Shri Vaishnav Vidyapeeth Vishwavidyalaya

Shri Vaishnav Institute of Technology and Science

B.Tech in Agricultural Engineering

SEMESTER VI

COURSE CODE	CATEGORY	COURSE NAME	L	T	P	CREDITS	TEACHING & EVALUATION SCHEME				
							THEORY		PRACTICAL		
							END SEM University Exam	Two Term Exam	Teachers Assessment*	END SEM University Exam	Teachers Assessment*
BTAE601	DCS	Farm Machinery and Equipment-II	2	0	1	3	50	30	0	15	5

Legends: **L** - Lecture; **T** - Tutorial/Teacher Guided Student Activity; **P** – Practical; C - Credit.
***Teacher Assessment** shall be based following components: Quiz/Assignment/ Project/Participation in Class.

Course Objectives:

1. To Study plant protection equipment, Sprayers, dusters, and Nozzles.
2. To Study of harvesting operation, mowers and harvesting devices.
3. To Study threshing systems and their types.
4. To Study grain combines, chaff cutters and capacity calculations and straw combines.
5. To Study root crop diggers, cotton harvesting, maize harvesting.

Course Outcomes:

1. Student would be able to understand plant protection equipment, Sprayers, dusters, and Nozzles.
2. Student would be able to understand harvesting operation, mowers and harvesting devices.
3. Student would be able to understand threshing systems and their types.
4. Student would be able to understand grain combines, chaff cutters and capacity calculations and straw combines.
5. Student would be able to understand root crop diggers, cotton harvesting, maize harvesting.

Syllabus:

UNIT I **10HRS**

Introduction to plant protection equipment: - Sprayers and dusters. Classification of sprayers and sprays. Types of nozzles. 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.

Chairperson
Board of Studies
Shri Vaishnav Vidyapeeth
Vishwavidyalaya,Indore

Chairperson
Faculty of Studies
Shri Vaishnav Vidyapeeth
Vishwavidyalaya,Indore

Controller of Examination
Shri Vaishnav Vidyapeeth
Vishwavidyalaya,Indore

Joint Registrar
Shri Vaishnav Vidyapeeth
Vishwavidyalaya,Indor

Shri Vaishnav Vidyapeeth Vishwavidyalaya

Shri Vaishnav Institute of Technology and Science

B.Tech in Agricultural Engineering

SEMESTER VI

UNIT II **9HRS**

Study of harvesting operation – harvesting methods, harvesting terminology. Study of mowers – types, constructional details, working and adjustments. Study of shear type harvesting devices – cutter bar, inertial forces, counter balancing, terminology, cutting pattern. Study of reapers, binders, and windrowers – principle of operation and constructional details. Importance of hay conditioning, methods of hay conditioning, and calculation of moisture content of hay.

UNIT III **8HRS**

Introduction to threshing systems – Manual and mechanical systems. Types of threshing drums and their applications. Types of threshers- tangential and axial, their constructional details and cleaning systems. Study of factors affecting thresher performance.

UNIT IV **7HRS**

Study of grain combines, combine terminology, classification of grain combines, study of material flow in combines. Computation of combine losses, study of combine troubles and troubleshooting. Study of chaff cutters and capacity calculations. Study of straw combines – working principle and constructional details.

UNIT V **8HRS**

Study of root crop diggers – principle of operation, blade adjustment and approach angle, and calculation of material handled. Study of potato and groundnut diggers. Study of Cotton harvesting – Cotton harvesting mechanisms, study of cotton pickers and strippers, functional components. Study of maize harvesting combines. Introduction to vegetables and fruit harvesting equipment and tools.

Text Books:

1. Kepner RA, Roy Barger & EL Barger. Principles of Farm Machinery.
2. Smith HP and LH Wilkey. Farm Machinery and Equipment.
3. Culpin Claude. Farm Machinery.

