### Minimum Credit Requirements

<table>
<thead>
<tr>
<th>Sr. No.</th>
<th>Subject</th>
<th>Minimum credit(s)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Major</td>
<td>20</td>
</tr>
<tr>
<td>2</td>
<td>Minor</td>
<td>09</td>
</tr>
<tr>
<td>3</td>
<td>Supporting</td>
<td>05</td>
</tr>
<tr>
<td>4</td>
<td>Seminar</td>
<td>01</td>
</tr>
<tr>
<td>5</td>
<td>Research</td>
<td>20</td>
</tr>
<tr>
<td></td>
<td><strong>Total</strong></td>
<td><strong>55</strong></td>
</tr>
<tr>
<td></td>
<td>Non Credit Compulsory Course</td>
<td>06</td>
</tr>
</tbody>
</table>

### Course Layout

#### A) Major Subjects (Min. 9 Credits)

<table>
<thead>
<tr>
<th>Sr. No</th>
<th>Course Number</th>
<th>Course Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>FMPE-501*</td>
<td>Design Of Farm Power &amp; Machinery System</td>
<td>4 (3+1)</td>
</tr>
<tr>
<td>2</td>
<td>FMPE-502*</td>
<td>Soil Dynamics In Tillage &amp; Traction</td>
<td>3 (2+1)</td>
</tr>
<tr>
<td>3</td>
<td>FMPE-503*</td>
<td>Testing And Evaluation Of Tractor And Farm Equipment</td>
<td>3 (2+1)</td>
</tr>
<tr>
<td>4</td>
<td>FMPE-504</td>
<td>System Simulation And Computer Aided Problems Solving In Engineering</td>
<td>2 (1+1)</td>
</tr>
<tr>
<td>5</td>
<td>FMPE-507</td>
<td>Farm Machinery Dynamics Noise And Vibration</td>
<td>4 (3+1)</td>
</tr>
<tr>
<td>6</td>
<td>FMPE-508</td>
<td>Tractor Design</td>
<td>3 (2+1)</td>
</tr>
<tr>
<td>7</td>
<td>FMPE-509</td>
<td>Operational Research In Farm Power And Machine Management</td>
<td>3 (2+1)</td>
</tr>
<tr>
<td>No</td>
<td>Course Code</td>
<td>Course Title</td>
<td>Credits</td>
</tr>
<tr>
<td>----</td>
<td>-------------</td>
<td>--------------------------------------------------------</td>
<td>---------</td>
</tr>
<tr>
<td>8</td>
<td>FMPE-510</td>
<td>Ergonomics And Safety In Farm Operation</td>
<td>3 (2+1)</td>
</tr>
<tr>
<td>9</td>
<td>FMPE - 592</td>
<td>Special Problem</td>
<td>1 (0+1)</td>
</tr>
<tr>
<td>10</td>
<td>FMPE – 595*</td>
<td>Industry/Institute Training</td>
<td>NC</td>
</tr>
</tbody>
</table>

**B) Minor Subjects (Min. 9 Credits)**

<table>
<thead>
<tr>
<th>No</th>
<th>Course Code</th>
<th>Course Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>FMPE-505</td>
<td>Instrumentation And Stress Analysis</td>
<td>3 (2+1)</td>
</tr>
<tr>
<td>2</td>
<td>FMPE- 521</td>
<td>Computer Aided System Design</td>
<td>2 (0+2)</td>
</tr>
<tr>
<td>3</td>
<td>RES -501</td>
<td>Renewable Energy Sources</td>
<td>3 (2+1)</td>
</tr>
<tr>
<td>4</td>
<td>RES- 505</td>
<td>Agro Energy Audit And Management</td>
<td>2 (2+1)</td>
</tr>
<tr>
<td>5</td>
<td>RES- 506</td>
<td>Design And Analysis Of Renewable Energy Conversion Systems</td>
<td>3 (3+0)</td>
</tr>
<tr>
<td>6</td>
<td>RES -508</td>
<td>Alternate Fuels For IC Engine</td>
<td>2 (2+1)</td>
</tr>
<tr>
<td>7</td>
<td>PFE-502</td>
<td>Engineering Properties Of Biological Material</td>
<td>3 (2+1)</td>
</tr>
<tr>
<td>8</td>
<td>BSCT-501</td>
<td>Computer Graphics</td>
<td>2 (2+1)</td>
</tr>
</tbody>
</table>

**C) Supporting Courses (Min. 5 Credits)**

<table>
<thead>
<tr>
<th>No</th>
<th>Course Code</th>
<th>Course Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>FMPE-531</td>
<td>Pesticides application techniques</td>
<td>3 (2+1)</td>
</tr>
<tr>
<td>2</td>
<td>FMPE-532</td>
<td>Advanced manufacturing technology</td>
<td>3 (2+1)</td>
</tr>
<tr>
<td>3</td>
<td>STAT- 511</td>
<td>Statistical methods for applied Sciences</td>
<td>3 (2+1)</td>
</tr>
<tr>
<td>4</td>
<td>MATHS-502</td>
<td>Methods of Numerical Analysis</td>
<td>2 (1+1)</td>
</tr>
<tr>
<td>5</td>
<td>FMPS-505</td>
<td>Research methodology</td>
<td>1 (0+1)</td>
</tr>
</tbody>
</table>

**D) Seminar (01 credit)**

<table>
<thead>
<tr>
<th>No</th>
<th>Course Code</th>
<th>Course Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>FMPE-591</td>
<td>Master’s seminar</td>
<td>1 (0+1)</td>
</tr>
</tbody>
</table>

**E) Master’s Research (20 Credits)**

<table>
<thead>
<tr>
<th>No</th>
<th>Course Code</th>
<th>Course Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>FMPE- 599</td>
<td>Master’s research</td>
<td>20 (0+20)</td>
</tr>
</tbody>
</table>

