B. Tech Agricultural Engineering First Year/First Semester (I/I)

Mathematics in Agricultural Engineering -I

Course Code: MT133

Course objectives:

- To provide the knowledge about Matrices: Elementary transformations, rank of a matrix, reduction to normal form, Gauss- Jordon method to find inverse of a matrix, Eigen values and Eigen vectors, Cayley-Hamilton theorem, linear transformation, orthogonal transformations, diagonalisation of matrices, quadratic forms.
- To provide the knowledge about PAQ form, Echelon form, Solution of linear equations, nature of rank, using Cayley-Hamilton theorem to find inverse of A. Differential calculus: Taylor's and Maclaurin's expansions; indeterminate form; curvature, function of two or more independent variables.
- To educate the students about Partial differentiation, homogeneous functions and Euler's theorem, composite functions, total derivatives, maxima and minima. Integral calculus: volumes and surfaces of revolution of curves; double and triple integrals, change of order of integration, application of double and triple integrals to find area and volume.
- To aware the students about the Vector calculus: Differentiation of vectors, scalar and vector point functions, vector differential operator Del, Gradient of a scalar point function, Divergence and Curl of a vector point function and their physical interpretations, identities involving Del, second order
- To provide Knowledge regarding differential operator; line, surface and volume integrals, Stoke's, divergence and Green's theorems (without proofs).

Course Outcomes

After completion of course, a student will be able to

COURSE OUTCOME (CO)	**DESCRIPTION**
CO1	Students able to provide the knowledge about Matrices: Elementary transformations, rank of a matrix, reduction to normal form, Gauss- Jordon method to find inverse of a matrix, Eigen values and Eigen vectors, Cayley-Hamilton theorem, linear transformation, orthogonal transformations, diagonalisation of matrices, quadratic forms
CO2	Able to know about provide the knowledge about PAQ form, Echelon form, Solution of linear equations, nature of rank, using Cayley-Hamilton theorem to find inverse of A. Differential calculus: Taylor's and Maclaurin's expansions; indeterminate form; curvature, function of two or more independent variables
CO3	Student able to understand about Partial differentiation, homogeneous functions and Euler's theorem, composite functions, total derivatives, maxima and minima. Integral calculus: volumes and surfaces of revolution of curves; double and triple integrals, change of order of integration, application of double and triple integrals to find area and volume.
CO4	Able to know about about the Vector calculus: Differentiation of vectors, scalar and vector point functions, vector differential operator Del, Gradient of a scalar point function, Divergence and Curl of a vector point function and their physical interpretations, identities involving Del, second order
CO5	Students able to understand the basic Knowledge regarding regarding differential operator; line, surface and volume integrals, Stoke's, divergence and Green's theorems (without proofs).

CO-PO MAPPING:

	CO	**PO1** Knowledge of Applied Science in Agricultural Engineering	**PO2** Knowledge of Basic Engineering	**PO3** Problem Solving	**PO4** Field Experimentations	**PO5** Knowledge of Soil and Water Conservation Engineering	**PO6** Knowledge of Irrigation and Drainage Engineering	**PO7** Knowledge of Farm Machinery, equipments and techniques	**PO8** Knowledge of Process and Food Engineering equipments and techniques	**PO9**Knowledge of Renewable Energy Engineering	**PO10** Environment and sustainability	**PO11** Ethics	**PO12** Individual and team work	**PO13** Communication and skill development	**PO14** Lifelong learning
CO1	Students able to provide the knowledge about Matrices: Elementary transformations, rank of a matrix, reduction to normal form, Gauss- Jordon method to find inverse of a matrix, Eigen values and Eigen vectors, Cayley-Hamilton theorem, linear transformation, orthogonal transformations, diagonalisation of matrices, quadratic forms	3	3	3	-	-	-	-	-	-	-	3	2	-	2
CO2	Able to know about provide the knowledge about PAQ form, Echelon form, Solution of linear equations, nature of rank, using Cayley-Hamilton theorem to find inverse of A. Differential calculus: Taylor's and Maclaurin's expansions; indeterminate form; curvature, function of two or more independent variables	3	3	3	-	-	-	-	-	-	-	2	3	-	3
CO3	Student able to understand about Partial differentiation, homogeneous functions and Euler's theorem, composite functions, total derivatives, maxima and minima. Integral calculus: volumes and surfaces of revolution of curves; double and triple integrals, change of order of integration, application of double and triple integrals to find area and volume.	3	3	2	-	-	-	-	-	-	-	2	3	-	3
CO4	Able to know about about the Vector calculus: Differentiation of vectors, scalar and vector point functions, vector differential operator Del, Gradient of a scalar point function, Divergence and Curl of a vector point function and their physical interpretations, identities involving Del, second order	3	3	3	-	-	-	-	-	-	-	2	3	-	3
CO5	Students able to understand the basic Knowledge regarding regarding differential operator; line, surface and volume integrals, Stoke's, divergence and Green's theorems (without proofs).	3	3	2	-	-	-	-	-	-	-	2	3	-	3

3: Strong contribution, 2: average contribution, 1: Low contribution

Engineering Physics

Course Code: PY110

Course objectives:

- To analyze the connection between daily life observations and science. To realize that apparently different ideas of Dia, Para and ferromagnetism. To realize the simplicity of ideas involved in explaining complex phenomenon. To grow in ideas of different aspect of magnetism and develop connection between daily life applications and science.
- To analyze the process of development of a new theory while dealing with metals. insulators and semiconductors. To correlate that the conceptualization of an idea is far ahead than its practical realization while dealing with LASER and Holography. To grow in realization of totally different manifestation of Langevin theory. To find the most recent applications of light in terms of communication and storage of data.
- To realize that how the design of complex systems is based on the simple ideas. To realize that the conceptualization of an idea is far ahead than its practical realization while dealing with Optical Fibers. To grow in developing connection between philosophy and science. To find that seemingly different ideas such as Illumination and interrelationship between them.
- To understand the process of development of a new theory and its application in day to day life. To find that seemingly different ideas such as de-Broglie hypothesis and Quantum theory and interrelationship between them. To understand and analyze the process of development of a new theory and how the development of one idea leads to the development of an apparently different idea. Torealize and appreciate the efforts made by the individuals to give a new understanding of science thatled to the modern day applications.
- To grow in developing connection between daily life utility and material science. To realize that apparently different materials with respect to Electric and Magnetic properties have inter relationship between them. To evaluate that how totally different manifestation of Modern Science leads to new technology. To do the evaluation that how an idea is far ahead than its practical realization while dealing with Nano Technology and Super Conductivity.

Course Outcome

After completion of course, a student will be able to

COURSE OUTCOME (CO)	DESCRIPTION
CO1	Students able to understand the conceptual knowledge about importance and scope of magnetic properties of materials, principles and methods of difference of magnetic properties of materials.
CO2	Able to analyze the process of development of a new theory while dealing with metals. insulators and semiconductors. To correlate that the conceptualization of an idea is far ahead than its practical realization while dealing with LASER and Holography. To grow in realization of totally different manifestation of Langevin theory. To find the most recent applications of light in terms of communication and storage of data.
CO3	Student able to understand about the design of complex systems is based on the simple ideas. To realize that the conceptualization of an idea is far ahead than its practical realization while dealing with Optical Fibers. To grow in developing connection between philosophy and science. To find that seemingly different ideas such as Illumination and interrelationship between them.
CO4	Able to know about the process of development of a new theory and its application in day to day life. To find that seemingly different ideas such as de-Broglie hypothesis and Quantum theory and interrelationship between them. To understand and analyze the process of development of a new theory and how the development of one idea leads to the development of an apparently different idea. Torealize and appreciate the efforts made by the individuals to give a new understanding of science thatled to the modern day applications.
CO5	Students able to understand the basic Knowledge regarding daily life utility of material science. To realize that apparently different materials with respect to Electric and Magnetic properties have inter relationship between them. To evaluate that how totally different manifestation of Modern Science leads to new technology. To do the evaluation that how an idea is far ahead than its practical realization while dealing with Nano Technology and Super Conductivity.