Reference Books:

1. Srivastava AC. Elements of Farm Machinery.
2. Lal Radhey and AC Datta. Agricultural Engineering Principles of Farm Machinery.

Chairperson Board of Studies Shri Vaishnav Vidyapeeth Vishwavidyalaya,Indore	Chairperson Faculty of Studies Shri Vaishnav Vidyapeeth Vishwavidyalaya,Indore	Controller of Examination Shri Vaishnav Vidyapeeth Vishwavidyalaya,Indore	Joint Registrar Shri Vaishnav Vidyapeeth Vishwavidyalaya,Indore

Shri Vaishnav Vidyapeeth Vishwavidyalaya

Shri Vaishnav Institute of Technology and Science

B.Tech in Agricultural Engineering

SEMESTER VI

List of Practical's:

1. Familiarization with plant protection and interculture equipment. Study of sprayers, types, functional components.
2. Study of dusters, types, and functional components. Calculations for chemical application rates.
3. Study of nozzle types and spread pattern using patternator.
4. Familiarization with manual and powered weeding equipment and identification of functional components.
5. Study of fertilizer application equipment including manure spreaders and fertilizer broadcasters.
6. Study of various types of mowers, reaper, reaper binder. Study of functional components of mowers and reapers.
7. Familiarization with threshing systems, cleaning systems in threshers. Calculations of losses in threshers.
8. Familiarization with functional units of Grain combines and their types. Calculations for grain losses in a combine.
9. Study of root crop diggers and familiarization with the functional units and attachments.
10. Familiarization with the working of cotton and maize harvesters. Familiarization with vegetable and fruit harvesters.

Chairperson
Board of Studies
Shri Vaishnav Vidyapeeth
Vishwavidyalaya,Indore

Chairperson
Faculty of Studies
Shri Vaishnav Vidyapeeth
Vishwavidyalaya,Indore

Controller of Examination
Shri Vaishnav Vidyapeeth
Vishwavidyalaya,Indore

Joint Registrar
Shri Vaishnav Vidyapeeth
Vishwavidyalaya,Indore

Shri Vaishnav Vidyapeeth Vishwavidyalaya

Shri Vaishnav Institute of Technology and Science

B.Tech in Agricultural Engineering

SEMESTER VI

COURSE CODE	CATEGORY	COURSE NAME	L	T	P	CREDITS	TEACHING & EVALUATION SCHEME				
							THEORY		PRACTICAL		
							END SEM University Exam	Two Term Exam	Teachers Assessment*	END SEM University Exam	Teachers Assessment*
BTAE602	DCS	Post Harvest Engineering of Horticultural Crops	1	0	1	2	50	30	0	15	5

Legends: L - Lecture; T - Tutorial/Teacher Guided Student Activity; P – Practical; C - Credit;
***Teacher Assessment** shall be based following components: Quiz/Assignment/ Project/Participation in Class.s

Course Objectives:

1. Know the different means of storage and value addition of fruits and vegetables along with the cold chain.
2. Know the different unit operations in the processing of major horticultural crops of the country and state.
3. Understand the working principles of different types of machinery used for the processing of fruits, vegetables and spices.
4. Understand the basics of the selection of appropriate machines/equipment for various applications of processing of horticultural crops.

Course Outcomes:

1. Use the different types of sorting, grading, peeling, slicing, blanching and other equipment for processing of fruits and vegetables.
2. Identify the suitable equipment, materials, and methods for storage, processing, packaging, and value addition of fruits and vegetables.
3. Develop at least 4 types of value-added products from fruits and vegetables.
4. Understand the technical and management aspects of the operation of fruits and vegetable processing industries.

