affecting the output of a power shovel.	10
4	Scraper: Types, construction and operation of scrapers, size of the scraper, cycle time production rates of scrapers, numerical problems, load-growth curve and estimation of output of a scraper. Dragline: Types of dragline, size basic parts and operation of a dragline, output of a dragline, estimation of output, effect of different factors on output, numerical problems. Clam shell: Basic parts and operation of a clam shell, application, size and output of a clam shell. Motor grader: Construction and operation of motor grader, application, basic adjustment parameters of major grader, output of motor grader.	10
5	Trenching machines: types, construction and operation of wheel and ladder type trenching machines, selection of suitable equipment for excavating trenches and production rates of trenching machines. Compactors: Properties-swell and shrinkage type of compacting equipment and construction details. Job planning and management: Project network analysis, definitions of terms used in critical path method (CPM), critical path scheduling, AOA diagram, computerized scheduling.	12
	<b>Total</b>	<b>41</b>



# RAJASTHAN TECHNICAL UNIVERSITY, KOTA

## Syllabus

3<sup>rd</sup> Year - VI Semester: B.Tech. (Agriculture Engineering)

### 6AG4-06: Watershed Planning and Management

**Credit: 2**  
**2L+0T+0P**

**Max. Marks: 100(IA:20, ETE:80)**

**End Term Exam: 2 Hours**

SN	Contents	Hours
1	Introduction: Objective, scope and outcome of the course.	1
2	Watershed management - problems and prospects; watershed based land use planning, watershed characteristics-physical and geomorphologic, factors affecting watershed management, hydrologic data for watershed planning, watershed delineation, delineation of priority watershed.	6
3	Water yield assessment and measurement from a watershed; hydrologic and hydraulic design of earthen embankments and diversion structures; sediment yield estimation and measurement from a watershed and sediment yield models	6
4	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.	7
5	Evaluation and monitoring of watershed programmes; people's participation in watershed management programmes; planning and formulation of project proposal; cost benefits analysis of watershed programmes; optimal land use models; case studies	6
	<b>Total</b>	<b>26</b>



# RAJASTHAN TECHNICAL UNIVERSITY, KOTA

## Syllabus

3<sup>rd</sup> Year - VI Semester: B.Tech. (Agriculture Engineering)

### 6AG5-11: Ground Water Recharge Technology

**Credit: 2**

**2L+0T+0P**

**Max. Marks: 100(IA:20, ETE:80)**

**End Term Exam: 2 Hours**

SN	Contents	Hours
1	Introduction: Objective, scope and outcome of the course.	1
2	Concept of artificial recharging. Basic Phenomena of ground water recharge, selection of site and identification of recharge structures, Natural recharging.	6
3	Artificial recharge structures, direct surface technique– flooding, basin or stream augmentation, ditch & furrow method, over irrigation; Direct sub surface technique – injection well, recharge pit and shaft, dug well recharge, sub surface dykes	6
4	Roof top rain water harvesting – Design of filter and estimation of size of pipe, runoff potential and size of tank.	7
5	Design criteria of recharge structures, Design and cost estimation of recharge structures, use of RS & GIS for identification of potential artificial recharge Zones.	7
	<b>Total</b>	<b>27</b>





# RAJASTHAN TECHNICAL UNIVERSITY, KOTA

## Syllabus

3<sup>rd</sup> Year - VI Semester: B.Tech. (Agriculture Engineering)

### 6AG5-12: Food Processing Plant Design and Layout

**Credit: 2**

**2L+0T+0P**

**Max. Marks: 100(IA:20, ETE:80)**

**End Term Exam: 2 Hours**

SN	Contents	Hours
1	Introduction: Objective, scope and outcome of the course.	1
2	Introduction to plant design: Types of manufacturing processes, phases of plant design. Plant location: levels of location problems, influence of location, location factors, plant site selection.	5
3	Industrial Buildings and grounds: Industrial buildings, building design and construction viz. floors, walls and windows, roof and ceilings; grounds and exterior facilities viz. Access highways and parking, rail access, access by water, landscaping, security, disaster protection.	5
4	Preparation of plant layout: layout problems, classes of layout problems, objectives, types of layout, optimization for plant layout, trends in plant layout, space requirement. Development of the layout: Developing the plot plan, constructing the detailed layout, layout installation.	8
5	Selection of processes, plant capacity, project design, flow diagrams, selection of equipments, process and controls. Material Handling: Importance, Kinds of conveyor systems, Plant layout for material handling, efficient use of material handling equipment, maintenance. Sanitary features of food processing plant.	8
	<b>Total</b>	<b>27</b>



