Syllabus of

UNDERGRADUATE DEGREE COURSE

Agricultural Engineering

Rajasthan Technical University, Kota

Effective from session: 2018 – 2019

RAJASTHAN TECHNICAL UNIVERSITY, KOTA

SYLLABUS

II Year - IV Semester: B.Tech. (Agricultural Engineering)

4AG2-01: Advance Engineering Mathematics-II

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	**Probability:** Basic concepts of probability, conditional probability, Baye's theorem. Random variable: Discrete and Continuous random variables, Joint distribution, Marginal distribution, Probability distribution function, Conditional distribution. Mathematical Expectations: Moments, Moment Generating Functions, variance and correlation coefficients, Chebyshev's Inequality, Skewness and Kurtosis. Binomial, Poisson and Normal distribution and their properties.	13
3	**Applied Statistics:** Basic concept of variance, Correlation and regression – Rank correlation. Curve fitting by the method of least squares- fitting of straight lines, second degree parabolas and more general curves. Test of significance: Large sample test for single proportion, difference of proportions, single mean, difference of means, and difference of standard deviations.	12
	Total	**26**

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SYLLABUS
II Year - IV Semester: B.Tech. (Agricultural Engineering)

4AG1-03/3AG1-03 : Managerial Economics and Financial accounting

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	**Basic economic concepts:** Meaning, nature and scope of economics, deductive vs inductive methods, static and dynamics, Economic problems: scarcity and choice, circular flow of economic activity, national income-concepts and measurement.	3
3	**Demand and Supply analysis:** Demand-types of demand, determinants of demand, demand function, elasticity of demand, demand forecasting –purpose, determinants and methods, Supply-determinants of supply, supply function, elasticity of supply.	5
4	**Production and Cost analysis:** Theory of production- production function, law of variable proportions, laws of returns to scale, production optimization, least cost combination of inputs. Cost concepts-explicit and implicit cost, fixed and variable cost, opportunity cost, sunk costs, cost function, cost curves, cost and output decisions, cost estimation.	5
5	**Market structure and pricing theory:** Perfect competition, Monopoly, Monopolistic competition, Oligopoly.	4
6	**Financial statement analysis:** Balance sheet and related concepts, profit and loss statement and related concepts, financial ratio analysis, cash-flow analysis, funds-flow analysis, comparative financial statement, analysis and interpretation of financial statements, capital budgeting techniques	8
	Total	**26**

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4AG1-02/3AG1-02 : Technical Communication

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	**Introduction to Technical Communication-** Definition of technical communication, Aspects of technical communication, forms of technical communication, importance of technical communication, technical communication skills (Listening, speaking, writing, reading writing), linguistic ability, style in technical communication.	3
3	**Comprehension of Technical Materials/Texts and Information Design & development-** Reading of technical texts, Readingand comprehending instructions and technical manuals, Interpreting and summarizing technical texts, Note-making. Introduction of different kinds of technical documents, Information collection, factors affecting information and document design, Strategies for organization, Information design and writing for print and online media.	6
4	**Technical Writing, Grammar and Editing-** Technical writing process, forms of technical discourse, Writing, drafts and revising, Basics of grammar, common error in writing and speaking, Study of advanced grammar, Editing strategies to achieve appropriate technical style, Introduction to advanced technical communication. Planning, drafting and writing Official Notes, Letters, E-mail, Resume, Job Application, Minutes of Meetings.	8
5	**Advanced Technical Writing-** Technical Reports, types of technical reports, Characteristics and formats and structure of technical reports. Technical Project Proposals, types of technical proposals, Characteristics and formats and structure of technical proposals. Technical Articles, types of technical articles, Writing strategies, structure and formats of technical articles.	8
	Total	26

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4AG3-04: Fluid Mechanics

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	**Hydrostatics:** Fluid Properties, Measurement of liquid pressure. Pascal's law fluid pressure on plane and curved stationery surface, Centre of pressure, Principal applications (preliminary) in simple gales and tanks	4
3	**Fluid motion:** Fluid motion: type and patterns, velocity and acceleration of fluid, continuity equation, elementary concept of velocity potential. Stream function and flow nets.	5
4	**Euler's equation:** Euler's equation of motion, integration of Euler's equation to give Bernoulli's equation for compressible and incompressible fluids. Euler's equation of motion. Integration of Euler's equation to give Bernoulli's equation for compressible and incompressible fluids, applications of Bernoulli's equation.	5
5	**Impulse momentum equation:** Impulse momentum equation: introduction, Force on pipe bends. Flow through sharp edged orifices, flow through mouth pieces (steady flow condition). Discharge measurement in pipes and open channels: Venturimeter, orifice meter. Nozzle and pitot tube (steady flow condition). Flow over weirs, and notches (steady flow condition).	5
6	**Flow through pipes:** Flow through pipes: Various types. Velocity distribution. Loss of head due to friction. Minor losses, hydraulic gradient, pipes in series and parallel. Open Channel Flow: Various types, flow equations, geometrical properties of sections, Most economical section.	6
	Total	26