	CO	**PO1** Knowledge of Applied Science in Agricultural Engineering	**PO2** Knowledge of Basic Engineering	**PO3** Problem Solving	**PO4** Field Experimentations	**PO5** Knowledge of Soil and Water Conservation Engineering	**PO6** Knowledge of Irrigation and Drainage Engineering	**PO7** Knowledge of Farm Machinery, equipments and techniques	**PO8** Knowledge of Process and Food Engineering equipments and techniques	**PO9**Knowledge of Renewable Energy Engineering	**PO10** Environment and sustainability	**PO11** Ethics	**PO12** Individual and team work	**PO13** Communication and skill development	**PO14** Lifelong learning
CO1	Students able to understand the conceptual knowledge about importance and scope of magnetic properties of materials, principles and methods of difference of magnetic properties of materials.	2	3	3	2	2	1	2	3	3	2	2	3	2	3
CO2	Able to analyze the process of development of a new theory while dealing with metals. insulators and semiconductors. To correlate that the conceptualization of an idea is far ahead than its practical realization while dealing with LASER and Holography. To grow in realization of totally different manifestation of Langevin theory. To find the most recent applications of light in terms of communication and storage of data.	2	3	3	2	2	1	2	3	3	2	2	3	2	3
CO3	Student able to understand about the design of complex systems is based on the simple ideas. To realize that the conceptualization of an idea is far ahead than its practical realization while dealing with Optical Fibers. To grow in developing connection between philosophy and science. To find that seemingly different ideas such as Illumination and interrelationship between them.	2	3	3	2	2	1	2	3	3	2	2	3	2	3
CO4	Able to know about the process of development of a new theory and its application in day to day life. To find that seemingly different ideas such as de-Broglie hypothesis and Quantum theory and interrelationship between them. To understand and analyze the process of development of a new theory and how the development of one idea leads to the development of an apparently different idea. Torealize and appreciate the efforts made by the individuals to give a new understanding of science thatled to the modern day applications.	2	3	3	2	2	1	2	3	3	2	2	3	2	3

CO5	Students able to understand the basic Knowledge regarding daily life utility of material science. To realize that apparently different materials with respect to Electric and Magnetic properties have inter relationship between them. To evaluate that how totally different manifestation of Modern Science leads to new technology. To do the evaluation that how an idea is far ahead than its practical realization while dealing with Nano Technology and Super Conductivity.	2	3	3	2	2	1	2	3	3	2	2	3	2	3

3: Strong contribution, 2: average contribution, 1: Low contribution

Engineering Chemistry

Course Code: CH116

Course objectives:

- To provide the knowledge about the phase rules, fuels and colloids: its type and significance with their quantitative and qualitative analysis correlated with the agricultural field.
- To give knowledge about the causes, types, control and future aspects of corrosion and water quality analysis, temporary and permanent hardness, disadvantages of hard water, scale and sludge formation in boilers and boiler corrosion.
- To provide the knowledge about the principles of food chemistry, chemistry of lipids, proteins, carbohydrates, vitamins, coloring and flavoring reagents of food. Food preservation, methods and principles. Enzyme action and their role in the manufacturing of ethanol and acetic acid.
- To educate the students about the properties, mechanisms, classification, types and tests of lubricants and polymers.
- To aware the students about the fundamentals of thermo-gravimetric, polarographic, nuclear radiation, radioactive materials and IR spectroscopy with their significance and role in the characterization and analysis of organic and inorganic materials.

Course Outcome

After completion of course, a student will be able to

COURSE OUTCOME (CO)	DESCRIPTION
CO1	Students are able to know about the role, advantage, significance and prospect of the chemistry related with the phase rules, fuels and colloids. That is provided extra strength to the students, to freely work in the field of agriculture.
CO2	Students are aware about the different types of chemical behavior/reactivity of corrosion and water quality; types of corrosion, theories of corrosion, corrosion control, and determination of water quality parameters, hardness, treatment as well as control of water contamination.
CO3	Students are able to know about the chemical composition, behavior, structure and types of lipids, proteins and carbohydrate, vitamin, coloring as well as flavoring reagents of food. They are also learned about the mechanism of enzyme action and its role in the chemical manufacturing such as EtOH and CH_3COOH.
CO4	Students are aware about the fundamentals of the polymers and lubricant. Its properties, mechanisms, classification, types and tests. Role of polymers and lubricant in the domestic and agricultural practices. Also possess the knowledge of synthesis of polymers and preparation of lubricants.
CO5	Students able to know about the basics of thermo-gravimetric, polarographic, nuclear radiation, radioactive materials and IR spectroscopy. There instrumentation and fundamental principles with their roles in the characterization of chemical composition.

	CO	**PO1** Knowledge of phase rules	**PO2** Knowledge of Fuels and Colloids	**PO3** Knowledge of Corrosion	**PO4** Knowledge of Water Quality/Parameters	**PO5** Knowledge of Food chemistry and enzymes	**PO6** Knowledge of Lubricants	**PO7** Knowledge of Polymers	**PO8** Knowledge of Radioactive Materials	**PO9**Knowledge of IR spectroscopy	**PO10** Problem Solving and Experimentations	**PO11** Ethics	**PO12** Individual and team work	**PO13** Communication and skill development	**PO14** Lifelong learning
CO1	Students are able to know about the role, advantage, significance and prospect of the chemistry related with the phase rules, fuels and colloids.	1	2	3	3	3	-	1	-	1	3				3
CO2	Students are aware about the different types of chemical behavior/reactivity of corrosion and water quality; types of corrosion, theories of corrosion, corrosion control, water quality parameters, hardness, treatment and control.	1	2	3	3	3	-	1	-	1	3				3
CO3	Students are able to know about the chemical composition, behavior, structure and types of lipids, proteins, carbohydrate, vitamin, coloring and flavoring reagents. Also learned about the mechanism of enzyme action and manufacturing such as EtOH and CH_3COOH through enzymes.	1	2	3	3	3	-	1	-	1	3				3
CO4	Students are aware about the fundamentals of the polymers and lubricant. Its properties, mechanisms, classification, types and tests. Role and synthesis of polymers and lubricant.	1	2	3	3	3	-	1	-	1	3				3
CO5	Students able to know about the basics of thermo-gravimetric, polarographic, nuclear radiation, radioactive materials and IR spectroscopy with instrumentation, fundamental principles and roles in the characterization of chemical composition.	1	1	1	3	3	-	1	-	1	3				3
	3: Strong contribution, 2: average contribution, 1: Low contribution														

Principles of Soil Science

Course Code:AE112

Course objective:

- To gain basic knowledge of soil fertility and productivity
- To study Importance or Significance of soil macronutrient and micronutrients
- To Assess and develop importance of soil physical and chemical properties
- To study about soil pollution and mitigation process

Course Outcome

After completion of course, a student will be able to

COURSE OUTCOME (CO)	DESCRIPTION
CO1	To gain basic knowledge of soil fertility and productivity
CO2	To study Importance or Significance of soil macronutrient and micronutrients
CO3	To Assess and develop importance of soil physical and chemical properties
CO4	To Assess and develop importance of soil physical and chemical properties
CO5	To study about soil pollution and mitigation process

CO-PO MAPPING:

	CO	**PO1** Knowledge of Applied Science in Agricultural Engineering	**PO2** Knowledge of Basic Engineering	**PO3** Problem Solving	**PO4** Field Experimentations	**PO5** Knowledge of Soil and Water Conservation Engineering	**PO6** Knowledge of Irrigation and Drainage Engineering	**PO7** Knowledge of Farm Machinery, equipments and techniques	**PO8** Knowledge of Process and Food Engineering equipments and techniques	**PO9**Knowledge of Renewable Energy Engineering	**PO10**Environment and sustainability	**PO11** Ethics	**PO12** Individual and team work	**PO13**Communication and skill development	**PO14**Lifelong learning
CO1	To gain basic knowledge of soil fertility and productivity	3	2	3	2	-	-	-	3	-	2	3	2	3	2
CO2	To study Importance or Significance of soil macronutrient and micronutrients	3	3	3	2	-	-	-	3	-	3	2	3	2	3
CO3	To Assess and develop importance of soil physical and chemical properties	3	3	2	2	-	-	2	3	-	3	2	3	2	3
CO4	To Assess and develop importance of soil physical and chemical properties	3	3	2	1	-	-	-	3	-	3	2	3	2	3
CO5	. To study about the soil minerals	3	3	2	3	-	-	-	3	-	3	2	3	2	3
3: Strong contribution, 2: average contribution, 1: Low contribution															