**F) Non Credit Compulsory Courses**

<table>
<thead>
<tr>
<th>No</th>
<th>Course Code</th>
<th>Course Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>PGS -501</td>
<td>Library and information services</td>
<td>1 (0+1)</td>
</tr>
<tr>
<td>2</td>
<td>PGS -502</td>
<td>Technical writing and communication skill</td>
<td>1 (0+1)</td>
</tr>
<tr>
<td>3</td>
<td>PGS -503</td>
<td>Intellectual property and its management in agriculture</td>
<td>1 (1+0)</td>
</tr>
<tr>
<td>4</td>
<td>PGS -504</td>
<td>Basic concept in laboratory techniques</td>
<td>1 (0+1)</td>
</tr>
<tr>
<td>5</td>
<td>PGS -505</td>
<td>Agricultural research, research ethics and rural development Programmes</td>
<td>1 (1+0)</td>
</tr>
<tr>
<td>6</td>
<td>PGS -506</td>
<td>Disaster management</td>
<td>1 (1+0)</td>
</tr>
</tbody>
</table>

* Compulsory

#Minimum of three weeks
Course Contents

A) Major Subjects

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Credit</th>
</tr>
</thead>
<tbody>
<tr>
<td>FMPE 501</td>
<td>Design of Farm Power and Machinery Systems</td>
<td>4(3+1)</td>
</tr>
</tbody>
</table>

Theory

UNIT I
Modern trends, principles, procedures, fundamentals and economic considerations for design and development of farm power and machinery systems. Design considerations, procedure and their applications in agricultural tractors & typical machines. Reliability criteria in design and its application.

UNIT II
Analytical design considerations of linkages/ components in farm machinery and its application.

UNIT III

UNIT IV
Design and selection of matching power unit.

UNIT V
Safety devices for tractors & farm implements.

Practical

Statement and formulation of design problems.
Design of farm power systems.
Design of mechanisms & prototypes in farm machinery.

Suggested Books

Katson Publishing House.

<table>
<thead>
<tr>
<th>FMPE 502</th>
<th>Soil Dynamics in Tillage and Traction</th>
<th>3(2+1)</th>
</tr>
</thead>
</table>

**Theory**

**UNIT I**
Dynamic properties of soil and their measurement, stress-strain relationships, theory of soil failure.

**UNIT II**
Mechanics of tillage tools and geometry of soil tool system, design parameters and performance of tillage tools.

**UNIT III**
Dimensional analysis of different variables related to soil-tyre system; soil vehicle models; mechanics of steering of farm tractor; special problems of wet land traction and floatation.

**UNIT IV**
Introduction of traction devices, tyres-types, function & size, their selection; mechanics of traction devices. Deflection between traction devices and soil, slippage and sinkage of wheels, evaluation and prediction of traction performance, design of traction and transport devices. Soil compaction by agricultural vehicles and machines.

**Practical**

- Relationship of soil parameters to the forces acting on tillage tools,
- Wheel slippage and tyre selection,
- Design and performance of traction devices and soil working tools.

**Suggested Books**
FMPE 503  Testing and Evaluation of Tractors and Farm Equipment
3(2+1)

Theory

UNIT I
Types of tests; test procedure, national and international codes.

UNIT II
Test equipment; usage and limitations. Power losses in dynamometers and hydraulic test equipment.

UNIT III
Prototype feasibility testing and field evaluation. Laboratory and field testing of selected farm equipment. Non-destructive testing techniques.

UNIT IV
Tractor performance testing, evaluation and interpretation of results.

UNIT V
Review and interpretation of test reports. Case studies.

Practical

Laboratory and field testing of selected farm equipment.
Interpretation and reporting of test results.
Material testing and its chemical composition.
Accelerated testing of fast wearing components.
Non-destructive testing techniques.

Suggested Books
Indian Standard Codes for Agril. Implements. Published by ISI, New Delhi.
Nebraska Tractor Test Code for Testing Tractor, Nebraska, USA.
FAO Agricultural Services Bull. 110.
<table>
<thead>
<tr>
<th>UNIT I</th>
</tr>
</thead>
<tbody>
<tr>
<td>Concept, advantages and limitation of dimensional analysis, dimensions and units, fundamental and derived units, systems of units, conversion of units of measurement, conversion of dimensional constants, conversion of equations in different units, complete set of dimensionless products and their formulation methods- the Rayleigh’s method, Buckingham’s Pi theorem and other methods.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>UNIT II</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mathematical modeling and engineering problem solving.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>UNIT III</th>
</tr>
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</table>

<table>
<thead>
<tr>
<th>UNIT IV</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>UNIT V</th>
</tr>
</thead>
<tbody>
<tr>
<td>Solving differential equation on computers- modeling engineering systems with ordinary differential equations- solution techniques using computers.</td>
</tr>
</tbody>
</table>

**Suggested Books**


<table>
<thead>
<tr>
<th>UNIT I</th>
<th>Theory</th>
</tr>
</thead>
<tbody>
<tr>
<td>Principles of soil working tools: shares, discs, shovels, sweeps and blades, rota-tillers and puddlers.</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>UNIT II</th>
<th>Theory</th>
</tr>
</thead>
<tbody>
<tr>
<td>Metering of seeds and granular fertilizers with various mechanism, effect of various parameters on distribution of seed and fertilizer in seed cum fertilizer drills and planters, flow of seeds and fertilizers through tubes and boots. Kinematics of transplanters.</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>UNIT III</th>
<th>Theory</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>UNIT IV</th>
<th>Theory</th>
</tr>
</thead>
<tbody>
<tr>
<td>Noise and vibration theory- Definition, units and parameters of measurement and their importance. Types of vibrations- free and forced, in damped and without damped analysis of one, two and multiple degree of freedom systems and their solution using Newton’s motion, energy method, longitudinal, transverse and torsional vibrations, Raleigh’s methods, Lagrange equation.</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>UNIT V</th>
<th>Theory</th>
</tr>
</thead>
<tbody>
<tr>
<td>Introduction of transient vibration in systems, vibration of continuous media. Balancing of single rotating weight and number of weights in same plane and different planes. Complete balancing of reciprocating parts of engine</td>
<td></td>
</tr>
</tbody>
</table>

### Pratical

- Study of vibration measurement and analysis equipment,
- Study of different vibration measurement and evaluation,
- Measurement and analysis of vibration on different components of thresher, combine, reaper, power tiller and tractor.
- Determination of modulus of elasticity, rigidity, and MI by free vibration test.
- Evaluation of logarithmic decrement and damping factor.
- Whirling of shaft. Heat motion in two pendulum system.
- Detailed analysis of multi-degree of freedom system.

