# MAHARASHTRA INSTITUTE OF TECHNOLOGY, AURANGABD

**An Autonomous Institute Affiliated to Dr. Babasaheb Ambedkar Marathwada University, Aurangabad, Maharashtra (India)**

# Second Year B.Tech. Syllabus (Agricultural Engineering) 2022-23

| Sr. No | Course Category | Course Code | Course Title | L | T | P | Contact Hr /Wk | Credits | MSE-I | MSE-II | CIE | TA | ESE/ Oral | Total |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | **S. Y. B. Tech. Syllabus Structure w.e.f. 2022-23** | | | | | | | | | | | |
| | | | **Agricultural Engineering** | | | | | | | | | | | |
| | | | **Orientation Program (2 Days)** | | | | | | | | | | | |
| 1.1 | BSC | BSC204 | Linear Algebra & Transform | 3 | 1 | - | 4 | 4 | 15 | 15 | 10 | 10 | 50 | 100 |
| 1.2 | PCC | AED201 | Tractor Systems and Controls | 3 | - | - | 3 | 3 | 15 | 15 | 10 | 10 | 50 | 100 |
| 1.3 | PCC | AED202 | Unit Operations in Agriculture Processing | 3 | - | - | 3 | 3 | 15 | 15 | 10 | 10 | 50 | 100 |
| 1.4 | PCC | AED203 | Fluid Mechanics | 3 | - | - | 3 | 3 | 15 | 15 | 10 | 10 | 50 | 100 |
| 1.5 | PCC | AED204 | Surveying and Leveling | 3 | - | - | 3 | 3 | 15 | 15 | 10 | 10 | 50 | 100 |
| 1.6 | PCC | AED221 | Lab-I: Tractor Systems and Controls | - | - | 2 | 2 | 1 | - | - | - | - | 25 | 25 |
| 1.7 | PCC | AED222 | Lab-II: Unit Operations in Agriculture Processing | - | - | 2 | 2 | 1 | - | - | - | 25 | - | 25 |
| 1.8 | PCC | AED223 | Lab-III: Surveying and Leveling | - | - | 2 | 2 | 1 | - | - | - | 25 | 25 | 50 |
| 1.9 | PCC | AED224 | Lab-IV: Workshop Practices | - | - | 2 | 2 | 1 | - | - | - | - | 25 | 25 |
| 1.10 | PCC | AED225 | Lab-V: Data Analytics Lab | - | - | 2 | 2 | 1 | - | - | - | 25 | - | 25 |
| 1.11 | HSM | HSM804 | Mandatory Non-Credit Course | 2 | - | - | - | Non-Credit Mandatory Course | | | | | | |
| **S3** | | | | 17 | 1 | 10 | 28 | 21 | 75 | 75 | 50 | 125 | 325 | 650 |

| Sr. No | Course Category | Course Code | Course Title | L | T | P | Contact Hr /Wk | Credits | MSE-I | MSE-II | CIE | TA | ESE/ Oral | Total |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 2.1 | BSC | BSC251B | Complex Variable & Vector Calculus | 3 | 1 | - | 4 | 4 | 15 | 15 | 10 | 10 | 50 | 100 |
| 2.2 | PCC | AED251 | Farm Machinery and Equipment | 3 | - | - | 3 | 3 | 15 | 15 | 10 | 10 | 50 | 100 |
| 2.3 | PCC | AED252 | Heat & Mass Transfer | 3 | - | - | 3 | 3 | 15 | 15 | 10 | 10 | 50 | 100 |
| 2.4 | PCC | AED253 | Strength of Material | 3 | - | - | 3 | 3 | 15 | 15 | 10 | 10 | 50 | 100 |
| 2.5 | PEC | AED281-AED283 | Professional Elective-I | 3 | - | - | 3 | 3 | 15 | 15 | 10 | 10 | 50 | 100 |
| 2.6 | PCC | AED271 | Lab-I: Farm Machinery and Equipment | - | - | 2 | 2 | 1 | - | - | - | - | 25 | 25 |
| 2.7 | PCC | AED272 | Lab-II: Heat & Mass Transfer | - | - | 2 | 2 | 1 | - | - | - | 25 | - | 25 |
| 2.8 | PCC | AED273 | Lab-III: Strength of Material | - | - | 2 | 2 | 1 | - | - | - | - | 25 | 25 |
| 2.9 | HSM | HSM254 | Lab-IV: Development of Skills (Soft Skills) | - | - | 2 | 2 | 1 | - | - | - | 25 | 25 | 50 |
| 2.10 | PCC | AED274 | Lab-V: Problem-based learning | - | - | 2 | 2 | 1 | - | - | - | 25 | - | 25 |
| 2.11 | HSM | HSM805-HSM807 | Mandatory Non-Credit Course | 2 | - | - | 2 | Non-Credit Mandatory Course | | | | | | |
| **S4** | | | | 17 | 1 | 10 | 28 | 21 | 75 | 75 | 50 | 125 | 325 | 650 |

MSE- Mid Semester Exam, ESE- End Semester Examination, OR- Oral, TA-Teacher Assessment, L-Theory, T- Tutorial, P- Practical, S3-Semster III, S4-Semester-IV

**Semester-3 Mandatory Non-Credit Course**

HSM804    Constitution of India


**Semester-4 Mandatory Non-Credit Course**

HSM805    Professional Ethics and Corporate Social Responsibility

HSM806    Emotional Intelligence

HSM807    Stress Management Through Yoga


**Semester-4 Professional Elective-I**

AED281    Dairy and Food Engineering

AED282    Watershed Planning and Management

AED283    Precision Agriculture and Management

# Maharashtra Institute of Technology, Aurangabad
## (An Autonomous Institute)

| **Faculty of Science & Technology** | |
|---|---|
| **Syllabus of S. Y. B.Tech. Agricultural Engineering (Semester III)** | |
| Course Code: AED201 <br> Course: Tractor Systems and Controls <br> **Teaching Scheme:** <br> Theory: 03 Hrs./week | Credits: 3-0-0 <br> Mid Semester Examination-I: 15 Marks <br> Mid Semester Examination-II: 15Marks <br> Teacher Assessment: 10 Marks <br> Continuous Internal Evaluation: 10 Marks <br> End Semester Examination: 50 Marks <br> End Semester Examination (Duration): 02 Hrs. |

| | |
|---|---|
| **Prerequisite** | An Agricultural Engineer must know the operations control, maintenance and repairing idea of different sources of power and agricultural tractors used in Agricultural sector |
| **Objectives** | 1. To know the different conventional and non-conventional power sources of energy used in agricultural sector. <br> 2. To study the principle and working operations of different engines system and Power Transmission system of Tractor and Power Tiller. <br> 3. To calculate the Power estimation and power losses in agricultural sector. |
| **Unit-I** | Sources of farm power-conventional & non-conventional energy sources. Classification of tractors and IC engines. Review of thermodynamic principles of IC (CI & SI) engines and deviation from ideal cycle ( 06 Hrs.) |
| **Unit-II** | Study of engine components their construction, operating principles and functions. Engine Terminology: valves & valve mechanism. Firing order and diagram, criteria for firing order selection. IC engine fuels - their properties & combustion of fuels, diesel fuel tests and their significance, detonation and knocking in IC engines ( 06 Hrs.) |
| **Unit-III** | Fuel & air supply, cooling, lubricating, ignition, starting, Engine governing systems and electrical systems. Study of constructional details, adjustments & operating principles of these systems. (06 Hrs.) |
| **Unit-IV** | Transmission systems of tractors: clutch, gear box, differential and final drive system. Study of constructional details, adjustments & operating principles of these systems. ( 06 Hrs.) |
| **Unit-V** | Tractor power outlets: PTO, belt pulley, drawbar, Hydraulic system, Torque convertor, Hitching System and Control of Tractors. Power tiller construction and Working operations. ( 06 Hrs.) |
| **Unit-VI** | Tractor testing, reliability and cost analysis of tractor. Selection of tractor, tractor service life and advanced trends in tractor design. (06 Hrs.) |

| | Sr. No. | Title | Author | Publication | Edition |
|---|---|---|---|---|---|
| **References** | 1 | Elements of Agricultural Engineering | Dr. Jagdishwar Sahay | Standard Publishers | 5 |
| | 2 | Farm Tractor maintenance and repair | S. C. Jain | Standard Publishers | 4 |
| | 3 | Tractors and their Power Units | John B. Lijiedahal, Paul K. Turnquist David W. Smith and Makoto Hoki | CBS Publication | 4 |
| | 4 | Design of Agricultural Tractor (Principle and Problems) | D. N. Sharma &S. Mukesh | Jain Brothers | 3 |

