आईएफटीएम विश्वविद्यालय, मुरादाबाद, उत्तर प्रदेश

IFTM University, Moradabad, Uttar Pradesh

NAAC ACCREDITED

SCHOOL OF AGRICULTURAL SCIENCES & ENGINEERING

DEPARTMENT OF AGRICULTURAL ENGINEERING

MASTER OF TECHNOLOGY
AGRICULTURAL ENGINEERING

[*w.e.f.* ACADEMIC SESSION 2021 – 22]

IFTM UNIVERSITY, MORADABAD
N.H.-24, Lodhipur Rajput, Delhi Road, Moradabad, Uttar Pradesh-244102
Website: www.iftmuniversity.ac.in

Director
School of Agril. Sci. & Engg.
IFTMU, Moradabad.

Registrar
IFTM University
Moradabad

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SCHOOL OF AGRICULTURAL SCIENCES & ENGINEERING

DEPARTMENT OF AGRICULTURAL ENGINEERING

CBCS Based Course Structure and Syllabi

of

MASTER OF TECHNOLOGY
Agricultural Engineering

Farm Machinery & Power Engineering

[*w.e.f.* Academic Session 2021 – 22]

(As per CBCS guidelines given by UGC)

Summary

Programme	**: Master of Technology Agricultural Engineering**
Programme Level	**: Degree (Post Graduation)**
Duration	**: Two Years (Four Semesters) Full time**
Medium of Instruction	**: English**
Minimum Required Attendance	**: 75%**
Maximum Credits	**: 66**

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Programme:

M. Tech. Agricultural Engineering (Farm Machinery and Power Engineering)

Programme Outcomes (POs):
Students completing this course will be able to:

1. Understand and application of the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to solve the complex engineering problems.
2. Use and implement of recourses which will be economically feasible, agro and energy technologies for sustainable agriculture
3. Synthesizing and analyzing of farm machinery and power and management system in the field of agriculture.
4. Conduct demonstrates; develop ability to Design and Conduct Experiments, Interpret and Analyzes Data and Report Results. Deeply elaborate various fundamental concepts learned at graduation level.
5. Demonstrate an Understanding of their Professional Ethical Responsibilities.
6. Develop to conduct demonstrate ability to Function Effectively Individually and also as a Team Member in Multidisciplinary activities.
7. Understand the importance & role of government all over the world to promote use of the renewable energy sources
8. Communicate Effectively in both Verbal and Written Forms.

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ORDINANCE

Eligibility Criteria for Admission:

(a) M. Tech. Agricultural Engineering (Farm Machinery & Power Engineering)

The candidates possess minimum 55% (50% for SC/ST) in B. Tech. Agricultural Engineering / B. Tech. Mechanical Engineering for admission.

(b) M. Tech. Agricultural Engineering (Soil and Water Conservation Engineering)

The candidates possess minimum 55% (50% for SC/ST) in B. Tech. Agricultural Engineering / B. Tech. Civil Engineering for admission.

(c) M. Tech. Agricultural Engineering (Process and Food Engineering)

The candidates possess minimum 55% (50% for SC/ST) in B. Tech. Agricultural Engineering/B. Tech. Biotechnology for admission.

Examination:

Question Paper Structure:

There will be 10 descriptive type questions out of which 5 question have to be attempt. Each question carries 14 marks.

Evaluation and Assessment:

<table>
<tr><th colspan="7">Assessment:</th></tr>
<tr><th colspan="4">Evaluation</th><th>Internal</th><th>External</th><th>Total</th></tr>
<tr><td colspan="4">Theory</td><td>30</td><td>70</td><td>100</td></tr>
<tr><td colspan="4">Practical/ Project Reports/ Viva-Voce</td><td>30</td><td>70</td><td>100</td></tr>
<tr><td colspan="3">Class Test-1</td><td>Class Test-2</td><td>Class Test-3</td><td rowspan="2">Assignment(s)</td><td rowspan="2">Attendance & Participation</td><td rowspan="2">Total</td></tr>
<tr><td colspan="5">Best two out of three</td></tr>
<tr><td colspan="3">10</td><td>10</td><td>10</td><td>5</td><td>5</td><td>30</td></tr>
<tr><td colspan="4" rowspan="2">Duration of Examination</td><td>Internal</td><td colspan="2">External</td></tr>
<tr><td>1 Hour</td><td colspan="2">3 Hours</td></tr>
</table>

Grade:

a) The minimum Grade required to pass in each Theory & Practical paper is 'GRADE D'.

i) A candidate, in order to pass have to obtain minimum CGPA of 4.50 is required in a particular academic year inclusive of both semesters of that academic year subject to conditions of carry over system.

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*Grade, Semester Grade Point Average (SGPA), Cumulative Grade Point Average (CGPA) , Final CGPA and Percentage equivalence of CGPA/ Final CGPA will be awarded as per University norms.

Carry Over System: The student will be permitted maximum 04 carry over papers included theory/ practicals/projects for promotion to next academic year.

***All the following will be governed as per university norms and regulations.**

i) Promotion,
ii) Change of grade already awarded,
iii) Award of division,
iv) Unfair means,
v) Results,
vi) Improvement,
vii) Grade card,
viii) Ex- studentship,
ix) Re- admission,
x) Convocation

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ORDINANCE

Eligibility Criteria for Admission:

(a) M. Tech. Agricultural Engineering (Farm Machinery & Power Engineering)

The candidates possess minimum 55% (50% for SC/ST) in B. Tech. Agricultural Engineering / B. Tech. Mechanical Engineering (In – Service Candidates) if need arises the regular students of B. Tech (Mechanical Engineering) can also be admitted after taking permission of competent authority for admission.

(b) M. Tech. Agricultural Engineering (Soil and Water Conservation Engineering)

The candidates possess minimum 55% (50% for SC/ST) in B. Tech. Agricultural Engineering / B. Tech. Civil Engineering for admission (In – Service Candidates) if need arises the regular students of B. Tech (Civil Engineering) can also be admitted after taking permission of competent authority for admission.

(c) M. Tech. Agricultural Engineering (Process and Food Engineering)

The candidates possess minimum 55% (50% for SC/ST) in B. Tech. Agricultural Engineering / B. Tech. Biotechnology/ B. Tech. (Food Technology/ Food Engineering) for admission. (In – Service Candidates) if need arises the regular students of B. Tech (Biotechnology) can also be admitted after taking permission of competent authority for admission.

Examination:

Question Paper Structure:

There will be 10 descriptive type questions out of which 5 question have to be attempted. Each question carries 14 marks.

Evaluation and Assessment:

<table>
<tr><th colspan="6">Assessment:</th></tr>
<tr><th colspan="4">Evaluation</th><th>Internal</th><th>External</th><th>Total</th></tr>
<tr><td colspan="4">Theory</td><td>30</td><td>70</td><td>100</td></tr>
<tr><td colspan="4">Practical/ Project Reports/ Viva-Voce</td><td>30</td><td>70</td><td>100</td></tr>
<tr><td colspan="3">Class Test-1</td><td>Class Test-2</td><td>Class Test-3</td><td rowspan="2">Assignment(s)</td><td rowspan="2">Attendance & Participation</td><td rowspan="2">Total</td></tr>
<tr><td colspan="4">Best two out of three</td></tr>
<tr><td colspan="3">10</td><td>10</td><td>10</td><td>5</td><td>5</td><td>30</td></tr>
<tr><td colspan="4" rowspan="2">Duration of Examination</td><td>Internal</td><td colspan="2">External</td></tr>
<tr><td>1 Hour</td><td colspan="2">3 Hours</td></tr>
</table>

Grade: The minimum Grade required to pass in each Theory & Practical paper is 'GRADE D'.

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i) A candidate, in order to pass have to obtain minimum CGPA of 4.50/10.00 is required in a particular academic year inclusive of both semesters of that academic year subject to conditions of carry over system.

*Grade, Semester Grade Point Average (SGPA), Cumulative Grade Point Average (CGPA) , Final CGPA and Percentage equivalence of CGPA/ Final CGPA will be awarded as per University norms.

Carry Over System: The student will be permitted maximum 04 carry over papers included theory/ practical's/projects for promotion to next academic year.

***All the following will be governed as per university norms and regulations.**

i) Promotion,
ii) Change of grade already awarded,
iii) Award of division,
iv) Unfair means,
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vii) Grade card,
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x) Convocation

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CHOICE BASED CREDIT SYSTEM (CBCS)

Choice Based Credit System (CBCS), It Provides a learning Platform where the student or knowledge seeker has flexibility to choose their course from a list of elective, core & soft skill courses. This is a student centric approach to achieve his target no. of credits as specified by the UGC and adopted by our university.

Group of CBCS:

05 Groups of courses have been identified to provide students comprehensive exposure to a large number of areas, leading to the holistic development of an individual. These groups / clusters are as follows:

1. Engineering Core Courses (ECC)
2. Engineering Laboratory Courses (ELC)
3. Engineering Departmental Elective(EDE)
4. Engineering Supporting Courses (ESC)
5. Project/Dissertation/Seminar/Industrial training/General proficiency (PDT)

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M. Tech. Agricultural Engineering (Farm Machinery & Power Engineering)			
Basic Structure: Distribution of Courses			
S. No.	**Type of Course**	**Credit**	**Total Credits**
1.	**Engineering Core courses (ECC)**	07 Courses of 3 Credits each (Total Credit 7X3)	21
2.	**Engineering Laboratory Courses (ELC)**	05 Courses of 1 Credits each (Total Credit 05X1)	05
3.	**Engineering Departmental Elective (EDE)**	03 Courses of 3 Credits each (Total Credit 3X3)	09
4.	**Engineering Supporting Courses (ESC)**	01 Courses of 3 Credits (Total Credit 1X3)	03
5.	**Project/Dissertation/ Colloquium (PDT)**	02 Course of 4 Credit (Total Credit 04X2) 01 Course of 20 Credits (Total credit 01x20)	28
Total Credits			**66**

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M. Tech AGRICULTURAL ENGINEERING (FMPE)
CHOICE BASED CREDIT SYSTEM
Effective from Session 2021-22

Course Code		CBCS BASKET	Credits			
Engineering/Discipline/Professional Core Courses(ECC)			**L**	**T**	**P**	**C**
MFM101		Design of Farm Power and Machinery Systems	2	1	0	3
MFM 102		Testing and Evaluation of Tractors and Farm Equipment	2	1	0	3
MFM 103		Soil Dynamics in Tillage and Traction	2	1	0	3
MFM 201		System Simulation and Computer Aided Problem Solving in Engineering	2	1	0	3
MFM202		Advances in Farm Machinery and Power Engineering	2	1	0	3
MFM301		Tractor Design	2	1	0	3
MFM 302		Applied Instrumentation in Farm Machines and Stress Analysis	2	1	0	3
Engineering Lab Course(ELC)			**L**	**T**	**P**	**C**
MFM 151		Farm Power and Machinery Systems Lab	0	0	2	1
MFM 152		Testing and Evaluation of Tractors and Farm Equipment Lab	0	0	2	1
MFM 251		Computer Aided Design Lab	0	0	2	1
MMAG254		Agricultural Statistics and Experimental Designs Lab	0	0	2	1
MFM351		Tractor Design Lab	0	0	2	1
Engineering Supporting Courses (ESC)						
MMAG204		Agricultural Statistics and Experimental Designs	3	1	0	3
Engineering Departmental Elective (EDE)			**L**	**T**	**P**	**C**
Elective-I	MFM 104 (I) MFM104 (II)	Agro-Energy Audit and Management Machinery for Natural Resources Management and Precision Farming	2	1	0	3
Elective-II	MFM 203 (I) MFM203 (II)	Ergonomics and Safety in Farm Operations Farm Machinery Dynamics Noise and Vibrations	2	1	0	3
Elective-III	MFM303 (I) MFM303 (II)	Energy Conservation and Management in Farm Power and Machinery Designs & Analysis of Renewable Energy Conservation System	2	1	0	3
Project/Dissertation/Seminar/Summer or Industrial Training (PDT)			**L**	**T**	**P**	**C**
MFM352		Seminar	0	0	2	4
MAE353		Pre-Dissertation	0	0	4	4
MAE451		Dissertation Work			20	20