### Suggested Books


<table>
<thead>
<tr>
<th>FMPE 508</th>
<th>Tractor Design</th>
<th>3(2+1)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Theory</td>
<td></td>
<td></td>
</tr>
<tr>
<td>UNIT I</td>
<td>Technical specifications of tractors available in India, modern trends in tractor design and development, special design features of tractors in relation to Indian agriculture.</td>
<td></td>
</tr>
<tr>
<td>UNIT II</td>
<td>Parameters affecting design of tractor engine and their selection. Design of fuel efficient engine components and tractor systems like transmission, steering, front suspension, hydraulic system &amp; hitching, chassis, driver’s seat, work-place area and controls. Tire selection</td>
<td></td>
</tr>
<tr>
<td>Practical</td>
<td>Extensive practices on the packages mentioned in the theory.</td>
<td></td>
</tr>
<tr>
<td>Suggested Books</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>FMPE 509</th>
<th>Operations Research In Farm Power &amp; Machinery Management 3 (2+1)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Theory</td>
<td></td>
</tr>
<tr>
<td>UNIT I</td>
<td>Nature, methods, impact and scope of operational research; linear programming and integer programming models and applications. Network terminology, shortest route and minimal spanning tree problems, maximal flow problem, project planning and control with PERT and CPM.</td>
</tr>
</tbody>
</table>
UNIT II
System approach in farm machinery management and application of programming techniques to the problems of farm power and machinery selection.

UNIT III
Maintenance and scheduling of operations. Replacement of old machines, repair and maintenance of agricultural machinery, inventory control of spare parts, work study, productivity, method study. First order Markov chains and their applications in sales forecasting and in problems of inventory control and modeling of workshop processes and quality control.

UNIT IV
Time and motion study. Man-machine task system in farm operations, planning of work system in agriculture. Computer application in selection of power units and to optimize mechanization system.

Practical
Management problems and case studies.

Suggested Books

FMPE 510 Ergonomics and Safety in Farm Operations 3(2+1)

Theory
UNIT I
Concept and design criteria for optimum mutual adjustment of man and his work: Importance of ergonomics and its application in agriculture, liberation and transfer of energy in human body, concept of indirect calorimeter, work physiology in various agricultural tasks.

UNIT II
Physiological stress indices and their methods of measurement: Mechanical efficiency of work, fatigue and shift work.

UNIT III
Anthropometry and Biomechanics: Anthropometric data and measurement techniques, joint movement and method of measurement, analysis and application of anthropometric data, measurement of physical and mental capacities.
UNIT IV

Human limitations in relation to stresses and demands of working environments. Mechanical environment; noise and vibration and their physiological effects, thermal environment; heat stress, thermal comfort, effect on performance and behavior, field of vision, color discrimination, general guidelines for designing visual display, safety standards at work place during various farm operations and natural hazards on the farm. Farm safety legislation.

UNIT V

Man-machine system concept. Human factors in adjustment of man and his work. Design aspects of foot and hand controls on tractors and farm equipment. Design of operator’s seat for tractors and agricultural equipment.

Practical

Laboratory experiments on measurement of physical and mental capacities and limitations of human-being in relation to the stress and environment,

Anthropometric measurements, study of human response to dust, noise and vibrations, case studies on ergonomics.

Suggested Books


FMPE 592 Special Problem 1(1+0)

Any related problem based on students requirement

FMPE -595 Industry / Institute Training 0+1 (NC)

Theory

In-plant training in the relevant farm power and machinery industry during manufacturing, assembly and testing of the machines and equipment. To study the actual working of the equipment and various unit operations. The evaluation will be based on the written report of the student and the comments of the factory managers. The duration of training shall be three weeks. The student shall be required to do training in the institute other than the institute in which he/she is enrolled.
Theory

UNIT I
Strain and stress, strain relationship, strain gauges. Mechanical, optical, electrical acoustical and pneumatic etc. and their use. Various methods of determining strain/stresses experimentally. Measuring devices for displacement (linear and rotational), velocity, force, torque and shaft power. Strain gauges: types and their application in two and three dimensional force measurement. Design and analysis of strain gauges.

UNIT II
Introduction to functional elements of instruments. Active and passive transducers, Analog and digital modes, Null and deflection methods. Performance characteristics of instruments including static and dynamic characteristics.

UNIT III
Devices for measurement of temperature, relative humidity, pressure, sound, vibration, flow etc. Recording devices and their type. Measuring instruments for calorific value of solid, liquid, and gaseous fuels. Measurement of gas composition using GLC.

UNIT IV
Basic signal conditioning devices - data acquisition system – micro computers for measurement and data acquisition. Data storage and their application.

Practical
Calibration of instruments, Experiment on LVDT, strain gauge transducer,
inductive and capacitive pick ups,
Speed measurement using optical devices, vibration measurement exercises, making of thermocouples and their testing-
Basic electronic circuits and application of linear ICs.

Suggested Books
**FMPE 521  Computer Aided System Design  2(0+2)**

**Practical**

Introduction to computer aided design, Geometric modeling and interactive graphics, Computer aided analysis and synthesis of common mechanical components. Application of numerical methods and optimal techniques to machine design problems. Computer aided selection of standard mechanical components. Introduction to FEM.

Preparation of engineering drawings of machine / implement components, design of plough share / furrow openers / plough discs, and other components of farm machinery, preparation of bill of material and costing.

**Suggested Books**


**RES 501  Renewable Energy Sources  3(2+1)**

**Theory**

Solar energy solar radiation. radiation exchange process. solar collection. thermosyphon effect; solar applications; direct and indirect heating, cooling, refrigeration, drying, dehydration. Sterilization; Pasteurization; cooking; power generation, biological conversion of solar energy; greenhouse agriculture, performance evaluation, economics of solar energy systems, solar energy materials & energy storage. Energy from biomass and wastes; Production, distribution, sources, plant, human animal and municipal waste, properties, composition, treatments, recycling, anaerobic digestion; crop residues and animal waste digestion, biogas; producer gas engines. Liquid fuels; Ethanol, methanol, anaerobic and aerobic fermentation, Wind energy; velocity and power duration curves, wind mill parameters, power, torque characteristics; design and performance of rotors, wind mill structure design; solar pv systems.