# Maharashtra Institute of Technology, Aurangabad
## (An Autonomous Institute)

| | |
|---|---|
| **Faculty of Science & Technology** <br> **Syllabus of S. Y. B.Tech. Agricultural Engineering (Semester III)** | |
| Course Code: AED202 <br> Course: Unit Operations in Agriculture Processing <br> **Teaching Scheme:** <br> Theory: 03 Hrs./week | Credits: 3-0-0 <br> Mid Semester Examination-I: 15 Marks <br> Mid Semester Examination-II: 15 Marks <br> Teacher Assessment: 10 Marks <br> Continuous Internal Evaluation: 10 Marks <br> End Semester Examination: 50 Marks <br> End Semester Examination (Duration): 02 Hrs. |

| | |
|---|---|
| **Prerequisite** | Students should have knowledge and understanding of different crops cultivated in field and different agricultural practices performed for cultivation. |
| **Objectives** | 1. To understand the basic knowledge of various unit operations carried out after harvesting of crops. <br> 2. To get acquainted with different technologies used for various unit operations in Agricultural Engineering. |
| **Unit-I** | Introduction to unit operations in agricultural processing. Cleaning and grading, Types of screens, Effectiveness of screen. Equipment's and machineries used in cleaning and grading of grains- Air screen cleaners and separators. (Descriptive and analytical). (06 Hrs.) |
| **Unit-II** | Drying & dehydration- General Principle, rates of drying, mechanism of drying, hysteresis, Different methods of drying and types of driers (Descriptive and analytical). (06 Hrs.) |
| **Unit-III** | Mixing, blending and size reduction: Characteristics of mixtures, measurement of mixing, mixing index, rates of mixing, Energy inputs in mixing, liquid mixing, mixing equipment's, Size reduction, methods and principles of size reduction, Energy used in grinding, Rittinger's, Kick's and Bond's law of crushing, types of crushers, crushing rolls, hammer mill, fine crushers (Descriptive and analytical). (06 Hrs.) |
| **Unit-IV** | Mechanical Separations: Filtration- filter media, filter aid, constant rate filtration, constant pressure filtration, filtration equipment's; Membrane Technology-Classification, Dialysis, Osmosis, Reverse Osmosis, types of membrane, ultra-filtration, equipment's; Sieving- standard sieve sizes, rate of throughput, particle size analysis (Descriptive and analytical). (06 Hrs.) |
| **Unit-V** | Sedimentation- gravitation sedimentation, Stoke's Law, rate of sedimentation, equipment's, centrifugation- rate of separation, liquid-liquid and liquid-solid separation, equipment's, Floatation- General Principle, Distillation- General Principle, equipment's, solvent extraction and expression. (06 Hrs.) |
| **Unit-VI** | Material handling and transport: Overview of Material Handling, Principles of Material handling, Characteristics of materials, Unit load concept, handling and transport of solid materials- conveyors (belt conveyors, screw/auger conveyors, bucket elevators and drag/chain conveyors, (06 Hrs.) |

| | Sr. No. | Title | Author | Publication | Edition |
|---|---|---|---|---|---|
| **References** | 1 | Unit operations of Agricultural processing | K. M. Sahay and K. K. Singh | Vikas publishing house New Delhi | Second revised and enlarged |
| | 2 | Unit Operations in Food Processing | R. L. Earle and M. D. Earle | NZ Institute of FST | Second |
| | 3 | Food processing technology- Principles and practices | P. J. Fellows | Woodhead publishing in food science and technology | Second |

## Maharashtra Institute of Technology, Aurangabad
### (An Autonomous Institute)

**Faculty of Science & Technology**
**Syllabus of S. Y. B.Tech. Agricultural Engineering (Semester III)**

| | |
|---|---|
| Course Code: AED203 <br> Course: Fluid Mechanics <br> **Teaching Scheme:** <br> Theory: 03 Hrs./week | Credits: 3-0-0 <br> Mid Semester Examination-I: 15 Marks <br> Mid Semester Examination-II: 15 Marks <br> Teacher Assessment: 10 Marks <br> Continuous Internal Evaluation: 10 Marks <br> End Semester Examination: 50 Marks <br> End Semester Examination (Duration):02 Hrs. |

| | |
|---|---|
| **Prerequisite** | Concepts of Engineering mechanics, basic physics, Newton's Laws. |
| **Objectives** | 1. To study the various properties of fluids <br> 2. To study the hydraulic losses through the pipe and fittings <br> 3. To learn kinematics of fluid flow |
| **Unit-I** | Properties of fluids: Types of fluid, Pressure and its measurement, Pascal's law, pressure forces on plane and curved surfaces, center of pressure, buoyancy and stability, meta-center and meta-centric height. (06 Hrs.) |
| **Unit-II** | Kinematics of fluid flow: Rate of flow, continuity equation, Types of fluid flow, Types of motion, Vortex, Bernoulli's theorem, Dynamics of fluid flow: Venturi meter, orifice-meter, Pitot tube, Introduction to weirs, notches and orifices (06 Hrs.) |
| **Unit-III** | Viscous flow: Shear stress distribution and velocity distribution in circular pipes and two parallel plates; kinetic energy correction factor and momentum energy correction factor, pressure gradient. (06 Hrs.) |
| **Unit-IV** | Hydraulic losses: Minor and major hydraulic losses through pipes and fittings, flow through network of pipes, hydraulic gradient and energy gradient, siphon; power transmission through pipe and nozzle. (06 Hrs.) |
| **Unit-V** | Turbulent flow: Renaults experiment, Friction loss in pipe flow, general equation for head loss-Darcy-Weisbach and Fanning's equations. (06 Hrs.) |
| **Unit-VI** | Dimensional analysis and similitude: Rayleigh's method and Buckingham's $\pi$ theorem, types of similarities, dimensionless numbers. (06 Hrs.) |

| | Sr. No. | Title | Author | Publication | Edition |
|---|---|---|---|---|---|
| **References** | 1 | Text book fluid mechanics and machinery | R. K. Bansal | Laxmi Publication, New Delhi | 2 |
| | 2 | Fluid mechanics fluid power Engineering | D.S. Kumar | Kaitson publication, New Delhi | 3 |
| | 3 | Engineering fluid mechanics | K. L. Kumar | Eurasia pub. House (p) Ltd | 2 |

# Maharashtra Institute of Technology, Aurangabad
## (An Autonomous Institute)

| | |
|---|---|
| **Faculty of Science & Technology**<br>**Syllabus of S. Y. B.Tech. Agricultural Engineering (Semester III)** | |

| | |
|---|---|
| Course Code: AED204<br>Course: Surveying and Leveling<br>**Teaching Scheme:**<br>Theory: 3Hrs./week | Credits: 3-0-0<br>Mid Semester Examination-I: 15 Marks<br>Mid Semester Examination-II: 15 Marks<br>Teacher Assessment: 10 Marks<br>Continuous Internal Evaluation: 10 Marks<br>End Semester Examination: 50 Marks<br>End Semester Examination (Duration): 2 Hrs. |
| **Prerequisite** | Fundamentals of Basic Civil Engineering and Engineering Mathematics |
| **Objectives** | 1. To understand the importance of surveying in the field of agricultural engineering<br>2. To get introduced to different plane and geodetic surveying applications such as chain, compass, plane table, leveling, triangulation, trigonometric leveling etc.<br>3. To understand the significance of each method in engineering and master the skill to carry out the proper surveying method in the field.<br>4. To design numerical solutions for carrying out surveying in agricultural engineering field.<br>5. To get introduced to modern advanced surveying techniques involved such as remote sensing, Total station, GPS etc. |
| **Unit-I** | **Introduction-** Basic definitions, principle and uses of surveying, concept of scale, difference between map and plan, classification of surveying, overview on land surveying: ranging, chaining, and traversing. (06 Hrs.) |
| **Unit-II** | **Chain and compass Traversing**<br>Introduction, Principles of chain surveying, equipment's for chain survey and plotting, errors in chaining, offsetting, well-conditioned and ill-conditioned triangle, instruments for measuring right angles, use of prismatic compass, principles of compass surveying concept of magnetic bearings, Local attraction, traversing with chain and compass, magnetic declination. (06 Hrs) |
| **Unit-III** | **Leveling**<br>Introduction to leveling, Types of leveling, Types of bench marks, Study and use of dumpy level, auto level, digital level and laser level in construction industry, principle axe sof dumpy level, testing and permanent adjustments, reciprocal leveling, curvature and refraction corrections, distance to the visible horizon .(06Hrs) |
| **Unit-IV** | **Theodolite Traversing-**<br>Definitions of different terms, measurement of horizontal angle repetition method and reiteration method, vertical angles, temporary and permanent adjustment of theodolite, direct method of measuring horizontal angle, methods of traversing, sources of error in theodolite, closing error and its limitation, trigonometrical leveling to find heights of objects. Tacheometry – application and limitations, principle of stadia tacheometry, fixed hair method with vertical staff to determine horizontal distances and elevations of points, finding tacheometric constants. (6Hrs) |
| **Unit-V** | **Plane Table Survey**<br>Equipment required for plane table Survey, uses, advantages, disadvantages and errors in plane table surveying; Methods of plane table Survey Radiation, intersection, traversing and resection; Two point and Three point problems and their solutions by different methods, Strength of fix, Lehman's Rules ( 06Hrs) |
| **Unit-VI** | **Contouring**<br>Definition, characteristics, uses, methods of locating contours, use of topo-sheets, profile leveling and cross-sectioning and their applications. (06Hrs) |

|  | Sr. No. | Title | Author | Publication | Edition |
|---|---|---|---|---|---|
| **References** | 1 | Plane Surveying | A. M. Chandra | New Age International Publishers | 3 |
|  | 2 | Surveying and Levelling | N. N. Basak | Tata McGraw Hill. | 2 |
|  | 3 | Surveying Vol. I & II | Dr. K. R. Arora | Standard Book House | 2 |
|  | 4 | Surveying: Theory and Practice | James M. Anderson, Edward M. Mikhail | Tata Mc Graw Hill | 2 |

| **Faculty of Science & Technology** | |
|---|---|
| **Syllabus of S. Y. B.Tech. Agricultural Engineering (Semester III)** | |
| Course Code: AED221 <br> Course: Lab-1 (Tractor Systems and Controls) <br> **Teaching Scheme:** <br> Practical: 02Hrs./week | Credits: 0-0-1 <br><br> Practical/Oral: 25 Marks |
| **Objectives** | 1. To know the different conventional and non-conventional power sources of energy used in agricultural sector. <br> 2. To study the principle and working operations of different engines system and Power Transmission system of Tractor and Power Tiller. <br> 3. To calculate the Power estimation and power losses in agricultural sector. |
| **List of Practical** | 1. Familiarization with different engine parts viz stationary, reciprocating and rotating. <br> 2. Study of two stroke and four stroke cycle engines. <br> 3. Familiarization with carburettors adjustment and fuel supply system. <br> 4. Study of cooling system in tractor <br> 5. Study of steering system in tractor <br> 6. Study of breaks system used in Tractors <br> 7. Familiarization of 2WD and 4 WD of tractors <br> 8. Familiarization with different controls of the tractors <br> 9. Study of hydraulic system in tractor <br> 10. Study of periodic trouble shooting <br> 11. Study of tyre, rim and ballasting methods of tractor. <br> 12. Preliminary checks measure before starting, running and stopping the tractor and power tillers <br><br> **Note:** Minimum 10 practical should be conducted. |