COURSE: Surveying and Levelling
COURSE CODE: AE101
COURSE OBJECTIVES:

- Students will able to understand the importance of surveying and the basics of linear methods like chain surveying, Tape surveying and Modern Instruments.
  - Students will understand about compass coordinates and different methods of calculating the horizontal and vertical angles.
  - Student will be able to understand the fundamentals of plane table survey.
  - Student will know the fundamentals of leveling work and to calculate the levels of different points above or below the earth surface.
  - Students have an ability to understand the basics of contour and use modern equipment like total station, electronic theodolite and GPS.
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COURSE OUTCOMES (CO):
After the successful course completion, learners will develop following attributes:

COURSE OUTCOME (CO)	DESCRIPTION
CO1	The students have the ability to understand the measurement techniques and equipment used in land surveying. They will take the liner measurement by chain and tape.
CO2	The students have the ability to take angular measurement from compass and correct them from different errors.
CO3	The students have an ability to find out the Reduced levels of different point on the ground.
CO4	The students will Gain the ability to prepare a map of the area.
CO5	The students will be able to represent the topography of the land graphically.

CO-PO MAPPING:

	CO	**PO1** Knowledge of Applied Science in Agricultural Engineering	**PO2** Knowledge of Basic Engineering	**PO3** Problem Solving	**PO4** Field Experimentations	**PO5** Knowledge of Soil and Water Conservation Engineering	**PO6** Knowledge of Irrigation and Drainage Engineering	**PO7** Knowledge of Farm Machinery, equipments and techniques	**PO8** Knowledge of Process and Food Engineering equipments and techniques	**PO9**Knowledge of Renewable Energy Engineering	**PO10** Environment and sustainability	**PO11** Ethics	**PO12** Individual and team work	**PO13** Communication and skill development	**PO14** Lifelong learning
CO1	The students have the ability to understand the measurement techniques and equipment used in land surveying. They will take the liner measurement by chain and tape.	1	2	1	2	0	0	1	0	0	0	0	2	1	1
CO2	The students have the ability to take angular measurement from compass and correct them from different errors.	0	1	1	2	0	0	1	0	0	0	0	2	0	1
CO3	The students have an ability to find out the Reduced levels of different point on the ground.	1	1	1	2	0	0	0	0	0	0	0	2	1	1
CO4	The students will Gain the ability to prepare a map of the area	1	2	1	2	0	0	0	0	0	0	0	2	1	1
CO5	The students will be able to represent the topography of the land graphically.	1	1	0	1	0	0	0	0	0	0	0	1	1	1
	3: Strong contribution, 2: average contribution, 1: Low contribution														

ENGINEERING MECHANICS
COURSE CODE: AE111

COURSE OBJECTIVES:

- Basic concepts of engineering mechanics.

COURSE OUTCOMES (CO):
After the successful course completion, learners will develop following attributes:

COURSE OUTCOME (CO)	DESCRIPTION
CO1	To share the basics of material properties (Mechanical).
CO2	To share the relevant problems and their solution by various methods.

CO-PO MAPPING:

	CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PO13	PO14
CO1	To share the basic of material properties (Mechanical).	3	3	2	0	0	0	0	0	0	0	0	0	0	0
CO2	To share the relevant problems and their solution by various methods.	3	2	2	0	0	0	0	0	0	0	0	0	0	0
		3: Strong contribution, 2: average contribution, 1: Low contribution													

Engineering Drawing
COURSE CODE: AE-113

COURSE OBJECTIVES:

- To educate the students about drawing scales, orthographic projections and drawing of points, lines, planes and solids.
- To educate the students about sections of solids, interpenetration of solid surfaces and development of surfaces.
- To educate the students about Isometric projections and drawing of missing views.
- To teach the students about preparation of working drawing from models.
- Understanding different methods of dimentioning.
- Understanding the concept of sectioning, revolved and oblique sections.
- To educate the students about sectional drawing of simple machine parts.
- Types of rivets, welds, and their joints.
- Learning symbols for different welded joints.
- To educate the students about types of threads, bolts, nuts, screws, foundation bolts, etc.

COURSE OUTCOMES (CO):
After the successful course completion, learners will develop following attributes:

COURSE OUTCOME (CO)	DESCRIPTION
CO1	Learner will be able to understand drawing scales and draw orthographic projections and drawing of points, lines, planes and solids.
CO2	Learner will be able to draw sections of solids, interpenetration of solid surfaces and development of surfaces.
CO3	Learner will be able to draw Isometric projections and drawing of missing views.
CO4	Learner will be able to prepare working drawing from models.
CO5	Learner will be able to understand different methods of dimentioning.
CO6	Learner will be able to understand concept of sectioning, revolved and oblique sections.
CO7	Learner will be able to draw sectional drawing of simple machine parts.
CO8	Learner will be able to understand and draw types of rivets, welds, and connections.
CO9	Learner will be able to understand symbols for different welded joints.
CO10	Learner will be able to understand and draw types of threads, bolts, nuts, screws, foundation bolts, etc.

CO-PO MAPPING:

	CO	**PO1** Knowledge of Applied Science in Agricultural Engineering	**PO2** Knowledge of Basic Engineering	**PO3** Problem Solving	**PO4** Field Experimentations	**PO5** Knowledge of Soil and Water Conservation Engineering	**PO6** Knowledge of Irrigation and Drainage Engineering	**PO7** Knowledge of Farm Machinery, equipments and techniques	**PO8** Knowledge of Process and Food Engineering equipments and techniques	**PO9**Knowledge of Renewable Energy Engineering	**PO10** Environment and sustainability	**PO11** Ethics	**PO12** Individual and team work	**PO13** Communication and skill development	**PO14** Lifelong learning
CO1	Learner will be able to understand drawing scales and draw orthographic projections and drawing of points, lines, planes and solids.	2	2	2	0	0	0	1	0	0	0	1	1	0	1
CO2	Learner will be able to draw sections of solids, interpenetration of solid surfaces and development of surfaces.	2	2	2	0	0	0	1	0	0	0	1	1	0	1
CO3	Learner will be able to draw Isometric projections and drawing of missing views.	2	2	2	0	0	0	1	0	0	0	1	1	0	1
CO4	Learner will be able to prepare working drawing from models.	2	2	2	0	0	0	1	0	0	0	1	1	0	1
CO5	Learner will be able to understand different methods of dimentioning.	2	2	1	0	0	0	1	0	0	0	1	1	0	1
CO6	Learner will be able to understand concept of sectioning, revolved and oblique sections.	2	2	1	0	0	0	1	0	0	0	1	1	0	1
CO7	Learner will be able to draw sectional drawing of simple machine parts.	3	3	3	0	0	0	1	0	0	0	1	1	0	1
CO8	Learner will be able to understand and draw types of rivets, welds, and connections.	3	3	3	0	0	0	1	0	0	0	1	1	0	1
CO9	Learner will be able to understand symbols for different welded joints.	2	2	1	0	0	0	1	0	0	0	1	1	0	1

C10	Learner will be able to understand and draw types of threads, bolts, nuts, screws, foundation bolts, etc.	2	2	1	0	0	0	1	0	0	0	1	1	0	1
	3: Strong contribution, 2: average contribution, 1: Low contribution														

HEAT AND MASS TRANSFER

COURSE CODE: ME111
COURSE OBJECTIVES:

- Formulate and predict heat conduction problems without heat generation in composite walls and extended surfaces subjected to convective boundaries. Analyze 1D unsteady conduction problems.
- Explain the concept of free convection mechanics, dimensionless number and introduction to the empirical correlation.
- Develop concept of monochromatic and total radiations, intensity of radiation, radiative heat exchange between two black bodies.
- Calculate fluid temperatures, mass flow rates, pressure drops and heat exchange during parallel, counter and cross flow in heat exchangers.

