

Syllabus of
UNDERGRADUATE DEGREE COURSE
Agricultural Engineering



Rajasthan Technical University, Kota
Effective from session: 2021 – 2022



RAJASTHAN TECHNICAL UNIVERSITY, KOTA

SYLLABUS

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

3AG2-01 : Advance Engineering Mathematics-I

Credit : 3

Max. Marks: 100 (IA:30, ETE:70)

3L+0T+0P

End Term Exam: 3 Hours

SN	Contents	Hours
1	Numerical Methods – 1 Finite differences, Relation between operators, Interpolation using Newton's forward and backward difference formulae. Gauss's forward and backward interpolation formulae. Stirling's Formulae. Interpolation with unequal intervals: Newton's divided difference and Lagrange's formulae. Numerical Differentiation, Numerical integration: Trapezoidal rule and Simpson's 1/3rd and 3/8 rules.	10
2	Numerical Methods – 2 Numerical solution of ordinary differential equations: Taylor's series, Euler and modified Euler's methods. Runge- Kutta method of fourth order for solving first and second order equations. Milne's and Adam's predictor-corrector methods. Solution of polynomial and transcendental equations-Bisection method, Newton-Raphson method and Regula-Falsi method.	8
3	Laplace Transform: Definition and existence of Laplace transform, Properties of Laplace Transform and formulae, Unit Step function, Dirac Delta function, Heaviside function, Laplace transform of periodic functions. Finding inverse Laplace transform by different methods, convolution theorem. Evaluation of integrals by Laplace transform, solving ODEs by Laplace transforms method.	10
4	Fourier Transform: Fourier Complex, Sine and Cosine transform, properties and formulae, inverse Fourier transforms, Convolution theorem, application of Fourier transforms to partial ordinary differential equation (One dimensional heat and wave equations only).	7
5	Z-Transform: Definition, properties and formulae, Convolution theorem, inverse Z-transform, application of Z-transform to difference equation.	5
Total		40

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SYLLABUS

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

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

Credit: 2
2L+0T+0P

Max. Marks: 100 (IA:30, ETE:70)
End Term Exam: 2 Hours

SN	Contents	Hours
1	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.	4
2	Comprehension of Technical Materials/Texts and Information Design & development- Reading of technical texts, Reading and 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
3	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
4	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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SYLLABUS

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

3AG 1-03/4AG 1-03 : Managerial Economics and Financial accounting

Credit : 2

Max. Marks: 100 (IA:30, ETE:70)

2L+0T+0P

End Term Exam: 2 Hours

SN	Contents	Hours
1	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.	4
2	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
3	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
4	Market structure and pricing theory: Perfect competition, Monopoly, Monopolistic competition, Oligopoly.	4
5	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
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SYLLABUS

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

3AG3-04 : Strength of Material

Credit : 2
2L+0T+0P

Max. Marks: 100 (IA:30, ETE:70)
End Term Exam: 2 Hours

SN	Contents	Hours
1	Fundamentals: Stress and strain, engineering properties, Saint-Venant's Principle. Stress strain diagram's, mechanical properties of materials, elasticity and plasticity. Shear stress. and strain, pure shear. Complementary shear. Linear elasticity and Hooke's law. Poisson's ratio, volumetric strain, bulk modulus of elasticity. Elastic constants and relation between elastic modulus. Stress and strain in axially loaded members. Temperature stresses and effects.	6
2	Analysis of stress and strain: Stress at a point, stress components. Stresses on inclined planes. Plane stress and strain. Mohr's circle representation of plain stress and strain. Principal stresses and strains, maximum shear stresses. Hooke's law for plain stress. Stresses in thin cylinder and special shells subjected to internal & external pressures.	5
3	Beam under Flexural Loads: Bending moment and shear force, relation between load, shear force and bending moment. Bending moment and shear force diagrams for simply supported, cantilever and overhang beams under static loading of different types viz. point loads, uniformly distributed loads, linearly varying loads, Pure bending.	5
4	Theory of simple bending of initially straight beams: Flexural stresses in beams. Built up and composite beams. Shear stresses in beams of rectangular, circular and I-section. Shear formula, effect of shear strain. Torsion: Torsion of solid and hollow circular shafts. Non-uniform torsion.	5
5	Columns: Buckling and stability, critical load. Euler's theory for initially straight column with different end conditions, equivalent length, limitation of Euler's formula. Rankine's formula. Column under concentric loading. Secant, Perry's and Indian standard Formulae.	5
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SYLLABUS