Page | 6

Syllabus of Second Year B.Tech. Agricultural Engineering 2022-23

| **Faculty of Science & Technology** |||
| :--- | :--- | :--- |
| **Syllabus of S. Y. B.Tech. Agricultural Engineering (Semester III)** |||
| Course Code: AED222 <br> Course: Lab-II (Unit Operations in Agriculture Processing) <br> **Teaching Scheme:** <br> Practical: 02Hrs./week || Credits: 0-0-1 <br> TA: 25 Marks |
| **Objectives** | | 1. To understand the basic knowledge of various unit operations carried out after harvesting of crops. <br> 2. To get acquainted with different technologies used for various unit operations in Agricultural Engineering. |
| **List of Practical** | | 1. To study cleaning and grading of freshly harvested grains <br> 2. To determine moisture content of agricultural commodity on dry weight basis and wet weight basis. <br> 3. To determine the rate of drying of given agricultural commodity. <br> 4. Study of hammer mill and burr mill. <br> 5. To separate cream and skim milk from milk. <br> 6. To study reverse osmosis system for filtration and purification of water. <br> 7. To extract fat from oil seeds by solvent extraction method <br> 8. Study of sedimentation process of food <br> 9. Study of different conveying equipment's used in food material handling. <br> 10. Visit to food processing industry. <br> 11. Visit to grain processing industry. <br> **Note:** Minimum 10 practical should be conducted. |

| **Faculty of Science & Technology** |
|---|
| **Syllabus of S. Y. B.Tech. Agricultural Engineering (Semester III)** |

| Course Code: AED223 | Credits: 0-0-1 |
|---|---|
| Course: Lab-III (Surveying and Leveling) | Practical/Oral: 25 Marks |
| **Teaching Scheme:** | |
| Practical: 02Hrs./week | TA: 25 Marks |

| **Objectives** | | 1. To understand the importance of surveying in the field of agricultural engineering<br>2. To get introduced to different plane and geodetic surveying applications such as chain, compass, plane table, leveling, triangulation, trigonometric leveling etc.<br>3. To understand the significance of each method in engineering and master the skill to carry out the proper surveying method in the field.<br>4. To design numerical solutions for carrying out surveying in agricultural engineering field.<br>5. To get introduced to modern advanced surveying techniques involved such as remote sensing, Total station, GPS etc. |
|---|---|---|
| **List of Practical** | | 1. Measurement of magnetic bearings of sides of a triangle or polygon, correction for local attraction and calculations of true bearings using prismatic compass.<br>2. Plane table survey by Radiation and Intersection method.<br>3. Plane table surveying by traversing method.<br>4. Finding horizontal and vertical distance using Tacheometer.<br>5. Simple and differential leveling with at least three change points using digital level.<br>6. Measurement of horizontal angles using Transit Theodolite.<br>7. Study of profile leveling<br>8. Study of precise leveling<br>9.To work out area by cross staff survey<br>10 Study of minor instruments (Planimeter)<br> **Note:** Minimum 10 practical should be conducted. |

Page | 8

Syllabus of Second Year B.Tech. Agricultural Engineering 2022-23

**Faculty of Science & Technology**
**Syllabus of S. Y. B.Tech. Agricultural Engineering (Semester III)**

| Course Code: AED224 | Credits: 0-0-1 |
|---|---|
| Course: Lab-IV (Workshop Practices) | Practical/Oral: 25 Marks |
| **Teaching Scheme:** | |
| Practical: 02Hrs./week | |

| Objectives | | 1. To develop general machining skills in the students |
|---|---|---|
| | | 2. To develop a skill in precision, safety at work place, team working and development of right attitude. |
| **List of Practical** | | 1. Preparation of simple joints: Cross half Lap joint and T-Halving joint |
| | | 2. Introduction to tools and measuring instruments for fitting |
| | | 3. Jobs on sawing, filing and right-angle fitting of MS Flat |
| | | 4. Operations of drilling, reaming, and threading with tap and dies |
| | | 5. Introduction to tools and operations in sheet metal work |
| | | 6. Making different types of sheet metal joints using G.I. sheets |
| | | 7. Introduction to welding equipment, processes tools, their use and precautions |
| | | 8. Jobs on ARC welding − Lap joint, butt joint; T-Joint and corner joint in Arc welding |
| | | 9. Gas welding Practice − Lab, butt and T-Joints |
| | | 10. Introduction to metal casting equipment, tools and their use |
| | | 11. Mould making using one-piece pattern and two pieces pattern |
| | | 12. Introduction to machine shop machines and tools |
| | | **Note:** Minimum 10 practical should be conducted. |

Page | 9

Syllabus of Second Year B.Tech. Agricultural Engineering 2022-23

| | |
|---|---|
| **Faculty of Science & Technology** <br> **Syllabus of S. Y. B.Tech. Agricultural Engineering (Semester III)** | |
| Course Code: AED225 <br> Course: Lab-IV (Data Analytics Lab) <br> **Teaching Scheme:** <br> Practical: 02Hrs./week | Credits: 0-0-1 <br><br> TA: 25 Marks |

| | | |
|---|---|---|
| **Objectives** | | 1. Understand the R Programming Language. <br> 2. Exposure on visualizing data science problems. <br> 3. Understand the classification and Regression Model. |
| **List of Practical** | | **1. Introduction to R Programming and Study of basic Syntax in R** <br><br> **2. R as a Calculator application:** <br> a. Using with and without R objects on console. b. Using mathematical functions on console. c. Write an R script, to create R objects for calculator application and save in a specified location in disk. <br><br> **3. Descriptive Statistics In R** <br> a. Write an R script to find basic descriptive statistics using summary, str, quartile function. b. Write an R script to find subset of dataset by using subset (), aggregate () functions on sample dataset <br><br> **4. Reading and Writing Different Types of Datasets** <br> a. Reading different types of data sets (.txt, .csv) from Web and disk and writing in file in specific disk location. b. Reading Excel data sheet in R. c. Reading XML dataset in R. <br><br> **5.Visualizations** <br> a. Find the data distributions using box and scatter plot. b. Find the outliers using plot. c. Plot the histogram, bar chart and pie chart on sample data Study and implementation of various control structures in R and calculate mean mode median for a dataset <br><br> **6. Correlation and Covariance** <br> a. Find the correlation matrix. b. Find the outliers using plot. <br> c. Plot the correlation plot on dataset and visualize giving an overview of relationships among data. <br><br> **7. Regression Model Import a data from web storage.** <br> Name the dataset and now do Linear/Logistic Regression to find out relation between variables that are affecting the admission of a student in an institute based on his or her entrance score <br><br> **8. Classification Model** <br> a. Install relevant package for classification. b. Choose classifier for classification problem. c. Evaluate the performance of classifier. <br><br> **9. Clustering Model** <br> a. Clustering algorithms for unsupervised classification. b. Plot the cluster data using R visualizations. <br><br> **10. Mini Project** |

| | | |
|---|---|---|
| **Faculty of Science & Technology** <br> **Syllabus of S. Y. B.Tech. Agricultural Engineering (Semester III)** | | |

| | |
|---|---|
| Course Code: HSM804 <br> Course: Constitution of India <br> (Mandatory non-credit course) <br> **Teaching scheme:** <br> Theory: 2 hrs. /week | Credits:0-0-0 |