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STUDY & EVALUATION SCHEME

M. Tech. Agricultural Engineering (Farm Machinery & Power Engineering)

CHOICE BASED CREDIT SYSTEM (CBCS)

YEAR - I, SEMESTER - I

YEAR - I, SEMESTER - II

S.N.	Category	Course Code	Course Name	Periods			EVALUATION SCHEME				Course Total	Credits
							Mid Term Exam			External Exam		
				L	T	P	CT	AS +AT	Total			
THEORY												
1.	ECC	MFM101	Design of Farm Power and Machinery Systems	3	0	0	20	10	30	70	100	3
2.	ECC	MFM 102	Testing and Evaluation of Tractors and Farm Equipment	3	0	0	20	10	30	70	100	3
3.	ECC	MFM 103	Soil Dynamics in Tillage and Traction	3	0	0	20	10	30	70	100	3
4.	EDE	MFM104 A	Elective Course	3	0	0	20	10	30	70	100	3
PRACTICALS / PROJECT												
							IA	AT				
5.	ELC	MFM 151	Farm Power and Machinery Systems Lab	0	0	2	20	10	30	70	100	1
6.	ELC	MFM 152	Testing and Evaluation of Tractors and Farm Equipment Lab	0	0	2	20	10	30	70	100	1
			TOTAL	12	00	04					600	14

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STUDY & EVALUATION SCHEME

M. Tech. Agricultural Engineering (Farm Machinery & Power Engineering)

CHOICE BASED CREDIT SYSTEM (CBCS)

S.N.	Category	Course Code	Course Name	Periods			EVALUATION SCHEME				Course Total	Credits
							Mid Term Exam			External Exam		
				L	T	P	CT	AS +AT	Total			
THEORY												
1.	ECC	MFM 201	System Simulation and Computer Aided Problem Solving in Engineering	3	0	0	20	10	30	70	100	3
2.	ECC	MFM202	Advances in Farm Machinery and Power Engineering	3	0	0	20	10	30	70	100	3
3.	EDE	MFM203 (B)	Elective Course	3	0	0	20	10	30	70	100	3
4.	ESC	MMAG204	Agricultural Statistics and Experimental Designs	3	0	0	20	10	30	70	100	3
PRACTICALS / PROJECT												
							IA	AT				
5.	ELC	MFM 251	Computer Aided Design Lab	0	0	2	20	10	30	70	100	1
6.	ELC	MMAG254	Agricultural Statistics and Experimental Designs Lab	0	0	2	20	10	30	70	100	1
			TOTAL	**12**	**00**	**04**					**600**	**14**

YEAR - II, SEMESTER - III

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STUDY & EVALUATION SCHEME

M. Tech. Agricultural Engineering (Farm Machinery & Power Engineering)

CHOICE BASED CREDIT SYSTEM (CBCS)

S.N.	Category	Course Code	Course Name	Periods			EVALUATION SCHEME				Course Total	Credits
							Mid Term Exam			External Exam		
				L	T	P	CT	AS +AT	Total			
THEORY												
1.	ECC	MFM301	Tractor Design	3	0	0	20	10	30	70	100	3
2.	ECC	MFM 302	Applied Instrumentation in Farm Machines and Stress Analysis	3	0	0	20	10	30	70	100	3
3.	EDE	MFM303 C	Elective Course	3	0	0	20	10	30	70	100	3
PRACTICALS / PROJECT												
							IA	AT				
4.	ELC	MFM351	Tractor Design Lab	0	0	2	20	10	30	70	100	1
5.	PDT	MFM352	Seminar	0	0	4	-	100	100	-	100	4
6.	PDT	MAE353	Pre-Dissertation	0	0	4	-	50	50	50	100	4
			Total	**09**	**0**	**10**					**600**	**18**

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STUDY & EVALUATION SCHEME

M. Tech. Agricultural Engineering (Farm Machinery & Power Engineering)

CHOICE BASED CREDIT SYSTEM (CBCS)

YEAR - II, SEMESTER - IV

S.N.	Category	Course Code	Course Name	Periods			EVALUATION SCHEME				Course Total	Credits
							Mid Term Exam			External Exam		
				L	T	P	CT	AS +AT	Total			
PRACTICALS / PROJECT												
1.	PDT	MFM451	**Dissertation Work**	-	-	20		300	300	300	600	20
			Total	-	-	**20**					**600**	**20**

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List of Electives

Elective-I	MFM 104 (I) MFM104 (II)	Agro-Energy Audit and Management Machinery for Natural Resources Management and Precision Farming
Elective-II	MFM 203 (I) MFM203 (II)	Ergonomics and Safety in Farm Operations Farm Machinery Dynamics Noise and Vibrations
Elective-III	MFM303 (I) MFM303 (II)	Energy Conservation and Management in Farm Power and Machinery Designs & Analysis of Renewable Energy Conservation System

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MFM101 Design of Farm Power and Machinery Systems L:T:P 3:0:0

Objective: To acquaint and equip with the latest design procedures of farm power and machinery systems.

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 **for skill enhancement**.

UNIT II

Analytical design considerations of linkages/ components in farm machinery and its application **for better skilling of entrepreneurship**.

UNIT III

Design of selected farm equipments–tillage, seeding, planting, interculture, plant protection, harvesting and threshing. Design of rotary vibrating and oscillating machines **for better employability in industry**.

UNIT IV

Design and selection of matching power unit **methods for skilling of rescue management.**

UNIT V

Safety devices for tractors and farm implements. Studies on land development machineries **for skill development and employability**.

Course Outcomes:

Students completing this course will be able to:

CO1: Able to design the agricultural machines for tillage, planting/ sowing, threshing and combine harvesting etc. **for skill enhancement**.

CO2: Able to testing of agricultural machines for tillage, planting/ sowing, threshing and combine harvesting etc **for better skilling of entrepreneurship**.

CO3: Mastering the methods and processes of design **for better employability in industry**.

CO4: Having fundamental knowledge of theories of agricultural machinery and equipment. **methods for skilling of rescue management.**

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CO5: Having knowledge and transfer of new technologies in the field of design and construction of agricultural machines and equipment. **for skill development and employability**.

PO-CO Mapping (Please write 3, 2, 1 wherever required)
Note: 3= Highly correlated, 2= Moderately correlated, 1= Less correlated

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8
CO:1	3	3	2	3	3	1	2	3
CO:2	1	3	1	2	3	3	1	2
CO:3	2	2	3	2	2	1	3	3
CO:4	3	1	3	3	1	3	3	
CO:5	3	1	3	1	3	3	1	3

CO-Curriculum Enrichment Mapping (Please write 3, 2, 1 wherever required)
Note: 3= Highly correlated, 2= Moderately correlated, 1= Less correlated

	Skill Development	Employability	Entrepreneurship Development
CO:1	3	2	2
CO:2	1	2	3
CO:3	2	3	1
CO:4	3	1	2
CO:5	3	3	2

Suggested Readings:

1. Anonymous.1983. RNAM Test Code and Procedures for Farm Machinery. Technical series 12.
2. Barger EL, Liljedahl JB & Mc Kibben EC. 1967. Tractors and their Power Units. Wiley Eastern.
3. Lal R & Dutta PC. Agricultural Engineering (through solved examples). Saroj Parkashan, Allahabad.
4. Metha ML, Verma SR, Mishra SK & Sharma VK. 1995. Testing and Evaluation of Agricultural Machinery. National Agricultural Technology Information Centre, Ludhiana

Website Sources:

- https://ecourses.icar.gov.in/
- www.agrimoon.com

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MFM151 **Farm Power and Machinery Systems Lab** **L:T:P 0:0:1**

List of Experiments: Minimum 08 experiments out of the following:

1. Statement and formulation of design problems.
2. Design of farm power systems
3. Design of mechanisms & prototypes in farm machinery.
4. Introduction to various farm machines,
5. Visit to implements shed and research hall;
6. Field capacity and field efficiency measurement for at least two machines/implements;
7. Draft & fuel consumption measurement for different implements under different soil conditions;
8. Construction details, adjustments and working of M.B. plow,
9. Construction details, adjustments and working Disc plow, disc harrow and secondary tillage tools;
10. Introduction, construction and working of earth moving equipment.

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MFM102 Testing and Evaluation of Tractors and Farm Equipment L:T:P 3:0:0

Objective: To acquaint and equip with the test procedures of agricultural machinery and tractors

UNIT I

Types of tests; test procedure, national and international codes **for skill enhancement**.

UNIT II

Test equipment; usage and limitations. Power losses in dynamometers and hydraulic test equipment **for better skilling of entrepreneurship**.

UNIT III

Prototype feasibility testing and field evaluation. Laboratory and field testing of selected farm equipment. Non-destructive testing techniques **for better employability in industry**.

UNIT IV

Tractor performance testing, evaluation and interpretation of results **methods for skilling of rescue management.**

UNIT V

Review and interpretation of test reports. Case studies. **for skill development and employability**.

Course Outcomes:

Upon completion of this course, students will be able to:

CO1: Understand the standard testing procedures and rules **for skill enhancement**.

CO2: Familiarize with different instruments used in testing of agricultural machinery **for better skilling of entrepreneurship**.

CO3: Understand different test codes of ISO, RNAM, ASTM, ASABE etc **for better employability in industry**.

CO4: Carry out performance evaluation of different agricultural implements **methods for skilling of rescue management.**

CO5: Able to review and interpretation of test report and case studies **for skill development and employability**.

PO-CO Mapping (Please write 3, 2, 1 wherever required)
Note: 3= Highly correlated, 2= Moderately correlated, 1= Less correlated

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	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8
CO:1	3	3	2	3	3	1	1	3
CO:2	1	3	1	2	3	3	2	1
CO:3	3	1	3	1	2	2	3	3
CO:4	3	1	3	3	2	3	3	2
CO:5	3	2	3	2	3	3	2	3

CO-Curriculum Enrichment Mapping (Please write 3, 2, 1 wherever required)
Note: 3= Highly correlated, 2= Moderately correlated, 1= Less correlated

	Skill Development	Employability	Entrepreneurship Development
CO:1	3	2	1
CO:2	2	1	3
CO:3	1	3	2
CO:4	3	2	1
CO:5	3	3	2

Suggested Readings:

1. Barger EL, Liljedahl JB & McKibben EC. 1967. Tractors and their Power Units. Wiley Eastern.
2. Selection, Testing and Evaluation of Agricultural Machines and Equipment. FAO Service Bulletin No. 115. Lal R & Dutta PC. Agricultural Engineering (through solved examples). Saroj Parkashan, Allahabad.
3. Metha ML, Verma SR, Mishra SK & Sharma VK. 1995. Testing and Evaluation of Agricultural Machinery. National Agricultural Technology Information Centre, Ludhiana

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MFM152 Testing and Evaluation of Tractors and Farm Equipment Lab L:T:P 0:0:1

List of Experiments: Minimum 08 experiments out of the following:

1. Laboratory and field testing of selected farm equipment.
2. Interpretation and reporting of test results.
3. Material testing and its chemical composition.
4. Accelerated testing of fast wearing components.
5. Study of Non-destructive testing techniques.
6. Field capacity and field efficiency measurement for at least two machines/implements;
7. Draft & fuel consumption measurement for different implements under different soil conditions;
8. Introduction to various Testing farm machines,
9. Study of calibration of seed drill and seed-cum fertilizer drill
10. Study of different machinery (testing BIS test codes).