Syllabus:

UNIT I **10HRS**

Processing of fruits and vegetables: Importance of processing of fruits and vegetables, spices, condiments and flowers. Characteristics and properties of horticultural crops important for processing,

Peeling: Different peeling methods and devices (manual peeling, mechanical peeling, chemical peeling, and thermal peeling)

Chairperson
Board of Studies
Shri Vaishnav Vidyapeeth
Vishwavidyalaya,Indore

Chairperson
Faculty of Studies
Shri Vaishnav Vidyapeeth
Vishwavidyalaya,Indore

Controller of Examination
Shri Vaishnav Vidyapeeth
Vishwavidyalaya,Indore

Joint Registrar
Shri Vaishnav Vidyapeeth
Vishwavidyalaya,Indore

UNIT II **9HRS**

Slicing of horticultural crops: equipment for slicing, shredding, crushing, chopping, juice extraction, etc., **Blanching:** Importance and objectives; blanching methods, effects on food (nutrition, colour, pigment, texture)

UNIT III

Chilling and freezing: Application of refrigeration in different perishable food products, Chilling requirements of different fruits and vegetables, Freezing of food, freezing time calculations, slow and fast freezing, Equipment for chilling and freezing (mechanical & cryogenic), Effect on food during chilling and freezing, Cold storage heat load calculations and cold storage design, refrigerated vehicle and cold chain system, Dryers for fruits and vegetables. **8HRS**

UNIT IV **7HRS**

Packaging: Packaging of horticultural commodities, Packaging requirements, Different types of packaging materials commonly used for raw and processed fruits and vegetables products, bulk and retail packages and packaging machines, handling and transportation of fruits and vegetables, Pack house technology, Minimal processing, Common methods of storage, Low temperature storage, evaporative cooled storage, Controlled atmospheric storage, Modified atmospheric packaging,

UNIT V **8HRS**

Preservation Technology and quality control: General methods of preservation of fruits and vegetables, Brief description and advantages and disadvantages of different physical/ chemical and other methods of preservation, Flowcharts for preparation of different finished products, Quality control in fruit and vegetable processing industry. Food supply chain.

Text Books:

1. Sudheer, K P. and Indira, V. 2007. Post Harvest Engineering of horticultural crops. New india Publishing House.
2. Pantastico, E.C.B. 1975. Postharvest physiology, handling and utilization of tropical and subtropical fruits and vegetables AVI Pub. Co., New Delhi.
3. Pandey, R.H. 1997. Postharvest Technology of fruits and vegetables (Principles and practices). Saroj Prakashan, Allahabad.
4. Arthey, D. and Ashurst, P. R. 1966. Fruit Processing. Chapman and Hall, New York.

Chairperson	Chairperson	Controller of Examination	Joint Registrar
Board of Studies	Faculty of Studies	Shri Vaishnav Vidyapeeth	Shri Vaishnav Vidyapeeth
Shri Vaishnav Vidyapeeth	Shri Vaishnav Vidyapeeth	Vishwavidyalaya,Indore	Vishwavidyalaya,Indore
Vishwavidyalaya,Indore	Vishwavidyalaya,Indore		

Reference Books:

1. Fellows, P. 2008. Food Processing Technology, Woodhead.
2. Pandey, R.H. 1997. Postharvest Technology of fruits and vegetables (Principles and practices). Saroj Prakashan, Allahabad.
3. Lal Giri dhari, Siddappa and Tondon. 2001. Preservation of fruits and vegetables. ICAR, New Delhi.
4. Srivastava and Sanjeev Kumar. 2008. Fruit and vegetable preservation: principles and practices. Kalyani Publishers.
5. Sudheer, K P. and Indira, V. 2007. Post-Harvest Engineering of Horticultural Crops. New India Publishing House.

List of Practical's: (If Practical Credit Shown in Syllabus)

1. Performance evaluation of peeler and slicer .
2. Performance evaluation of juicer and pulper.
3. Performance evaluation of blanching equipment.
4. Testing adequacy of blanching.
5. Study of cold storage and its design.
6. Study of CAP and MAP storage.
7. Minimal processing of vegetables.
8. Preparation of value added products.
9. Visit to fruit and vegetable processing industry.
10. Visit to spice processing plant.