| Prerequisite | Willingness to learn |
|---|---|
| **Objectives** | 1.To create awareness about the constitution of India <br> 2.To know different sections/articles of the constitution of India and their significance. |
| **Unit-I** | Meaning and Concept of Indian Constitution; Nature of Constitution; Brief Idea of Indian Constitution [Parts, Articles and Schedule] (02 Hrs.) |
| **Unit-II** | Salient Features of Indian Constitution <br> Written and Enacted Constitution; The longest and most detailed Constitution of the World; Rigidity and Flexible Constitution; Parliamentary system of Government; Federal system with unitary bias; Adult Franchise; Single Citizenship; Sovereign, Democratic, Republic; Secularism; Directive Principles of State Policy; Independent Judiciary; Fundamental Rights; Fundamental Duties. (05 Hrs.) |
| **Unit-III** | Fundamental Rights <br> Concept of State (Art. -12); Right to Equality (Art. -14 to 18); Right to Freedom (Art. -19 to 22);  Right against Exploitation (Art. -23 & 24); Right to Religion (Art. -25 to 28); Right of Minorities (Art. -29 & 30); Constitutional Remedies (Art.-32). <br> Fundamental Duties (Art.-51 A) (05 Hrs.) |
| **Unit-IV** | Directive Principles of State Policy (DPSP's) <br> Meaning and Significance of Directive Principles; Classification/ Principles of D.P.S.P.; Relationship between F.Rs. and D.P.S.P. (04 Hrs.) |
| **Unit-V** | Executives, Union Government, The President, Council of Ministers, and Prime Minister. <br> State Government, The Governor, Council of Ministers and Chief Minister (04 Hrs.) |
| **Unit-VI** | Election Commission: Election Commission: Role and Functioning; Chief Election Commissioner and Election Commissioners; State Election Commission: Role and Functioning; Institute and Bodies for the welfare of SC/ST/OBC and women. (04 Hrs.) |

| References | Sr. No. | Title | Author | Publication | Edition |
|---|---|---|---|---|---|
| | 1 | Constitution of India, Bare Act. Govt. of India | Constitution of India, Bare Act. Govt. of India | Constitution of India, Bare Act. Govt. of India | - |
| | 2 | Our Constitution (AN Introduction of Indians Constitution and Constitutional tow | Subhash C Kashyap | National Book Trust, India | 2001 |
| | 3 | Indian Constitution | Avasthi &, Maheshwarii | Lakshmi Narain Agrawal Agra, | 2017 |
| | 4 | Introduction to the Constitution of India | Basu D.D., | Lexis Nexis, | 2013 |
| | 5 | Indian Prime Minister | Sharma L.N. | the Macmillan Company of India, | 1976 |
| | 6 | Union Executive, | Jain H.M. | Chaitanya Publishing House, | 1969. |

Page | 11

Syllabus of Second Year B.Tech. Agricultural Engineering 2022-23

| | 7 | Dr. B.R. Ambedkar, Framing of Indian Constitution (1 to 6 Volume) | Dr. S.N. Busi, | Ava Publishers | First Edition, 2016 |
|---|---|---|---|---|---|
| | 8 | Indian Constitution Law, | M.P. Jain, | Nexis | 7th Edn. 2014 |
| | 9 | Outlines of Indian Legal and Constitutional History, | M.P. Jain, | Lexis Nexis, | 2014 |

Page | 12

Syllabus of Second Year B.Tech. Agricultural Engineering 2022-23

<table>
<tr><td colspan="2" align="center"><b>Faculty of Science &amp; Technology</b><br><b>Syllabus of S. Y. B. Tech. (Non Circuit Branches) (Semester IV)</b></td></tr>
</table>

| Course Code: BSC251B<br>Course: Complex Variable &Vector Calculus<br>**Teaching Scheme:**<br>Theory:  03 Hrs./week<br>Tutorial: 01Hrs./week | Credits: 3-1-0<br>Mid Semester Examination-I: 15 Marks<br>Mid Semester Examination-II: 15 Marks<br>Teacher Assessment: 10 Marks<br>Continuous Internal Evaluation: 10 Marks<br>End Semester Examination: 50 Marks<br>End Semester Examination (Duration): 2 Hrs. |
|---|---|

| Prerequisite | Basic formulae of trigonometry, Derivative, Integration, algebra of complex numbers, and fundamentals of vector algebra. |
|---|---|
| Objectives | 1. To develop the mathematical skills of the students related to the function of complex variables.<br>2. To make the students familiarize with the concept of vector differentiation and vector integration.<br>3. To apply mathematical concepts for solving practical problems in engineering and technology. |
| Unit-I | **The function of Complex Variable**:<br>Introduction, Analytic function, Cauchy-Riemann equation in Cartesian and polar coordinates, Harmonic function, orthogonal system, Integration in the complex plane: Line integral, Contour integral, Cauchy's integral theorem, Cauchy's integral formula, Extension of Cauchy's theorem on multiply connected region, Singularities, Residues, Cauchy's residue theorem. (07 Hrs.) |
| Unit-II | **Fourier Series:** Definition, Dirichlet's conditions; Fourier series for function having period 2L; Fourier series for even and odd function, half range expansion; Fourier sine and cosine series. (06 Hrs.) |
| Unit-III | **Fourier Transform:** Fourier integral theorem (without proof), Fourier sine and cosine integral, Fourier sine and cosine transform, inverse Fourier transform, inverse Fourier sine and cosine transform. (05 Hrs.) |
| Unit-IV | **Vector Differentiation**:  Differentiation of vectors, Scalar and Vector point functions, Gradient of a scalar point function, Directional derivative, Divergence and Curl of vector point function, Irrotational and Solenoidal vector fields. (06 Hrs) |
| Unit-V | **Vector Integration**: Line integral, Work done by a force, Surface integral, Green's theorem, Stokes's theorem. (06Hrs.) |
| Unit-VI | **Application of Partial Differential Equation**<br>Solution of partial differential equation by the method of separation of variables, Applications to the i.vibrationtion of a string (Wave equation) (without proof) ii. One-dimensional heat flow equation (Diffusion equation) (without proof) iii. Two-dimensional heat flow equation (Diffusion equation) (without proof). (6 Hrs.) |

| References | Sr. No. | Title | Author | Publication | Edition |
|---|---|---|---|---|---|
| | 1 | Advanced Engineering Mathematics | Erwin Kreyszig | Wiley eastern Ltd | 10th Edition |
| | 2 | Higher Engineering Mathematics | B.V. Ramana | Tata McGraw-Hill | 1st Edition |

| | 3 | Advanced Engineering Mathematics | C.R. Wylie | McGraw Hill Publications | 6th Edition |
|---|---|---|---|---|---|
| | 4 | Higher Engineering Mathematics | Dr. B. S. Grewal | Khanna Publications | 43rd Edition |
| | 5 | Applied Mathematics | P. N. Wartika&J. N. Wartikar | Pune VidyarthiGriha Prakashan,Pune | 9th Edition |
| | 6 | A textbook of Engineering Mathematics | N.P. Bali and Manish Goyal | Laxmi Publications | Laxmi Publications |
| | 7 | Advanced Engineering Mathematics. | H. K. Dass | S. Chand And Co. Ltd | 18th Edition |

## Faculty of Science & Technology
## Syllabus of S. Y. B. Tech. Agricultural Engineering (Semester-IV)

| | |
|---|---|
| Course Code: AED251 | Credits: 3-0-0 |
| Course: Farm Machinery and Equipments | Mid Semester Examination-I: 15 Marks |
| **Teaching Scheme:** | Mid Semester Examination-II: 15Marks |
| Theory: 3Hrs./week | Teacher Assessment: 10 Marks |
| | Continuous Internal Evaluation: 10 Marks |
| | End Semester Examination: 50 Marks |
| | End Semester Examination (Duration): 2 Hrs. |

| | |
|---|---|
| **Prerequisite** | A Degree holder in Agricultural Engineering must know the agricultural operations, Control, maintenance and repairing idea of different machines used in agricultural sector. |
| **Objectives** | 1. To know the conventional & modern agricultural operations. <br> 2. To impart student know-how about different farm machineries used in farm. <br> 3.To know the Material of construction, working principles, adjustments, capacities and efficiencies of different farm machines. <br> 4. To able to calculate cost of operation of different agricultural machines. |
| **Unit-I** | Introduction to farm mechanization – Scope, Merits, Limitations, Status of mechanization in the country and state - Classification of farm machines based on operation, power source, in relation to power unit etc. Power units/sources for farm machinery/implements, hitching systems and controls on farm machinery (06Hrs.) |
| **Unit-II** | Seed bed preparation operations and its classification - Concepts of deep tillage, rotary tillage and minimum tillage - Introduction to machines / implements used for primary and secondary tillage operations, Methods of ploughing, Indigenous plough, Mouldboard plough, and disc plough: functional components, type, constructional details, accessories and attachments. Horizontal suction, vertical suction of MB plough and Disc geometry of disc plough. Chisel plough and sub soiler: functional components, type, constructional details, accessories and attachment (06Hrs.) |
| **Unit-III** | Secondary tillage implements- Forces acting on tillage implements, Draft measurement of tillage implements and calculation of power requirement for the tillage implements. Study of cultivator, harrows, rotary tillers, leveling and paddling implements. Calculation of field capacity and field efficiency (06Hrs.) |
| **Unit-IV** | Introduction to sowing, planting and transplanting equipment - Introduction to seed drills, no-till drills, and strip-till drills. Introduction to planters- bed planters and other planting equipment, rice transplanters, types of furrow openers, metering systems in drills and planters, Calibration of seed-drills/ planters and adjustments (08Hrs.) |
| **Unit-V** | Introduction to plant protection equipment – sprayers and dusters, Classification of sprayers, Types of nozzles – components and function, Calculations for calibration of sprayers and chemical application rates. Introduction to interculture equipment - Use of weeders – manual and powered. Study of functional requirements of weeders and main components. Familiarization of fertilizer application equipment ( 06Hrs.) |
| **Unit-VI** | Harvesting and threshing- Principles and types of cutting mechanisms, construction and adjustments of shear and impact-type cutting mechanisms. Crop harvesting machinery: mowers, windrowers, reapers, reaper binders and forage harvesters. Forage chopping and handling equipment. Maize harvesting and shelling equipment, Root crop harvesting equipments– potato and groundnut digger. Cotton picking and Sugarcane harvester. Threshing mechanics and various types of threshers. Power thresher, straw combines and grain combines. Cost analysis of farm machinery. (06Hrs.) |