**Practical**

Suggested Books


RES 505 Agro-Energy Audit And Management 2(2+0)

Theory

UNIT I
Energy resources on the farm: conventional and non-conventional forms of energy and their use. Heat equivalents and energy coefficients for different agricultural inputs and products. Pattern of energy consumption and their constraints in production of agriculture. Direct and indirect energy.

UNIT II
Energy audit of production agriculture, and rural living and scope of conservation.

UNIT III
Identification of energy efficient machinery systems, energy losses and their management. Energy analysis techniques and methods: energy balance, output and input ratio, resource utilization, conservation of energy sources.

UNIT IV

Suggested Books

RES 508  Design And Analysis of Renewable Energy Conversion Systems  
3(3+0)

Theory

UNIT I
Energy cycle of the earth; water flow and storage; ocean currents and tides. Energy heat flow and energy storage; photosynthesis and biomass; renewable energy sources.

UNIT II
Thermodynamics of energy conversion; conversion of solar energy, wind energy, water flows, heat, biomass, etc.; other conversion processes.

UNIT III
Development and use of biogas, alcohols and plant oils, plant oil esters in I.C.engines. Study of various parameters for measuring the performance of the output.

UNIT IV

Suggested Books

RES 508  Alternate fuels for IC Engines  
2(1+1)

Theory

Introduction to alternate fuels, synthetic fuels, production composition and properties. combustion characteristics, bio, fuels ( alcohol, methanol, ethanol, biogas, producer gas and hydrogen ). Composition and Properties of alternate fuels, comparison with conventional fuels, potential, possibilities and problems, Production of biogas, producer gas, ethanol, methanol, alcohol and hydrogen.

Utilization : Thermal and mechanical applications, utilization in SI and CI engines to run on alternate fuels, utilization for miscellaneous applications, Environmental aspects of alternate fuel : Environmental impact and safety factors. Efficiency of different alternate fuels, Economic and commercial considerations.
Practical

Study of alternate fuels, performance of I.C. engines on alternate fuels, measurement of flue gas parameters, thermal applications of alternate fuels.

Suggested Books

Ratnakar, G.L. Utilization of Biogas in IC Engine

PFE 502  Engineering Properties Of Biological Materials  3(2+1)

Theory

UNIT I

Physical characteristics of different food grains, fruits and vegetables; Shape and size, description of shape and size, volume and density, porosity, surface area. Rheology; ASTM standard, terms, physical state of materials, classical ideal material, rheological models and equations, viscoelasticity, creep-stress relaxation, Non Newtonian fluid and viscometry, rheological properties; force, deformation, stress, strain, elastic, plastic behaviour.

UNIT II

Contact stresses between bodies, Hertz problems, firmness and hardness, mechanical damage, dead load and impact damage, vibration damage, friction, effect of load, sliding velocity, temperature, water film and surface roughness. Friction in agricultural materials, rolling resistance, angle of internal friction, angle of repose, flow of bulk granular materials, aerodynamics of agricultural products, drag coefficients, terminal velocity.

UNIT III

Thermal properties: Specific heat, thermal conductivity, thermal diffusivity, methods of determination, steady state and transient heat flow. Electrical properties; Dielectric loss factor, loss tangent, A.C. conductivity and dielectric constant, method of determination, energy absorption from high frequency electric field.

UNIT IV

Application of engineering properties in design and operation of agricultural equipment and structures.

Practical

Determination of physical properties like, length, breadth, thickness, surface area, bulk density, porosity, true density, coefficient of friction, angle of repose and colour for various food grains, fruits, vegetables, spices and processed foods, aerodynamic properties like terminal velocity, lift and drag force for food grains, thermal properties like thermal conductivity, thermal diffusivity and specific heat, firmness and hardness of grain, fruits and stalk, electrical properties like dielectric constant, dielectric loss factor, loss tangent and A.C. conductivity of various food materials.

Suggested Books

BSCT 501  Computer Graphics  3(2+1)

Theory

UNIT I
Graphic display devices, Interactive devices, Line and circle plotting techniques by using Bresenham’s algorithm, Windowing and clipping, Sutherland Cophen algorithm, Cyrus and Beck method.

UNIT II
Curve drawing using Hermite Polynomial, Bezier curve, B Splines, Picture Transformation, translation, rotation, Scaling and Mirroring

UNIT III

UNIT IV
Orthogonal Projection and multiple views, Isometric projection, Perspective projection, 3D Clipping

UNIT V

Practical
Practical problems on above topics.

Suggested Books
C) Supporting Subjects

<table>
<thead>
<tr>
<th>FMPE 514</th>
<th>Research Methodology</th>
<th>1(0+1)</th>
</tr>
</thead>
</table>

**Practical**


**Suggested Books**


<table>
<thead>
<tr>
<th>FMPE-531</th>
<th>Pesticide Application Equipments</th>
<th>3(2+1)</th>
</tr>
</thead>
</table>

**Theory**

UNIT I

Role of chemical control and formulations. Targets, droplet size, its distribution and determination methods, selection of droplet size, atomizing devices-nozzles, types of sprayers, dusters and granular applicators, manually and power operated sprayers hydraulic energy.

UNIT II

Centrifugal energy, electrical energy, hybrid and air blast sprayers, pumps. Agitators, filters, pressure control devices and systems. Manual and power operated dusters and granular applicators fogging machines, aerial applications of pesticide, application of pesticide in greenhouse, calibration of sprayers.

UNIT III

Design of spraying and dusting equipments, maintenance and selection of spraying equipments

UNIT IV

Application methods and economics of pest control, safety precautions in pesticide application.

**Practical:**

Study of different types of sprayers, dusters, granular applications fogging machines, nozzles, calibration of sprayers, selection of pesticide application equipment for field and orchard crops, weedicide application, droplet size
Suggested Books:

FMPE-532 Advanced manufacturing Technology 3(2+1)

Theory

UNIT I
Construction of material and their characteristics: The structure of material, properties of material, equilibrium diagram. Time temperature transformation curves. Heat treatment ferrous material alloys, Non ferrous metal alloys, non – metallic material plastic. Elastomers ceramics and composites, material selection surface treatment and finishing.

UNIT II

UNIT III
Forming processes: The fundamentals of metal forming, mechanism of hot and cold working. Hot rolling of metals, forging processes extrusion, cold rolling, cold forging, cold drawing, forming of plastic ceramic and composites, dies, shearing and blanking and dies: bending and drawing.