Chairperson Board of Studies Shri Vaishnav Vidyapeeth Vishwavidyalaya,Indore	Chairperson Faculty of Studies Shri Vaishnav Vidyapeeth Vishwavidyalaya,Indore	Controller of Examination Shri Vaishnav Vidyapeeth Vishwavidyalaya,Indore	Joint Registrar Shri Vaishnav Vidyapeeth Vishwavidyalaya,Indore

Shri Vaishnav Vidyapeeth Vishwavidyalaya

Shri Vaishnav Institute of Technology and Science

B.Tech in Agricultural Engineering

SEMESTER VI

COURSE CODE	CATEGORY	COURSE NAME	L	T	P	CREDITS	TEACHING & EVALUATION SCHEME				
							THEORY		PRACTICAL		
							END SEM University Exam	Two Term Exam	Teachers Assessment*	END SEM University Exam	Teachers Assessment*
BTAE603	DCS	Groundwater, Wells and Pumps	2	0	1	3	50	30	0	15	5

Legends: **L** - Lecture; **T** - Tutorial/Teacher Guided Student Activity; **P** – Practical; **C** - Credit;
***Teacher Assessment** shall be based following components: Quiz/Assignment/ Project/Participation in Class, given that no component shall exceed more than 10 marks.

Course Objectives:

To impart knowledge of

1. Occurrence and movement of ground water.
2. Design of wells.
3. Groundwater hydraulics
4. Selection, installation, performance and troubleshooting of various pumping system.

Course Outcomes:

After studying the course the students should be able to:

1. Understand and describe occurrence and movement of ground water.
2. Design the wells
3. Understand the groundwater hydraulics: estimation of ground water potential, know the quality of ground water and able to apply groundwater recharge techniques.
4. Select water lifting devices, install the pumping system.
5. Describe and determine the performance and troubleshoot the pumping systems

Syllabus:

UNIT I

Occurrence and movement of ground water; aquifer and its types; classification of wells, fully penetrating tubewells and open wells, familiarization of various types of bore wells **10HRS**

UNIT II

Design of open well; groundwater exploration techniques, methods of drilling of wells, percussion, rotary, reverse rotary, design of tubewells and gravel pack, installation of well screen, completion and development of well. **9HRS**

UNIT III

Groundwater hydraulics-determination of aquifer parameters by different method such as Theis, Jacob and Chow's, Theis recovery method; well interference, multiple well systems, estimation of ground water potential, quality of ground water, artificial groundwater recharge techniques. **8HRS**

Chairperson	Chairperson	Controller of Examination	Joint Registrar
Board of Studies	Faculty of Studies	Shri Vaishnav Vidyapeeth	Shri Vaishnav Vidyapeeth
Shri Vaishnav Vidyapeeth	Shri Vaishnav Vidyapeeth	Vishwavidyalaya,Indore	Vishwavidyalaya,Indore
Vishwavidyalaya,Indore	Vishwavidyalaya,Indore		

UNIT IV **7HRS**

Pumping Systems: Water lifting devices; different types of pumps, classification of pumps, component parts of centrifugal pumps; priming, pump selection, installation and trouble shooting, performance curves, effect of speed on capacity, head and power, effect of change of impeller dimensions on performance characteristics.

UNIT V **8HRS**

Hydraulic ram, propeller pumps, mixed flow pumps and their performance characteristics; deep well turbine pump and submersible pump

Text Books:

1. Michael AM, Khepar SD. and SK Sondhi. 2008. Water Well and Pumps, 2nd Edition, Tata Mc-Graw Hill
2. Michael AM. and Ojha TP. 2014. Principles of Agricultural Engineering Vol-II, 5th Edition Jain Brothers Publication, New Delhi
3. K. Karanth. 2003 Ground Water Assessment, Development and Management 1st Edition, McGraw Hill
4. Raghunath, H.M., 2000 "Groundwater Hydrology", Second reprint, Wiley Eastern Ltd., New Delhi.

