

• M. Tech. Farm Machinery & Power Engineering

Basic Supporting Courses

S. No.	Course Code	Course Title	L-T-P	Credits
1.	COMP 805	Computer Programming	2-0-1	3
2.	MAS 711	Statistics -I	2-0-1	3
3.	MAS 701	Advanced Engineering Mathematics	3-1-0	4
4.	AET 701	Optimization Techniques & Quality Management	3-0-0	3

Core Courses

S. No.	Course Code	Course Title	L-T-P	Credits
1.	FMP 700	Research Institution / Industrial Visit	0-0-1	1
2.	FMP 701	Farm Machinery Design	2-0-1	3
3.	FMP 702	Soil Dynamics in Tillage and Traction	2-0-1	3
4.	FMP 704	Ergonomics in Agro-systems	2-0-1	3
5.	FMP 705	Farm Machinery and Power Testing	2-0-1	3
6.	FMP 707	Farm Machinery & Power Management	2-0-1	3
7.	FMP 780	Seminar -I	0-0-1	1
8.	FMP 800	Field /Industrial Training	0-0-1	1
9.	FMP 880	Seminar -II	0-0-1	1
10.	FMP 899	Dissertation	0-0-15	15

Specialized Courses

S. No.	Course Code	Course Title	L-T-P	Credits
1.	FMP 703	Tractor Design Principles	2-0-1	3
2.	FMP 706	Alternative Energy Sources	2-0-1	3
3.	FMP 708	Land Grading & Heavy Earth Moving Machinery	2-0-1	3
4.	FMP 801	Experimental Stress Analysis	2-0-1	3
5.	FMP 802	Advanced Internal Combustion Engine	2-0-1	3
6.	FMP 803	Advanced Mechanic of Solids	2-0-1	3
7.	FMP 804	Advanced Farm Machinery and Power Engineering	2-0-1	3

Basic Supporting Courses

COMP 805 Computer Programming

3 (2-0-1)

Algorithms & Flow Charts, C programming :Preliminaries, Constants & Variables, Arithmetic Expressions, Input- Output statements, Control Statements, Do-Statements, Subscripted variables, Elementary Format Specifications, Logical Statements & Decision Tables, Function & Subroutines Computer Oriented Numerical Methods: Solution of Non Linear Equation, Bisection Method, Newton Method, Numerical Integration, Trapezoidal Method, Simpson's 1/3 & 3/8 rule , Curve Fitting, Construction of forward, backward difference table, Interpolation Application of statistical packages

MAS 711 Statistics – I

3 (2-0-1)

Standard – deviation, coefficient of variation, standards error of mean

Theory of probability : equally likely, mutually exclusive events, definitions of probability, additions & multiplication theorems of probability and problems based on them. Normal & Binomial distributions. Simple correlation & regression, multiple – regression, multiple & partial – correction.

Testing of hypothesis : Concept of Hypothesis, Degree of freedom, levels of significance. Type I & Type II errors X^2 , t, Z & F – Tests. (definition, applications & Problems based on these tests).

MAS 701 Advanced Engineering Mathematics

4 (3-1-0)

Gamma, Beta and Legendre's functions, Euler's equations, Lang-range equations, the Ritz method, the Greens functions. Bolazane Weirestrass theorem in finite products. Laplace transforms, Inverse Laplace Transforms and application to differential equations, Fourier series, Fourier transforms, Solution of non linear algebraic and transcendental equation by regula Falsi method. Newton Raphson method.

Newton forward and backward interpolation formula, divided differences. Trapezoidal Rule, Simpsons 1/3 rule, numerical solution of ordinary differential equations by Runge Kutta Method, Picards equations.

AET 701 Optimization Techniques & Quality Management 3(3-0-0)

Basic concepts of optimization, Formulation of objective functions, Fitting models to data. Optimization of unconstrained functions; One-dimensional search, Unconstrained multi-variable optimization, Linear Programming with applications. Application of optimization in energy conservation, Fluid flow systems and separation processes. Management of quality, Meeting customers requirements, Planning and Control of Quality Policy and Strategy, Total Quality Concept, The Deming Approach, Costs of Quality, Make it right for the first time, Quality Teams, Baldrige Award, Just in time Production. Value Management, Creativity, System approach, Functional Analysis.

Core Courses

FMP 700 Research Institution / Industrial Visit 1(0-0-1)

FMP 701 Farm Machinery Design 3(2-0-1)
Research and development procedure; Basic design principals of farm machines, implements and tools. Design of various components for performance, strength, and wear. Selection of materials of construction. Design of power transmission of elements, bearings, controls and safety devices. Application of design in primary tillage implements, secondary tillage implements, seed drill, planter, harvesting and threshing machine and its components. Reliability criteria in design.