UNIT IV
Material removal processes: machining process , cutting tools for matching , turning and boring and related processes, drilling and related hole making processes, milling, broaching–sawing-filling, abrasive machining processes, work holding devices, matching centers, thread, manufacture, gear manufacturing and non traditional machining processes (FCM,EDH,LBM,AJM,wire EDM)

UNIT V

UNIT VI
Numerical control: command system, codes, programme, cutter position X and Y incremental movements, linear countering Z movement and commands.

### Practical:

<table>
<thead>
<tr>
<th>Study of physical and mechanical properties of material tensile test. Hardness, impact. Material fatigue and endurance limit, study of metallographic structures of metals, determination of carbon and sulphur content, carbonizing and hardening of plain and medium carbon steel by heating and annealing.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Study and use of measuring and inspection tools, study of limits, tolerance and geometric dimensioning, study and use of optical comparator. Vision system measurement. Co-ordinate measuring machine, surface roughness measurement. Non destructive inspection and testing and statistical process control.</td>
</tr>
<tr>
<td>Study of pattern and sand moulding techniques, preparation of small moulds and carry out sand casting, study of different casting processes.</td>
</tr>
<tr>
<td>Design and development of simple tooling for shearing bending and deep drawing and use them in workshop, study of different hot and cold working processes practice on different machines like lathe, Drill press, milling machine slotting machine, shaper planers and grinders. Study of non traditional machining processes. Study the tools geometry and their angles for different chip machining processes. Study and practice on gas, arc, resistance, Mic and Tig welding, soldering, brazing and braze welding processes. Study and design of different types of joints for welding. Welding of different materials ferrous, cast iron, non-ferrous and stainless steel. Developing a programme for CNC machines (turning and milling) and practice on operation and turning and milling centers. Study of surface finishing methods. Cleaning, coating and paint application. Carry out the practice on powder coating and painting by different method.</td>
</tr>
</tbody>
</table>

### Suggested Books:


### STAT 511  Statistical Methods for Applied Science  3(2+1)

#### Theory

<table>
<thead>
<tr>
<th>UNIT I</th>
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<tbody>
<tr>
<td>Measures of central tendency and dispersion Theory of probability: classical, empirical, axiomatic probability, random variable and mathematical expectation</td>
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<table>
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<tr>
<th>UNIT II</th>
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<tr>
<th>UNIT III</th>
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</thead>
<tbody>
<tr>
<td>Correlation and regression: Simple and multiple linear regression model, Stepwise regression, Estimation of parameters, Correlation, Partial and multiple correlation. Rank</td>
</tr>
</tbody>
</table>
correlation, Path analysis, Test of significance of correlation coefficients and regression coefficients, coefficient of multiple determination. Polynomial regression model and their fitting, Estimation of parameters.

**UNIT IV**

Non-parametric tests: sign, Mann-Whitney U test, Run test, Median test.

**Practical**

Calculation of mean, median, mode, variance and standard deviation etc. Fitting of Binomial, Poisson and Normal distributions, Large sample test, t, F and Chi-square test, Correlation, Partial and multiple correlation, Rank correlation and linear, multiple and non-linear regression, Path analysis, Non-parametric tests.

**Suggested Books**


**MATHS 502 Methods of Numerical Analysis 2(1+1)**

**Theory**

<table>
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<tr>
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<tbody>
<tr>
<td>UNIT II</td>
<td>Least squares. Numerical solution of differential equations and non linear equations in several variables.</td>
</tr>
</tbody>
</table>

**Practical**

Practice on matrix manipulation, Exercises on solution of the systems of linear and non linear equations, solution of differential equations

**Suggested Books**


### D) Seminar

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>FMPE 591</td>
<td>Master’s Seminar</td>
<td>1(0+1)</td>
</tr>
</tbody>
</table>

### E) Master’s Research

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>FMPE 599</td>
<td>Master’s Research</td>
<td>20(0+20)</td>
</tr>
</tbody>
</table>

### F) Non-Credit Compulsory Courses

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>PGS 501</td>
<td>Library And Information Services</td>
<td>1(0+1)</td>
</tr>
</tbody>
</table>

**Practical**

Introduction to library and its services; Role of libraries in education, research and technology transfer; Classification systems and organization of library; Sources of information- Primary Sources, Secondary Sources and Tertiary Sources; Intricacies of abstracting and indexing services (Science Citation Index, Biological Abstracts, Chemical Abstracts, CABI Abstracts, etc.); Tracing information from reference sources; Literature survey; Citation techniques/Preparation of bibliography; Use of CD-ROM Databases, Online Public Access Catalogue and other computerized library services; Use of Internet including search engines and its resources; resources access methods.

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Credits</th>
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</thead>
<tbody>
<tr>
<td>PGS 502</td>
<td>Technical Writing and Communications Skills</td>
<td>1(0+1)</td>
</tr>
</tbody>
</table>

**Practical**

Technical Writing - Various forms of scientific writings- theses, technical papers, reviews, manuals, etc; Various parts of thesis and research communications (title page, authorship contents page, preface, introduction, review of literature, material and methods, experimental results and discussion); Writing of abstracts, summaries, précis, citations etc.; commonly used abbreviations in the theses and research communications; illustrations, photographs and drawings with suitable captions; pagination, numbering of tables and illustrations; Writing of numbers and dates in scientific write-ups; Editing and proof-reading; Writing of a review article.

Communication Skills - Grammar (Tenses, parts of speech, clauses, punctuation marks); Error analysis (Common errors); Concord; Collocation; Phonetic symbols and transcription; Accentual pattern: Weak forms in connected speech: Participation in group discussion: Facing an interview; presentation of scientific papers.

**Suggested Books**


<table>
<thead>
<tr>
<th>PGS 503</th>
<th>Intellectual Property and Its Management in Agriculture 1(1+0)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>(e-Course)</td>
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</tbody>
</table>

**Theory**

Historical perspectives and need for the introduction of Intellectual Property Right regime; TRIPs and various provisions in TRIPS Agreement; Intellectual Property and Intellectual Property Rights (IPR), benefits of securing IPRs; Indian Legislations for the protection of various types of Intellectual Properties; Fundamentals of patents, copyrights, geographical indications, designs and layout, trade secrets and traditional knowledge, trademarks, protection of plant varieties and farmers’ rights and biodiversity protection; Protectable subject matters, protection in biotechnology, protection of other biological materials, ownership and period of protection; National Biodiversity protection initiatives; Convention on Biological Diversity; International Treaty on Plant Genetic Resources for Food and Agriculture; Licensing of technologies, Material transfer agreements, Research collaboration Agreement, License Agreement.