Reference Books:

1. Fletcher.G.Driscoll, 1995 "Groundwater and Wells", 6th ed. Johnson Revision, New York,
2. Todd David Keith and Larry W. Mays. 2004. Groundwater Hydrology, 3rd Edition, John Wiley & Sons, New York.
3. P. Kumar. 2019 'Ground Water and Well Drilling' 1st Edition, CBS Pub.
4. Modi, P.N. and Seth S.M. (1998). Hydraulics and Fluid Mechanics. Twelfth Edition, Standard Book House, New Delhi

Chairperson Board of Studies Shri Vaishnav Vidyapeeth Vishwavidyalaya,Indore	Chairperson Faculty of Studies Shri Vaishnav Vidyapeeth Vishwavidyalaya,Indore	Controller of Examination Shri Vaishnav Vidyapeeth Vishwavidyalaya,Indore	Joint Registrar Shri Vaishnav Vidyapeeth Vishwavidyalaya,Indore

Shri Vaishnav Vidyapeeth Vishwavidyalaya

Shri Vaishnav Institute of Technology and Science

B.Tech in Agricultural Engineering

SEMESTER VI

List of Practical's:

1. Verification of Darcy's Law.
2. Study of different drilling equipments.
3. Sieve analysis for gravel and well screens design.
4. Estimation of specific yield and specific retention.
5. Testing of well screen.
6. Estimation of aquifer parameters by Theis method, Cooper-Jacob method, Chow method.
7. Well design under confined and unconfined conditions.
8. Study of well losses and well efficiency.
9. Estimating ground water balance.
10. Study of artificial groundwater recharging structures.
11. Study of radial flow and mixed flow centrifugal pumps, multistage centrifugal pumps, turbine, propeller and other pumps.
12. Installation of centrifugal pump.
13. Testing of centrifugal pump and study of cavitations.
14. Study of hydraulic ram.
15. Study and testing of submersible pump.

Chairperson
Board of Studies
Shri Vaishnav Vidyapeeth
Vishwavidyalaya,Indore

Chairperson
Faculty of Studies
Shri Vaishnav Vidyapeeth
Vishwavidyalaya,Indore

Controller of Examination
Shri Vaishnav Vidyapeeth
Vishwavidyalaya,Indore

Joint Registrar
Shri Vaishnav Vidyapeeth
Vishwavidyalaya,Indore

Shri Vaishnav Vidyapeeth Vishwavidyalaya

Shri Vaishnav Institute of Technology and Science

B.Tech in Agricultural Engineering

SEMESTER VI

COURSE CODE	CATEGORY	COURSE NAME	L	T	P	CREDITS	TEACHING & EVALUATION SCHEME				
							THEORY		PRACTICAL		
							END SEM University Exam	Two Term Exam	Teachers Assessment*	END SEM University Exam	Teachers Assessment*
BTAE604	DCS	Tractor and Farm Machinery Operation and Maintenance	0	0	2	2	0	0	0	60	40

Legends: **L** - Lecture; **T** - Tutorial/Teacher Guided Student Activity; **P** – Practical; **C** - Credit;
***Teacher Assessment** shall be based following components: Quiz/Assignment/ Project/Participation in Class, given that no component shall exceed more than 10 marks.

Course Objectives:

To familiarize the students with agricultural tractors and power tillers, its systems, operation, maintenance and safety precautions

Course Outcomes:

1. Familiarization with different makes and models of agricultural tractors and Power Tillers.
2. Identification of functional systems and controls of tractors. Safety rules and precautions. Maintenance and trouble shooting. Driving practice of tractor and Power tiller.
3. Familiarization with tools for general and special maintenance

List of Practical's: (If Practical Credit Shown in Syllabus)

1. Familiarization with different makes and models of Agricultural tractors.
2. Identification of functional systems including fuels system, cooling system, transmission system, steering and hydraulic systems.
3. Practice of operating a tillage tool (mould-board plough/ disc plough) and their adjustment in the field.
4. Study of field patterns while operating a tillage implement. Hitching & De-hitching of mounted and trail type implement to the tractor.
5. Driving practice with a trail type trolley - forward and in reverse direction.
6. Introduction to tractor maintenance - precautionary and break-down maintenance.
7. Care and maintenance procedure of agricultural machinery during operation and off-season.
8. Repair and maintenance of implements - adjustment of functional parameters in tillage implements.