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MFM103 **Soil Dynamics in Tillage and Traction** **L:T:P 3:0:0**

Objective: To acquaint and equip with the dynamic properties of soil, soil failure and design of tillage tools, prediction of traction performance and dimensional analysis of different variables related to soil-tire system.

UNIT I

Dynamic properties of soil and their measurement, stress-strain relationships, theory of soil failure **for skill enhancement**.

UNIT II

Mechanics of tillage tools and geometry of soil tool system, design parameters and performance of tillage tools **for better skilling of entrepreneurship**.

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 **for better employability in industry**.

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 **methods for skilling of rescue management.**

UNIT V

Design of traction and transport devices. Soil compaction by agricultural vehicles and machines. **for skill development and employability**.

Course Outcomes:

Upon completion of this course, students will be:

CO1: Able to measure and utilize physical and mechanical properties of soil in order to interpret and predict soil stress-strain behavior **for skill enhancement**.

CO2: Able to design and implement safe and cost-effective mechanical soil tillage systems for producing desired physical states **for better skilling of entrepreneurship**.

CO3: Able to design and implement and cost-effective mechanical traction/transport systems which produce specified performance and acceptable alteration of affected soil profiles **for better employability in industry**.

CO4: Understand the need to learn and apply improved methodologies through continuing education **methods for skilling of rescue management.**

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CO5: Understand the design of traction and transport devices also soil compaction **for skill development and employability**.

PO-CO Mapping (Please write 3, 2, 1 wherever required)
Note: 3= Highly correlated, 2= Moderately correlated, 1= Less correlated

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8
CO:1	3	3	1	3	3	2	1	3
CO:2	1	3	2	1	3	3	2	2
CO:3	3	2	3	2	2	1	3	3
CO:4	3	1	3	3	1	3	3	
CO:5	3	2	3	1	3	3	1	3

CO-Curriculum Enrichment Mapping (Please write 3, 2, 1 wherever required)
Note: 3= Highly correlated, 2= Moderately correlated, 1= Less correlated

	Skill Development	Employability	Entrepreneurship Development
CO:1	3	1	2
CO:2	2	3	3
CO:3	3	1	2
CO:4	3	1	2
CO:5	3	3	1

References:

1. Daniel Hill. 1962. Fundamentals of Soil Physics. Academic Press.
2. Gill & Vandenberg.1968. Soil Dynamics in Tillage and Traction. Supdt. of Documents, U.S. Govt. Printing Office, Washington, D.C.
3. Sineokov GN. 1965. Design of Soil Tillage Machines. INSDOC, New Delhi.
4. Terzaghi K & Peck Ralph B.1967. Soil Mechanics in Engineering Practices. John Wiley & Sons.

Website Sources:

- https://ecourses.icar.gov.in/
- www.agrimoon.com

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MFM 201 System Simulation and Computer Aided Problem Solving in Engineering L:T:P 3:0:0

Objective: To acquaint and equip with the concept of dimensional analysis, mathematical modeling, software development process and the use of CAD software and in solving the engineering problems related to design of farm machinery.

UNIT I

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 **for skill enhancement**.

UNIT II

Mathematical modeling and engineering problem solving **for better skilling of entrepreneurship**.

UNIT III

Computers and software's – software development process – Algorithm design, – program composition- quality control- documentation and maintenance – software strategy **for better employability in industry**.

UNIT IV

Approximation- round off errors- truncation errors. Nature of simulation- systems models and simulation- discreet event simulation- time advance mechanisms- components of discreet event simulation model. Simulation of singular server que-programme organization and logic- development **methods for skilling of rescue management.**

UNIT V

Solving differential equation on computers- modeling engineering systems with ordinary differential equations- solution techniques using computers.

Course outcomes:

CO1: Computer graphics and tools for designing and drafting. & Mathematical modeling and engineering problem solving **for skill enhancement**.
CO2: Develop a good knowledge about construction of numerical control systems and machines **for better skilling of entrepreneurship**.
CO3: Develop a good knowledge about operation of numerical control systems and machines **for**

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better employability in industry.

CO4: Process planning and Part programming & software development process **methods for skilling of rescue management.**

CO5: Understand the solving of differential equation on computers **for skill development and employability**.

PO-CO Mapping (Please write 3, 2, 1 wherever required)
Note: 3= Highly correlated, 2= Moderately correlated, 1= Less correlated

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8
CO:1	3	3	1	3	3	2	1	3
CO:2	1	3	2	1	3	3	2	1
CO:3	3	1	3	2	2	1	3	3
CO:4	3	2	3	3	1	3	3	2
CO:5	3	1	3	1	3	3	1	3

CO-Curriculum Enrichment Mapping (Please write 3, 2, 1 wherever required)
Note: 3= Highly correlated, 2= Moderately correlated, 1= Less correlated

	Skill Development	Employability	Entrepreneurship Development
CO:1	3	2	1
CO:2	3	1	3
CO:3	2	3	1
CO:4	3	2	2
CO:5	3	3	2

References:

1. Averill M. Law & W David Kelton.2000. Simulation Modeling and Analysis. McGraw Hill.
2. Balagurusamy E. 2000. Numerical Methods. Tata McGraw Hill.
3. Buckingham E. 1914. On Physical Similar System. Physical Reviews 4: 345.
4. Langhar H. 1951. Dimensional Analysis and Theory of Models. John Wiley & Sons.
5. Murphy J. 1950. Similitude in Engineering. The Roland Press Co.

Website Sources:

- https://ecourses.icar.gov.in/
- www.agrimoon.com

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MFM 251 **Computer Aided Design Lab** **L:T:P 0:0:1**

List of Experiments: Minimum 08 experiments out of the following:

1. Study CAD Fundamental concept
2. Mathematical modeling and engineering problem solving.
3. Study software development process – Algorithm design,
4. Study Simulation of singular server que- programme organization and logic- development2
5. Extensive practice on Software development process, modeling techniques, use of CAD
6. Study of Software in solving engineering problems related to design of farm machinery
7. Study acquaint and equip with the concept of dimensional analysis,
8. Study Basic Fundamental concept of mathematical modeling,
9. Design of Farm equipment (minimum 2or3)
10. Study of Computers aided design softwares.

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MFM 202 Advances in Farm Machinery and Power Engineering L:T:P 3:0:0

Objective: To acquaint and equip with the latest design procedures of farm power and machinery systems.

UNIT I

Farm machinery system, its characteristics and evaluation. Identification of dynamic characteristics of related components of engine and agricultural machines. Mechanism of dynamic elements and analysis of forces, displacement and their equilibrium in machines **for skill enhancement**.

UNIT II

Statement and formulation of design problems. Computer-aided design of mechanical power transmission systems. Half interval search method **for better skilling of entrepreneurship**.

UNIT III

Analysis of forces in tractor implement combinations under two and three dimensional conditions. Vibrations, transmissibility and effect of damping on various agricultural machine systems like engine, cutter-bar, straw walker, threshing cylinder and reaper-binder **for better employability in industry**.

UNIT IV

Application of various vibration analysis methods. Tractor dynamics; development of the model. Checking, interpretation and statistical analysis of results. **methods for skilling of rescue management.**

UNIT V

Single and double-tie-rod steering systems, development of mathematical models and its computer-aided solutions **for skill development and employability**.

Course outcomes:

CO1: Getting knowledge of Farm Mechanization scenario and report writing **for skill enhancement**.

CO2: Learning selection of farm machinery on the basis of various requirements, their costing and replacement **for better skilling of entrepreneurship**.

CO3: Develop a good knowledge about Statement and formulation of design problems **for better employability in industry**.

CO4: Understand the application of various vibration analysis **methods for skilling of rescue management.**

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CO5: Understand the single and double-tie-road steering system **for skill development and employability**.

PO-CO Mapping (Please write 3, 2, 1 wherever required)
Note: 3= Highly correlated, 2= Moderately correlated, 1= Less correlated

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8
CO:1	3	3	1	3	3	2	2	3
CO:2	1	3	2	1	3	3	1	1
CO:3	3	2	3	2	1	1	3	3
CO:4	3	1	3	3	1	3	3	1
CO:5	3	2	3	1	3	3	1	3

CO-Curriculum Enrichment Mapping (Please write 3, 2, 1 wherever required)
Note: 3= Highly correlated, 2= Moderately correlated, 1= Less correlated

	Skill Development	Employability	Entrepreneurship Development
CO:1	3	2	1
CO:2	3	2	3
CO:3	1	3	2
CO:4	3	2	1
CO:5	3	3	2

References:

1. DK & Newwell IC. 2001. Modelling and Analysis of Dynamic System. John Wiley & Sons.
2. Franklin GF & Powell JD. 1980. Digital Control of Dynamic System. Addison Wesley Publ.
3. Kepner R A, Bainer R & Berger EL. 1978. Principles of Farm Machinery. AVI Publ.
4. Mabie H H & Ocrirk FW.1987. Mechanism and Dynamics of Machinery. John Wiley &Sons.
5. Shigley J E & Uicker JJ .1980. Theory of Machinery and Mechanism. McGraw Hill.

Website Sources:

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MMAG 204 Agricultural Statistics and Experimental Design L:T:P : 3:0:0

Objective: The main aims of this course are to provide comprehensive knowledge of the basic information of agriculture statistics and experimental design.

Unit I

Presentation of Data: Frequency distributions; graphical presentation of data by histogram, frequency polygon, frequency curve and cumulative frequency curves Measures of Locations and Dispersion: Mean, median, mode and their simple properties (with-out derivation) and calculations of median by graphs; range, mean deviation, standard deviation, standard error, coefficient of variation **for skill enhancement**.

Unit II

Probability and Distributions: Random distributions; events exhaustive, mutually exclusive and equally likely; definition of probability (with simple exercises); definitions of binomial, Poisson's and normal distributions; and simple properties of the above distributions (without derivation) **for better skilling of entrepreneurship**.

Unit III

Correlation and Regression: Bivariate data-simple correlation and regression coefficients and their relation; Spearman rank correlation; limits of correlation coefficient; effect of change of origin and scale on correlation coefficient; linear regression and equations of line of regression; association and independence of attributes **for better employability in industry**.

Unit IV

Sampling: Concept of population and sample; random samples; methods of taking a simple random sample. Tests of significance: sampling distribution of mean and standard error; z and t-test (equality of means; paired and unpaired t-test); t-test for comparison of means when variances of two populations differ; Chi- square test for goodness of fit; independence of attributes, and homogeneity of samples; interrelation between t-test and F-Test **methods for skilling.**

Unit V

Experimental Designs: Principles of experimental designs; completely randomized, randomized complete block design (missing plot value in RBD); latin square designs; augmented block design; simple factorial experiments including split and strip plot design (mathematical derivations not required); analysis of variance (ANOVA) and its use including estimation of LSD (CD) **for skill development and employability**.

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Course Outcomes:

The student is able to

CO1: Understand basic theoretical and applied principles of agricultural statistics needed to enter in agriculture **for skill enhancement**.

CO2: Demonstrate an understanding of the basic concepts of probability and random variables. **for better skilling of entrepreneurship**.

CO3: Understand and interpret the concepts of descriptive statistics from the obtained data **for better employability in industry**.

CO4: Utilize and apply regression and other statistical methods to analyze commodity markets and economic data **methods for skilling.**

CO5: Gain proficiency in using statistical software for data analysis **for skill development and employability**.

PO-CO Mapping (Please write 3, 2, 1 wherever required)
Note: 3= Highly correlated, 2= Moderately correlated, 1= Less correlated

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8
CO:1	3	3	2	3	3	1	1	3
CO:2	2	3	1	2	3	3	2	1
CO:3	3	1	3	1	1	2	3	3
CO:4	3	2	3	3	2	3	3	2
CO:5	3	1	3	2	3	3	2	3

CO-Curriculum Enrichment Mapping (Please write 3, 2, 1 wherever required)
Note: 3= Highly correlated, 2= Moderately correlated, 1= Less correlated

	Skill Development	Employability	Entrepreneurship Development
CO:1	3	2	3
CO:2	3	2	3
CO:3	2	3	2
CO:4	3	2	1
CO:5	3	3	3

References:

1. J. Medhi: Statistical Methods, New age International (P) Ltd.

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IFTMU, Moradabad.

