# D. Y. Patil Agriculture and Technical University, Talsande- Kolhapur

## SCHOOL OF ENGINEERING AND TECHNOLOGY

# M. Tech Agricultural Engineering

# Syllabus Structure

# Course Structure and Content

| | Subject | Minimum Credits |
|---|---|---|
| A | **MAJOR COURSES** | 20 |
| B | **MINOR COURSES** | 08 |
| C | **SUPPORTING COURSES** | 06 |
| D | **OTHER ESSENTIAL REQUIREMENTS**<br>Seminar<br>Inplant Training<br>Research | <br>01<br>02<br>30 |
| F | **COMMON COURSES** / Compulsory noncredit courses, PGS | 05 |
| | **Total** | **72** |

## M. Tech - Farm Machinery and Power Engineering (Masters' Programme) [Requirement: 70 Credits]

## MAJOR COURSES (Requirement: 20 Credits)

| S. No. | Course Title | Course Code | Credits |
|---|---|---|---|
| 1 | Soil Dynamics in Tillage and Traction | FMPE 501* | 2+1 |
| 2 | Testing and Evaluation of Agricultural Equipment | FMPE 502* | 2+1 |
| 3 | Ergonomics and Safety in Farm Operations | FMPE 503* | 2+1 |
| 4 | Design of Tractor systems | FMPE 504 | 2+1 |
| 5 | Design of Farm Machinery-I | FMPE 505 | 2+1 |
| 6 | Design of Farm Machinery-II | FMPE 506 | 1+1 |
| 7 | Management of Farm Power and Machinery System | FMPE 507* | 2+1 |
| 8 | Principles of Automation and Control | FMPE 511 | 2+1 |
| 9 | Principles of Hydraulic and Pneumatic Systems | FMPE 512 | 2+1 |
| 10 | Applied Instrumentation in Farm Machinery | FMPE 513 | 2+1 |
| 11 | Systems Simulation and Computer Aided Problem Solving in Engineering | FMPE 514 | 1+1 |
| 12 | Computer Aided Design of Machinery | FMPE 515 | 0+2 |
| 13 | Advance Manufacturing Technologies | FMPE 516 | 2+0 |
| 14 | Machinery for Precision Agriculture | FMPE 517 | 2+1 |
| 15 | Machinery for Horticulture and Protected Agriculture | FMPE 518 | 2+0 |

***Compulsory Course3**

## MINOR COURSES (Requirement: 08 Credits)

| S. No. | Course Title | Course Code | Credits |
|---|---|---|---|
| 1 | Engineering Properties of Biological Materials | PFE 511 | 2+1 |
| 2 | Mechatronics and Robotics in Agriculture | ME 501 | 2+0 |
| 3 | Vibrations | ME-504 | 2+1 |
| 4 | Fatigue Design | ME-507 | 2+1 |
| 5 | Computer Aided Design | ME-515 | 2+1 |
| 6 | Biomass Energy Conversion Technologies | REE 503 | 2+1 |
| 7 | Agro Energy Audit and Management | REE 516 | 2+1 |
| 8 | Dimensional Analysis and Similitude | CE 501 | 1+1 |
| 9 | Experimental Stress Analysis | CE 510 | 2+1 |
| 10 | Finite Element Methods | MATHS 501 | 1+1 |
| 11 | Numerical Methods for Engineers | MATHS 502 | 2+0 |
| 12 | Big Data Analytics | CSE 501 | 2+1 |
| 13 | Artificial Intelligence | CSE 502 | 2+1 |
| 14 | Database Management System | CSE 505 | 2+1 |
| 15 | Any other course (s) of other department other than course(s) from major can be taken as per recommendations of the student's advisory committee. | | |

## SUPPORTING COURSES (Requirement: 06 Credits)

| S. No. | Course Title | Course Code | Credits |
|---|---|---|---|
| 1 | Statistical Methods for Research Works | *STAT 501 | 2+1 |
| 2 | Courses from subject matter fields (other than Major and Minor) relating to area of special interest and research problem can be taken as per recommendations of the student's advisory committee. | | |

***Compulsory Course**

## COMMON COURSES (Requirement: 05 Credits)

| S. No. | Course Title | Course Code | Credits |
|---|---|---|---|
| 1 | Library and Information Services | *PGS 501 | 0+1 |
| 2 | Technical Writing and Communications Skills | *PGS 502 | 0+1 |
| 3 | Intellectual Property and its management in Agriculture | *PGS 503 | 0+1 |
| 4 | Basic Concepts in Laboratory Techniques | *PGS 504 | 0+1 |
| 5 | Agricultural Research, Research Ethics and Rural Development Programmes | *PGS 505 | 0+1 |