# RAJASTHAN TECHNICAL UNIVERSITY, KOTA

## Syllabus

3<sup>rd</sup> Year - VI Semester: B.Tech. (Agriculture Engineering)

### 6AG5-13: Tractor Design and Testing

**Credit: 2**

**2L+0T+0P**

**Max. Marks: 100(IA:20, ETE:80)**

**End Term Exam: 2 Hours**

SN	Contents	Hours
1	Introduction: Objective, scope and outcome of the course.	1
2	Introduction to development of agricultural tractor. Study of parameters for balanced design of tractor for stability, weight distribution and hitch system	6
3	Design of various engine components: piston, cylinder and cylinder liner, connecting rod, crankshaft and valve.	5
4	Design of mechanical power transmission in agricultural tractors. Design of Ackerman Steering. Introduction of computer application to design of engine components, differential, final drive and axle power takeoff shaft	7
5	Design of seat and controls of an agricultural tractor. Tractor Testing as per BIS codes.	8
	<b>Total</b>	<b>27</b>



# BIKANER TECHNICAL UNIVERSITY, BIKANER

## बीकानेर तकनीकी विश्वविद्यालय, बीकानेर

University College of Engineering & Technology, Bikaner Campus Karni Industrial Area.  
Pugal Road, Bikaner Pin Code: 334004 Ph. 0151-2250948

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### **6AG5-14: Values, Relationship & Ethical Human Conduct-For a Happy & Harmonious Society (Professional Elective Course)**

**Prerequisites:** For this subject only those faculty will teach these courses who had done the FDP for these courses.

**Course Objectives:**

1. To help the students to understand the importance and types of relationship with expressions.
2. To develop the competence to think about the conceptual framework of undivided society as well as universal Human order.
3. To help the students to develop the exposure for transition from current state to the undivided society and universal human order.

**Course Methodology:**

1. The methodology of this course is explorational and thus universally adaptable. It involves a systematic and rational study of the human being vis-a-vis the rest of existence.
2. It is free from any dogma or set of do's and don'ts related to values.
3. It is a process of self-investigation and self-exploration, and not of giving sermons. Whatever is found as truth or reality is stated as a proposal and the students are facilitated and encouraged to verify it in their own right, based on their Natural Acceptance and subsequent Experiential Validation.
4. This process of self-exploration takes the form of a dialogue between the teacher and the students to begin with, and then to continue within the student leading to continuous self-evolution.
5. This self-exploration also enables them to critically evaluate their pre-conditionings and present beliefs.

**Course content**

**Unit I: Introduction to the course** - Basic aspiration of a Human Being and program for its fulfillment, Need for family and relationship for a Human Being, Human-human relationship and role of behavior in its fulfillment, Human-rest of Nature relationship and role of work in its fulfillment, Comprehensive Human Goal, Need for Undivided Society, Need for Universal Human Order, an appraisal of the Current State, Appraisal of Efforts in this Direction in Human History.



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**Unit II: Understanding Human-Human Relationship & its fulfillment** – Recognition of Human-Human Relationship, Recognition of feelings in relationship, established values and Expressed Values in Relationship, interrelatedness of feelings and their purpose, mutual evaluation in relationship, meaning of justice in relationship, justice leading to culture, civilization and human conduct.

**Unit III: Justice from family to world family order** -Undivided Society as continuity and expanse of Justice in behavior – family to world family order, continuity of culture and civilization, Universal Order on the basis of Undivided Society, Conceptual Framework for Universal human order, Universal Human Order as continuity and expanse of order in living: from family order to world family order, a conceptual framework for universal human order.