2. J.K. Goyal & J.N. Sharma, Mathematical Statistics.
3. J.K. Ghosh, Mathematical Statistics, John Wiley & Sons, New York.
4. S.C. Gupta & V.K. Kapoor .Advanced Statistics, S. Chand.
5. M. Ray, Mathematical Statistics, R.P & Sons, Agra.
6. Goulden, C.H. (1952). Methods of Statistical Analysis, 2/e, John Wiley, New York
7. Kempton RA and Fox PN (1997). Statistical Methods for Plant Variety Evaluation.
8. Chapman and Hall.
9. Panse, V.C. and Sukhatme, P.V. (1967). Statistical Methods for Agricultural Workers,
10. I.C.A.R., New Delhi.

Website Sources:

- www.pdfdrive.com
- www.dmi.gov.in
- www.yourarticlelibrary.com
- www.onlinecourses.nptel.ac.in
- www.en.wikipedia.org

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MMAG 254 Agricultural Statistics and Experimental Design Lab L:T:P 0:0:1

List of Experiments:

1. Measurement of central tendency and dispersion
2. Standard deviation and standard error
3. Principle uses of χ_2, F and T- test.
4. Correlation Coefficient, Regression coefficient and Regression equation.
5. Analysis of data generated from completely randomized design, randomized block design.
6. Analysis of data generated from Latin square design, factorial experiments in 2^2, 2^3 Split plot designs
7. Missing plot techniques.
8. Analysis of covariance.
9. Sampling in field experiments.
10. Analysis of variance (ANOVA).

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MFM301 **Tractor Design** **L:T:P 3:0:0**

Objective: To acquaint and equip with the latest design procedures of tractor and its systems.

UNIT I

Technical specifications of tractors available in India, modern trends in tractor design and development **for skill enhancement**.

UNIT II

Special design features of tractors in relation to Indian agriculture Parameters affecting design of tractor engine and their selection **for better skilling of entrepreneurship**.

UNIT III

Design of fuel efficient engine components and tractor systems like transmission, steering, front suspension **for better employability in industry**.

UNIT IV

Design of hydraulic system & hitching, chassis, driver's seat, work-place area and controls. Tire selection **methods for skilling of rescue management.**

UNIT V

Mechanics of tractor. Computer aided design and its application in agricultural tractors **for skill development and employability**.

Course outcomes:

CO1: Design parameters of tractor engine components and power transmission system **for skill enhancement**.

CO2: Stability during operation and different tests conducted on tractor **for better skilling of entrepreneurship**.

CO3: Demonstrate of hydraulic system & hitching **for better employability in industry**.

CO4: Design of fuel efficient engine components and tractor systems **methods for skilling of rescue management.**

CO5: Understand the computer aided design and its application in agriculture tractors **for skill development and employability**.

PO-CO Mapping (Please write 3, 2, 1 wherever required)

Note: 3= Highly correlated, 2= Moderately correlated, 1= Less correlated

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	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8
CO:1	3	3	1	3	3	1	1	3
CO:2	1	3	2	1	3	3	2	2
CO:3	3	2	3	1	1	2	3	3
CO:4	3	2	3	3	2	3	3	1
CO:5	3	1	3	2	3	3	1	3

CO-Curriculum Enrichment Mapping (Please write 3, 2, 1 wherever required)
Note: 3= Highly correlated, 2= Moderately correlated, 1= Less correlated

	Skill Development	Employability	Entrepreneurship Development
CO:1	3	2	1
CO:2	3	2	3
CO:3	1	3	1
CO:4	3	1	2
CO:5	3	3	2

References:

1. Arther W Judge 1967. High Speed Diesel Engines. Chapman & Hall.
2. Barger E L, Liljedahl JB & Mc Kibben EC. 1967. Tractors and their Power Units. Wiley Eastern.
3. Macmillan R H. The Mechanics of Tractor - Implement Performance, Theory and Worked Example. University of Melbourne.
4. Maleev V L. 1945. Internal Combustion Engines. McGraw Hill.
5. Ralph Alcock 1986. Tractor Implements System. AVI Publ. Co.

Website Sources:

- https://ecourses.icar.gov.in/
- www.agrimoon.com

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MFM351 **Tractor Design Lab** **L:T:P 0:0:1**

List of Experiments: Minimum 08 experiments out of the following:

1. Extensive practices on the design of tractor engine
2. Study hydraulic system, driver seat, place area and control.
3. Study of Fuel supply system of SI engine;
4. Diesel injection system & timing;
5. Cooling system, and fan performance, thermostat and radiator 9 performance evaluation;
6. Study of Part load efficiencies & governing; lubricating system.
7. Study of adjustments; Starting and electrical system; Ignition system;
8. Study of Tractor engine heat balance and engine performance
9. Visit to engine manufacturer/assembler/spare parts agency.
10. Visit to Tractor manufacturer and assembler.

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MFM -302 Applied Instrumentation in Farm Machines and Stress Analysis L:T:P 3:0:0

Objective: To acquaint and equip with the concept of instrumentation used in farm power & machinery and measuring devices for force, torque and other parameters.

UNIT I

Basic instrumentation systems and transducer principles. Displacement Transducers Potentiometer, LVDT, Piezoelectric and capacitive transducers. Digital Transducers. Velocity transducers – Analog and Digital **for skill enhancement**.

UNIT II

Acceleration and absolute motion measurement. Force transducer _ Strain Gauge, Hydraulic load cell, Cantilever type and Probing ring. Method of separation of force – Torque, Power and Energy measuring techniques **for better skilling of entrepreneurship**.

UNIT III

Temperature measurement using Bi-metals, PTRs, Thermistors, Thermocouples, Electronic IC sensors and Pyrometers. Heat flux measurement. Humidity measurement – Dry and Wet bulb, Hair hygrometer and Humister. Soil and Grain moisture transducers, pressure measurement – Manometers, Bourdon Tube, Diaphragm type transducer. High pressure and vacuum sensing techniques **for better employability in industry**.

UNIT IV

Flow transducers, Positive displacement, venturimeter, Rota meter, Drag force, Ultrasonic, Electromagnetic, Hot wire anemometers. Time and frequency measurement **for skilling**

UNIT V

Level measurement, OD and pH measurement, PCO2 and grain quality measurement. Biomedical measurement – BP, ECG etc., Ultrasonic flaw detection, Spectroscopy **for skill development and employability**.

Course outcomes:

CO1: To help understand students the basics of Instrumentation, control and automation emphasizing on measurement principles, transducers and their types with applications **for skill enhancement**.

CO2: Demonstrate an awareness of the Basic instrumentation systems and transducer principles **for better skilling of entrepreneurship**.

CO3: Understand what are the high pressure and vacuum sensing techniques **for better employability**

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in industry.

CO4: Understand the Flow transducers, Positive displacement, venturimeter, Rota meter and Drag force, **for skilling.**

CO5: Demonstrate an awareness of the Level measurement, OD and pH measurement, PCO2 and grain quality measurement. BP, ECG etc **for skill development and employability**.

PO-CO Mapping (Please write 3, 2, 1 wherever required)
Note: 3= Highly correlated, 2= Moderately correlated, 1= Less correlated

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8
CO:1	3	3	2	3	3	1	1	3
CO:2	1	3	1	2	3	3	2	1
CO:3	3	2	3	1	1	2	3	3
CO:4	3	1	3	3	2	3	3	1
CO:5	3	1	3	2	3	3	2	3

CO-Curriculum Enrichment Mapping (Please write 3, 2, 1 wherever required)
Note: 3= Highly correlated, 2= Moderately correlated, 1= Less correlated

	Skill Development	Employability	Entrepreneurship Development
CO:1	3	2	1
CO:2	3	2	3
CO:3	1	3	1
CO:4	3	1	2
CO:5	3	3	2

References:

1. Doebelin EO.1990. Measurement Systems Applications and Design. Tata McGraw Hill.
2. Nakra BC & Chaudhary KK. 2004. Instrumentation Measurement and Analysis. Tata McGraw Hill.
3. Sawhney AK. 2008. Electrical and Electronics Measurement and Instrumentation. Dhanpat Rai & Sons.

Website Sources:

- https://ecourses.icar.gov.in/
- www.agrimoon.com

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MFM104 I Agro-Energy Audit and Management L:T:P 3:0:0

Objective: To acquaint and equip about the sources of energy, conservation of energy and its management. Energy use scenario in agricultural production system, agro-based industry. Study of energy efficiency, energy planning, forecasting and energy economics.

UNIT I

Energy resources on the farm Direct and indirect energy. Conventional and non-conventional forms of energy and their use. Heat equivalents and energy coefficients for different agricultural inputs and products **for skill enhancement**.

UNIT II

Energy audit of production agriculture, and rural living and scope of conservation. Energy use scenario in agricultural production system, agro-based industry **for better skilling of entrepreneurship**.

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. **for better employability in industry**.

UNIT IV

Energy conservation planning and practices. Energy forecasting, Energy economics, Energy pricing and incentives for energy conservation, factors effecting energy economics. Energy modelling. **methods for skilling of rescue management.**

UNIT V

Study of energy efficiency, energy planning, forecasting and energy economics. pattern of energy consumption and their constraints in production of agriculture **for skill development and employability**.

Course outcomes:

CO1: Understand need to differentiate between conventional, non-conventional & renewable energy sources **for skill enhancement**.

CO2: Reason out why the non-conventional energy sources need to be used as replacement to conventional form of energy **for better skilling of entrepreneurship**.

CO3: To know the importance & role of government all over the world to promote use of the renewable energy sources **for better employability in industry**.

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CO4: Recognizing of energy sources and types of energy used in agricultural production and agro-industry **methods for skilling of rescue management.**

CO5: Collecting of necessary data for pre-energy audit in an agricultural enterprise or agroindustry, Performing of organization and planning of necessary infrastructure studies for establishing of energy management system **for skill development and employability**.

PO-CO Mapping (Please write 3, 2, 1 wherever required)
Note: 3= Highly correlated, 2= Moderately correlated, 1= Less correlated

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8
CO:1	3	3	1	3	3	1	2	3
CO:2	1	3	1	2	3	3	1	1
CO:3	3	2	3	2	1	1	3	3
CO:4	3	1	3	3	2	3	3	2
CO:5	3	1	3	1	3	3	2	3

CO-Curriculum Enrichment Mapping (Please write 3, 2, 1 wherever required)
Note: 3= Highly correlated, 2= Moderately correlated, 1= Less correlated

	Skill Development	Employability	Entrepreneurship Development
CO:1	3	2	1
CO:2	3	1	3
CO:3	1	3	1
CO:4	3	2	2
CO:5	3	3	1

References:

1. Kennedy WJ Jr. & Wayne C Turner.1984. Energy Management. Prentice Hall.
2. CRC Fluck RC & Baird CD.1984. Agricultural Energetics. AVI Publ.
3. Rai GD. 1998. Non-conventional Sources of Energy. Khanna Publ.
4. Twindal JW & Anthony D Wier 1986. Renwable Energy Sources. E & F.N. Spon Ltd.

Website Sources:

- https://ecourses.icar.gov.in/
- www.agrimoon.com

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MFM 104 II Machinery for Natural Resources Management and Precision Farming L:T:P 3:0:0

Objective: To Acquaint and equip with the farm Machinery used for natural recourses management and machinery for precision farming use of GIS and GPS in farm Machinery :

UNIT I

Functional design, specifications, requirements and working of farm machinery needed for natural resources management like rotavator, Precision sowing and planting machines, laser guided leveller, power sprayer ,straw chopper cum spreader, straw bailer , combine harvester etc **for skill enhancement**.