COURSE OUTCOMES (CO):
After completion of the course, a student will be able to

COURSE OUTCOME (CO)	DESCRIPTION
CO1	Formulate and predict heat conduction problems with and without heat generation in composite walls, critical insulation thickness and extended surfaces subjected to convective boundaries. Analyze 1D steady conduction problems.
CO2	Explain the concept of free convection mechanics, dimensionless number and introduction to the empirical correlation.
CO3	Explain the concept of radiation, monochromatic emissive power, total radiations, intensity of radiation and heat exchange between two black surfaces
CO4	Calculate fluid temperatures, mass flow rates and heat exchange during parallel and counter in heat exchangers.

CO-PO MAPPING:

	CO	**PO1** Knowledge of Applied Science in Agricultural Engineering	**PO2** Knowledge of Basic Engineering	**PO3** Problem Solving	**PO4** Field Experimentations	**PO5** Knowledge of Soil and Water Conservation Engineering	**PO6** Knowledge of Irrigation and Drainage Engineering	**PO7** Knowledge of Farm Machinery, equipments and techniques	**PO8** Knowledge of Process and Food Engineering equipments and techniques	**PO9**Knowledge of Renewable Energy Engineering	**PO10**Environment and sustainability	**PO11** Ethics	**PO12** Individual and team work	**PO13**Communication and skill development	**PO14**Lifelong learning
CO1	Formulate and predict heat conduction problems with and without heat generation in composite walls, critical insulation thickness and extended surfaces subjected to convective boundaries. Analyze 1D steady conduction problems.	2	3	3	1	-	-	-			2				3
CO2	Explain the concept of free convection mechanics, dimensionless number and introduction to the empirical correlation.	3	3	2	1	-	-				3				3
CO3	Explain the concept of radiation, monochromatic emissive power, total radiations, intensity of radiation and heat exchange between two black surfaces	3	3	2	1	-	-				3				3
CO4	Calculate fluid temperatures, mass flow rates and heat exchange during parallel and counter in heat exchangers	3	3	3	1	-	-		2		3				3
	3: Strong contribution, 2: average contribution, 1: Low contribution														

B. Tech Agricultural Engineering (SEMESTER II)

Mathematics in Agricultural Engineering-II

Course Code: MT134

Course objectives:

- To provide the knowledge about Ordinary differential equations: Exact and Bernoulli's differential equations, equations reducible to exact form by integrating factors, equations of first order and higher degree, Clairaut's equation
- To provide the knowledge about Differential equations of higher orders, methods of finding complementary functions and particular integrals, method of variation of parameters, Cauchy's and Legendre's linear equations, simultaneous linear differential equations with constant coefficients, series solution techniques, Bessel's and Legendre's differential equations.
- To educate the students about Functions of a Complex variable: Limit, continuity and analytic function, Cauchy-Riemann equations, Harmonic functions. Infinite series and its convergence, periodic functions, Fourier series, Euler's formulae, Dirichlet's conditions, functions having arbitrary period, even and odd functions, half range series, Harmonic analysis
- To aware the students about the Fourier Sine and Cosine Series, Fourier series for function having period 2L, Elimination of one and two arbitrary function.
- To provide Knowledge regarding Partial differential equations: Formation of partial differential equations Higher order linear partial differential equations with constant coefficients, solution of non-linear partial differential equations, Charpit's method, and application of partial differential equations (one dimensional wave and heat flow equations, Laplace Equation.

Course Outcomes

After completion of course, a student will be able to

COURSE OUTCOME (CO)	DESCRIPTION
CO1	Students able to provide the knowledge about Ordinary differential equations: Exact and Bernoulli's differential equations, equations reducible to exact form by integrating factors, equations of first order and higher degree, Clairaut's equation
CO2	Able to know about provide the knowledge about about Differential equations of higher orders, methods of finding complementary functions and particular integrals, method of variation of parameters, Cauchy's and Legendre's linear equations, simultaneous linear differential equations with constant coefficients, series solution techniques, Bessel's and Legendre's differential equations.
CO3	Students able to provide the knowledge about Functions of a Complex variable: Limit, continuity and analytic function, Cauchy-Riemann equations, Harmonic functions. Infinite series and its convergence, periodic functions, Fourier series, Euler's formulae, Dirichlet's conditions, functions having arbitrary period, even and odd functions, half range series, Harmonic analysis
CO4	Able to know about about the the Fourier Sine and Cosine Series, Fourier series for function having period 2L, Elimination of one and two arbitrary function.
CO5	Students able to understand the basic Knowledge regarding Partial differential equations: Formation of partial differential equations Higher order linear partial differential equations with constant coefficients, solution of non-linear partial differential equations, Charpit's method, and application of partial differential equations (one dimensional wave and heat flow equations, Laplace Equation

CO-PO MAPPING:

	CO	**PO1** Knowledge of Applied Science in Agricultural Engineering	**PO2** Knowledge of Basic Engineering	**PO3** Problem Solving	**PO4** Field Experimentations	**PO5** Knowledge of Soil and Water Conservation Engineering	**PO6** Knowledge of Irrigation and Drainage Engineering	**PO7** Knowledge of Farm Machinery, equipments and techniques	**PO8** Knowledge of Process and Food Engineering equipments and techniques	**PO9**Knowledge of Renewable Energy Engineering	**PO10** Environment and sustainability	**PO11** Ethics	**PO12** Individual and team work	**PO13** Communication and skill development	**PO14** Lifelong learning
CO1	Students able to provide the knowledge about Ordinary differential equations: Exact and Bernoulli's differential equations, equations reducible to exact form by integrating factors, equations of first order and higher degree, Clairaut's equation	3	3	3	-	-	-	-	-	-	-	3	2	-	2
CO2	Able to know about provide the knowledge about about Differential equations of higher orders, methods of finding complementary functions and particular integrals, method of variation of parameters, Cauchy's and Legendre's linear equations, simultaneous linear differential equations with constant coefficients, series solution techniques, Bessel's and Legendre's differential equations.	3	3	3	-	-	-	-	-	-	-	2	3	-	3
CO3	Students able to provide the knowledge about Functions of a Complex variable: Limit, continuity and analytic function, Cauchy-Riemann equations, Harmonic functions. Infinite series and its convergence, periodic functions, Fourier series, Euler's formulae, Dirichlet's conditions, functions having arbitrary period, even and odd functions, half range series, Harmonic analysis	3	3	2	-	-	-	-	-	-	-	2	3	-	3
CO4	Able to know about about the the Fourier Sine and Cosine Series, Fourier series for function having period 2L, Elimination of one and two arbitrary function.	3	3	3	-	-	-	-	-	-	-	2	3	-	3

CO5	Students able to understand the basic Knowledge regarding Partial differential equations: Formation of partial differential equations Higher order linear partial differential equations with constant coefficients, solution of non-linear partial differential equations, Charpit's method, and application of partial differential equations (one dimensional wave and heat flow equations, Laplace Equation	3	3	2	-	-	-	-	-	-	-	2	3	-	3
3: Strong contribution, 2: average contribution, 1: Low contribution																

Environmental Science and Disaster Management

Course Code: ES124

Course objectives:

- To provide the knowledge about Environmental Studies: Scope and importance. Natural Resources: Renewable and nonrenewable resources Natural resources and associated problems. a) Forest resources: Use and over-exploitation, deforestation, case studies. Timber extraction, mining, dams and their effects on forest and tribal people. b) Water resources: Use and over-utilization of surface and ground water, floods, drought, conflicts over water, dams-benefits and problems. c) Mineral resources: Use and exploitation, environmental effects of extracting and using mineral resources, case studies. d) Food resources: World food problems, changes caused by agriculture and overgrazing, effects of modern agriculture, fertilizer-pesticide problems, water logging, salinity, case studies. e) Energy resources: Growing energy needs, renewable and non-renewable energy sources, use of alternate energy sources. Case studies. f) Land resources: Land as a resource, land degradation, man induced landslides
- To provide the knowledge about Soil erosion and desertification. Role of an individual in conservation of natural resources. Equitable use of resources for sustainable lifestyles. Ecosystems: Concept, Structure, function, Producers, consumers, decomposers, Energy flow, ecological succession, food chains, food webs, ecological pyramids. Introduction, types, characteristic features, structure and function of the forest, grassland, desert and aquatic ecosystems (ponds, streams, lakes, rivers, oceans, estuaries
- To educate the students about Biodiversity and its conservation: - Introduction, definition, genetic, species & ecosystem diversity and bio-geographical classification of India. Value of biodiversity: consumptive use, productive use, social, ethical, aesthetic and option values. Biodiversity at global, National and local levels, India as a mega-diversity nation. Hot-sports of biodiversity. Threats to biodiversity: habitat loss, poaching of wildlife, man-wildlife conflicts. Endangered and endemic species of India. Conservation of biodiversity: In-situ and Ex-situ conservation of biodiversity
- To provide Knowledge regarding Environmental Pollution: definition, cause, effects and control measures of a. Air pollution b. Water pollution c. Soil pollution d. Marine pollution e. Noise pollution f. Thermal pollution g. Nuclear hazards. Solid Waste Management: causes, effects and control measures of urban and industrial wastes. Role of an individual in prevention of pollution. Pollution case studies. Social Issues and the Environment from Unsustainable to Sustainable development, Urban problems related to energy. Water conservation, rain water harvesting, watershed management. Environmental ethics: Issues and possible solutions, climate change, global warming, acid rain, ozone layer depletion, nuclear accidents and holocaust. dies. Wasteland reclamation. Consumerism and waste products. Environment Protection Act. Air (Prevention and Control of Pollution) Act. Water (Prevention and control of Pollution) Act. Wildlife Protection Act. Forest Conservation Act. Issues involved in enforcement of environmental legislation. Public awareness. Human Population and the Environment: population growth, variation among nations, population explosion, Family Welfare Programme. Environment and human health: Human Rights, Value Education, HIV/AIDS. Women and Child Welfare. Role of Information Technology in Environment and human health.
- To provide the knowledge about Disaster Management:Natural Disasters 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. Man Made Disasters-Nuclear disasters, chemical disasters, biological disasters, building fire, coal fire, forest fire, oil fire, air pollution, water pollution, deforestation, industrial waste water pollution, road accidents, rail accidents, air accidents, sea accidents. Disaster Management- Effect to migrate natural disaster 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.

Course Outcomes

After completion of course, a student will be able to

COURSE OUTCOME (CO)	DESCRIPTION
CO1	Students able to know about Environmental Studies: Scope and importance. Natural Resources: Renewable and nonrenewable resources Natural resources and associated problems. a) Forest resources: Use and over-exploitation, deforestation, case studies. Timber extraction, mining, dams and their effects on forest and tribal people. b) Water resources: Use and over-utilization of surface and ground water, floods, drought, conflicts over water, dams-benefits and problems. c) Mineral resources: Use and exploitation, environmental effects of extracting and using mineral resources, case studies. d) Food resources: World food problems, changes caused by agriculture and

	overgrazing, effects of modern agriculture, fertilizer-pesticide problems, water logging, salinity, case studies. e) Energy resources: Growing energy needs, renewable and non-renewable energy sources, use of alternate energy sources. Case studies. f) Land resources: Land as a resource, land degradation, man induced landslides
CO2	Able to know about the Soil erosion and desertification. Role of an individual in conservation of natural resources. Equitable use of resources for sustainable lifestyles. Ecosystems: Concept, Structure, function, Producers, consumers, decomposers, Energy flow, ecological succession, food chains, food webs, ecological pyramids. Introduction, types, characteristic features, structure and function of the forest, grassland, desert and aquatic ecosystems (ponds, streams, lakes, rivers, oceans, estuaries
CO3	Students able to Biodiversity and its conservation: - Introduction, definition, genetic, species & ecosystem diversity and bio-geographical classification of India. Value of biodiversity: consumptive use, productive use, social, ethical, aesthetic and option values. Biodiversity at global, National and local levels, India as a mega-diversity nation. Hot-sports of biodiversity. Threats to biodiversity: habitat loss, poaching of wildlife, man-wildlife conflicts. Endangered and endemic species of India. Conservation of biodiversity: In-situ and Ex-situ conservation of biodiversity
CO4	Able to know about about Environmental Pollution: definition, cause, effects and control measures of a. Air pollution b. Water pollution c. Soil pollution d. Marine pollution e. Noise pollution f. Thermal pollution g. Nuclear hazards. Solid Waste Management: causes, effects and control measures of urban and industrial wastes. Role of an individual in prevention of pollution. Pollution case studies. Social Issues and the Environment from Unsustainable to Sustainable development, Urban problems related to energy. Water conservation, rain water harvesting, watershed management. Environmental ethics: Issues and possible solutions, climate change, global warming, acid rain, ozone layer depletion, nuclear accidents and holocaust. dies. Wasteland reclamation. Consumerism and waste products. Environment Protection Act. Air (Prevention and Control of Pollution) Act. Water (Prevention and control of Pollution) Act. Wildlife Protection Act. Forest Conservation Act. Issues involved in enforcement of environmental legislation. Public awareness. Human Population and the Environment: population growth, variation among nations, population explosion, Family Welfare Programme. Environment and human health: Human Rights, Value Education, HIV/AIDS. Women and Child Welfare. Role of Information Technology in Environment and human health.
CO5	Students able to understand the basic Knowledge regarding Disaster Management:Natural Disasters 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. Man Made Disasters-Nuclear disasters, chemical disasters, biological disasters, building fire, coal fire, forest fire, oil fire, air pollution, water pollution, deforestation, industrial waste water pollution, road accidents, rail accidents, air accidents, sea accidents. Disaster Management- Effect to migrate natural disaster 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

CO-PO MAPPING:

	CO	**PO1** Knowledge of Applied Science in Agricultural Engineering	**PO2** Knowledge of Basic Engineering	**PO3** Problem Solving	**PO4** Field Experimentations	**PO5** Knowledge of Soil and Water Conservation Engineering	**PO6** Knowledge of Irrigation and Drainage Engineering	**PO7** Knowledge of Farm Machinery, equipments and techniques	**PO8** Knowledge of Process and Food Engineering equipments and techniques	**PO9**Knowledge of Renewable Energy Engineering	**PO10** Environment and sustainability	**PO11** Ethics	**PO12** Individual and team work	**PO13** Communication and skill development	**PO14** Lifelong learning
CO1	Students able to know about Environmental Studies: Scope and importance. Natural Resources: Renewable and nonrenewable resources Natural resources and associated problems. a) Forest resources: Use and over-exploitation, deforestation, case studies. Timber extraction, mining, dams and their effects on forest and tribal people. b) Water resources: Use and over-utilization of surface and ground water, floods, drought, conflicts over water, dams-benefits and problems. c) Mineral resources: Use and exploitation, environmental effects of extracting and using mineral resources, case studies. d) Food resources: World food problems, changes caused by agriculture and overgrazing, effects of modern agriculture, fertilizer-pesticide problems, water logging, salinity, case studies. e) Energy resources: Growing energy needs, renewable and non-renewable energy sources, use of alternate energy sources. Case studies. f) Land resources: Land as a resource, land degradation, man induced landslides	3	3	3	-	-	-	-	-	2	3	3	2	-	2
CO2	Able to know about the Soil erosion and desertification. Role of an individual in conservation of natural resources. Equitable use of resources for sustainable lifestyles. Ecosystems: Concept, Structure, function, Producers, consumers, decomposers, Energy flow, ecological succession, food chains, food webs, ecological pyramids. Introduction, types, characteristic features, structure and function of the forest, grassland, desert and aquatic ecosystems (ponds, streams, lakes, rivers, oceans, estuaries	3	3	3	-	-	-	-	-	2	3	2	3	-	3