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4AG4-05: Surveying

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	**Plane table surveying:** Plane table surveying: Description, construction and use of various accessories and centring, leveling and orientation. Method of plane table: Radiation, Intersection, Traversing & resection. Two Point problems and their solution by Different methods. Three point problems and their solution by different methods, Great circle method. Advantages and disadvantages of plane table.	5
3	**Theodolite:** Description, construction and use of Theodolite, Temporary adjustments of Theodeolite, Fixing, Centring, levelling and elimination of parallax. various axes and their relationship. Principles of Tacheomertic survey and its field application. Constants of Tachometer. Staff held vertical and inclined. Use of Analytical lensor, calculation of R.L. Use of stadia cross wires.	5
4	**Contours:** Contours, contouring and their characteristics. Methods of contour surveying by Theodolites. Methods of contour surveying by Tachometer. Contour Drawing by different methods.	5
5	**Area calculations:** Area calculation of regular boundaries by mathematical formulas. Use of Trapezoidal and Simpson's formula, their limitation. Planimeter: Its construction use and theory, Area calculations, Use of zero circle and solution of numerical Problems.	5
6	**Computation of volumes:** Computation of volumes, Earth work calculations. Level, Two level and Three level sections. Calculation of volume by the use of contour and their use in computing the reservoir capacity.	5
	Total	26

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4AG4-06: Food Process Engineering

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	**Heat transfer in food processing:** Heat transfer in food processing, conduction, conduction through bodies in series and parallel, convection, overall heat transfer coefficients, natural and forced convection. Introduction to Psychrometry, psychrometric properties, psychrometric chart, various psychrometric processes, application of psychormetry in simple food processing operations.	6
3	**Cleaning and Grading:** Cleaning and Grading, screening, types of screen, grain size, particle motion on screen, screen opening, ideal and actual screen, screen analysis, fineness modulus, effectiveness of screen. Equipments for cleaning, grading and separations, air screen cleaner, disc separator, indented cylinder separator, spiral separator, specific gravity separator, cyclone separator.	7
4	**Size reduction:** Size reduction, Principal of size reduction, crushing efficiency, energy requirement in size reduction, power requirement in size reduction by Kick's Rittinger's and Bond's laws, size reduction procedures, size reduction equipments, crushers, grinders, attrition mills, hammer mill, cutting machines, performance of size reduction machines. Introduction to Mixing: Theory of mixing, types of mixtures for dry and paste. materials, rate of mixing and power requirement, mixing index.	6
5	**Material handling:** Scope & importance of material handling devices, study of different types of material handling devices such as belt, chain, screw conveyor, bucket elevator, pneumatic conveying- design consideration, capacity and power requirement.	6
	Total	26

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4AG4-07: Soil and Water Conservation 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	**Introduction of soil erosion:** Introduction of soil erosion: Causes, types and agents of soil erosion; water erosion - forms of water erosion, mechanics of erosion; gullies and their classification, stages of gully development; soil loss estimation - universal soil loss equation and modified soil loss equation, determination of their various parameters;	7
3	**Erosion control measures:** Erosion control measures: Agronomical measures - contour cropping, strip cropping, mulching; mechanical measures - terraces - level and graded broad base terraces and their design, bench terraces & their design, layout procedure, terrace planning.	8
4	**Bunds:** Bunds- contour bunds, graded bunds and their design; characteristics of contours and preparation of contour maps; land use capability classification; Gully and ravine reclamation - principles of gully control - vegetative and temporary structures;	8
5	**Wind erosion:** Wind erosion: Factors affecting wind erosion, mechanics of wind erosion, soil loss estimation, wind erosion control measures - vegetative, mechanical measures, wind breaks & shelter belts, sand dunes stabilization; sedimentation - sedimentation in reservoirs and streams, estimation and measurement, sediment delivery ratio, trap efficiency;	8
6	**Water harvesting:** Grassed water ways and their design; introduction to water harvesting techniques; introduction to stream water quality and pollution.	7
	Total	39

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4AG4-08: Wells and Pumps

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	**Occurrence and movement of ground water:** 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, familiarization of various types of bore wells common in the state.	4
3	**Design of open well:** 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.	5
4	**Groundwater hydraulics:** Groundwater hydraulics-determination of aquifer parameters by different method such as Theis, Jacob and Chow's etc. Theis recovery method, well interference, multiple well systems, surface and subsurface exploitation and estimation of ground water potential, quality of ground water, artificial ground water recharge planning, modelling, ground water project formulation.	6
5	**Pumping Systems:** 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, performance curves, effect of speed on head capacity, power capacity and efficiency curves, effect of change of impeller dimensions on performance characteristics.	5
6	**Pumps:** 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.	5
	Total	**26**

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II Year - IV Semester: B.Tech. (Agricultural Engineering)