FMP 702 Soil Dynamics in Tillage and Traction 3 (2-0-1)
Properties of soil related to tillage and traction. Measurement of dynamic properties of soil in compression, tension, shear , impact, friction and adhesion. Mechanics of rigid, rotary and oscillating tillage tools. Mechanics and design of traction and transport device. Evaluating and predicting traction performance. Soil vehicle models.

FMP 704 Ergonomics in Agro-systems 3(2-0-1)
Human factors in system development. Energy liberation and mechanical efficiency of human body. Anthropometry and its applications. Biomechanics of motion-controls and related devices and their design considerations. Man- machine system concept, human behaviour models, thermal and non-thermal factors and their influence on human performance. Case studies on ergonomics.

FMP 705 Farm Machinery and Power Testing 3(2-0-1)
Testing types; procedures and codes; Performance testing of I. C. Engines. Application of different types of strain gauge transducers and dynamometers. Testing of different farm equipment; Tractor testing, performance evaluation and interpretation. Case studies.

FMP 707 Farm Machinery and Power Management 3(2-0-1)
Recent development in farm machinery inside and outside India. Economic performance of machine-power-labour combination. Costs, operational management, power, drafts, efficiency analysis. Equipment selection. Methods of estimating, repair cost pattern system in farm machinery selection, maintenance, scheduling of operations, maintenance, equipment placement and inventory control of spare parts.

FMP 780	Seminar – I	1(0-0-1)
FMP 800	Field / Industrial Training	1(0-0-1)
FMP 880	Seminar – II	1(0-0-1)
FMP 899	Dissertation	15(0-0-15)

Specialized courses

FMP 703 Tractor Design Principles 3(2-0-1)
Trends in tractor design. Engine performance. Selection of engines for various types of tractors. Principles of similitude in engine design. Design of principle engine parts. Design of main, big and small end bearings. Design of cooling and lubrication systems. Design of tractor clutches, brakes, Transmission, chassis, steering, and hydraulics system. Design of seat and controls from ergonomic consideration. Introduction to computer aided design.

FMP 706 Alternative Energy Sources 3 (2-0-1)
Solar system, Design of solar energy operated systems for heating, cooling, distillation, drying, dehydration, water pump and power generation for applications in agriculture. Photo-Voltaic devices. Utilization of wind energy for generating electricity and mechanical power. Types wind mill and their characteristics. Mechanics of wind mills. Biochemical and thermochemical conversion of biomass. Design of biogas plants and gasifiers. Geothermal energy and energy storage.

FMP 708 Land Grading and Heavy Earth Moving Machinery 3(2-0-1)
Principles and mechanisms of crawler tractors. Dump trucks and their mechanisms. Load hoisting equipments. Earth moving operating members. Earth diggers and ditchers. Bulldozers and scrapers, elevating and self powered graders. Automization of earth moving and grading machines. Performance of above mentioned machines.

FMP 801 Experimental stress Analysis 3(2-0-1)
Strain and stress - strain relationship. strain Gauges-Mechanical, optical, electrical, accoustical and pneumatic etc. and their use. Different types of electrical strain gauges. Semi-conductor gauges. Rosette analysis. strain gauge circuits. strain measurements at high temperatures. Two dimensional and three dimensional photo-elastic method of strain analysis. Bifringent coatings and scattered light in photo-elasticity. Brittle coating methods Moire's method of strain analysis. Grid method of strain analysis. Photoelastic strain gauges.

FMP 802 **Advanced Internal Combustion Engines** **3(2-0-1)**
Design of spark ignition engine, valve design and valve materials. Combustion chamber design. Engine balancing and fly wheel. Fuel and air system of tractor engines. Electrical system and equipment in tractor engines. Spark arrestors and air cleaners. Types of different types of governors for tractor engines. Cooling system and heat transfer, fan performance.

FMP 803 **Advanced Mechanic of Solids** **3(3-0-0)**
Analysis of State of Stress and strain at a point, Different equation of equilibrium of a deformable body and strain displacement relations in Cartesian and cylindrical coordinator, Generalized Hookes Law, solution of Boundary value problems of infinite domain, thick cylinders, stresses concentrations around holes, specialization to problems of semi infinite domains, computation of contact stresses for two bodies in line contact. Torsion of non circular cross sections. Membrane analogy, hallow thin well multiply connected torsion members, beam on elastic foundations, short beams, theories of ductile and brittle materials, Yield criteria

FMP 804 **Advanced Farm Machinery and Power Engg.** **3(2-0-1)**
Recent research trends in the field of farm machinery and power, e.g. similitude in soil- machine system, distribution pattern of seed and fertilizer, dynamic shear stress of forage and cereal crops, harvesting of fruits and vegetables. Safety consideration in design of tractors and farm machines.