***Compulsory Course**

## LIST OF OTHER ESSENTIAL REQUIREMENTS

| S. No. | Course Title | Course Code | Credits |
|---|---|---|---|
| 1 | Masters' Seminar | FMPE 591 | 0+1 |
| 2 | Inplant Training | | 0+2 |
| 3 | Masters' Research | FMPE 599 | 0+30 |

## PROCESSING AND FOOD ENGINEERING (Master's Programme) [Requirement: 70 Credits]

### MAJOR COURSES (Requirement: 20 Credits)

| S. No. | Course Title | Course Code | Credits |
|---|---|---|---|
| 1 | Transport Phenomena in Food Processing | *PFE 501 | 2+1 |
| 2 | Unit Operations in Food Process Engineering | *PFE 502 | 2+1 |
| 3 | Field Crops Process Engineering | *PFE 503 | 2+1 |
| 4 | Horticultural Crops Process Engineering | *PFE 504 | 2+1 |
| 5 | Storage Engineering and Handling of Agricultural Produce | PFE 505 | 2+1 |
| 6 | Food Package Engineering | PFE 506 | 1+1 |
| 7 | Instrumentation and Sensors in Food Processing | PFE 507 | 2+1 |
| 8 | Application of Engineering Properties in Food Processing | PFE 508 | 2+1 |
| 9 | Food Quality and Safety | PFE 509 | 2+1 |
| 10 | Food Processing Technologies | PFE 510 | 2+1 |
| 11 | Food Processing Equipment and Plant Design | PFE 511 | 1+1 |
| 12 | Seed Process Engineering | PFE 512 | 1+1 |
| 13 | Agri-Project Planning and Management | PFE 513 | 2+1 |
| 14 | Farm Structures and Environmental Control | PFE 514 | 2+1 |
| 15 | Dairy Product Processing | PFE 515 | 2+1 |
| 16 | Processing of Meat, Poultry and Fish | PFE 516 | 2+1 |
| 17 | Design of Aquacultural Structures | PFE 517 | 2+1 |
| 18 | Thermal Environmental Engineering for Agricultural Processing | PFE 518 | 2+1 |
| Total | | | 33+18 |

*Compulsory Courses

### MINOR COURSES (Requirement: 08 Credits)

| S. No. | Course Title | Course Code | Credits |
|---|---|---|---|
| 1 | Mechatronics and Robotics in Agriculture | ME 501 | 2+0 |
| 2 | Refrigeration Systems | ME 502 | 2+1 |
| 3 | Energy, Ecology and Environment | REE 513 | 3+0 |
| 4 | Energy Management in Food Processing Industries | REE 518 | 1+1 |
| 5 | Testing and Evaluation of Agricultural Equipment | FMPE 502 | 1+1 |
| 6 | System Simulation and Computer Aided Problem Solving in Engineering | FMPE 514 | 1+1 |
| 7 | Computer Aided Design of Machinery | FMPE 515 | 0+2 |
| 8 | Big Data Analytics | CSE 501 | 2+0 |
| 9 | Artificial Intelligence | CSE 502 | 2+0 |
| 10 | Finite Elements Method | MATHS 501 | 1+1 |
| 11 | Numerical Methods for Engineers | MATHS 502 | 2+1 |
| 12 | Dimensional Analysis and Similitude | CE 501 | 1+1 |
| 13 | Any other course (s) of other department other than course(s) from major can be takenas per recommendations of the student's advisory committee. | | |

## SUPPORTING COURSES (Requirement: 06 Credits)

| S. No. | Course Title | Course Code | Credits |
|---|---|---|---|
| 1 | Statistical Methods for Research Works | *STAT 501 | 2+1 |
| 2 | Courses from subject matter fields (other than Major and Minor) relating to area of special interest and research problem can be taken as per recommendations of the student's advisory committee. | | |