UNIT II

Ag GPS parallel swathing option, data base management, functional systems documentation. Application of relevant software **for better skilling of entrepreneurship**.

UNIT III

An introduction to precision farming. GIS/GPS positioning system for precision farming, Yield monitoring and mapping, soil sampling and analysis. Computers and Geographic information systems. Precision farming- Issues and conditions. Role of electronics in farm machinery for precision farming **for better employability in industry**.

UNIT IV

Engineering fundamentals related to earth moving machinery: Swell, shrinkage and compaction measurements. Use of tractors & Crawlers and effects of altitude & temperature on their performance. Grade resistance and gradability **methods for skilling of rescue management.**

UNIT V

Land cleaning and reclamation equipment. Land leveling equipment. Power shovels, drag lines, cam shells. Rubber tire for earth moving machinery. Trenching machineries and wagons. Economic analysis of land development machinery. Application of PERT and CPM to the problems related to land development **for skill development and employability**.

Course outcomes:

CO1: Students interested in technology will learn how satellite based guidance systems and other related technologies can be utilized to track and manage agricultural inputs (i.e. seed, fertilizer, fuel) and better manage their farming operation **for skill enhancement**.

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CO2: Take this knowledge directly to industry working for agricultural consults and manufacturers **for better skilling of entrepreneurship**.

CO3: Understanding how to set up an auto guidance system is only a small piece of the puzzle. **for better employability in industry**.

CO4: Students master precision agriculture technologies like soil and crop health sensors, yield monitors, GNSS, GIS and mapping, variable rate controllers, and automated guidance. **methods for skilling of rescue management.**

CO5: Graduates of this program are challenged to understand management and troubleshooting of the entire agricultural system **for skill development and employability**.

PO-CO Mapping (Please write 3, 2, 1 wherever required)
Note: 3= Highly correlated, 2= Moderately correlated, 1= Less correlated

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8
CO:1	3	3	1	3	3	3	3	1
CO:2	3	3	3	1	1	3	1	1
CO:3	3	1	1	1	1	2	1	3
CO:4	3	2	3	3	1	1	3	3
CO:5	3	3	3	1	3	3	1	3

CO-Curriculum Enrichment Mapping (Please write 3, 2, 1 wherever required)
Note: 3= Highly correlated, 2= Moderately correlated, 1= Less correlated

	Skill Development	Employability	Entrepreneurship Development
CO:1	3	2	1
CO:2	3	1	3
CO:3	2	3	1
CO:4	3	2	1
CO:5	3	3	2

References:

1. Dutta SK. 1987. Soil conservation and land management. International distributors, Dehradun.

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2. Kuhar, John. E. 1977. The precision farmimg guide for agriculturalist. Lori J. Dhabalt, USA.
3. Lille Sand, T and Kaiffer, R. Remote Sensing and Image Interpretation, John Willy and Sons, London.
4. Nichols HL& Day DH.1998. Moving the earth. The work book of excavation. Mcgraw Hill.
5. Peurifoy RL 1956.Construction, planning, equipment and methods. Mcgraw Hill

Website Sources:

- https://ecourses.icar.gov.in/
- www.agrimoon.com

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MFM104(III) – MACHINERY FOR PRECISION AGRICULTURE

Course objective

To learn the principles behind precision agriculture and the systems for implantingthe same.

Unit I

Importance of precision agriculture. Mapping in farming for decision making. Geographical concepts of PA. Understanding and identifying variability. **for skill enhancement**

Unit II

Geographical Position System (GPS) Basics (Space Segment, Receiver Segment, Control Segment), Error and correction, Function and usage of GPS. Introduction to Geographic Information system (GIS), function of GIS, use of GIS for decisions. IDI devices usage in Precision Agriculture Yield monitor, variable rate applicator for fertilizers, seed, chemicals etc. Remote sensing Aerial and satellite imagery. Above ground (non-contact) sensors. **better skilling of entrepreneurship**

Unit III

Data analysis, concepts of data analysis, resolution, Surface analysis. Analysis application interpretive products (map, charts, application map etc). **better skilling ofentrepreneurship**

Unit IV

Electronics and Control Systems for Variable rate applications, Precision Variable Equipment, Tractor-Implement interface technology, Environmental Implications of Precision Agriculture. **For better employability in industry**

Unit V

Goals based on end results of Precision Agriculture, Recordkeeping, Spatial Analysis, Variable Rate Application, Reducing of negative environmental impact, Crop/ technology cost optimization. Economic of precision agriculture and determining equipment and software, review of Cost/Benefit of Precision Agriculture, System vs. Parcels. Making a selection. **For better employability in industry**

Outcomes

Knowledge about the

CO1: principles guiding the concept of precision agriculture **for skill enhancement**

CO2: Farm Machinery and for **better skilling of entrepreneurship**

CO3: equipment systems that make use of this principle. **For better skilling ofentrepreneurship**

CO4: Electronics and Control Systems for Variable rate applications **For better employability in industry**

CO5: Goals based on end results of Precision Agriculture **For better employability in industry**

PO-CO Mapping (Please write 3, 2, 1 wherever required)

Note: 3= Highly correlated, 2= moderately correlated, 1= Less correlated

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	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8
CO:1	2	3	3	2	3	2	1	3
CO:2	3	2	3	3	3	3	2	3
CO:3	1	2	3	2	3	1	3	3
CO:4	3	3	1	3	2	1	3	2
CO:5	3	2	1	3	2	1	2	3

CO-Curriculum Enrichment Mapping (Please write 3, 2, 1 wherever required)

Note: 3= Highly correlated, 2= Moderately correlated, 1= Less correlated

	Skill Development	Employability	Entrepreneurship Development
CO:1	3	2	1
CO:2	2	1	3
CO:3	2	1	3
CO:4	1	3	2
CO:5	2	3	1

Suggested Books

• Clay SA, Clay DE and Bruggeman SA. 2017. *Practical Mathematics for Precision Farming* American Society of Agronomy, Crop Science Society and Soil Science Society of America, 5585 Gulford Rd, Madison, WI 53711

Henten EJV, Goense D and Lokhorst C. 2009. *Precision Agriculture*. Wageningen Academic Publishers.

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MFM104(IV) – FUNDAMENTALS OF NEW INTRODUCE AGRICULTURE FARM

Course objectives:

- To introduce the students to the working principles of New Introduce Agricultural Farm hand Tools
- To expose the students to farm mechanization benefits and constraints, identification of components of tillage hand tools /implements

Unit-I

Agriculture- horticulture farm- small implements for the use of kitchen gardening tools and use for the operation of flowering plant in the house. Intercultural operation potato field **for skill enhancement**

Unit-II

Equipment for slicing, shredding, crushing, chopping, juice extraction, etc. **for skill enhancement**

Unit-III

Introduction to new inter-culture equipments. Weeder – manual and powered, main components and their functional requirement. Study of harvesting operation – methods and terminology. Working efficiency new farm hand tools. **For better skilling of entrepreneurship**

Unit-IV

Weeding equipment – hand hoe – long handled weeding tools – dryland star weeder – wetland conoweeder and rotary weeder – Engine operated and tractor weeders Sprayers –types-classification – methods of atomization, spray application rate, droplet size determination – volume median diameter, numerical median diameter – drift control **For better employability in industry**

Unit- V

Farm mechanisation – objectives. Tillage - objectives - methods – New Introduce Agricultural Farm hand Tools - construction. Types of farm tools - forces acting on tillage tool. **For better skilling of entrepreneurship**

Outcomes:

CO: 1 The students will be able to understand agriculture- horticulture farm- small implements for the use of kitchen gardening tools **for skill enhancement**

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CO: 2 The students will be able to understand equipment for slicing, shredding, crushing, chopping, juice extraction, etc. **for skill enhancement**

CO:3 The students will be able to understand the new inter-culture equipments for the different operations. **For better skilling of entrepreneurship**

CO: 4 The students will be able to understand the Weeding equipment **For better employability in industry**

CO: 5 The students will be able to understand the mechanization and various equipment used in the farm for different field operations. **For better skilling of entrepreneurship**

PO-CO Mapping (Please write 3, 2, 1 wherever required)

Note: 3= Highly correlated, 2= moderately correlated, 1= Less correlated

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8
CO:1	2	3	3	2	3	2	1	3
CO:2	3	2	3	3	3	3	2	3
CO:3	1	2	3	2	3	1	3	3
CO:4	3	3	1	3	2	1	3	2
CO:5	3	2	1	3	2	1	2	3

CO-Curriculum Enrichment Mapping (Please write 3, 2, 1 wherever required)

Note: 3= Highly correlated, 2= Moderately correlated, 1= Less correlated

	Skill Development	Employability	Entrepreneurship Development
CO:1	3	2	1
CO:2	3	1	2
CO:3	2	1	3
CO:4	1	3	2
CO:5	2	1	3

Suggested Books:

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1. Jagdishwar Sahay. Elements of Agricultural Engineering. Standard Publishers Distributors, Delhi 6.,2010.
2. Michael and Ohja. Principles of Agricultural Engineering. Jain brothers, New Delhi., 2005
3. Kepner, R.A., et al. Principles of farm machinery. CBS Publishers and Distributers, Delhi. 99, 1997.
4. Harris Pearson Smith et al. Farm machinery and equipment. Tata McGraw-Hill pub., New Delhi. 1996.
5. Srivastava, A.C. Elements of Farm Machinery. Oxford and IBH Pub. Co., New Delhi, 1990.

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MFM104(V) – MACHINERY FOR HORTICULTURE AND PROTECTEDAGRICULTURE

Course objective To learn about the different machinery used in cultivation of vegetable crops, orchard crops and also in protected agriculture.

Unit I

Vegetable cultivation, nursery machinery, tray seeders, grafting machines, vegetable trans-planters. Machinery for planting crops on raised beds, mulch laying and planting machines. Harvesting of vegetable crops: Harvesting platforms and pickers **for skill enhancement.**

Unit II

Machinery for orchard crops: Pit diggers, inter-cultivators and basin forming equipment for orchards. Machinery for transplanting of trees. Harvesters for fruit crops: Shaker harvesters, types and principle of operation. Elevated platforms for orchard management and harvesting. Pruning machines **for skill enhancement.**

Unit III

Machinery for orchards, vineyard machinery spraying machines, inter-cultivation machines. High clearance machines and special purpose machinery for crops on trellis. Machinery for special crops: Tea leaf harvesters, pruners and secateurs f**or betterskilling of entrepreneurship.**

Unit IV

Machinery for lawn and garden: Grass cutters, special machinery for turf maintenance. Turf aerators and lime applicators **for better employability in industry.**

Unit V

Protected agriculture: Principles, mechanical systems of greenhouse, ventilation systems, shading system, water fogging system, irrigation system, sensors, electrical and electronic system. Intelligent Control system for greenhouses. Machinery for processing of growth media, tray filling machines-tray sowing machines, transplanting machines. Robotic grafting machines. Weeding and thinning equipment. Crop protection and harvest under protected agriculture **for better skilling of entrepreneurship.**

Outcomes

Knowledge about

CO1: Machinery for planting crops on raised bed **for skill enhancement**

CO2: different principles of mechanizing cultivation of horticultural crops **for skillenhancement**

CO3: Machinery for orchards, vineyard **for better skilling of entrepreneurship**

CO4: Machinery for lawn and garden **better employability in industry**

CO5: mechanizing cultivation of protected agriculture **for better skilling of entrepreneurship**

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PO-CO Mapping (Please write 3, 2, 1 wherever required)

Note: 3= Highly correlated, 2= moderately correlated, 1= Less correlated

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8
CO:1	2	3	3	2	3	2	1	3
CO:2	3	2	3	3	3	3	2	3
CO:3	1	2	3	2	3	1	3	3
CO:4	3	3	1	3	2	1	3	2
CO:5	3	2	1	3	2	1	2	3

CO-Curriculum Enrichment Mapping (Please write 3, 2, 1 wherever required)

Note: 3= Highly correlated, 2= Moderately correlated, 1= Less correlated

	Skill Development	Employability	Entrepreneurship Development
CO:1	3	2	1
CO:2	3	1	2
CO:3	2	1	3
CO:4	1	3	2
CO:5	2	1	3

Suggested Reading

• Bell B and Cousins S. 1997. *Machinery for Horticulture*. Old Pond Publishing Ltd ISBN-10: 0852363699,ISBN-13: 978-0852363690

• *Good Agricultural Practices for Greenhouse Vegetable Production in the South East European countries* FAO Rome 201

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MFM104(VI) – FATIGUE DESIGN

Course objective

The course provides an understanding on fatigue design considerations of mechanical components. The causes of fatigue in brittle and ductile materials are taught with focus on crack initiation, propagation and fracture.