| | Sr. No. | Title | Author | Publication | Edition |
|---|---|---|---|---|---|
| **References** | 1 | Elements of Agricultural Engineering | Dr. Jagdishwar Sahay | Standard Publishers | 5 |
| | 2 | Principles of Agricultural Engineering, Vol-I | A. M. Michel & T.P. Ojha | Jain Brothers | 10 |
| | 3 | Principles of Farm Machinery | C.P.Nakra | CBS Publication | 3 |
| | 4 | Farm Machines & Equipments | D. N. Sharma &S. Mukesh | Dhanpat Rai Publishing | 3 |

| | |
|---|---|
| **Faculty of Science & Technology** <br> **Syllabus of S. Y. B. Tech. Agricultural Engineering (Semester-IV)** ||
| Course Code: AED252 <br> Course: Heat and Mass Transfer <br> **Teaching Scheme:** <br> Theory:  3 Hrs./week | Credits: 3-0-0 <br> Mid Semester Examination-I: 15Marks <br> Mid Semester Examination-II:  15 Marks <br> Teacher Assessment: 10 Marks <br> Continuous Internal Evaluation: 10 Marks <br> End Semester Examination: 50 Marks <br> End Semester Examination (Duration): 02 Hrs. |

| | |
|---|---|
| **Prerequisite** | Basic thermodynamics, derivatives and integration |
| **Objectives** | 1.The subject intends to make aware about fundamental laws and modes of heat and mass transfer for application in agricultural processing. <br> 2. It also includes the need of refrigeration for perishable commodities of agriculture and its application to increase the shelf life of fruits and vegetables |
| **Unit-I** | **Introduction**- Modes and laws of heat transfer, Mechanism of modes of heat transfer, Fourier's law of heat conduction, Stefan-Boltzmann law, Newton's law of cooling, Electrical analogy, Thermal conductivity. (06 Hrs.) |
| **Unit-II** | **Conduction**-General differential equation of conduction. Heat conduction through a plane wall, cylindrical wall and sphere, Heat conduction through a composite slab, cylinder and Sphere, Insulation materials, critical thickness. (06 Hrs.) |
| **Unit-III** | **Convection-** Free and forced convection, Heat transfer coefficient in convection. Dimensional analysis of free convection, Empirical correlations for free and forced convection for heat transfer in laminar and turbulent flow over a flat plate, film wise and drop wise condensation, heat transfer in pool boiling phenomenon. (06 Hrs.) |
| **Unit-IV** | **Radiation-**  Introduction, absorptivity, reflectivity and transmissivity of radiation, Black body and monochromatic radiation, Planck' s law, Kirchoff' s law, grey bodies and emissive power, solid angle, intensity of radiation. (06 Hrs.) |
| **Unit-V** | **Heat Exchangers-** Heat exchanger's classification, Overall heat transfer coefficient, log mean temperature difference (LMTD) for parallel and counter flow heat exchangers, fouling factor, Mass  Transfer: Fick's law,  mass  transfer  coefficients,  Types  of  mass  transfer. (06Hrs.) |
| **Unit-VI** | **Refrigeration-** Carnot cycle, working of heat engine, heat pump and refrigerator, COP, Vapor compression system, properties of refrigerants, two stage refrigeration system, cascade refrigeration system, Calculations for single stage refrigeration system, vapor absorption system, ice manufacturing. (06Hrs.) |

| | Sr. No. | Title | Author | Publication | Edition |
|---|---|---|---|---|---|
| **References** | 1. | A Text Book of Heat Transfer | S. P Sukhatme | University Press | 4th |
| | 2. | Heat & Mass Transfer | Yunis A. Cengel& A. J. Gajar | Tata McGrawHill | 2nd |
| | 3. | Heat & Mass Transfer | R. K. Rajput | S. Chand Publication | 5th |
| | 4. | Refrigeration & Air Conditioning | C. P. Arora | Tata McGrawHill | 2nd |

**Faculty of Science & Technology**
**Syllabus of S. Y. B. Tech. Agricultural Engineering (Semester-IV)**

| | |
|---|---|
| Course Code: AED253 | Credits: 3-0-0 |
| Course: Strength of Materials | Mid Semester Examination-I: 15 Marks |
| **Teaching Scheme:** | Mid Semester Examination-II: 15 Marks |
| Theory:  03Hrs./week | Teacher Assessment: 10 Marks |
| | Continuous Internal Evaluation: 10 Marks |
| | End Semester Examination: 50 Marks |
| | End Semester Examination (Duration): 02 Hrs. |

| | |
|---|---|
| **Prerequisite** | The purpose of the subject of Strength of Materials is to be make the students aware of the limiting values of stresses, safe carrying stresses and various mechanical properties of Materials. |
| **Objectives** | 1. To learn about the concept of stress, strain and deformation of solid and state of stress.<br>2. To learn the bending moment, shear force and the corresponding stress distribution for different types of beams.<br>3. To know the concepts of strain energy, principal stress and principal planes. |
| **Unit-I** | Simple Stresses and strains: Mechanical properties of materials, Simple stress and strain, Stress-Strain Curve for Steel, Ductile Material, Brittle Material, Hooke's Law, Shearing Stresses, Bearing stresses, Composite sections, Statically Indeterminate Members, temperature stresses, lateral strains and linear strains, elastic constants, biaxial and triaxial deformations. (Descriptive and Analytical)                                                                         (06 Hrs.) |
| **Unit-II** | Shear Force and Bending Moment: Concept, Types of Supports, beam and loads, shear force and bending moments, Shear force and bending moment diagrams for statically determinate beams subjected to various loading conditions like udl ,uvl, bracket loads , point loads and moments etc. SF and BM for section with varying Young's modulus and moment of Inertia. (Descriptive and Analytical)                                                                         (06 Hrs.) |
| **Unit-III** | Theory of simple bending: Pure bending, assumptions made in theory of simple bending, neutral axis, moment of resistance, section modulus, Flexural formula and Filched Beam. (Descriptive and Analytical)                                                                         (06 Hrs.) |
| **Unit-IV** | Shear Stress Distribution: Shear stress equation, Distribution of shear stress over rectangular, circular and triangular section, complementary shear, Direct and bending stresses: Direct Bending stress in column. Core of section for rectangular, hallow rectangular, circular and hallow circular section. (Descriptive and Analytical)                                                                         (06 Hrs.) |
| **Unit-V** | Theory of Torsion: Torsional Formula, Assumptions made in theory of torsion, Polar modulus, torsional stresses, Power Transmission, torsional stress on composite shaft for various conditions. (Descriptive and Analytical)                                                                         (06 Hrs.) |
| **Unit-VI** | Principal stresses and strains: Concept, stress on oblique plane, Method of finding stresses on inclined section of body Analytical and Graphical method (Mohr's circle diagram).(Descriptive and Analytical)                                                                         (06 Hrs.) |

| | Sr. No. | Title | Author | Publication | Edition |
|---|---|---|---|---|---|
| **References** | 1. | Strength of Materials | S. Ramamrutham | Dhanpatrai and Sons | 14th |
| | 2. | Strength of Materials | R.K. Bansal | Laxmi Publications | 4th |
| | 3. | Mechanics of Materials | R. C. Hibbler | Pearson Education | 2th |
| | 4. | Mechanics of Structure, vol-I | Junnarkar | Charotar | 4th |

**Faculty of Science & Technology**
**Syllabus of S. Y. B. Tech. Agricultural Engineering (Semester-IV)**

| Course Code: AED281 | Credits: 3-0-0 |
|---|---|
| Course: Professional Elective Courses-I | Mid Semester Examination-I: 15 Marks |
| (Dairy and Food Engineering) | Mid Semester Examination-II: 15 Marks |
| **Teaching Scheme:** | Teacher Assessment: 10 Marks |
| Theory: 03 Hrs./week | Continuous Internal Evaluation: 10 Marks |
| | End Semester Examination: 50 Marks |
| | End Semester Examination (Duration):  02 Hrs. |