***Compulsory Course**

## COMMON COURSES (Requirement: 05 Credits)

| S. No. | Course Title | Course Code | Credits |
|---|---|---|---|
| 1 | Library and Information Services | *PGS 501 | 0+1 |
| 2 | Technical Writing and Communications Skills | *PGS 502 | 0+1 |
| 3 | Intellectual Property and its management in Agriculture | *PGS 503 | 0+1 |
| 4 | Basic Concepts in Laboratory Techniques | *PGS 504 | 0+1 |
| 5 | Agricultural Research, Research Ethics and Rural Development Programmes | *PGS 505 | 0+1 |

*Detailed course outline to be developed by designated BSMA

## LIST OF OTHER ESSENTIAL REQUIREMENTS

| S. No. | Course Title | Course Code | Credits |
|---|---|---|---|
| 1 | Seminar | PFE 591 | 0+1 |
| 2 | Inplant Training | | 0+2 |
| 3 | Thesis Research | PFE 599 | 0+30 |

## IRRIGATION AND DRAINAGE ENGINEERING (Masters' Programme) [Requirement: 70 Credits]

### MAJOR COURSES (Requirement: 20 Credits)

| S. No. | Course Title | Course Code | Credits |
|---|---|---|---|
| 1 | Design of Surface Irrigation Systems | IDE 501 | 1+1 |
| 2 | Design of Farm Drainage Systems | *IDE 502 | 2+1 |
| 3 | Command Area Management | IDE 503 | 2+1 |
| 4 | Water and Nutrient Management Under Protected Cultivation | IDE 504 | 2+1 |
| 5 | Design of Drip and Sprinkler Irrigation Systems | *IDE 505 | 2+1 |
| 6 | Ground Water Engineering | *IDE 506 | 2+1 |
| 7 | Remote Sensing and GIS for Land and Water Resource Management | SWCE 507/ IDE 507 | 2+1 |
| 8 | Waste Water Management and Utilization in Agriculture | IDE 508 | 2+1 |
| 9 | Water Conveyance and Distribution | IDE 509 | 2+1 |
| 10 | Minor Irrigation | IDE 510 | 2+1 |
| 11 | Design of Pumps for Irrigation and Drainage | IDE 511 | 2+0 |
| 12 | Crop Environmental Engineering | IDE 512 | 2+0 |
| 13 | Water Resources Systems Engineering | IDE 513 | 2+1 |
| 14 | Irrigation Economics, Planning and Management | IDE 514 | 2+0 |
| 15 | Sensing and Automation in Irrigation Systems | IDE 515 | 3+0 |
| Total | | | 30+11 |

*Compulsory course

### MINOR COURSES (Requirement: 08 Credits)

| S. No. | Course Title | Course Code | Credits |
|---|---|---|---|
| 1 | Watershed Management and Modeling | SWCE 505 | 2+1 |
| 2 | Flow Through Porous Media | SWCE 506 | 2+0 |
| 3 | Climate Change and Water Resources | SWCE 508 | 3+0 |
| 4 | Dryland Water Management Technologies | SWCE 510 | 2+0 |
| 5 | Machinery for Precision Agriculture | FMPE 517 | 2+1 |
| 6 | Energy, Ecology and Environment | REE 513 | 3+0 |
| 7 | Dimensional Analysis and Similitude | CE 501 | 2+0 |
| 8 | Big Data Analytics | CSE 501 | 2+0 |
| 9 | Artificial Intelligence | CSE 502 | 2+0 |
| 10 | Soft Computing Techniques in Engineering | CSE 504 | 2+1 |
| 11 | Finite Element Methods | MATH 501 | 2+0 |
| 12 | Numerical Methods for Engineers | MATH 502 | 2+0 |
| 13 | Mechatronics and Robotics in Agriculture | ME 501 | 2+0 |
| 14 | Any other course(s) of other department can be taken as per recommendationsof the student's advisory committee. | | |

## SUPPORTING COURSES (Requirement: 06 Credits)

| S. No. | Course Title | Course Code | Credits |
|---|---|---|---|
| 1 | Statistical Methods for Research Works | *STAT 501 | 2+1 |
| 2 | Courses from subject matter fields (other than Major and Minor) relating to area of special interest and research problem can be taken as per recommendations of the student's advisory committee. | | |

*Compulsory Course

## COMMON COURSES (Requirement: 05 Credits)

| S. No. | Course Title | Course Code | Credits |
|---|---|---|---|
| 1 | Library and Information Services | *PGS 501 | 1+0 |
| 2 | Technical Writing and Communication Skills | *PGS 502 | 1+0 |
| 3 | Intellectual Property and its management in Agriculture | *PGS 503 | 1+0 |
| 4 | Basic Concepts in Laboratory Techniques | *PGS 504 | 1+0 |
| 5 | Agricultural Research, Research Ethics and Rural Development Programmes | *PGS 505 | 1+0 |