4AG4-09: Farm Machinery and Equipment

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	**Principles and types of cutting mechanisms:** Principles and types of cutting mechanisms. Harvesting equipment, Mowers – types of mowers (reciprocating and rotary); cutter bar, mowers parts, construction operation and adjustments. Accelerating forces on reciprocating parts and numerical problems. Attachments to the cutter bar, trouble shooting, cutting pattern of reciprocating knife. Simple numerical problems on mowers.	5
3	**Forage Chopping and Handling:** Forage Chopping and Handling: Types of field forage harvesters and choppers, part and construction, details of forage choppers, Attachments, maintenance, trouble shooting. Numerical problems on forage choppers	5
4	**Introduction of Grain harvesting.:** Introduction of Grain harvesting. Types and different functional units of combine. Operation, adjustment and different losses. Numerical problems on losses. Introduction to straw combine. VCR :Parts and working.	5
5	**Threshing:** Principles of threshing and various types of threshers. Maize harvesting and shelling equipment, Introduction to plot combines and plot threshers.	5
6	**Hharvesting tools:** Root crop harvesting equipment – potato. Horticultural tools: hand tools and posthole digger. Testing procedure for thresher and combine by using BIS Test codes. Introduction to Laser land leveller.	5
	Total	26

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4AG4-21: Surveying Lab

Credit : 1   **Max. Marks: 50 (IA:30, ETE:20)**

0L+0T+2P

1. Setting up of plane table, use of various accessories and practice for orientation and charge of Point.
2. Radiation and intersection method of plane tabling.
3. Two point problem and it solution, three point problem and its solution.
4. Contouring by plane table method.
5. Conducting contour survey in different area their compilation.
6. Study of theodolite, fixing on stand and themporary adjustment, Permanent adjustment of theoddolite and their checking.
7. Horizontal and vertical angle measurements by theodolite.
8. Problems of height and distance.
9. Use of tacheometer with inclined sight and staff held inclined.
10. Contouring by grid method.
11. Contouring by radial line method.
12. Contouring by spot level method.
13. Practice of contour plotting by various methods.
14. Use of planimeter, finding constants and calculation of areas of irregular boundaries.
15. Introduction of total station.

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4AG4-22: Food Process Engineering Lab

Credit : 1   **Max. Marks: 50 (IA:30, ETE:20)**

0L+0T+2P

1. Determination of fineness modulus.
2. Determination of uniformity index.
3. Determination of effectiveness of screens.
4. Study of cyclone separator.
5. Study of air screen cleaner.
6. Study of indented cylinder separator.
7. Study of specific gravity separator.
8. Study of hammer mill.
9. Study of attrition mill.
10. Study of various cleaning equipment.
11. Study of belt conveyor.
12. Study of bucket elevator.
13. Study of screw conveyor.

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4AG4-23: Soil and Water Conservation Engineering Lab

Credit : 1.5   **Max. Marks: 75 (IA:45, ETE:30)**

0L+0T+3P

1. Study of soil loss measurement techniques.
2. Study of details of Coshocton wheel and multi-slot runoff samplers.
3. Determination of sediment concentration through oven dry method.
4. Problems on Universal Soil Loss Equation.
5. Preparation of contour map of an area and its analysis.
6. Design of vegetative waterways; Design of contour bunding system.
7. Design of graded bunding system.
8. Design of various types of bench terracing systems.
9. Determination of rate of sedimentation and storage loss in reservoir.
10. Design of Shelter belts and wind breaks.

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4AG4-24: Wells and Pumps Lab

Credit : 1.5   Max. Marks: 75 (IA:45, ETE:30)

0L+0T+3P

1. Verification of Darcy's Law.
2. Study of different drilling equipments.
3. Sieve analysis for gravel and well screens design.
4. Estimation of specific yield and specific retention.
5. Testing of well screen.
6. Drilling of a tube well.
7. Measurement of water level and drawdown in pumped wells.
8. Estimation of aquifer parameters by Thies method, Coopers-Jacob method, Chow method, Thies Recovery method.
9. Well design under confined and unconfined conditions, well losses and well efficiency.
10. Estimating ground water balance.
11. Study of artificial ground water recharge structures.
12. Study of radial flow and mixed flow centrifugal pumps, multistage centrifugal pumps, turbine, propeller and other pumps; Installation of centrifugal pump.
13. Testing of centrifugal pump and study of cavitations.
14. Study of performance characteristics of hydraulic ram.
15. Study and testing of submersible pump.

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II Year - IV Semester: B.Tech. (Agricultural Engineering)

4AG4-25: Farm Machinery and Equipment Lab

Credit : 1   **Max. Marks: 50 (IA:30, ETE:20)**

0L+0T+2P

1. Familiarization with various farm machines related to harvesting, threshing and combine.
2. Study of cutter bar: constructional details, adjustments and working.
3. Study of vertical conveyor reaper: constructional details, adjustments and working.
4. Study of potato harvester: constructional details, adjustments and working.
5. Study of forage harvester: constructional details, adjustments and working.
6. Study of maize sheller: constructional details, materials and working.
7. Study of various types of threshers: constructional details, adjustments and working.
8. Study of combine harvester: constructional details, working and trouble shooting.
9. Study of straw combine.
10. Study of laser land leveller.
11. Study of pot hole digger.

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