Unit I

Theories of failure, maximum normal stress, maximum shear stress and distortion energy theory, failure of ductile materials, failure of brittle materials **for skill enhancement.**

Unit II

Stress concentration and its evaluation, stress concentration of ductile and brittle materials under static loading and under dynamic loading, determining geometric stress concentration factors, designing to avoid stress concentration **for skill enhancement.**

Unit III

Fatigue of machine components, mechanism of fatigue failure, fatigue failure models and their considerations in design of machine elements, fatigue loads. Fatigue testing and presentation of fatigue data. Influence of stress conditions on fatigue strength/endurance limit of metals. Low and high cycle fatigue f**or better skilling ofentrepreneurship.**

Unit IV

Cumulative fatigue damage. Designing for finite and infinite life. Improving fatigue resistance of machine elements. Stress corrosion. Corrosion fatigue **for better employability inindustry.**

Unit V

Practical Fatigue tests on testing machine(s) for specimens of different materials having different discontinuities/stress raisers and various surface conditions. Determination of correlation between fatigue limit and ultimate strength of material. Problems in fatigue design of common machine component. **For better skilling of entrepreneurship.**

Outcomes

The students is able to understand
CO1: technical aspects and principles of fatigue design.
CO2: design the engineering product having good durability and
CO3: design the engineering product having long fatigue life
CO4: Cumulative fatigue damage
CO5: Practical Fatigue tests on testing machine

PO-CO Mapping (Please write 3, 2, 1 wherever required)

Note: 3= Highly correlated, 2= moderately correlated, 1= Less correlated

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	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8
CO:1	2	3	3	2	3	2	1	3
CO:2	3	2	3	3	3	3	2	3
CO:3	1	2	3	2	3	1	3	3
CO:4	3	3	1	3	2	1	3	2
CO:5	3	2	1	3	2	1	2	3

CO-Curriculum Enrichment Mapping (Please write 3, 2, 1 wherever required)

Note: 3= Highly correlated, 2= Moderately correlated, 1= Less correlated

	Skill Development	Employability	Entrepreneurship Development
CO:1	3	2	1
CO:2	3	1	2
CO:3	2	1	3
CO:4	1	3	2
CO:5	2	1	3

Suggested books

• Lessells, J.M. 1955. *Strength and resistance of metals*. John Wiley & sons, Michigan.
• T.L. Anderson. 2005. *Fracture Mechanics Fundamentals and Applications*. CRC press, Boca Raton.
• Bhandari V.B.2019. *Design of Machine Elements*. Mcgraw Hill Education Pvt. Ltd, NewDelhi

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MFM 203 I Ergonomics and Safety in Farm Operations L:T:P 3:0:0

Objective: To acquaint and equip with the ergonomic aspects in the design of farm machinery for safety of human beings

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 **for skill enhancement**.

UNIT II

Physiological stress indices and their methods of measurement Mechanical efficiency of work, fatigue and shift work **for better skilling of entrepreneurship**.

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 **for better employability in industry**.

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 **methods for skilling of rescue management.**

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. **for skill development and employability**.

Course outcomes:

CO1: Demonstrate an awareness of the unique attributes involved with farm work and planning for safety on a farm **for skill enhancement**.

CO2: Understand the impact of near misses, injuries and fatalities on the farm, including the daily workings, business finances, the wide range of people affected, etc. **for better skilling of entrepreneurship**.

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CO3: Understand what hazards are, how they manifest, and how they impact business efficiency **for better employability in industry**.
CO4: Understand the elements involved in creating a farm safe plan **methods for skilling of rescue management.**
CO5: Understand how developing a farm safe plan can be valuable tool for business management, risk **for skill development and employability**.

PO-CO Mapping (Please write 3, 2, 1 wherever required)
Note: 3= Highly correlated, 2= Moderately correlated, 1= Less correlated

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8
CO:1	3	3	1	3	3	2	1	3
CO:2	1	3	1	2	3	3	2	
CO:3	3	2	3	1	1	1	3	3
CO:4	3	1	3	3	2	3	3	
CO:5	3	2	3	1	3	3	1	3

CO-Curriculum Enrichment Mapping (Please write 3, 2, 1 wherever required)
Note: 3= Highly correlated, 2= Moderately correlated, 1= Less correlated

	Skill Development	Employability	Entrepreneurship Development
CO:1	3	2	1
CO:2	1	3	2
CO:3	3	2	3
CO:4	3	1	3
CO:5	3	2	1

References:

1. Bridger R S. 1995. Introduction to Ergonomics. McGraw Hill.
2. Charles D Reese. 2001. Accident / Incident Prevention Techniques. Taylor & Francis.
3. Gavriel Salvendy. 1997. Hand Book of Human Factors and Ergonomics. John Wiley & Sons.
4. Kromer KHE. 2001. Ergonomics. Prentice Hall.
5. Mathews J & Knight AA.1971. Ergonomics in Agricultural Design. National Institute of Agric. Engineering, Wrest Park Silsoe, Bedford.

Website Sources:

- https://ecourses.icar.gov.in/
- www.agrimoon.com

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MFM 203 II Farm Machinery Dynamics Noise and Vibrations L:T:P 3:0:0

Objective: To acquaint and equip with the theoretical aspects of farm machinery used on the farm

UNIT I

Principles of soil working tools: shares, discs, shovels, sweeps and blades, rota-tillers and puddlers **for skill enhancement**.

UNIT II

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 **for better skilling of entrepreneurship**.

UNIT III

Theory of atomization, specific energy for atomization, electrostatic spraying and dusting, spray distribution patterns. Kinematics of reapers/harvesting machines. Theory of mechanical separation of grains from ear heads/pods. Parameters affecting performance of threshers, aerodynamic properties of straw and grain mixture, theory of root crop harvesters, power requirement of various components of field machines. **for better employability in industry**.

UNIT IV

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 **methods for skilling of rescue management.**

UNIT V

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 **for skill development and employability**.

Course outcomes:

CO1: Demonstrate of all type of soil working tools **for skill enhancement**.
CO2: Understand Metering of seeds and granular fertilizers with various mechanisms & distribution of seed and fertilizer in seed cum fertilizer drills and planters etc. **for better skilling of entrepreneurship**.

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CO3: Understand Theory of atomization, specific energy for atomization, electrostatic spraying and dusting, spray distribution patterns. Kinematics of reapers/harvesting machines **for better employability in industry**.

CO4: Understand the theory of root crop harvesters, power requirement of various components of field machines **methods for skilling of rescue management.**

CO5: Understand about transient vibration in systems **for skill development and employability**.

PO-CO Mapping (Please write 3, 2, 1 wherever required)
Note: 3= Highly correlated, 2= Moderately correlated, 1= Less correlated

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8
CO:1	3	1	3	3	3	1	3	1
CO:2	3	3	1	1	2	3	1	2
CO:3	3	2	3	2	3	2	3	3
CO:4	3	1	2	3	1	3	3	1
CO:5	3	2	3	1	3	3	2	3

CO-Curriculum Enrichment Mapping (Please write 3, 2, 1 wherever required)
Note: 3= Highly correlated, 2= Moderately correlated, 1= Less correlated

	Skill Development	Employability	Entrepreneurship Development
CO:1	3	2	1
CO:2	3	1	3
CO:3	2	3	2
CO:4	3	2	1
CO:5	3	1	2

References:

1. Ballaney P L. 1974. Theory of Machines. Khanna Publ.
2. Harris C M & Crede CE. 1976. Shock and Vibration Hand Book. McGraw Hill.
3. Holowenko AR. 1967. Dynamics of Machinery. McGraw Hill. Kelly SG. 2000. Fundamental of Mechanical Vibration. 2nd Ed. McGraw Hill.

Website Sources:

- https://ecourses.icar.gov.in/
- www.agrimoon.com

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MFM203(III) - DESIGN OF FARM MACHINERY – I

Course objective

To understand the interaction of tillage tools with soil and design the componentsof the tillage tools based on their requirement and also to learn how the systems of planting machinery are designed.

Unit I

Farm machinery design: Modern trends, tasks and requirements, economic considerations of durability, reliability and rigidity. Physico-mechanical properties of soils. Technological process of ploughing. Wedge. Working process of mould board plough, determination of basic parameters. Design of coulters, shares, mouldboards. **for skill enhancement**

Unit II

Constructing of mould board working surface. Design of landside, frog, jointer. Forces acting on plough bottom and their effect on plough balance: Trailed, semi mounted and mounted plough. Draft on ploughs, resistance during ploughing. Design disk ploughs: Concave disk working tools, forces acting. **for skill enhancement**

Unit III

Machines and implements for surface and inter row tillage; Peg toothed harrow, disk harrows,rotary hoes, graders, rollers, cultivators. Design of V shaped sweeps. Rigidity of working tools. Rotary machines: Trajectory of motion of rotary tiller tynes, forces acting, power requirement. Machines with working tools executing anoscillatory motion. **For better skilling of entrepreneurship**

Unit IV

Methods of sowing and planting: Machines, agronomic specifications. Sowing intertilled crop. Grain hoppers: Seed metering mechanism, furrow openers and seed tubes. For better employability in industry

Unit V

Machines for fertilizer application: Discs type broadcasters. Organic fertilizer application: Properties of organic manure, spreading machines. Liquid fertilizer distributors. Planting and transplanting: Paddy transplanters, potato planters. **For better skillingof entrepreneurship**

Outcomes

The student will be able to appreciate the

CO1: principles behind the design of tillage tools **for skill enhancement**

CO2: planting machinery **for skill enhancement**

CO3: design configurations for such machines. . **For better skilling of entrepreneurship**

CO4: Methods of sowing and planting **For better employability in industry**

CO5: Machines for fertilizer application . **For better skilling of entrepreneurship**

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PO-CO Mapping (Please write 3, 2, 1 wherever required)

Note: 3= Highly correlated, 2= moderately correlated, 1= Less correlated

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8
CO:1	2	3	3	2	3	2	1	3
CO:2	3	2	3	3	3	3	2	3
CO:3	1	2	3	2	3	1	3	3
CO:4	3	3	1	3	2	1	3	2
CO:5	3	2	1	3	2	1	2	3

CO-Curriculum Enrichment Mapping (Please write 3, 2, 1 wherever required)

Note: 3= Highly correlated, 2= Moderately correlated, 1= Less correlated

	Skill Development	Employability	Entrepreneurship Development
CO:1	3	2	1
CO:2	3	1	2
CO:3	2	1	3
CO:4	1	3	2
CO:5	2	1	3

Suggested books

• Bernacki C, Haman J and Kanafajski Cz. 1972. *Agricultural Machines Theory and Construction.* Vol.I. U.S. Dept. of Commerce, National Technical Information Service,Springfield, Virginia 22151.

• Bosoi ES, Verniaev OV, Smirnov II and Sultan-Shakh EG. 1990. *Theory, Construction and Calculations of Agricultural Machinery - Vol. I.* Oxonian Press Pvt. Ltd. No.56, Connaught Circle, New Delhi.