* Detailed course outline to be developed by designated BSMA

## LIST OF OTHER ESSENTIAL REQUIREMENTS

| S. No. | Course Title | Course Code | Credits |
|---|---|---|---|
| 1 | Seminar | IDE 591 | 0+1 |
| 2 | Inplant Training | | 0+2 |
| 3 | Thesis Research | IDE 599 | 0+30 |

## SOIL AND WATER CONSERVATION ENGINEERING (Masters' Programme) [Requirement: 70 Credits]

### MAJOR COURSES (Requirement: 20 Credits)

| S. No. | Course Title | Course Code | Credits |
|---|---|---|---|
| 1 | Advanced Soil and Water Conservation Engineering | *SWCE 501 | 2+1 |
| 2 | Applied Watershed Hydrology | *SWCE 502 | 2+1 |
| 3 | Soil and Water Conservation Structures | SWCE 503 | 2+1 |
| 4 | Stochastic Hydrology | SWCE 504 | 2+1 |
| 5 | Watershed Management and Modeling | *SWCE 505 | 2+1 |
| 6 | Flow Through Porous Media | SWCE 506 | 2+0 |
| 7 | Remote Sensing and GIS for Land and Water Resource Management | SWCE 507/ IDE 507 | 2+1 |
| 8 | Climate Change and Water Resources | SWCE 508 | 3+0 |
| 9 | Numerical Methods in Hydrology | SWCE 509 | 2+0 |
| 10 | Dryland Water Management Technologies | SWCE 510 | 2+0 |
| Total | | | 19+6 |

*Compulsory course

### MINOR COURSES (Requirement: 08 Credits)

| S. No. | Course Title | Course Code | Credits |
|---|---|---|---|
| 1 | Design of Drip and Sprinkler Irrigation Systems | IDE 505 | 2+1 |
| 2 | Groundwater Engineering | IDE 506 | 2+1 |
| 3 | Minor Irrigation | IDE 510 | 2+1 |
| 4 | Water Resources Systems Engineering | IDE 513 | 2+1 |
| 5 | Dimensional Analysis and Similitude | CE 501 | 2+0 |
| 6 | Water Quality and Pollution Control | CE 502 | 2+1 |
| 7 | Machinery for Precision Agriculture | FMPE 517 | 2+1 |
| 8 | Energy, Ecology and Environment | REE 513 | 3+0 |
| 9 | Big Data Analytics | CSE 501 | 2+0 |
| 10 | Artificial Intelligence | CSE 502 | 2+0 |
| 11 | Soft Computing Techniques in Engineering | CSE 504 | 2+1 |
| 12 | Finite Element Methods | MATH 501 | 2+0 |
| 13 | Numerical Methods for Engineers | MATH 502 | 2+0 |
| 14 | Mechatronics and Robotics in Agriculture | ME 501 | 2+0 |
| 15 | Any other course(s) of other department can be taken as per recommendations of the student's advisory committee. | | |

### SUPPORTING COURSES (Requirement: 06 Credits)

| S. No. | Course Title | Course Code | Credits |
|---|---|---|---|
| 1 | Statistical Methods for Research Works | *STAT 501 | 2+1 |
| 2 | Courses from subject matter fields (other than Major and Minor) relating to area of special interest and research problem can be taken as per recommendations of the student's advisory committee. | | |

*Compulsory Course

COMMON COURSES (Requirement: 05 Credits)

| S. No. | Course Title | Course Code | Credits |
|---|---|---|---|
| 1 | Library and Information Services | *PGS 501 | 1+0 |
| 2 | Technical Writing and Communication Skills | *PGS 502 | 1+0 |
| 3 | Intellectual Property and its management in Agriculture | *PGS 503 | 1+0 |
| 4 | Basic Concepts in Laboratory Techniques | *PGS 504 | 1+0 |
| 5 | Agricultural Research, Research Ethics and Rural Development Programmes | *PGS 505 | 1+0 |

* Detailed course outline to be developed by designated BSMA

List of other Essential Requirements

| S. No. | Course title | Course Code | Credits |
|---|---|---|---|
| 1 | Seminar | SWCE 591 | 0+1 |
| 2 | Inplant Training | | 0+2 |
| 3 | Thesis Research | SWCE 599 | 0+30 |