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

3AG 4-05 : Fundamentals of Agriculture

Credit : 2
2L+0T+0P

Max. Marks: 100 (IA:30, ETE:70)
End Term Exam: 2 Hours

SN	Contents	Hours
1	Soils: Definition of soil, important soil physical properties and their importance, soil inorganic colloids, their composition, properties and origin of charge, ion exchange in soil and nutrient availability, soil organic matter,	4
2	Soil composition and decomposition: Soil composition and decomposition, effect on soil fertility, soil reaction; acid, saline and sodic soils, quality of irrigation water, essential plant nutrients, their functions and deficiency symptoms in plants, important inorganic fertilizers and their mode of action in soils.	4
3	Agronomy: Definition and scope of agronomy, classification of crops, effects of different weather parameters on crop growth and development.	4
4	Soil-water-plant relationship: Soil-water-plant relationship and water requirement of crops, weeds and their control, crop rotation, cropping systems, mono-cropping, double cropping, relay cropping and mixed cropping. Introduction to cash crops-cotton, sugarcane and potato and fodder crop berseem.	4
5	Study of crops : Study of following crops with reference to soil and climate requirements, seedbed preparation, improved varieties, seed rate, time and method of sowing, manuring, fertilisation, intercultural operations, weed control, irrigation, crop protection and their area, production and productivity in Rajasthan: Cereals-wheat, maize and bajra, Pulses- bengal gram, kharif pulses (green gram, black gram, and cowpea), Oil seeds- groundnut and mustard.	5
6	Horticulture: Scope of horticulture and vegetable crops, soil and climatic requirements for fruits, vegetable and floriculture crops, improved varieties, criteria for site selection, layout and planting methods, nursery raising and micro propagation methods, plant growing structures, pruning and training, fertilizer application, fertigation, irrigation methods, harvesting, grading and packaging, post harvest practices, management of orchards, extraction and storage of vegetable seeds. Introduction to hi-tech horticulture.	5
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SYLLABUS

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

3AG 4-06 : Hydrology

Credit:3

Max. Marks: 100 (IA:30, ETE:70)

3L+0T+0P

End Term Exam: 3 Hours

SN	Contents	Hours
1	Introduction: hydrologic cycle; precipitation- forms, rainfall measurement, mass curve, hydrograph, mean rainfall depth, frequency analysis of point rainfall, plotting position, estimation of missing data, test for consistency of rainfall records.	8
2	Interception: Interception; infiltration; evaporation; evapo-transpiration-estimation and measurement; geomorphology of watersheds - stream number, stream length, stream area, stream slope and Horton's laws;	8
3	Runoff: Runoff- factors affecting, measurement; stage and velocity, rating curve, extension of rating curve; Estimation of peak runoff rate and volume; rational method, Cook's method, SCS method, Curve number method.	8
4	Hydrograph: Hydrograph, components, base flow separation, unit hydrograph theory- unit hydrograph of different durations, dimensionless unit hydrograph, distribution hydrograph, synthetic unit hydrograph, uses and limitations of unit hydrograph.	8
5	Head water flood control: Head water flood control- methods, retards and their location; flood routing - graphical methods of reservoir flood routing; hydrology of dry land areas - drought and its classification.	8
Total		40



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SYLLABUS

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

3AG 4-07 : Farm Power

Credit :3

Max. Marks: 100 (IA:30, ETE:70)

3L+0T+0P

End Term Exam: 3 Hours

SN	Contents	Hours
1	Sources of farm power: Sources of farm power- conventional and non-conventional energy sources. Classification of tractors and CI engines. Difference between CI and SI, Two stroke and four stroke engines.	8
2	Status of tractor and power tiller: Status of tractor and power tiller industries in India. Review of thermodynamic principles of CI engines and deviation from ideal cycle. Simple numerical problems horse power calculation.	8
3	CI Engine systems: CI Engine systems: Study of engine components their construction, operating principles and functions. valves & valve mechanism. Fuel, intake and exhaust, ignition, starting and electrical systems.	8
4	IC engine fuels: 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, Simple numerical problems on fuel combustion.	8
5	Study of properties of coolants: Study of properties of coolants, anti freeze and anti-corrosion materials, lubricant types and study of their properties. Engine cooling and lubricating systems. Engine governing systems: centrifugal and pneumatic.	8
Total		40