CO3	Students able to Biodiversity and its conservation: - Introduction, definition, genetic, species & ecosystem diversity and bio-geographical classification of India. Value of biodiversity: consumptive use, productive use, social, ethical, aesthetic and option values. Biodiversity at global, National and local levels, India as a mega-diversity nation. Hot-sports of biodiversity. Threats to biodiversity: habitat loss, poaching of wildlife, man-wildlife conflicts. Endangered and endemic species of India. Conservation of biodiversity: In-situ and Ex-situ conservation of biodiversity	3	3	2	-	-	-	-	-	-	3	2	3	-	3
CO4	Able to know about about Environmental Pollution: definition, cause, effects and control measures of a. Air pollution b. Water pollution c. Soil pollution d. Marine pollution e. Noise pollution f. Thermal pollution g. Nuclear hazards. Solid Waste Management: causes, effects and control measures of urban and industrial wastes. Role of an individual in prevention of pollution. Pollution case studies. Social Issues and the Environment from Unsustainable to Sustainable development, Urban problems related to energy. Water conservation, rain water harvesting, watershed management. Environmental ethics: Issues and possible solutions, climate change, global warming, acid rain, ozone layer depletion, nuclear accidents and holocaust. dies. Wasteland reclamation. Consumerism and waste products. Environment Protection Act. Air (Prevention and Control of Pollution) Act. Water (Prevention and control of Pollution) Act. Wildlife Protection Act. Forest Conservation Act. Issues involved in enforcement of environmental legislation. Public awareness. Human Population and the Environment: population growth, variation among nations, population explosion, Family Welfare Programme. Environment and human health: Human Rights, Value Education, HIV/AIDS. Women and Child Welfare. Role of Information Technology in Environment and human health.	3	3	3	-	-	-	-	-	2	3	2	3	-	3

CO5	Students able to understand the basic Knowledge regarding Disaster Management:Natural Disasters 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. Man Made Disasters-Nuclear disasters, chemical disasters, biological disasters, building fire, coal fire, forest fire, oil fire, air pollution, water pollution, deforestation, industrial waste water pollution, road accidents, rail accidents, air accidents, sea accidents. Disaster Management- Effect to migrate natural disaster 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	3	3	2	-	-	-	-	-	2	3	2	3	-	3

3: Strong contribution, 2: average contribution, 1: Low contribution

Name of Course/ Subject: Entrepreneurship Development and Business -Management

Paper Code: BM126

Course objectives:

- To provide the knowledge about Entrepreneurship, management – Management functions – planning- Organizing –Directing motivation – ordering – leading – supervision-Communication and control – Capital – Financial management – importance of financial statements – balance sheet – profit and loss statement
- To provide the knowledge about Analysis of financial statements – liquidity ratios – leverage ratios, Coverage ratios – turnover ratios – profitability ratios, Agro-based industries – Project – project cycle – Project appraisal and evaluation techniques – undiscounted measures – payback period – proceeds per rupee of outlay, Discounted measures – Net Present Value (NPV) – Benefit-Cost Ratio (BCR) – Internal Rate of Return (IRR) Net benefit investment ratio (N / K ratio) – sensitivity analysis-Importance of agribusiness in Indian economy International trade-WTO agreements – Provisions related to agreements in agricultural and food commodities. Agreements on agriculture (AOA).
- To educate the students about Domestic supply, market access, export subsidies agreements on sanitary and phyto-sanitary (SPS) measures, Trade related intellectual property rights (TRIPS). Development (ED): Concept of entrepreneur and entrepreneurship Assessing overall business environment in Indian economy Entrepreneurial and managerial characteristics
- To provide Knowledge regarding Entrepreneurship development Programmes (EDP) Generation incubation and commercialization of ideas and innovations- Motivation and entrepreneurship development- Globalization and the emerging business entrepreneurial environment- Managing an enterprise: Importance of planning, budgeting, monitoring evaluation and follow-up managing competition. Role of ED in economic development of a country- Overview of Indian social, political systems and their implications for decision making by individual entrepreneurs- Economic system and its implications for decision making by individual entrepreneurs- Social responsibility of business. Morals and ethics in enterprise management- SWOT analysis.
- To provide the knowledge about Government schemes and incentives for promotion of entrepreneurship. Government policy on small and medium enterprises (SMEs)/SSIs/MSME sectors- Venture capital (VC), contract farming (CF) and joint ventures (JV), public-private partnerships (PPP) - Overview of agricultural engineering industry, characteristics of Indian farm machinery industry

Course Outcomes

After completion of course, a student will be able to

COURSE OUTCOME (CO)	DESCRIPTION
CO1	Students able to know Entrepreneurship, management – Management functions – planning- Organizing – Directing motivation – ordering – leading – supervision-Communication and control – Capital – Financial management – importance of financial statements – balance sheet – profit and loss statement
CO2	Able to know about the Analysis of financial statements – liquidity ratios – leverage ratios, Coverage ratios – turnover ratios – profitability ratios, Agro-based industries – Project – project cycle – Project appraisal and evaluation techniques – undiscounted measures – payback period – proceeds per rupee of outlay, Discounted measures – Net Present Value (NPV) – Benefit-Cost Ratio (BCR) – Internal Rate of Return (IRR) Net benefit investment ratio (N / K ratio) – sensitivity analysis-Importance of agribusiness in Indian economy International trade-WTO agreements – Provisions related to agreements in agricultural and food commodities. Agreements on agriculture (AOA).
CO3	Students able to know the Domestic supply, market access, export subsidies agreements on sanitary and phyto-sanitary (SPS) measures, Trade related intellectual property rights (TRIPS). Development (ED): Concept of entrepreneur and entrepreneurship Assessing overall business environment in Indian economy Entrepreneurial and managerial characteristics
CO4	Able to know about Entrepreneurship development Programmes (EDP) Generation incubation and commercialization of ideas and innovations- Motivation and entrepreneurship development- Globalization and the emerging business entrepreneurial environment- Managing an enterprise: Importance of planning, budgeting, monitoring evaluation and follow-up managing competition. Role of ED in economic development of a country- Overview of Indian social, political systems and their implications for decision making by individual entrepreneurs- Economic system and its implications for decision making by individual entrepreneurs- Social responsibility of business. Morals and ethics in enterprise management- SWOT analysis.
CO5	Students able to understand the basic Knowledge regarding Government schemes and incentives for promotion of entrepreneurship. Government policy on small and medium enterprises (SMEs)/SSIs/MSME sectors- Venture capital (VC), contract farming (CF) and joint ventures (JV), public-private partnerships (PPP) - Overview of agricultural engineering industry, characteristics of Indian farm

	machinery industry

	CO	PO1 Knowledge of Applied Science in Agricultural Engineering	PO2 Knowledge of Basic Engineering	PO3 Problem Solving	PO4 Field Experimentations	PO5 Knowledge of Soil and Water Conservation Engineering	PO6 Knowledge of Irrigation and Drainage Engineering	PO7 Knowledge of Farm Machinery, equipments and techniques	PO8 Knowledge of Process and Food Engineering equipments and techniques	PO9Knowledge of Renewable Energy Engineering	PO10 Environment and sustainability	PO11 Ethics	PO12 Individual and team work	PO13 Communication and skill development	PO14 Lifelong learning

CO-PO MAPPING:

CO1	Students able to know about Introduction to various carpentry tools, materials, types of wood and their characteristics and Processes or operations in wood working; Introduction to Smithy tools and operations	3	3	3	-	-	-	-	-	-	-	3	2	3	2
CO2	Able to know about the Introduction to welding, types of welding, oxyacetylene gas welding, types of flames, welding techniques and equipment. Principle of arc welding, equipment and tools. Casting processes; Classification, constructional details of center lathe, Main accessories and attachments. Main perations and tools used on center lathes	3	3	3	-	-	-	-	-	2	-	2	3	3	3
CO3	Students able to know the Types of shapers, Constructional details of standard shaper. Work holding devices, shaper tools and main operations. Types of drilling machines. Constructional details of pillar types and radial drilling machines	3	3	2	-	-	-	-	-	-	-	2	3	3	3
CO4	Able to know about Work holding and tool holding devices. Main operations. Twist drills, drill angles and sizes	3	3	3	-	-	-	-	-	2	-	2	3	3	3
CO5	Students able to understand the basic Knowledge regarding Types and classification. Constructional details and principles of operation of column and knee type universal milling machines. Plain milling cutter. Main operations on milling machine	3	3	2	-	-	-	-	-	-	-	2	3	3	3

3: Strong contribution, 2: average contribution, 1: Low contribution

Fluid Mechanics and Open Channel Hydraulics

Course Code: AE106

Course objectives:

- To provide the knowledge about Properties of fluids: Ideal and real fluid. Pressure and its measurement, Pascal's law, pressure forces on plane and curved surfaces, centre of pressure, buoyancy, Meta centre and Meta centric height, condition of floatation and stability of submerged and floating bodies
- To provide the knowledge about Kinematics of fluid flow: Lagrangian and Eulerian description of fluid motion, continuity equation, path lines, streak lines and stream lines, stream function, velocity potential and flow net. Types of fluid flow, translation, rotation, circulation and vorticity, Vortex motion
- To educate the students about Dynamics of fluid flow, Bernoulli's theorem, venturimeter, orifice meter and nozzle, siphon; Laminar flow: Stress strain relationships, flow between infinite parallel plates both plates fixed, one plate moving, discharge, average velocity
- To provide Knowledge regarding Laminar and turbulent flow in pipes, general equation for head loss Darcy, Equation, Moody's diagram, Minor and major hydraulic losses through pipes and fittings, flow through network of pipes, hydraulic gradient and energy gradient; Flow through orifices (Measurement of Discharge, Measurement of Time), Flow through Mouthpieces, Flow over Notches, Flow over weirs, Chezy's formula for loss of head in pipes
- To provide the knowledge about Flow through simple and compound pipes, Open channel design and hydraulics: Chezy's formula, Bazin's formula, Katter's Manning's formula, Velocity and Pressure profiles in open channels, Hydraulic jump; Dimensional analysis and similitude: Rayleigh's method and Buckingham's Pi-theorem, types of similarities, dimensional analysis, dimensionless numbers. Introduction to fluid machinery.

Course Outcomes

After completion of course, a student will be able to

COURSE OUTCOME (CO)	DESCRIPTION
CO1	Students able to know about Properties of fluids: Ideal and real fluid. Pressure and its measurement, Pascal's law, pressure forces on plane and curved surfaces, centre of pressure, buoyancy, Meta centre and Meta centric height, condition of floatation and stability of submerged and floating bodies
CO2	Able to know about the Kinematics of fluid flow: Lagrangian and Eulerian description of fluid motion, continuity equation, path lines, streak lines and stream lines, stream function, velocity potential and flow net. Types of fluid flow, translation, rotation, circulation and vorticity, Vortex motion
CO3	Students able to know the dynamics of fluid flow, Bernoulli's theorem, venturimeter, orifice meter and nozzle, siphon; Laminar flow: Stress strain relationships, flow between infinite parallel plates both plates fixed, one plate moving, discharge, average velocity
CO4	Able to know about Laminar and turbulent flow in pipes, general equation for head loss Darcy, Equation, Moody's diagram, Minor and major hydraulic losses through pipes and fittings, flow through network of pipes, hydraulic gradient and energy gradient; Flow through orifices (Measurement of Discharge, Measurement of Time), Flow through Mouthpieces, Flow over Notches, Flow over weirs, Chezy's formula for loss of head in pipes
CO5	Students able to understand the basic Knowledge regarding Flow through simple and compound pipes, Open channel design and hydraulics: Chezy's formula, Bazin's formula, Katter's Manning's formula, Velocity and Pressure profiles in open channels, Hydraulic jump; Dimensional analysis and similitude: Rayleigh's method and Buckingham's Pi-theorem, types of similarities, dimensional analysis, dimensionless numbers. Introduction to fluid machinery

CO-PO MAPPING:

	CO	**PO1** Knowledge of Applied Science in Agricultural Engineering	**PO2** Knowledge of Basic Engineering	**PO3** Problem Solving	**PO4** Field Experimentations	**PO5** Knowledge of Soil and Water Conservation Engineering	**PO6** Knowledge of Irrigation and Drainage Engineering	**PO7** Knowledge of Farm Machinery, equipments and techniques	**PO8** Knowledge of Process and Food Engineering equipments and techniques	**PO9**Knowledge of Renewable Energy Engineering	**PO10** Environment and sustainability	**PO11** Ethics	**PO12** Individual and team work	**PO13** Communication and skill development	**PO14** Lifelong learning
CO1	Students able to know about Properties of fluids: Ideal and real fluid. Pressure and its measurement, Pascal's law, pressure forces on plane and curved surfaces, centre of pressure, buoyancy, Meta centre and Meta centric height, condition of floatation and stability of submerged and floating bodies	3	3	3	-	2	3	-	-	-	3	3	2	-	2
CO2	Able to know about the Kinematics of fluid flow: Lagrangian and Eulerian description of fluid motion, continuity equation, path lines, streak lines and stream lines, stream function, velocity potential and flow net. Types of fluid flow, translation, rotation, circulation and vorticity, Vortex motion	3	3	3	-	1	3	-	-	2	3	2	3	-	3
CO3	Students able to know the dynamics of fluid flow, Bernoulli's theorem, venturimeter, orifice meter and nozzle, siphon; Laminar flow: Stress strain relationships, flow between infinite parallel plates both plates fixed, one plate moving, discharge, average velocity	3	3	2	-	1	2	-	-	-	3	2	3	-	3

CO4	Able to know about Laminar and turbulent flow in pipes, general equation for head loss Darcy, Equation, Moody's diagram, Minor and major hydraulic losses through pipes and fittings, flow through network of pipes, hydraulic gradient and energy gradient; Flow through orifices (Measurement of Discharge, Measurement of Time), Flow through Mouthpieces, Flow over Notches, Flow over weirs, Chezy's formula for loss of head in pipes	3	3	3	-	2	3	-	-	2	3	2	3	-	3
CO5	Students able to understand the basic Knowledge regarding Flow through simple and compound pipes, Open channel design and hydraulics: Chezy's formula, Bazin's formula, Katter's Manning's formula, Velocity and Pressure profiles in open channels, Hydraulic jump; Dimensional analysis and similitude: Rayleigh's method and Buckingham's Pi-theorem, types of similarities, dimensional analysis, dimensionless numbers. Introduction to fluid machinery	3	3	2	-	2	3	-	-	-	3	2	3	-	3

3: Strong contribution, 2: average contribution, 1: Low contribution

COURSE: Strength of materials
COURSE CODE: AE 107

COURSE OBJECTIVES:

- To educate the students such that they will be able to analyze the structure and calculate the slope and deflection at various points in the structure using different methods.
- Understanding the analysis and design of columns, riveted and welded connections, masonary dams and analysis of statically indeterminate beams.
- To educate the students in a manner such that they will be able to analyze the fixed and continuous beams using various methods.

COURSE OUTCOMES (CO):

After the successful course completion, learners will develop following attributes:

COURSE OUTCOME (CO)	DESCRIPTION
CO1	Learner will be able to analyze the structure and determine slope and deflections in the structure using various methods learned.
CO2	Utilizing the knowledge of this topic and the mathematical skills, learner will be able to classify, analyze and design the columns, riveted and welded connections, masonary dams and statically indeterminate beams.
CO3	Learner will be able to analyze the fixed and continuous beams using various methods.

CO-PO MAPPING

Workshop Technology and Practice

Course Code: ME 107

Course objectives:

	CO	PO1 Knowledge of Applied Science in Agricultural Engineering	PO2 Knowledge of Basic Engineering	PO3 Problem Solving	PO4 Field Experimentations	PO5 Knowledge of Soil and Water Conservation Engineering	PO6 Knowledge of Irrigation and Drainage Engineering	PO7 Knowledge of Farm Machinery, equipments and techniques	PO8 Knowledge of Process and Food Engineering equipments and techniques	PO9Knowledge of Renewable Energy Engineering	PO10 Environment and sustainability	PO11 Ethics	PO12 Individual and team work	PO13 Communication and skill development	PO14 Lifelong learning
CO1	Learner will be able to analyze the structure and determine slope and deflections in the structure using various methods learned.	2	3	3	0	0	0	0	0	0	0	0	0	1	1
CO2	Utilizing the knowledge of this topic and the mathematical skills, learner will be able to classify, analyze and design the columns, riveted and welded connections, masonary dams and statically indeterminate beams.	2	3	3	2	0	0	0	0	0	0	0	0	1	1
CO3	Learner will be able to analyze the fixed and continuous beams using various methods.	2	3	3	0	0	0	0	0	0	0	0	0	1	1
		3: Strong contribution, 2: average contribution, 1: Low contribution													

- To provide the knowledge about Introduction to various carpentry tools, materials, types of wood and their characteristics and Processes or operations in wood working; Introduction to Smithy tools and operations
- To provide the knowledge about Introduction to welding, types of welding, oxyacetylene gas welding, types of flames, welding techniques and equipment. Principle of arc welding, equipment and tools. Casting processes; Classification, constructional details of center lathe, Main accessories and attachments. Main perations and tools used on center lathes.
- To educate the students about Types of shapers, Constructional details of standard shaper. Work holding devices, shaper tools and main operations. Types of drilling machines. Constructional details of pillar types and radial drilling machines
- To provide Knowledge regarding Work holding and tool holding devices. Main operations. Twist drills, drill angles and sizes.
- To provide the knowledge about Types and classification. Constructional details and principles of operation of column and knee type universal milling machines. Plain milling cutter. Main operations on milling machine.