**Unit IV: Program for Ensuring Undivided Society and Universal Human Order** -Education – Sanskar, Health – Sanyam, Production-work, Exchange – storage, Justice-preservation.

**Unit V: Human Tradition** -Scope and Steps of Universal Human Order, Human Tradition (Ex. Family order to world family order), Steps for transition from the current state, Possibilities of participation of students in this direction, Present efforts in this direction, Sum up.

### Text Books:

1. A Foundation Course in Human Values and Profession Ethics (Text Book and Teachers' Manual), R. R. Gaur, R. Asthana, G. P. Bagaria (2010), Excel Books, New Delhi.
2. Avartansheel Arthshastra, A. Nagraj, Divya Path Sansthan, Amarkantak, India.
3. An Appeal by the Dalai Lama to the World: Ethics Are More Important Than Religion , Dalai Lama XIV, 2015.
4. Economy of Permanence – (a quest for social order based on non-violence), J. C. Kumarappa (2010), Sarva-Seva-Sangh-Prakashan, Varansi, India.
5. Energy and Equity, Ivan Illich (1974), The Trinity Press, Worcester & Harper Collins, USA.
6. Human Society, Kingsley Davis, 1949.
7. Hind Swaraj or, Indian home rule Mohandas K. Gandhi, 1909.
8. Integral Humanism, Deendayal Upadhyaya, 1965.
9. Lohiya Ke Vichar, Lok Bharti , Rammanohar Lohiya, 2008.
10. Manav Vyavahar Darshan, A. Nagraj, Divya Path Sansthan, Amarkantak, India.
11. Manaviya Sanvidhan, A. Nagraj, Divya Path Sansthan, Amarkantak, India
12. Samadhanatmak Bhautikvad, A. Nagraj, Divya Path Sansthan, Amarkantak, India
13. Small Is Beautiful: A Study of Economics as if People Mattered, E. F. Schumacher, 1973, Blond & Briggs, UK.
14. Slow is Beautiful, Cecile Andrews (<http://www.newsociety.com/Books/S/Slow-is-Beautiful>)
15. Sociology Themes and Perspectives, Harper Collins; EIGHT edition (2014), Martin Holborn and Peter Langley, 1980.



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16. Samagra kranti: Jaya Prakash Narayan's philosophy of social change, Siddharth Publications Renu Sinha, 1996.
17. Science & Humanism – towards a unified worldview, P. L. Dhar & R. R. Gaur (1990), Commonwealth Publishers, New Delhi
18. Vyavaharvadi Samajshastra, A. Nagraj, Divya Path Sansthan, Amarkantak, India.
19. Vyavahatmak Janvad, A. Nagraj, Divya Path Sansthan, Amarkantak, India.
20. The Communist Manifesto, Karl Marx, 1848.
21. Toward a True Kinship of Faiths: How the World's Religions Can Come Together Dalai Lama XIV, 2011.

### Reference Videos.

1. kin school (30 minutes)
2. Technology (Solar City etc.).
3. Natural Farming.
4. Economics of Happiness ( 1h 8m)



# RAJASTHAN TECHNICAL UNIVERSITY, KOTA

## Syllabus

3<sup>rd</sup> Year - VI Semester: B.Tech. (Agriculture Engineering)

### 6AG4-21: Drainage Engineering Lab

**Credit: 1**

**OL+OT+2P**

**Max. Marks: 50(IA:30, ETE:20)**

**End Term Exam: 2 Hours**

SN	Contents	Hours
1	In-situ measurement of hydraulic conductivity.	1
2	Determination of drainage coefficients.	1
3	Installation of piezometer and observation well.	1
4	Preparation of iso-bath and iso-bar maps.	1
5	Measurement of hydraulic conductivity and drainable porosity.	1
6	Design of surface drainage systems.	1
7	Design of subsurface drainage systems.	1
8	Determination of chemical properties of soil and water.	2
9	Fabrication of drainage tiles.	1
10	Testing of drainage tiles.	1
11	Determination of gypsum requirement for land reclamation.	1
12	Installation of sub-surface drainage system..	2
13	Cost analysis of surface and sub-surface drainage system	2
	<b>Total</b>	<b>16</b>