| | |
|---|---|
| **Prerequisite** | Students should have basics knowledge of animal husbandry, milk production and unit operations in processing |
| **Objectives** | 1. To get acquainted with basic concepts in dairy processing. <br> 2. To study milk processing and their products |
| **Unit-I** | Introduction: Milk and Milk production in India, importance of milk processing, Milk composition. Effects on physicochemical, microbial and nutritional properties of milk and milk products, present status of preservation of raw milk by chemical preservatives & thermal preservation, heat stability of milk. (Descriptive)                                                    (06 Hrs.) |
| **Unit-II** | Supply chain & types of Milk: Problems of milk supply in India, Scope and functioning of milk supply schemes and various national and international organizations, Standardized milk, recombined milk, reconstituted milk toned and double toned milk, humanized milk, fortified milk, flavored milks and other milks. Curd tension and soft curd milk. Principles and equipment for of milk: Principle, equipment, effects and applications, Homogenization and their applications in dairy industry. (Descriptive)                                                    (06 Hrs.) |
| **Unit-III** | Processing of milk and milk product: Dairy plant operations viz. receiving, separation, clarification, standardization, homogenization, pasteurization, sterilization, storage, transport and distribution of milk. Concentration and condensed milks, evaporation and evaporated milk, drying and dried milk, manufacturing of cream, butter, butter oil and ice-cream. bactofugation and Bactotherm processes, Micro fluidization, UHT processed milk products, aseptic fillers. (Descriptive and analytical)                                                    (06 Hrs.) |
| **Unit-IV** | Quality of Milk and milk products: Judging and grading of milk and milk products, Nutritional and physico-chemical changes during processing and storage of milk and milk products, microbiology of milk and milk products, defects, causes and remedies in milk product like cream, butter, butter oil, ice-cream and indigenous and fermented milk products. (Descriptive) (06Hrs.) |
| **Unit-V** | Role of Water & enzyme in dairy: Sorption behavior of foods, energy of binding water, control of water activity of different milk products in relation to their chemical; microbiological and textural properties; Use of carbonation in extending the shelf life of dairy products. Judging and grading of milk products. Cheese spreads by spray and roller drying techniques. EMC (Enzyme modified cheese), Enzymes in dairy processing. (Descriptive and analytical) (06 Hrs.) |
| **Unit-VI** | Cleaning and sanitation in milk processing plant: Handling and maintenance of dairy plant equipment in cleaning and sanitization of dairy equipment: biological; detergents; Automation; Ultrasonic techniques in cleaning; bio detergents, development of sanitizers- heat; chemical; radiation, mechanism of fouling; Bio-films, assessing the effectiveness of cleaning and sanitization of dairy products, selection and use of dairy cleaner and sanitizer. In-plant cleaning system.(Descriptive) <br><br> (08 Hrs.) |

Page | 19

Syllabus of Second Year B.Tech. Agricultural Engineering 2022-23

| | Sr. No. | Title | Author | Publication | Edition |
|---|---|---|---|---|---|
| **References** | 1. | Ultra-high Temperature Processing of Milk and Milk Products | H. Burton | Elsevier 1998 | 1 |
| | 2. | Food Processing Technology | P. Fellow | Elliss Horwood Ltd.1998 | 4 |
| | 3. | Dairy Processing – Improving Quality | G. Smit | Woodhead Publ 2003 | 1 |

Page | 20

Syllabus of Second Year B.Tech. Agricultural Engineering 2022-23

| | |
|---|---|
| **Faculty of Science & Technology** | |
| **Syllabus of S. Y. B. Tech. Agricultural Engineering (Semester-IV)** | |

| | |
|---|---|
| Course Code: AED282<br>Course: Professional Elective Courses-I<br>(Watershed Planning and Management)<br>**Teaching Scheme:**<br>Theory: 03 Hrs./week | Credits: 3-0-0<br>Mid Semester Examination-I: 15 Marks<br>Mid Semester Examination-II: 15 Marks<br>Teacher Assessment: 10 Marks<br>Continuous Internal Evaluation: 10 Marks<br>End Semester Examination: 50 Marks<br>End Semester Examination (Duration): 02 Hrs. |

| Prerequisite | Awareness of soil and water conservation problems |
|---|---|
| **Objectives** | 1.To study various methods of water resource management<br>2. To understand Rehabilitation, Protection and improvement of water yields.<br>3. To study the formulation of project proposals for watershed management Programmes. |
| **Unit-I** | Watershed management - problems and prospects; watershed-based land use planning, watershed characteristics – physical and geomorphologic, factors affecting watershed management. (06Hrs.) |
| **Unit-II** | Hydrologic data for watershed planning, watershed delineation, delineation of priority watershed, water yield assessment and measurement from a watershed. (06Hrs.) |
| **Unit-III** | Hydrologic and hydraulic design of earthen embankments and diversion structures; sediment yield estimation and measurement from a watershed and sediment yield models. (06Hrs.) |
| **Unit-IV** | Rainwater conservation technologies - in-situ and storage, design of water harvesting tanks and ponds, water budgeting in a watershed; effect of cropping system, land management and cultural practices on watershed hydrology; evaluation and monitoring of watershed programmes. (06 Hrs.) |
| **Unit-V** | People's participation in watershed management programmes; planning and formulation of project proposal. (06Hrs.) |
| **Unit-VI** | Cost benefits analysis of watershed programmes; watershed management technologies, optimal land use models, case studies. (06Hrs.) |

| | Sr. No. | Title | Author | Publication | Edition |
|---|---|---|---|---|---|
| **References** | 1 | Manual of Soil & Water conservation Practices | G. Singh, C. Venkataramanan, G.Sastry& B. P. Joshi | Oxford & IBH Publishing Co. Pvt. Ltd., NewDelhi | 2 |
| | 2 | Soil & Water Conservation Engineering | R. Suresh | Standard Publisher Distributors, New Delhi | 2 |
| | 3 | Watershed Management | V. V. Druvanarayan, G. Sastry& U. S. Patnaik | ICAR New Delhi | 1 |

Page | 21

Syllabus of Second Year B.Tech. Agricultural Engineering 2022-23

| | |
|---|---|
| **Faculty of Science & Technology** | |
| **Syllabus of S. Y. B. Tech. Agricultural Engineering (Semester-IV)** | |

| | |
|---|---|
| Course Code: AED283<br>Course: Professional Elective Courses-I (Precision Agriculture and Management)<br>**Teaching Scheme:**<br>Theory:  03Hrs./week | Credits: 3-0-0<br>Mid Semester Examination-I: 15 Marks<br>Mid Semester Examination-II: 15 Marks<br>Teacher Assessment: 10 Marks<br>Continuous Internal Evaluation: 10 Marks<br>End Semester Examination: 50 Marks<br>End Semester Examination (Duration): 03 Hrs. |

| | |
|---|---|
| **Prerequisite** | A Degree holder in Agricultural Engineering must know the agricultural operations, different machines used in Agricultural sector. |
| **Objectives** | 1.To impart basic knowledge in Precision Agriculture<br>2.To know the use of GIS based or sensor based modern equipments for precision farming.<br>3.Students able to system approach in machinery selection and improve the related problem-solving skills. |
| **Unit-I** | Precision Agriculture – Introduction, need and functional requirements. Familiarization with issues relating to natural resources. Familiarization with equipment for precision agriculture. Concept of Protected Cultivation- Hydroponics, aeroponics and aquaponics. Climate control in protected cultivation. Precision agriculture and management, Geographic context: scales in the spatial spiral, Subfield Management, beyond Subfield Management, regional Management (06 Hrs.) |
| **Unit-II** | Familiarization with equipment for precision agriculture including sowing and planting machines, power sprayers, land clearing machines, laser guided land levellers, straw chopper, straw-balers, grain combines.                                                   (06 Hrs.) |
| **Unit-III** | Introduction to GIS based precision agriculture and its applications-Data input to FIS, Map coordination, Data analysis in the FIS. Control area networks. Introduction to sensors and application of sensors for data generation. Database management. GPS and its application (06 Hrs.) |
| **Unit-IV** | System concept. System approach in farm machinery management, problems on machinery selection, maintenance and scheduling of operations. Application to PERT and CPM for machinery system management. (06 Hrs.) |
| **Unit-V** | Precision Farming Tools: Variable Rate application-VRA methods, Map based VRA and Sensor based VRA, Seeding VRA, weed control VRA, flow based control systems, Chemical Direct-Injection Systems, Modulated Spraying-Nozzle Control Systems, New and Developing VRA Systems, Sensor-Based Devices, Lime VRA, fertilizer VRA Phosphorous VRA, Nitrogen VRA, Nitrogen Application for Grain Crop.                                                   (06 Hrs.) |
| **Unit-VI** | Adoption of Precision Agriculture, Current status and likely trends, Status of Current Adoption, Diffusion of New Technologies, Determinants of Long-Term Adoption, Determinants of the Speed of Diffusion of New Technologies, Long-Term Potential of Precision Agriculture, Evolution of Precision Agriculture, Effects of widespread adoption of precision agriculture, Effects on Rural Employment, Effects on the Structure of Farming, Environmental Implications. (06 Hrs.) |

| | Sr. No. | Title | Author | Publication | Edition |
|---|---|---|---|---|---|
| **References** | 1 | Advances in Protected Cultivation | Brahma Singh, Balraj Singh, Naved Sabir and Murtaza Hasan. | New India Publishing Agency, New Delhi. | **2** |

| | 2 | Precision Farming | Jana, B. L., 2008. | AgroTech Publishing Academy | **1** |
| | 3 | Farm power and Machinery Management | Donell Hunt, | MedTec Publishers, New Delhi | **1** |

| | | |
|---|---|---|
| **Faculty of Science & Technology** <br> **Syllabus of S. Y. B. Tech. Agricultural Engineering (Semester-IV)** | | |
| Course Code: AED271 | | Credits: 0-0-1 |
| Course: Laboratory-I (Farm Machinery and Equipments) | | Oral: 25 Marks |
| **Teaching Scheme:** | | |
| Practical: 02Hrs./week | | |
| **Objectives** | : | 1. To know the conventional & modern agricultural operations. <br> 2. To impart student know-how about different farm machineries used in farm. <br> 3. To know the Material of construction, working principles, adjustments, capacities and efficiencies of different farm machines. <br> 4. To able to calculate cost of operation of different agricultural machines. |
| **List of Practical** | : | 1 Introduction to various farm machines and visit to implements shed and research hall. <br> 2. Field capacity and field efficiency measurement for machines and implements. <br> 3. Draft and fuel consumption measurement for different implements under different oil conditions. <br> 4. Construction details, adjustments and working of M.B. plough, disc plough, disc harrow and secondary tillage tools. <br> 5. Construction and working of rotavators and other rotary tillers, measurement of speed and working width. <br> 6. Working of seed-cum-fertilizer drills, planters and their calibration in the field. <br> 7. Constructional details and working of transplanters in the field. <br> 8. Measurement of nozzle discharge and field capacity of sprayers and dusters. <br> 9. Familiarization with various farm machines related to harvesting, constructional details, materials and working of combine harvester. <br> 10. Study of various types of potato harvesters, constructional details, materials and working. <br> 11. Study of various types of threshers, constructional details, materials, working and performance <br> 12. Study of various types of reapers and mowers, constructional details, materials and working. <br> **Note:** minimum10 Practical's Should perform |