**Suggested Books**


| PGS 504 | Basic Concepts in Laboratory Techniques 1(0+1) |
Practical
Safety measures while in Lab; Handling of chemical substances; Use of burettes, pipettes, measuring cylinders, flasks, separatory funnel, condensers, micropipettes and vaccupets; washing, drying and sterilization of glassware; Drying of solvents/chemicals. Weighing and preparation of solutions of different strengths and their dilution; Handling techniques of solutions; Preparation of different agro-chemical doses in field and pot applications; preparation of solutions of acids; Neutralisation of acid and bases; Preparation of buffers of different strengths and pH values. Use and handling of microscope, laminar flow, vacuum pumps, viscometer, thermometer, magnetic stirrer, micro-ovens, incubators, sandbath, waterbath, oilbath; Electric wiring and earthing. Preparation of media and methods of sterilization; Seed viability testing, testing of pollen viability; Tissue culture of crop plants; Description of flowering plants in botanical terms in relation to taxonomy

Suggested Books

PGS 505 Agricultural Research, Research Ethics And Rural Development Programmes 1(1+0)
(e-Course)

Theory
UNIT I
History of agriculture in brief; Global agricultural research system: need, scope, opportunities; Role in promoting food security, reducing poverty and protecting the environment; National Agricultural Research Systems (NARS) and Regional Agricultural Research Institutions; Consultative Group on International Agricultural Research (CGIAR): International Agricultural Research Centres (IARC), partnership with NARS, role as a partner in the global agricultural research system, strengthening capacities at national and regional levels; International fellowships for scientific mobility.

UNIT II
Research ethics: research integrity, research safety in laboratories, welfare of animals used in research, computer ethics, standards and problems in research ethics.

UNIT III
Concept and connotations of rural development, rural development policies and strategies. Rural development programmes: Community Development Programme, Intensive agricultural District Programme, Special group –Area Specific Programme, Integrated Rural Development Programme (IRDP) Panchayati Raj Institutions, Co-operatives, Voluntary Agencies/Non-Governmental Organisations. Critical evaluation of rural development policies and programmes. Constraints in implementation of rural policies and programmes.

Suggested Books
Punia MS. Manual on International Research and Research Ethics. CCS, Haryana Agricultural University, Hisar.

PGS 506 (e-Course)  
**Disaster Management**  
1(1+0)

**Theory**

**UNIT I**
Natural Disasters- Meaning and nature of natural disasters, their types and effects. Floods, Drought, Cyclone, Earthquakes, Landslides, Avalanches, Volcanic eruptions, Heat and cold Waves, Climatic Change: Global warming, Sea Level rise, Ozone Depletion

**UNIT II**
Man Made Disasters- Nuclear disasters, chemical disasters, biological disasters, building fire, coal fire, forest fire. Oil fire, air pollution, water pollution, deforestation, Industrial wastewater pollution, road accidents, rail accidents, air accidents, sea accidents.

**UNIT III**
Disaster Management- Efforts to mitigate natural disasters at national and global levels. International Strategy for Disaster reduction. Concept of disaster management, national disaster management framework; financial arrangements; role of NGOs, Community-based organizations, and media. Central, State, District and local Administration; Armed forces in Disaster response; Disaster response: Police and other organizations.

**Suggested Books**
Sharma VK. 2001. Disaster Management. National Centre for Disaster Management, India

RES 623  
**Energy Management and Planning**  
3(2+1)

**Theory**
Human, animal, mechanical energy sources, fuel: solid, liquid, gaseous, crop production energy, plantation, rained, irrigated, tractor owned, bullock frames, crop rotation and energy needs, agro industries/ processing and energy needs, animal raising, domestic purpose, emerge requirements, energy use patterns, different categories of farmers, resource use pattern, input/output ratio, energy inflow in village ecosystem, self sufficiency in energy, system planning for energy conservation, Questionnaire and contact procedures for survey, field survey, Yardstick for energy resource analysis and conservation efficiency, reliability and availability , Economics, study on energy needs for household, energy budgeting for crop reduction, energy in – flow, out flow in a atypical village, Energy audit in agro- processing industries like rice mill, oil mill, poultry, dairy etc. Integrated energy system, scope, planning and design of energy, modeling, project preparation strategies, socioeconomic and environmental aspect of energy management. Rural and urban energy planning waste heat recovery. Co-generation with alternate energy system.

**Practical**
Preparation of energy census schedule visit to sample farm and date collocation on energetic. Estimation of energy equivalents for inflow outflow analysis. Intergraded energy planning exercise for farm. visit to oil mill for energy use pattern date collection visit to sugar mill, village Gur Industry for energy pattern date collection in Agro industries. Energy analysis for household sector. Energy planning for village Eco- System. Estimation and energy planning for mixed and integrated farming system, Case study of energy conservation in a typical agro industry.

**Suggested Books**


**RES 624**  **Agro-Energy Audit And Management**  **2(2+0)**

**Theory**

UNIT I
Energy resources on the farm: conventional and non-conventional forms of energy and their use. Heat equivalents and energy coefficients for different agricultural inputs and products. Pattern of energy consumption and their constraints in production of agriculture. Direct and indirect energy.

UNIT II
Energy audit of production agriculture, and rural living and scope of conservation.

UNIT III
Identification of energy efficient machinery systems, energy losses and their management. Energy analysis techniques and methods: energy balance, output and input ratio, resource utilization, conservation of energy sources.

UNIT IV

**Suggested Books**

C) Supporting Subjects

<table>
<thead>
<tr>
<th>AE 502</th>
<th>Similitude in Engineering</th>
<th>3(2+1)</th>
</tr>
</thead>
</table>

**Theory**
UNIT I
Dimensions and units.
UNIT II
Dimensional and similarity analysis. Theory of models.
UNIT III
True, distorted and dissimilar models.
UNIT IV
Application to different systems with special reference to Structural and fluid flow systems, Analogues.