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MFM203(V) – VIBRATIONS

Course objective

To enable the students to design vibration control sytem,and balancing of rotating and reciprocating masses.

Unit I

Vibration motion and its terminology. Undamped free vibrations, equations of motion- natural frequency. Energy method, Rayleigh method; effective mass principle of Virtual work. Equivalent spring stiffness in parallel and in series. Harmonic analysis and Fourier Series **for skill enhancement**

Unit II

Damping - viscous, solid, coulomb equivalent dampers. Viscosity damped free vibrations, Logarithmic decrement. Forced vibrations with harmonic excitation and rotating unbalance. Energy dissipated by damping for skill enhancement

Unit III

Forced vibration with damping, Vibration isolation and force and motion transmissibility. Two degree of freedom systems. Principal modes of vibration, coordinate coupling. Vibration absorbers **For better employability in industry**

Unit IV

Free vibration equation of motion for multi-degree of freedom systems. Influence coefficients and Maxwell's reciprocal theorem, stiffness coefficients. Numerical methods for finding natural frequencies for multi-degree of freedom systems. **For better skillingof entrepreneurship**

Unit V

Vibration of lumped parameter systems and continuous systems. Lagrange equations. Vibration measuring instruments, Vibrometers, velocity pickups, Accelerometer and frequency measuring instruments. Applications of vibrations. Vibration control, balancing of rotating and reciprocating machines, design of vibration isolators. **For better employability in industry**

Outcomes

The student will be able to understand the

CO1: concept of vibrations, **for skill enhancement**

CO2: analyze the mathematical modeling of the multidegree freedom systems **for skill enhancement**

CO3: design vibration isolators. **For better employability in industry**

CO4: Free vibration equation of motion for multi-degree of freedom systems **For better skilling of entrepreneurship**

CO5: Vibration of lumped parameter systems and continuous systems **For better employability in industry**

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PO-CO Mapping (Please write 3, 2, 1 wherever required)

Note: 3= Highly correlated, 2= moderately correlated, 1= Less correlated

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8
CO:1	2	3	3	2	3	2	1	3
CO:2	3	2	3	3	3	3	2	3
CO:3	1	2	3	2	3	1	3	3
CO:4	3	3	1	3	2	1	3	2
CO:5	3	2	1	3	2	1	2	3

CO-Curriculum Enrichment Mapping (Please write 3, 2, 1 wherever required)

Note: 3= Highly correlated, 2= Moderately correlated, 1= Less correlated

	Skill Development	Employability	Entrepreneurship Development
CO:1	3	2	1
CO:2	3	1	2
CO:3	2	3	1
CO:4	1	2	3
CO:5	2	2	1

Suggested Reading

- V.P. Singh.2014. *Mechanical Vibrations*. Dhanpat Rai and Comopany, New Delhi
- Rao S S. 2010.*Mechanical Vibrations*. Pearson Education, Delhi
- Srinivas P.1983. *Mechanical Vibration Analysis*. Tata McGraw Hill Company Limited, New Delhi

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MFM203(VI) – NUMERICAL METHODS FOR ENGINEERS

Course objective

To expose students to various numerical methods for solving algebraic equations, ordinary and partial differential equations.

Unit I

Solution of Algebraic Equations: Solution of non-linear and transcendental equations in one or more than one variable using bisection, false position, iteration, Newton Raphson, Secant methods. Solution of linear simultaneous equations: Matrix inversion, Gauss elimination, Gauss Jordan, LU decomposition methods, ill conditioned systems **for skill enhancement**

Unit II

Solution of Ordinary Differential Equations: Initial Value Problem, Taylor series method, Picard's method, Euler method, Modified Euler method, RK class and predictor corrector class methods. Stiff ODE's and Gear's methods. Boundary Value Problem, Shooting methods, finite difference method. Use of Method of weighted residuals and orthogonal collocation and Galerkin technique to solve BVP in ODEs **for skillenhancement**

Unit III

Eigen values and Eigen vectors: Maximum and minimum eigen value by Power spectral and Inverse Power Method, all eigen values by Fadeev-Leverrier method. Introduction to diagonalization and QR Factorization. Approximation Theory. **For betterskilling of entrepreneurship**

Unit IV

Finite difference formulae: Forward and backward differences, Richardson's extrapolation, interpolation formulae, polynomial forms, linear interpolation, Lagrange interpolation polynomial, Newton interpolation polynomial. **For better employabilityin industry**

Unit V

Solution of Partial Differential Equations: Classification of PDEs(Parabolic, elliptical and hyperbolic equation), Elliptical equations, standard five points formula, diagonal five-point formula. Solution of Laplace equation by Liebman's iteration method. Poisson's equation and its applications. Solution of parabolic equations by Bender–Schmidt method, Bender-Schmidt recurrence equation, Crank-Nicholson difference method. **For better employability in industry**

Outcomes

Ability to solve
CO1: algebraic equations, ordinary and partial differential equations coming across in Agricultural Engineering problems **for skill enhancement**
CO2: use various numerical methods, **for skill enhancement**

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CO3: ability to use latest software's towards numerical problems. **For better skilling of entrepreneurship**

CO4: Finite difference formulae **For better employability in industry**

CO5: Solution of Partial Differential Equations **For better employability in industry**

PO-CO Mapping (Please write 3, 2, 1 wherever required)

Note: 3= Highly correlated, 2= moderately correlated, 1= Less correlated

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8
CO:1	2	3	3	2	3	2	1	3
CO:2	3	2	3	3	3	3	2	3
CO:3	1	2	3	2	3	1	3	3
CO:4	3	3	1	3	2	1	3	2
CO:5	3	2	1	3	2	1	2	3

CO-Curriculum Enrichment Mapping (Please write 3, 2, 1 wherever required)

Note: 3= Highly correlated, 2= Moderately correlated, 1= Less correlated

	Skill Development	Employability	Entrepreneurship Development
CO:1	3	2	1
CO:2	3	1	2
CO:3	2	1	3
CO:4	1	3	2
CO:5	2	3	1

Suggested Books

• Anderson T W 1958. *An Introduction to Multivariate Statistical Analysis*. John Wiley.
• Dillon W R and Goldstein M. 1984. *Multivariate Analysis - Methods and Applications*. John Wiley.

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MFM 303 I Energy Conservation and Management in Farm Power and Machinery L:T:P 3:0:0

Objective: To acquaint and equip with the energy use pattern in agriculture production systems, conservation of energy, energy planning and economics.

UNIT I

Energy requirement of different operations in agricultural production systems viz. crop, livestock and aquaculture **for skill enhancement**.

UNIT II

Energy conservation through proper management and maintenance of farm machinery, planning and management of agricultural production systems for energy conservation and energy returns assessment **for better skilling of entrepreneurship**.

UNIT III

Development of computer program for efficient energy management in a given agricultural production system. Energy use planning and forecasting for a given system **for better employability in industry**.

UNIT IV

Computer aided design and its application in agricultural tractors. IC engine fuels - their properties & combustion of fuels, gasoline tests and their significance, diesel fuel tests and their significance, detonation and knocking in IC engines, **methods for skilling of rescue management.**

UNIT V

Study of properties of coolants, anti freeze and anti-corrosion materials, lubricant types & study of their properties **for skill development and employability**.

Course outcomes:

CO1: Determine what farm practices use the most energy for producing a crop **for skill enhancement**.

CO2: Describe farm equipment options for reducing energy use **for better skilling of entrepreneurship**.

CO3: Describe management options for reducing energy use **for better employability in industry**.

CO4: Understand the computer aided design and its application **methods for skilling of rescue management.**

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CO5: Understand the properties of coolants **for skill development and employability**.

PO-CO Mapping (Please write 3, 2, 1 wherever required)
Note: 3= Highly correlated, 2= Moderately correlated, 1= Less correlated

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8
CO:1	3	1	3	1	1	2	3	1
CO:2	3	3	1	2	3	1	2	2
CO:3	3	1	3	3	1		3	3
CO:4	3	2	2	3	3	3	3	3
CO:5	1	3	3	2	3	3	1	3

CO-Curriculum Enrichment Mapping (Please write 3, 2, 1 wherever required)
Note: 3= Highly correlated, 2= Moderately correlated, 1= Less correlated

	Skill Development	Employability	Entrepreneurship Development
CO:1	3	1	2
CO:2	3	2	3
CO:3	2	3	1
CO:4	3	2	1
CO:5	3	3	1

References:

1. Mittal J P, Panesar BS, Singh S, Singh CP & Mannan K D. 1987. Energy in agriculture
2. Production Agriculture and Food Processing. ISAE and School of Energy Studies, Ludhiana. ISAE Publ.
3. Pimental D. 1980. Handbook of Energy Utilization in Agriculture. CRC Press.

Website Sources:

- https://ecourses.icar.gov.in/
- www.agrimoon.com

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MFM 303 II Designs and Analysis of Renewable Energy Conversion Systems L:T:P 3:0:0

Objective: To acquaint and equip with the conventional and non-conventional energy sources. Energy from biomass, conversion of energy from biomass. Development of biogas and biofuels.

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 **for skill enhancement**.

UNIT II

Thermodynamics of energy conversion; conversion of solar energy, wind energy, water flows, heat, biomass, etc.; other conversion processes **for better skilling of entrepreneurship**.

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 **for better employability in industry**.

UNIT IV

Design of bio-fuel production units: design of gasifiers, gas flow rates, bio-gasplants. Establishment of esterification plant, fuel blending **methods for skilling of rescue management.**

UNIT V

Exhaustible and inexhaustible energy sources. Commercial, non commercial energy **for skill development and employability**.

Course outcomes:

On completion of this course, the students will be able to

CO1: Learn about the Indian and World Energy Scenario and world energy use resources, Energy cycle on earth etc **for skill enhancement**.

CO2: Understand the types of energy, energy storage and energy conversion systems **for better skilling of entrepreneurship**.

CO3: Development and use of biogas, alcohols and plant oils, plant oil esters in I.C.engines **for better employability in industry**.

CO4: Design of bio-fuel production units **methods for skilling of rescue management.**

CO5: Learn about the Exhaustible and inexhaustible energy sources. Commercial and non commercial energy **for skill development and employability**.

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PO-CO Mapping (Please write 3, 2, 1 wherever required)
Note: 3= Highly correlated, 2= Moderately correlated, 1= Less correlated

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8
CO:1	3	3	1	3	3	2	1	3
CO:2	1	3	2	1	3	3	2	1
CO:3	3	2	3	2	2	1	3	3
CO:4	3	1	3	3	1	3	3	2
CO:5	**3**	2	**3**	1	**3**	**3**	1	**3**

CO-Curriculum Enrichment Mapping (Please write 3, 2, 1 wherever required)
Note: 3= Highly correlated, 2= Moderately correlated, 1= Less correlated

	Skill Development	Employability	Entrepreneurship Development
CO:1	3	1	2
CO:2	3	2	3
CO:3	2	3	1
CO:4	3	2	1
CO:5	3	3	3

References:

1. Boyle Godfrey. 1996. Renewable Energy: Power for Sustainable Future. Oxford Univ. Press.
2. Culp AW. 1991. Principles of Energy Conservation. Tata McGraw Hill.
3. Duffle J A & Beckman WA. 1991. Solar Engineering of Thermal Processes. John Wiley.
4. Garg H P & Prakash J.1997. Solar Energy - Fundamental and Application. Tata McGrawHill.
5. Grewal N S, Ahluwalia S, Singh S & Singh G. 1997. Hand Book of Biogas Technology
6. Rai GD. 1998. Non-conventional Sources of Energy. Khanna Publ.

Website Sources:

- https://ecourses.icar.gov.in/
- www.agrimoon.com

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MFM303(III) - DESIGN OF FARM MACHINERY – II

Course objective

To learn the engineering principles behind application of pesticides and the systems that implements the same. To learn the concepts behind design of crop harvesting and threshing equipment.