# RAJASTHAN TECHNICAL UNIVERSITY, KOTA

## Syllabus

3<sup>rd</sup> Year - VI Semester: B.Tech. (Agriculture Engineering)

### 6AG4-22: Hydraulic Drive and Control Lab

**Credit: 1.5**

**OL+OT+3P**

**Max. Marks: 75(IA:45, ETE:30)**

**End Term Exam: 2 Hours**

SN	Contents	Hours
1	Introduction to Hydraulic Systems.	1
2	Study of Hydraulic Pumps.	3
3	Study of Hydraulic Actuators.	3
4	Study of Hydraulic Motors.	3
5	Study of Hydraulic Valves.	2
6	Maintenance of hydraulic system.	2
7	Study of Hydraulics in Tractors	3
8	Study of Pneumatics in Agriculture	3
	<b>Total</b>	<b>20</b>



# RAJASTHAN TECHNICAL UNIVERSITY, KOTA

## Syllabus

3<sup>rd</sup> Year - VI Semester: B.Tech. (Agriculture Engineering)

### 6AG4-23: Post Harvest Engineering Lab

**Credit: 1**

**OL+OT+2P**

**Max. Marks: 50(IA:30, ETE:20)**

**End Term Exam: 2 Hours**

SN	Contents	Hours
1	To find the shape and size of cereals, pulses and oil seeds grains	1
2	To determine the bulk density of grains	1
3	To determine porosity of grain	1
4	Study of cleaner cum grader	1
5	Study of mechanical oil expeller	2
6	Study of maize dehusker sheller	2
7	Study of whole flour mill	1
8	Study of CFRTI Dal mill	1
9	Study of CIAE Dal mill	1
10	Study of modern rice mill	2
11	Visit to modern flour mill	1
12	Visit to solvent extraction plant	1
13	Determination of hardness of grain	1
	<b>Total</b>	<b>16</b>





# RAJASTHAN TECHNICAL UNIVERSITY, KOTA

## Syllabus

3<sup>rd</sup> Year - VI Semester: B.Tech. (Agriculture Engineering)

### 6AG4-24: Land Development and Grading Lab

**Credit: 1**  
**OL+OT+2P**

**Max. Marks: 50(IA:30, ETE:20)**  
**End Term Exam: 2 Hours**

SN	Contents	Hours
1	Introduction: Objective, scope and outcome of the course.	1
2	Studies on plane inspection and contour adjustment methods	1
3	Land levelling design and earth work calculation.	1
4	Study on earth moving and excavation machines	1
5	Study on land clearing equipments	1
6	Study on different types of scraper	1
7	Study on different types of dragline:	1
8	Study on different types of clam shell	1
9	Study on different types of motor grader	1
10	Study on different types of trenching machines	1
11	Study on different types of compactors	1
12	Project network analysis through CPM	1
13	Planning of critical path schedules through AOA diagram and computerized scheduling.	2
	<b>Total</b>	<b>14</b>



# RAJASTHAN TECHNICAL UNIVERSITY, KOTA

## Syllabus

3<sup>rd</sup> Year - VI Semester: B.Tech. (Agriculture Engineering)

### 6AG4-25: Watershed Planning and Management

**Credit: 1.5**

**OL+OT+3P**

**Max. Marks: 75(IA:45, ETE:30)**

**End Term Exam: 2 Hours**

SN	Contents	Hours
1	Study of watershed characteristic.	1
2	Analysis of hydrologic data for watershed management.	2
3	Delineation of watershed and measurement of area under different vegetative and topographic conditions.	2
4	Measurement of water and sediment yield from watershed.	2
5	Study of different watershed management structures.	3
6	Study of various water budget parameters.	2
7	Study of watershed management technologies.	3
8	Preparation of a techno-economically effective project proposal	3
	<b>Total</b>	<b>18</b>