**Practical**
Equations for the period of simple pendulum. Uniform rectangular cantilever beam.
Spring mass level system. Investigation of extrapolation.
Deflection of a cantilever beam. Prediction of the deflection of a beam using a model. Analogue model experiments

**Suggested Books**

<table>
<thead>
<tr>
<th>MATH 601</th>
<th>Mathematical Modelling and Software Applications</th>
<th>3(1+2)</th>
</tr>
</thead>
</table>

**Theory**
UNIT I
Introduction, stages in mathematical modeling, importance of mathematical modeling.
UNIT II
Classification of mathematical models: Continuous and discrete models, linear models and its applications, quadratic models and its applications, exponential models and its applications, empirical models and its applications.
UNIT III
Introduction to MAT LAB, Desktop tools
UNIT IV
MAT LAB basics: variables and arrays, Initialization variables, Matrix manipulation, linear algebra, roots of polynomials, data analysis and statistics. Solution of the mathematical problems using MAT LAB & MAT LAB tools. Graph plotting: 2-D, 3-D, Contour.
UNIT V
Simulation of mathematical models using MAT LAB programming.

Practical
Hands on for UNIT III, IV and V.

Suggested Books
  Dym, Clive L. Principles of Mathematical modeling.
  Chapman, Stephen J. MAT LAB programming for Engineers.

PFE 605 Agricultural Waste and By-Products 3(2+1)
Utilization

Theory
UNIT I
Generation of by-products, agricultural and agro industrial byproducts/wastes, properties, on site handling, storage and processing.

UNIT II
Collection of wastes, utilization pattern as fuel, agricultural waste fired furnaces: Mechanism, construction and efficiency, suitability of wastes as fuel, fuel briquettes, briquetting process, equipment, factors affecting briquetting.

UNIT III
Utilization of wastes for paper production, production of particle board, utilization, by-products from rice mill, rice husk, rice bran, utilisation.

UNIT IV
Thermo-chemical conversions, densification, combustion and gasification, extraction, biological conversions, anaerobic digestion, biochemical digestion process, digestion systems, energy from anaerobic digestion, cellulose degradation, fermentation process.

Practical
Exercises on stepped grate and fixed grate rice husk furnaces, waste fired furnace, briquette machine,
Production of alcohol from waste materials, production and testing of paperboards and particleboards from agricultural wastes.

Suggested Books
  USDA 1992. Agricultural Waste Management Field Handbook. USDA.
**MATH 602  Optimization Techniques  2(1+1)**

**Theory**
UNIT I
UNIT II
Multi-variable optimization algorithms: Unidirectional search, Direct search methods, Gradient based methods.
UNIT III
Constrained optimization algorithms: Kuhn-Tucker conditions, Transformation methods,
UNIT IV
Sensitivity analysis, Direct search for constrained minimization, Linearized search techniques, Feasible direction method, Generalized reduced gradient method, Gradient projection method
UNIT V
Specialized algorithms: Integer programming, Geometric programming.
UNIT VI
Nontraditional optimization algorithms: Genetic algorithms, simulated annealing, Global optimization.

**Suggested Books**
Deb K., Optimization for engineering design, Algorithms and examples, Prentice Hall of India, New Delhi 1996

**STAT 531  Data Analysis using Statistical Packages  3(2+1)**

**Theory**
UNIT I
Use of Software packages for: Summarization and tabulation of data; Descriptive statistics; Graphical representation of data, Exploratory data analysis.
UNIT II
Fitting and testing the goodness of fit of discrete and continuous probability distributions; Testing of hypothesis based on large sample test statistics; Testing of hypothesis using chi-square, t and F statistics.
UNIT III
Concept of analysis of variance and covariance of data for single factor, multi-factor, one-way and multi-classified experiments, contrast analysis,multiple comparisons.
UNIT IV
Analysis of mixed models; Estimation of variance components; Testing the significance of contrasts; Correlation and regression including multiple regression.
UNIT V
Discriminant function; Factor analysis; Principal component analysis; Analysis of time series data, Fitting of non-linear models; Time series data; Spatial analysis; Neural networks.

**Practical**
Use of software packages for summarization and tabulation of data, obtaining descriptive statistics, graphical representation of data., Fitting and testing the goodness of fit of probability
distributions; Testing the hypothesis for one sample $t$-test, two sample $t$-test, paired $t$-test, test for large samples - Chi-squares test, $F$ test, One way analysis of variance , contrast and its testing, fixed effect models, random effect models, estimation of variance components; Generalized linear models - analysis of unbalanced data set s, testing and significance of contrasts, Estimation of variance components in unbalanced data sets - maximum likelihood, ANOVA, REML, and partial correlation, dissimilarity measures, similarity measures; Linear regression, Multiple regression, Regression plots, Variable selection, Fitting of growth models - curve estimation models, Factor analysis. Principal component analysis - obtaining principal component, spectral composition; Analysis of time series data - fitting of ARIMA models, working out moving averages. Spatial analysis; Neural networks.

**Suggested Books**


**AE 605  Project Planning and Implementation  3(2+1)**

**Theory**

**UNIT I**
An introduction to project management: An overview of project management. The differences between Product, Project and Program management, Industrial, R&D and social security projects.

**UNIT II**
Successful Initialization and Project Planning: Defining the project scope. Establishing the project scope and defining project deliverables. Defining and Sequencing of Project Deliverables. Project scheduling techniques, Market research and forecasting. GMP and HACCP.

**UNIT III**
Resource Planning: Determining resource requirements and acquiring those resources, Source of finance, Debt-equity ratio, Debt service coverage ratio, ROI, RONW. Process of soliciting and selecting vendors for material and services for the project. Cost Management. Establishing the project budget and analyzing budget variances, techno-economic feasibility analysis.

**UNIT IV**
Execution of the Project Plan and Evaluating Project Progress: Execution of the project plan and activities required to create the project team, monitor progress against the plan, and keep the project on track. Capacity utilization, Break even point.

UNIT V
Risk Identification and Analysis: Identify risky events, measure the element of risk, and develop responses to high-risk events. Establishing the Project Management Team Identifying project team members, and structuring a successful project team. Keeping the Project on Track The quality process, Project’s quality standards and how performance to those standards will be measured. Managing Project Change Handling formal and informal change, how to identify and evaluate change, and incorporate change into the project plan.