| | | |
|---|---|---|
| | **Faculty of Science & Technology** **Syllabus of S. Y. B. Tech. Agricultural Engineering (Semester-IV)** | |
| Course Code: AED272 Course: Laboratory-II (Heat and Mass Transfer) **Teaching Scheme:** Practical: 02Hrs./week | | Credits: 0-0-1 TA: 25 Marks |
| **Objectives** | : | 1.The subject intends to make aware about fundamental laws and modes of heat and mass transfer for application in agricultural processing. 2. It also includes the need of refrigeration for perishable commodities of agriculture and its application to increase the shelf life of fruits and vegetables |
| **List of Practical** | : | 1 Determination of Thermal conductivity of metal rod 2 Determination of Thermal conductivity of Composite Wall 3 Determination of Thermal conductivity of Insulating Powder 4 Determination of the local heat transfer coefficient of air for a vertical tube loosing heat by natural convection. 5 Determination of average heat transfer coefficient in forced convection of air in a tube. 6 Determination of heat transfer, fin efficiency and temperature distribution along the length of pin-fin in natural and forced convection. 7 Experimental verification of Steffen Boltzmann's constant. 8 Determination of emissivity of the test plate surface. 9 Determination of LMTD, the heat transfer rate, overall heat transfer coefficient and effectiveness of a parallel flow heat exchanger. 10 Determination of LMTD, the heat transfer rate, overall heat transfer coefficient and effectiveness of a counter flow heat exchanger. 11 Study of condensation and pool boiling. **Note:** minimum10 Practical's Should perform |

Page | 25

Syllabus of Second Year B.Tech. Agricultural Engineering 2022-23

**Faculty of Science & Technology**
**Syllabus of S. Y. B. Tech. Agricultural Engineering (Semester-IV)**

| | | |
|---|---|---|
| Course Code: AED273 | | Credits: 0-0-1 |
| Course: Laboratory-III (Strength of Materials) | | Oral: 25 Marks |
| **Teaching Scheme:** | | |
| Practical: 02Hrs./week | | |
| **Objectives** | : | 1. To learn about the concept of stress, strain and deformation of solid and state of stress. 2. To learn the bending moment, shear force and the corresponding stress distribution for different types of beams. 3. To know the concepts of strain energy, principal stress and principal planes. |
| **List of Practical** | : | 1. Study of universal testing machine 2. Tension test on the ductile materials like mild steel and TOR steel 3. Flexural test on timber beam 4. Shear test on metals. 5. Compressive Strength Test on Burnt clay Building Bricks. 6. Water absorption test on burnt bricks. 7. Transverse test on flooring tiles. 8. Abrasion test on flooring tiles. 9. Impact tests on metals-Izod and Charpy. 10. Torsion test on steel. 11. Rockwell Hardness test. 12. Deflection of Beam. 13. Study the Buckling of column 14. Study the Defection of Spring **Note:** minimum10 Practical's Should perform |

Page | 26

Syllabus of Second Year B.Tech. Agricultural Engineering 2022-23

| | | | |
|---|---|---|---|
| **Faculty of Science & Technology** | | | |
| **Syllabus of S. Y. B. Tech. Agricultural Engineering (Semester-IV)** | | | |

| | |
|---|---|
| Course Code: HSM254<br>Course: Development of Skills (Soft Skills)<br>**Teaching Scheme:**<br>Theory:  02Hrs./week | Credits: 0-0-1<br>TA-25 Marks<br>Oral: 25 Marks |

| | |
|---|---|
| **Objectives** | 1. Students will be able to communicate in English accurately and effectively.<br>2. Students will be able to enhance employability skills.<br>3. Students will be able to participate in debate and group discussion in English effectively.<br>4. Students will be able to enhance verbal ability.<br>5. Students will be able to face interview effectively. |
| **Unit-I** | **Common Errors in English Communication**<br>• Grammatical<br>• Spelling<br>• Pronunciation                                                                    (02 Hrs.) |
| **Unit-II** | **Enhancing Employability skills**<br>• Job application<br>• Resume / CV<br>• Essay<br>• Reading Comprehension                                                      (06 Hrs.) |
| **Unit-III** | **Debate and Group Discussion**<br>• Communication<br>• Appearance<br>• Preparation                                                                      (04 Hrs.) |
| **Unit-IV** | **Verbal Ability**<br>• Synonyms<br>• Antonyms<br>• Idioms and Phrases<br>• One word substitution<br>• Word analogy                                                                  (04 Hrs.) |
| **Unit-V** | **Presentation Skills**<br>• Body language<br>• Grooming<br>• Preparation: power point, Prezi, vizme, etc.                           (02 Hrs.) |
| **Unit-VI** | **Interview Skills**<br>• Body language<br>• Grooming<br>• Preparation                                                                       (02 Hrs.) |

| | Sr. No. | Title | Author | Publication |
|---|---|---|---|---|
| **References** | 1 | Verbal and Non-Verbal Reasoning | R.S. Agrawal | S. Chand Publication |
| | 2 | Effective Technical Communication | Anne Eisenberge | Mc Graw Hill International Editors |
| | 3 | Professional Communication Skills | A. K. Jain, Pravin, S. R. Bhatia, A. M. Sheikh | S. Chand & Company Ltd. |
| | 4 | Business Communication | Urmila Rai, S. M. Rai | Himalaya Publishing House |

| 5 | Better English Pronunciation | J.D.O'Connor. | Cambridge University Press |
|---|---|---|---|
| 6 | Grammar of Spoken and Written English | DauglasBiber, Geoffrey Leech | Longman |
| 7 | Technical Communication-Principles and Practice | Meenakshi Raman & Sangeeta Sharma | Oxford University Press |
| 8 | A course in Phonetics & Spoken English | J.Sethi, P.V.Dhamija | PHI publication |
| 9 | Communication Skills for Engineers | Sunita Mishra, C. Murli Krishna | Pearson Education |
| 10 | Soft Skills: Enhancing Employability: Connecting Campus with Corporate | M.S. Rao | I.K. International |
| 11 | Technical Communication A Reader Centred Approach | Paul V. Anderson | Thomson Publication |
| 12 | Grammar of Spoken and Written English | Dauglas Biber, Geoffrey Leech | Longman |
| 13 | Oxford English Grammar | Sydney Greenbaum | Oxford University Press |
| 14 | Verbal and Non-Verbal Reasoning | R.S. Agrawal | S. Chand Publication |
| 15 | Effective Technical Communication | Anne Eisenberge | Mc Graw Hill International Editors |
| 16 | Professional Communication Skills | A. K. Jain, Pravin, S. R. Bhatia, A. M. Sheikh | S. Chand & Company Ltd. |
| 17 | Business Communication | Urmila Rai, S. M. Rai | Himalaya Publishing House |

Syllabus of Second Year B.Tech. Agricultural Engineering 2022-23

| **Faculty of Science & Technology** |  |
|---|---|
| **Syllabus of S. Y. B. Tech. Agricultural Engineering (Semester-IV)** |  |
| Course Code: AED274<br>Course: Problem Based Learning<br>**Teaching Scheme:**<br>Theory:  02Hrs./week | Credits: 0-0-1<br>TA-25 Marks |

| **Prerequisite** | Basic understanding of Engineering concepts and practices. |
|---|---|
| **Objectives** | On completion of the course, learner will be able to –<br>• To develop positive attitude, new skills, or new ways of thinking.<br>• To introduce independent and group learning by solving real world problem with the help of available resources.<br>• To be able to develop systematic approach in technical documentation.<br>• To select and utilize appropriate Software tools/Equipment/Problem solving tools to solve real life problems. |
| **Guidelines:** | The students plan, manage and complete an activity which addresses the stated problem.<br>1. The students must work in group of 3 to solve real life problem.<br>2. Open ended problems from course teachers can be considered from any course related to engineering field. (It can be domain specific/multidisciplinary but the emphasis on Mechanical Engineering)<br>3. A mentor to be assigned to 3-4 groups / one batch.<br>4. The steps to be followed for problem-based learning are as mentioned below: |

| Issues | Action |
|---|---|
| Explore the issue | Gather necessary information; learn new concepts, principles, and skills about the proposed topic. |
| Identification of problem | Identification of the problem from the sources explored |
| Formulating the problem | Frame the problem in a context of what is already known and information the students expect to learn. |
| Researching the sources for probable solutions | Find resources and information that will help create a compelling resource to look out for the solutions |
| Investigate solutions | List possible actions and solutions to the problem, formulate and test potential hypotheses |
| Review the solutions | Students must evaluate their performance and plan improvements for the next problem |

**Steps involved in Problem based learning:**

- Exploration: searching and identifying of all domains of knowledge to look out for problems
- Identification of problem
- Formulating the problem
- Researching the sources for probable solutions
- Investigation of the solutions (generation of solutions)
- Review the solutions