Course Outcomes

After completion of course, a student will be able to

COURSE OUTCOME (CO)	DESCRIPTION
CO1	Students able to know about Introduction to various carpentry tools, materials, types of wood and their characteristics and Processes or operations in wood working; Introduction to Smithy tools and operations
CO2	Able to know about the Introduction to welding, types of welding, oxyacetylene gas welding, types of flames, welding techniques and equipment. Principle of arc welding, equipment and tools. Casting processes; Classification, constructional details of center lathe, Main accessories and attachments. Main perations and tools used on center lathes
CO3	Students able to know the Types of shapers, Constructional details of standard shaper. Work holding devices, shaper tools and main operations. Types of drilling machines. Constructional details of pillar types and radial drilling machines
CO4	Able to know about Work holding and tool holding devices. Main operations. Twist drills, drill angles and sizes
CO5	Students able to understand the basic Knowledge regarding Types and classification. Constructional details and principles of operation of column and knee type universal milling machines. Plain milling cutter. Main operations on milling machine

CO-PO MAPPING:

	CO	**PO1** Knowledge of Applied Science in Agricultural Engineering	**PO2** Knowledge of Basic Engineering	**PO3** Problem Solving	**PO4** Field Experimentations	**PO5** Knowledge of Soil and Water Conservation Engineering	**PO6** Knowledge of Irrigation and Drainage Engineering	**PO7** Knowledge of Farm Machinery, equipments and techniques	**PO8** Knowledge of Process and Food Engineering equipments and techniques	**PO9**Knowledge of Renewable Energy Engineering	**PO10** Environment and sustainability	**PO11** Ethics	**PO12** Individual and team work	**PO13** Communication and skill development	**PO14** Lifelong learning
CO1	Students able to know about Introduction to various carpentry tools, materials, types of wood and their characteristics and Processes or operations in wood working; Introduction to Smithy tools and operations	3	3	3	-	2	3	3	-	-	3	3	2	-	2
CO2	Able to know about the Introduction to welding, types of welding, oxyacetylene gas welding, types of flames, welding techniques and equipment. Principle of arc welding, equipment and tools. Casting processes; Classification, constructional details of center lathe, Main accessories and attachments. Main perations and tools used on center lathes	3	3	3	-	1	3	2	-	2	3	2	3	-	3
CO3	Students able to know the Types of shapers, Constructional details of standard shaper. Work holding devices, shaper tools and main operations. Types of drilling machines. Constructional details of pillar types and radial drilling machines	3	3	2	-	1	2	3	-	-	3	2	3	-	3
CO4	Able to know about Work holding and tool holding devices. Main operations. Twist drills, drill angles and sizes	3	3	3	-	2	3	2	-	2	3	2	3	-	3
CO5	Students able to understand the basic Knowledge regarding Plain milling cutter. Main operations on milling machine	3	3	2	-	2	3	3	-	-	3	2	3	-	3

3: Strong contribution, 2: average contribution, 1: Low contribution

COURSE: Theory of Machines in Agriculture

COURSE CODE: ME108

COURSE OBJECTIVES:

- To impart understanding of different types of Mechanisms and its inversion.
- To analyze the velocity and acceleration of planar mechanisms.
- To synthesize planar mechanisms based on motion requirements.
- Understanding of gear drives and analysis of gear trains.
- Understanding of governors and static and dynamic balancing

COURSE OUTCOMES (CO):

After completion of the course, a student will be able to

COURSE OUTCOME (CO)	DESCRIPTION
CO1	Ability to identify and analyze the mechanisms required for a particular motion requirement.
CO2	Capability to analyze and synthesize the velocity and acceleration of planar mechanisms.
CO3	Know about gears like helical, spiral, bevel and worm gear. Simple, compound, reverted, and epicyclic trains. Ability to understand the suitability of different gear drives for motion/power transmission and to analyze different types of gear trains
CO4	Identify different types of governors and their applications
CO5	Ability to understand the static and dynamic balancing, Balancing of rotating masses in one and different planes, Partial primary balancing of reciprocating masses

Web Designing and Internet Applications
CODE: CA171

COURSE OBJECTIVES:

- To learn principles of web designing.
- To learn basic web design and know about history of Internet.
- To learn fundamental language of Internet i.e. HTML, DHTML and JavaScript.
- Learn to use FLASH, DREAM WEAVER, GIF ANIMATION and FTP.

COURSE OUTCOMES (CO):

After completion of the course, a student will be able to

COURSE OUTCOME (CO)	DESCRIPTION
CO1	Able to manage web designing project successfully.
CO2	Ability to design and create of a web site using Web Standards after understanding Audience requirement..
CO3	Hands on practice on HTML and learn the concepts of Client Side JavaScript.
CO4	Upgrading skill set according to latest market needs and use web testing tools.

	CO	**PO1** Knowledge of Applied Science in Agricultural Engineering	**PO2** Knowledge of Basic Engineering	**PO3** Problem Solving	**PO4** Field Experimentations	**PO5** Knowledge of Soil and Water Conservation Engineering	**PO6** Knowledge of Irrigation and Drainage Engineering	**PO7** Knowledge of Farm Machinery, equipments and techniques	**PO8** Knowledge of Process and Food Engineering equipments and techniques	**PO9**Knowledge of Renewable Energy Engineering	**PO10**Environment and sustainability	**PO11** Ethics	**PO12** Individual and team work	**PO13**Communication and skill development	**PO14**Lifelong learning
CO1	Ability to identify and analyze the mechanisms required for a particular motion requirement.	3	3	2	1	-	-	3	1		3				3
CO2	Capability to analyze and synthesize the velocity and acceleration of planar mechanisms.	3	3	2	1	-	-	1	-		3				3
CO3	Know about gears like helical, spiral, bevel and worm gear. Simple, compound, reverted, and epicyclic trains. Ability to understand the suitability of different gear drives for motion/power transmission and to analyze different types of gear trains.	3	3	2	1	-	-	2	-		3				3
CO4	Identify different types of governors and their applications	3	3	3	1	-	-	2	-		3				3
CO5	Ability to understand the static and dynamic balancing, Balancing of rotating masses in one and different planes, Partial primary balancing of reciprocating masses	3	3		1	-	-		-		3				3
		3: Strong contribution, 2: average contribution, 1: Low contribution													

CO-PO MAPPING:

	CO	**PO1** Knowledge of Applied Science in Agricultural Engineering	**PO2** Knowledge of Basic Engineering	**PO3** Problem Solving	**PO4** Field Experimentations	**PO5** Knowledge of Soil and Water Conservation Engineering	**PO6** Knowledge of Irrigation and Drainage Engineering	**PO7** Knowledge of Farm Machinery, equipments and techniques	**PO8** Knowledge of Process and Food Engineering equipments and techniques	**PO9**Knowledge of Renewable Energy Engineering	**PO10** Environment and sustainability	**PO11** Ethics	**PO12** Individual and team work	**PO13** Communication and skill development	**PO14** Lifelong learning
CO1	Able to manage web designing project successfully.	2	2	3	0	0	0	0	0	0	0	2	1	1	1
CO2	Ability to design and create of a web site using Web Standards after understanding Audience requirement..	2	3	3	2	0	0	0	0	0	0	2	2	2	1
CO3	Hands on practice on HTML and learn the concepts of Client Side JavaScript.	2	3	3	0	0	0	0	0	0	0	1	2	1	2
CO4	Upgrading skill set according to latest market needs and use web testing tools.	2	3	3	0	0	0	0	0	0	0	2	2	2	2
3: Strong contribution, 2: average contribution, 1: Low contribution															