Practical
Preparation of a model detailed project report for a small scale food processing unit and its power point presentation, Case studies of various food products, projections planning for sales target achievements, Risk analysis for financial and technical feasibilities of the projects, Project appraisal methods as applied to selected projects.

Suggested Books

F) Non-Credit Compulsory Courses

PGS 501  Library And Information Services  1(0+1)

Practical
Introduction to library and its services; Role of libraries in education, research and technology transfer; Classification systems and organization of library; Sources of information- Primary Sources, Secondary Sources and Tertiary Sources; Intricacies of abstracting and indexing services (Science Citation Index, Biological Abstracts, Chemical Abstracts, CABI Abstracts, etc.); Tracing information from reference sources; Literature survey; Citation techniques/Preparation of bibliography; Use of CD-ROM Databases, Online Public Access Catalogue and other computerized library services; Use of Internet including search engines and its resources; e-resources access methods.

PGS 502  Technical Writing and Communications Skills  1(0+1)

Practical
Technical Writing - Various forms of scientific writings- theses, technical papers, reviews, manuals, etc; Various parts of thesis and research communications (title page, authorship contents page, preface, introduction, review of literature, material and methods, experimental results and discussion); Writing of abstracts, summaries, précis, citations etc.; commonly used abbreviations in the theses and research communications; illustrations, photographs and drawings with suitable captions; pagination, numbering of tables and illustrations; Writing of numbers and dates in scientific write-ups; Editing and proof-reading; Writing of a review article.
Communication Skills - Grammar (Tenses, parts of speech, clauses, punctuation marks); Error analysis (Common errors); Concord; Collocation; Phonetic symbols and transcription; Accentual pattern: Weak forms in connected speech: Participation in group discussion: Facing an interview; presentation of scientific papers.

Suggested Books

PGS 503 (e-Course) Intellectual Property and Its Management in Agriculture 1(1+0)

Theory
Historical perspectives and need for the introduction of Intellectual Property Right regime; TRIPs and various provisions in TRIPS Agreement; Intellectual Property and Intellectual Property Rights (IPR), benefits of securing IPRs; Indian Legislations for the protection of various types of Intellectual Properties; Fundamentals of patents, copyrights, geographical indications, designs and layout, trade secrets and traditional knowledge, trademarks, protection of plant varieties and farmers’ rights and biodiversity protection; Protectable subject matters, protection in biotechnology, protection of other biological materials, ownership and period of protection; National Biodiversity protection initiatives; Convention on Biological Diversity; International Treaty on Plant Genetic Resources for Food and Agriculture; Licensing of technologies, Material transfer agreements, Research collaboration Agreement, License Agreement.

Suggested Books
Practical
Safety measures while in Lab; Handling of chemical substances; Use of burettes, pipettes, measuring cylinders, flasks, separatory funnel, condensers, micropipettes and vaccupets; washing, drying and sterilization of glassware; Drying of solvents/chemicals. Weighing and preparation of solutions of different strengths and their dilution; Handling techniques of solutions; Preparation of different agro-chemical doses in field and pot applications; reparation of solutions of acids; Neutralisation of acid and bases; Preparation of buffers of different strengths and pH values. Use and handling of microscope, laminar flow, vacuum pumps, viscometer, thermometer, magnetic stirrer, micro-ovens, incubators, sandbath, waterbath, oilbath; Electric wiring and earthing. Preparation of media and methods of sterilization; Seed viability testing, testing of pollen viability; Tissue culture of crop plants; Description of flowering plants in botanical terms in relation to taxonomy

Suggested Books

Theory
UNIT I
History of agriculture in brief; Global agricultural research system: need, scope, opportunities; Role in promoting food security, reducing poverty and protecting the environment; National Agricultural Research Systems (NARS) and Regional Agricultural Research Institutions; Consultative Group on International Agricultural Research (CGIAR): International Agricultural Research Centres (IARC), partnership with NARS, role as a partner in the global agricultural research system, strengthening capacities at national and regional levels; International fellowships for scientific mobility.

UNIT II
Research ethics: research integrity, research safety in laboratories, welfare of animals used in research, computer ethics, standards and problems in research ethics.

UNIT III
Concept and connotations of rural development, rural development policies and strategies. Rural development programmes: Community Development Programme, Intensive agricultural District Programme, Special group –Area Specific Programme, Integrated Rural Development Programme (IRDP) Panchayati Raj Institutions, Co-operatives, Voluntary Agencies/Non-Governmental Organisations. Critical evaluation of rural development policies and programmes. Constraints in implementation of rural policies and programmes.
Suggested Books

Punia MS. Manual on International Research and Research Ethics. CCS, Haryana Agricultural University, Hisar.

PGS 506
Disaster Management 1(1+0)

Unit I
Natural Disasters- Meaning and nature of natural disasters, their types and effects. Floods, Drought, Cyclone, Earthquakes, Landslides, Avalanches, Volcanic eruptions, Heat and cold Waves, Climatic Change: Global warming, Sea Level rise, Ozone Depletion

Unit II
Man Made Disasters- Nuclear disasters, chemical disasters, biological disasters, building fire, coal fire, forest fire. Oil fire, air pollution, water pollution, deforestation, Industrial wastewater pollution, road accidents, rail accidents, air accidents, sea accidents.

Unit III
Disaster Management- Efforts to mitigate natural disasters at national and global levels. International Strategy for Disaster reduction. Concept of disaster management, national disaster management framework; financial arrangements; role of NGOs, Community-based organizations, and media. Central, State, District and local Administration; Armed forces in Disaster response; Disaster response: Police and other organizations.

Suggested Books

Sharma VK. 2001. Disaster Management. National Centre for Disaster Management, India

FARM MACHINERY AND POWER ENGINEERING

List of Journals

• Journal of Agricultural Engineering, ISAE, New Delhi
• Journal of Arid Land Research Management
• Journal of Agricultural Engineering Research
• Transactions of American Society of Agricultural Engineers (TASAE)
• Journal of Computer and Electronics in Agriculture
• Journal of Terramechanics
• Indian Journal of Agriculture Sciences
• Agricultural Engineering Today
• Journal of Agricultural Mechanization in Asia, Africa and Latin America (AMA)
• Agricultural Engineering Journal( AIT Bangkok)
• Seed research Journal, New Delhi