**Evaluations and weight age:**

| 1 | Identification of the Problem | 20% |
|---|---|---|
| 2 | Documentation | 30% |
| 3 | Demonstration | 20% |
| 4 | Awareness /Consideration of - Environment/ Social /Ethics/ Safety measures/Legal aspects | 10% |
| 5 | Outcome | 20% |

| | Sr. No. | Title | Author | Publication | Edition |
|---|---|---|---|---|---|
| **References** | 1 | A new model of problem-based learning | Terry Barrett | All Ireland Society for Higher Education (AISHE) | 2017 |
| | 2 | Research Methodology: Methods and Techniques C. R. Kothari | Research Methodology: Methods and Techniques C. R. Kothari | New Age International Publishers; | Fourth edition, 2019 |

1 Problem based learning: https://www.coursera.org/lecture/universityteaching/problem-based-learning-i-pbl-in-practice-SMXol
2 Problem-Based Learning: https://onlinecourses.swayam2.ac.in/ntr20_ed29/preview

Page | 30

Syllabus of Second Year B.Tech. Agricultural Engineering 2022-23

| | |
|---|---|
| **Faculty of Science & Technology** | |
| **Syllabus of S. Y. B.Tech. All Branches (Semester IV)** | |

| | |
|---|---|
| Course Code: HSM805<br>Course: Non-Credits Mandatory course (Professional Ethics and Corporate Social Responsibility)<br>**Teaching Scheme:**<br>Theory: 02 Hrs. /week | Credits: 0-0-0 |
| **Objectives** | To develop understanding of professional ethics in different organizational context.<br>To identify, analyse, and resolve ethical issues in business decision making.<br>To develop various corporate social Responsibilities and practice in the professional life |
| **Unit-I** | Professional Ethics and Business: The Nature of Business Ethics; Ethical Issues in Business; Moral Responsibility and Blame; Utilitarianism: Weighing Social Costs and Benefits; Rights and Duties of Business. (04 Hrs.) |
| **Unit-II** | Professional Ethics in the Marketplace: Perfect Competition; Monopoly Competition; Oligopolistic Competition; Oligopolies and Public Policy Professional Ethics and the Environment: Dimensions of Pollution and Resource Depletion; Ethics of Pollution Control; Ethics of Conserving Depletable Resources. (04 Hrs.) |
| **Unit-III** | Professional Ethics of Consumer Protection: Markets and Consumer Protection; Contract View of Business Firm's Duties to Consumers; Due Care Theory; Advertising Ethics; Consumer Privacy. (4 Hrs.) |
| **Unit-IV** | Introduction to Corporate Social Responsibility: Corporate Social Responsibility: Concept, Scope &Relevance and Importance of CSR in Contemporary Society. CSR and Indian Corporations- Legal Provisions and Specification on CSR, A Score Card, Future of CSR . (4 Hrs.) |
| **Unit-V** | Potential Business Benefits—Triple bottom line, Human resources, Risk management, Supplier relations; Criticisms and concerns—Nature of business; Motives; Misdirection. (4 Hrs.) |
| **Unit-VI** | Corporate Social Responsibility: Corporate Social Responsibility and Small and Medium Enterprises (SMEs) in India, Corporate Social Responsibility and Public-Private Partnership (PPP) in India. (04 Hrs.) |

| **Textbooks / Reference Books** | Sr. No. | Title | Author | Publication | Edition |
|---|---|---|---|---|---|
| | 1 | Business Ethics: Texts and Cases from the Indian Perspective | Ananda Das Gupta | Springer | 2014 |
| | 2 | Business Ethics: Concepts and Cases | Manuel G. Velasquez. | Pearson | 2014 |
| | 3 | Corporate Social Responsibility: Readings and Cases in a Global Context | Andrew Crane, Dirk Matten, Laura Spence; | Routledge | 2013 |
| | 4 | Corporate Social Responsibility in India | Bidyut Chakrabarty | Routledge | 2015 |

Page | 31

Syllabus of Second Year B.Tech. Agricultural Engineering 2022-23

| Faculty of Science & Technology |
|---|
| **Syllabus of S. Y. B.Tech. All Branches (Semester IV)** |

| Course Code: HSM806<br>Course: Non-Credits Mandatory course<br>(Emotional Intelligence)<br>**Teaching Scheme:**<br>Theory: 02 Hrs. /week | Credits: 0-0-0 | | | |
|---|---|---|---|---|
| **Objectives** | To interpret and manage emotions.<br>To learn the four core skills required to practice emotional intelligence.<br>To relate emotional intelligence to the workplace. | | | |
| **Unit-I** | Introduction to emotion, Development of emotions and emotional maturity, intelligence & wisdom, Science of Emotional Intelligence, EQ and IQ (04 Hrs.) | | | |
| **Unit-II** | Concept, theory, measurement and applications of intelligence, Dimensions of Trait EI Model: Self-awareness, Self-regulation, Motivation, Empathy, Social skills. (04 Hrs.) | | | |
| **Unit-III** | Emotional intelligence: concept, theory and measurements, Correlates of emotional intelligence (04 Hrs.) | | | |
| **Unit-IV** | Emotional intelligence, culture, schooling and happiness, Emotional Intelligence at Work place: Importance of Emotional Intelligence at Workplace? Cost–savings of Emotional Intelligence. (04 Hrs.) | | | |
| **Unit-V** | For enhancing emotional intelligence EQ mapping, Managing stress, suicide prevention, through emotional intelligence, spirituality and meditation. (04 Hrs.) | | | |
| **Unit-VI** | Application of emotional intelligence at family, school and workplace, Case Studies Measuring Emotional Intelligence: Emotionally Intelligence Tests. (04 Hrs.) | | | |
| **Textbooks / Reference Books** | **Sr. No.** | **Title** | **Author** | **Publication** | **Edition** |
| | 1. | Emotional Intelligence-Why it can Matter More than IQ | Daniel Goleman | Bantam Doubleday Dell Publishing Group | 1996 |
| | 2. | Working with Emotional Intelligence | Manuel G. Velasquez. | Bantam Doubleday Dell Publishing Group | 2000 |
| | 3. | Emotional Intelligence Coaching | Liz Wilson, Stephen Neale & Lisa Spencer-Arnell | Kogan Page India Private Limited | 2012 |
| | 4. | Corporate Social Responsibility in India | Bradberry, Travis and Jean Greaves | Perseus Books Group | 2009 |

Page | 32

Syllabus of Second Year B.Tech. Agricultural Engineering 2022-23

<table>
<tr><td colspan="6" align="center"><strong>Faculty of Science & Technology</strong><br><strong>Syllabus of S. Y. B.Tech. All Branches (Semester IV)</strong></td></tr>
</table>

| | |
|---|---|
| Course Code: HSM807<br>Course: Non-Credits Mandatory course<br>(Stress Management Through Yoga)<br>Teaching Scheme: Theory: 02 Hrs. /week | Credits: 0-0-0 |

| | |
|---|---|
| **Objectives** | To identify common stressors inherent in today's global marketplace.<br>To develop an understanding of the impact of stress on physiological, emotional and cognitive processes.<br>To learn to manage the stress through art of Yoga |
| **Unit-I** | Mental Health: Meaning and Importance; Yogic Perspective of Mental Health, Indicators of Mental Health, Stress: Meaning and Definition; Symptoms, Causes and Consequences of Stress, Meaning of Management – Stress Management, Stress in Modern Culture & Society.<br>(06Hrs.) |
| **Unit-II** | Concept of Stress according to Yoga, Assessing your Stress & Building Resilience.<br>(03Hrs.) |
| **Unit-III** | Physiology of Stress on: Autonomic Nervous System (ANS), Endocrine System, Hypothalamus, Cerebral Cortex and Neuro humors.<br>(03Hrs) |
| **Unit-IV** | Mechanism of Stress related diseases: Psychic, Psychosomatic, Somatic and Organic phase. Role of Meditation & Pranayama on stress - physiological aspect of Meditation, Constant stress & strain, anxiety.<br>(04 Hrs) |
| **Unit-V** | Meaning and definition of Health: various dimensions of health (Physical, Mental, Social and Spiritual) - Yoga and health -Yoga as therapy. Physical fitness. Stress control exercise - Sitting meditation, Walking meditation, Progressive muscular relaxation, Gentle stretches and Massage.<br>(05Hrs) |
| **Unit-VI** | Preventive and curative effects of Yoga on stress related disorders: Hypertension, Heart problems, Bronchial Asthma, Peptic Ulcer, Diabetes Mellitus, Arthritis, Anxiety Neurosis and Headache<br>(03Hrs) |

| Textbooks / Reference Books | Sr. No. | Title | Author | Publication | Edition |
|---|---|---|---|---|---|
| | 1 | Stress Control for peace of Mind | Linda Wasmer Andrews | Main Street | 2005 |
| | 2 | Yoga for stress | VimlaLalvani | Hamlyn | 1998 |
| | 3 | Yoga perspective in stress management | H.R. Nagendra, and R. Nagarathana, | Swami Vivekananda Yoga Prakashana | 2004 |
| | 4 | Yoga practices for anxiety & depression | H.R. Nagendra, and R. Nagarathana, | Swami Sukhabodhanandha Yoga Prakashana | 2004 |
| | 5 | Stress management by Yoga | K.N. Udupa, | Motilal Banaridass Publishers Private Limited. | 1996 |

Page | 33

Syllabus of Second Year B.Tech. Agricultural Engineering 2022-23