## RENEWABLE ENERGY ENGINEERING (Masters' Programme) [Requirement: 70 Credits]

### MAJOR COURSES (Requirement: 20 Credits)

| S. No. | Course Title | Course Code | Credits |
|---|---|---|---|
| 1 | Renewable Energy Technologies | *REE 501 | 2+1 |
| 2 | Solar Thermal Energy Conversion Technologies | *REE 502 | 2+1 |
| 3 | Biomass Energy Conversion Technologies | *REE 503 | 2+1 |
| 4 | Energy Auditing, Conservation and Management | REE 504 | 2+1 |
| 5 | Wind Energy Conversion and Utilization | REE 505 | 2+1 |
| 6 | Solar Photovoltaic System Design and Analysis | REE 506 | 1+1 |
| 7 | Renewable Energy Policy, Planning and Economics | REE 507 | 3+0 |
| 8 | Alternate Fuels and Applications | REE 508 | 2+1 |
| 9 | Biogas Technology and Mechanism | REE 509 | 1+1 |
| 10 | Energy, Ecology and Environment | REE 510 | 3+0 |
| 11 | Design and Analysis of Renewable Energy ConversionSystems | REE 511 | 2+1 |
| 12 | Energy Generation from Agricultural Waste and Byproducts | REE 512 | 2+1 |
| 13 | Agro Energy Audit and Management | REE 513 | 2+1 |
| 14 | Green House Energetic and Passive Architecture | REE 514 | 1+1 |
| 15 | Energy Management in Food Processing Industries | REE 515 | 1+1 |
| **Total** | | | **28+13** |

*Compulsory Course

### MINOR COURSES (Requirement: 08 Credits)

| S. No. | Course Title | Course Code | Credits |
|---|---|---|---|
| 1 | Machinery for Precision Agriculture | FMPE 517 | 2+1 |
| 2 | Machinery for Horticulture and Protected Agriculture | FMPE 518 | 2+0 |
| 3 | Application of Engineering Properties in Food Processing | PFE 511 | 2+1 |
| 4 | Bioprocess Engineering | PFE 519 | 2+1 |
| 5 | Design of Pumps for Irrigation and Drainage | IDE 511 | 2+0 |
| 6 | Dimensional Analysis and Similitude | CE 501 | 2+0 |
| 7 | Computer Aided System Design | FMPE 515 | 0+2 |
| 8 | Big Data Analytics | CSE 501 | 2+1 |
| 9 | Artificial Intelligence | CSE 502 | 2+1 |
| 10 | Soft Computing Techniques in Engineering | CSE 504 | 2+1 |
| 11 | Finite Element Methods | MATH 501 | 1+1 |
| 12 | Numerical Methods for Engineers | MATH 502 | 2+1 |
| 13 | Mechatronics and Robotics in Agriculture | ME 501 | 2+0 |
| 14 | Any other course(s) of other department other than courses from major can be takenas per recommendations of the student's advisory committee. | | |

### SUPPORTING COURSES (Requirement: 06 Credits)

| Sr. No. | Course Title | Course Code | Credits |
|---|---|---|---|
| 1 | Statistical Methods for Research Works | *STAT 501 | 2+1 |
| 2 | Courses from subject matter fields (other than Major and Minor) relating to area of special interest and research problem can be taken as per recommendations of the student's advisory committee. | | |

***Compulsory Course**

## COMMON COURSES (Requirement: 05 Credits)

| S. No. | Course Title | Course Code | Credits |
|---|---|---|---|
| 1 | Library and Information Services | *PGS 501 | 1+0 |
| 2 | Technical Writing and Communication Skills | *PGS 502 | 1+0 |
| 3 | Intellectual Property and its management in Agriculture | *PGS 503 | 1+0 |
| 4 | Basic Concepts in Laboratory Techniques | *PGS 504 | 1+0 |
| 5 | Agricultural Research, Research Ethics and Rural Development Programmes | *PGS 505 | 1+0 |

* Detailed course outline to be developed by designated BSMA

## LIST OF OTHER ESSENTIAL REQUIREMENTS

| S. No. | Course Title | Course Code | Credits |
|---|---|---|---|
| 1 | Seminar | REE 591 | 0+1 |
| 2 | Inplant Training | | 0+2 |
| 3 | Thesis Research | REE 599 | 0+30 |