Unit I

Pesticide calculation examples. Multidisciplinary nature of pesticide application. Overview of chemical control integrated pest management. Targets for pesticide deposition. Formulation of pesticides. **for skill enhancement**

Unit II

Spray droplets. Hydraulic nozzles. Power operated hydraulic sprayer design principles. Air assisted hydraulic sprayer design principles. Controlled droplet application. Electrostatically charged sprayers. Spray drift and its mitigation. Aerial spraying systems. Use of drones for spraying: Design of spray generation and application issues. **For better skilling of entrepreneurship**

Unit III

Introduction to combine harvesters: Construction, equipment subsystems, power sub systems. Crop harvesting: Plant properties, physical and mechanical properties of plant stem, plant bending modelling. Properties of plant grain: Physical, mechanical, grain damage. Properties of MOG; Mechanical and aerodynamic. **For betterskilling of entrepreneurship**

Unit IV

Design of grain header; Orienting and supporting reel. Plant cutting cutter bar: Working process, cutter bar drive. Knife cutting speed pattern area. Design of auger for plant collection. Corn header: Working elements, snapping roll design, stalk grasping and drawing process. Corn ear detachment: Stalk cutting and chopping. **For better employability in industry**

Unit V

Cereal threshing and separation; Design of tangential and axial threshing units. Performance indices of threshing units. Modelling material kinematics in different threshing units. Factors influencing the threshing process and power requirement. Separation process and design of straw walker. Cleaning Unit process and operation. Grain pan; Chaffer and bottom sieve. Blower design and flow orientation. Design of conveying system for grain. Straw choppers and shredders. **for skill enhancement**

Outcomes

The student will know the

CO1: principles behind the design of crop spraying equipments **for skill enhancement**

CO2: harvesting and threshing machinery. **For better skilling of entrepreneurship**

CO3: combine harvesters **For better skilling of entrepreneurship**

CO4: Design of grain header **For better employability in industry**

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CO5: Cereal threshing and separation **for skill enhancement**

PO-CO Mapping (Please write 3, 2, 1 wherever required)

Note: 3= Highly correlated, 2= moderately correlated, 1= Less correlated

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8
CO:1	2	3	3	2	3	2	1	3
CO:2	3	2	3	3	3	3	2	3
CO:3	1	2	3	2	3	1	3	3
CO:4	3	3	1	3	2	1	3	2
CO:5	3	2	1	3	2	1	2	3

CO-Curriculum Enrichment Mapping (Please write 3, 2, 1 wherever required)

Note: 3= Highly correlated, 2= Moderately correlated, 1= Less correlated

	Skill Development	Employability	Entrepreneurship Development
CO:1	3	2	1
CO:2	2	1	3
CO:3	2	1	3
CO:4	1	3	2
CO:5	3	1	2

Suggested books

• Bernacki C, Haman J and Kanafajski Cz 1972. *Agricultural Machines Theory and Construction.* Vol-I. U.S. Department of Commerce, National Technical Information Service, Springfield, Virginia22151.

• Bindra, OS and Singh H. 1971. *Pesticides Application Equipments.* Oxford & IBH Publishing Co., New Delhi.

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MFM303(IV) – PRINCIPLES OF HYDRAULIC AND PNEUMATIC SYSTEM

Course objective

To understand the principles behind operation of hydraulic and pneumatic systems and their components and design simple hydraulic and pneumatic circuits and select components for the same.

Unit I

Hydraulic power, its advantages, applications, properties of hydraulic fluids, viscosity, bulk modulus, density. Concepts of energy of hydraulic systems, laws of fluid flow.

Unit II

Hydraulic pump and motors, principle, capacity, classifications, working, performance. Design of various types of pumps and motors.

Unit III

Actuators, types, design of linear actuator and rotary actuators. Hydraulic rams, gear motors, piston motors and their performance characteristics. Hose, filters, reservoirs, types of circuits, intensifier, accumulator, valves. Valve types: Direction control, deceleration, flow, pressure control, check valve and their working etc.

Unit IV

Hydraulic circuit design. Applications in farm power and machinery: Tractor, combine, farm machinery systems, hydrostatic system etc.

Unit V

Power pack, pneumatic circuits, properties of air. Compressors, types. Design of pneumatic circuits.

Outcomes

Students will be able to

- design simple hydraulic circuits
- pneumatic circuits and to select the components for the same.
- To design hydraulic and pneumatic systems of farmMachinery.

Outcomes

The student will know the

CO1: Design simple hydraulic circuits **for skill enhancement**

CO2: Pneumatic circuits and to select the components for the same f**or better skilling of entrepreneurship**

CO3: To design hydraulic and pneumatic systems of farm Machinery **for better skilling of entrepreneurship**

CO4: Hydraulic circuit design **for better employability in industry**

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CO5: Power pack, pneumatic circuits **for skill enhancement**

PO-CO Mapping (Please write 3, 2, 1 wherever required)

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	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8
CO:1	2	3	3	2	3	2	1	3
CO:2	3	2	3	3	3	3	2	3
CO:3	1	2	3	2	3	1	3	3
CO:4	3	3	1	3	2	1	3	2
CO:5	3	2	1	3	2	1	2	3

CO-Curriculum Enrichment Mapping (Please write 3, 2, 1 wherever required)

Note: 3= Highly correlated, 2= Moderately correlated, 1= Less correlated

	Skill Development	Employability	Entrepreneurship Development
CO:1	3	2	1
CO:2	2	1	3
CO:3	2	1	3
CO:4	1	3	2
CO:5	3	1	2

Suggested Reading

• Anthony E. 2003. Fluid Power with Applications. Pearsons Education (Singapore) Pvt. Ltd.
• Krutz G. 1984. Design of Agricultural Machines. John Wiley and Sons.
• Majumdar S R. 2003. Oil Hydraulics Systems: Principles and Maintenance. Tata McGraw Hill Co.

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MFM303(V) – MECHATRONICS AND ROBOTICS IN AGRICULTURE

Course objective

To introduce the fundamentals of mechatronics and the concepts behind designing mechatronic systems and their subsystems and its application in automation in agriculture.

Unit I

Introduction to mechatronics: Basic definitions, key elements of mechatronics, historical perspective, the development of the automobile as a mechatronic system. Mechatronic design approach, functions of mechatronic systems, ways of integration, information processing systems, concurrent design procedure for mechatronic systems. **for skill enhancement**

Unit II

System interfacing, instrumentation, and control systems.Input/output signals of a mechatronic system, signal conditioning, microprocessor control, microprocessor numerical control, microprocessor input/output control. **For better employability in industry**

Unit III

Microprocessor based controllers and microelectronics: Introduction to microelectronics, digital logic, overview of control computers, microprocessors and microcontrollers, programmable logic controllers, digital communications. **for skillenhancement**

Unit IV

Technologies of robot: Sub systems, transmission system (Mechanics), power generation and storage system, sensors, electronics, algorithms and software. Servo motor drives types and applications. Stepper motor and its concept. Industrial robots: Classification and sub systems. Defining work space area. **For better skilling ofentrepreneurship**

Unit V

Application of robots in agriculture: Harvesting and picking, weed control, autonomous mowing, pruning, seeding, spraying and thinning, phenotyping, sorting and packing. Utility platforms. Use of different agrobots in agriculture. **For better employability in industry**

Outcomes

Ability to understand

CO1: agricultural machinery that is built on concepts of mechatronics **for skill enhancement**

CO2: ability to use robotic machinery in agriculture. **For better employability in industry**

CO3: Microprocessor based controllers and microelectronics **for skill enhancement**

CO4: Technologies of robot **For better skilling of entrepreneurship**

CO5: Application of robots in agriculture **For better employability in industry**

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PO-CO Mapping (Please write 3, 2, 1 wherever required)

Note: 3= Highly correlated, 2= moderately correlated, 1= Less correlated

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8
CO:1	2	3	3	2	3	2	1	3
CO:2	3	2	3	3	3	3	2	3
CO:3	1	2	3	2	3	1	3	3
CO:4	3	3	1	3	2	1	3	2
CO:5	3	2	1	3	2	1	2	3

CO-Curriculum Enrichment Mapping (Please write 3, 2, 1 wherever required)

Note: 3= Highly correlated, 2= Moderately correlated, 1= Less correlated

	Skill Development	Employability	Entrepreneurship Development
CO:1	3	2	1
CO:2	1	3	2
CO:3	3	1	2
CO:4	1	2	3
CO:5	2	3	1

Suggested Books

• Alciatore DG and Histand MB. 2002. *Introduction to Mechatronics and Measurement System.* McGraw Hill Pvt Limited, New Delhi.
• Robert HB. 2002. *Mechatronic Hand Book.* CRC Press.
• Shakhatreh and Fareed. 2011. *The Basics of Robotics.* Lahti University of Applied Sciences Machine and Production Technology.

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MFM303(VI) – ARTIFICIAL INTELLIGENCE

Course objective To introduce students with techniques and capabilities of artificial intelligence (AI)and enable them to do simple exercises.

Unit I

Definitions of intelligence and artificial intelligence. What is involved in intelligence? Disciplines important to AI. History of development of AI. Different types of AI. Acting humanly, Turing test. AI systems in everyday life. Applications of AI. **for skillenhancement**

Unit II

Classical AI, concept of expert system, conflict resolution, multiple rules, forward chaining, backward chaining. Advantages and disadvantages of expert system. Fuzzy logic and fuzzy rules. Fuzzy expert systems. **For better skilling of entrepreneurship**

Unit III

Problem solving using AI, search techniques, breadth first search, depth first search, depth limited search, bidirectional search, heuristic search, problems and examples. Knowledge representation, frames, methods and demons, correlations, decision trees, fuzzy trees. **For better employability in industry**

Unit IV

Philosophy of AI, Penrose's pitfall, weak AI, strong AI, rational AI, brain prosthesis experiment, the Chinese room problem, emergence of consciousness, technological singularity, Turing test. **For better skilling of entrepreneurship**

Unit V

Modern AI, biological brain, basic neuron model, perceptrons and learning, self organizing neural network, N-tuple network, evolutionary computing, genetic algorithms, agent methods, agents for problem solving, software agents, multi agents, hardware agents. **For better employability in industry**

Outcomes

Ability to understand and apply

CO1: principles of AI in solving simple problems **for skill enhancement**

CO2: enable them to get insight into working of AI based systems **For better skilling ofentrepreneurship**

CO3: Problem solving using AI **For better employability in industry**

CO4: Philosophy of AI **For better skilling of entrepreneurship**

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CO5: Modern AI, biological brain, basic neuron model, perceptrons and learning **For betteremployability in industry**

PO-CO Mapping (Please write 3, 2, 1 wherever required)

Note: 3= Highly correlated, 2= moderately correlated, 1= Less correlated

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8
CO:1	2	3	3	2	3	2	1	3
CO:2	3	2	3	3	3	3	2	3
CO:3	1	2	3	2	3	1	3	3
CO:4	3	3	1	3	2	1	3	2
CO:5	3	2	1	3	2	1	2	3

CO-Curriculum Enrichment Mapping (Please write 3, 2, 1 wherever required)

Note: 3= Highly correlated, 2= Moderately correlated, 1= Less correlated

	Skill Development	Employability	Entrepreneurship Development
CO:1	3	2	1
CO:2	2	1	3
CO:3	2	3	1
CO:4	1	2	3
CO:5	2	3	1

Suggested Reading

• GNU PROLOG *A Native Prolog Compiler with Constraint Solving over Finite Domains* Edition 1.44, for GNU Prolog version 1.4.5 July 14, 2018.
• Ivan Bratko, *Prolog Programming for Artificial Intelligence.*
• Warwick K. 2012. *Artificial Intelligence: The Bas*

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