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SYLLABUS

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

3AG 4-08 : Introductory Food Engineering

Credit: 2

Max. Marks: 100 (IA:30, ETE:70)

2L+0T+0P

End Term Exam: 2 Hours

SN	Contents	Hours
1	Introduction to food engineering: Introduction to food engineering, units and dimensions, introduction to mass and energy balance, simple food processing operations, problems based on of mass and energy balance of simple food processing operations.	5
2	Fluid flow in food processing: Fluid flow in food processing: properties of liquid, handling system for Newtonian liquid, mechanical energy balance, flow measurement, flow past immersed bodies, drag, drag coefficient, motion of particle through fluid, equation for one dimensional motion of particle through fluid.	8
3	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.	7
4	Introduction to Psychrometry: Introduction to Psychrometry, psychrometric properties, psychrometric chart, various psychrometric processes, application of psychrometry in simple food processing operations.	6
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SYLLABUS

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

3AG 4-21 : Fundamentals of Agriculture Lab

Credit :1

Max. Marks: 100 (IA:60, ETE:40)

OL+OT+2P

Soils:

1. Determination of electrical conductivity and pH of soil.
2. Estimation of organic carbon of soil.
3. Determination of bulk density.
4. Determination of particle density and computation of soil porosity.

Agronomy:

1. Identification of crops.
2. Identification of seeds of different crops.
3. Identification of weeds.
4. Fertilizer application methods
5. Different weed control methods
6. Judging maturity time for harvesting of kharif crops

Horticulture:

1. Identification and description of important fruit, flower and vegetable crops.
2. Study of different vegetable cultivation tools.
3. Practices of training and pruning in some important crops.
4. Vegetative propagation methods



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SYLLABUS

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

3AG 4-22 : Hydrology Lab

Credit:1

Max. Marks: 100 (IA:60, ETE:40)

0L+0T+2P

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.



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SYLLABUS

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

3AG 4-23 : Farm Power Lab

Credit :1

Max. Marks: 100 (IA:60, ETE:40)

0L+0T+2P

1. Introduction to different systems of a CI engine; Engine parts and functions.
2. Valve system – study and adjustments.
3. Oil & Fuel - determination of physical properties.
4. Study of Air cleaning system.
5. Study of Fuel supply system of CI engine.
6. Study of Cooling system: thermostat and radiator.
7. Study of Lubricating system.
8. Study of Starting and electrical system of tractor.
9. Study of engine performance curves.
10. Visit to engine manufacturer/ assembler/ spare parts agency.

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SYLLABUS

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

3AG 4-24 : Introductory Food Engineering Lab

Credit:1

Max. Marks: 100 (IA:60, ETE:40)

OL+OT+2P

1. Study of applications of dimensional analysis.
2. Study of simple processes for mass balance in food processing
 - (a) Evaporation
 - (b) Drying
3. Study of simple processes for energy balance in food processing
 - (a) Evaporation
 - (b) Drying
4. Study of pumping systems for liquid food processing plants.
5. Determination of energy requirement for pumping in liquid food processing plants.
6. Study of flow past immersed bodies.
7. Study of heat transfer calculations for various shapes.
8. Study of cooling load calculations for food industries.
9. Calculations of drag coefficients for various shapes.
10. Determination of liquid properties
 - (a) Density
 - (b) Viscosity



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SYLLABUS

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

3AG 4-25 : Field Operations and Maintenance of Tractor Lab

Credit:2

Max. Marks: 100 (IA:60, ETE:40)

OL+OT+4P

1. Identification and location of various systems of a tractor viz. fuel, lubrication, cooling, electrical, transmission, hydraulic and final drive system.
2. Familiarization with tractor controls and learning procedure of tractor starting and stopping.
3. Study of driving safety rules: Road signs, traffic rules, road safety, driving and parking of tractor.
4. Familiarization with different makes and models of tractors in India.
5. Forward and reverse tractor driving practice.
6. Tractor driving practice with two wheeled tractor trailer forward and reverse.
7. Familiarization with tools and equipment used for maintaining and servicing of tractors and farm machines; Doing the 10-hours service jobs and Maintenance after 50- hours of operation; Maintenance after 100 hours of operation; Maintenance after 250 hours of operation; Maintenance after 500 hours and 1000 hours of operation.
8. Dismantling and assembling of major engine parts.
9. Visit to tractor/ engine repair workshop.

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