Chairperson
Board of Studies
Shri Vaishnav Vidyapeeth
Vishwavidyalaya,Indore

Chairperson
Faculty of Studies
Shri Vaishnav Vidyapeeth
Vishwavidyalaya,Indore

Controller of Examination
Shri Vaishnav Vidyapeeth
Vishwavidyalaya,Indore

Joint Registrar
Shri Vaishnav Vidyapeeth
Vishwavidyalaya,Indore

9. Replacement of furrow openers and change of blades of rotavators.
10. Maintenance of cutter bar in a reaper.
11. Adjustments in a thresher for different crops.
12. Setting of agricultural machinery workshop.

Text Books:

1. Ghosh, R. K., Swan, S. 1993. Practical Agricultural Engineering. Kolkata NayaPrakosh.
2. Jain, S. C., and Rai, C. R. 2013.Farm Tractor Maintenance and Repair. Standard Publishers
3. Surendra Singh, Verma, S. R. 2009. Farm Machinery Maintenance and Management. India

Chairperson
Board of Studies
Shri Vaishnav Vidyapeeth
Vishwavidyalaya,Indore

Chairperson
Faculty of Studies
Shri Vaishnav Vidyapeeth
Vishwavidyalaya,Indore

Controller of Examination
Shri Vaishnav Vidyapeeth
Vishwavidyalaya,Indore

Joint Registrar
Shri Vaishnav Vidyapeeth
Vishwavidyalaya,Indore

Shri Vaishnav Vidyapeeth Vishwavidyalaya

Shri Vaishnav Institute of Technology and Science

B.Tech in Agricultural Engineering

SEMESTER VI

COURSE CODE	CATEGORY	COURSE NAME	L	T	P	CREDITS	TEACHING & EVALUATION SCHEME				
							THEORY			PRACTICAL	
							END SEM University Exam	Two Term Exam	Teachers smAssesent*	END SEM University Exam	Teachers Assessment*
BTAE605	DCS	Dairy and Food Engineering	2	0	1	3	50	30	0	15	5

Legends: **L** - Lecture; **T** - Tutorial/Teacher Guided Student Activity; **P** – Practical; **C** - Credit;
***Teacher Assessment** shall be based following components: Quiz/Assignment/ Project/Participation in Class.

Course Objectives:

This course provides comprehensive knowledge of:

1. To introduce the dairy industry, properties and processing of milk, manufacture of dairy products .
2. To expose the fundamental knowledge of food .
3. To gain the knowledge of dairy products properties and different methods of food processing.
4. To introduce the sanitation and effluent treatment in dairy industry.
5. To understand the importance of packaging and quality of dairy products.

Course Outcomes:

After completion of this course the students are expected to be able to demonstrate following knowledge, skills and attitudes:

1. Students will gain knowledge about Dairy and Food process engineering
2. Students will able to explain the process of manufacturing of dairy products and thermal processing of food.
3. Students will able to demonstrate the value addition of dairy products.
4. Students will able to demonstrate and apply drying and separation methods of dairy products.
5. Students will able to the importance of quality control and food preservation and packaging.

Syllabus:

10HRS

UNIT I

Introduction, milk properties : Dairy development in India, Engineering, thermal and chemical properties of milk and milk products, Process flow charts for product manufacture, Theory Deterioration in food products and their controls, Physical, chemical and biological methods of food preservation.

Chairperson Board of Studies Shri Vaishnav Vidyapeeth Vishwavidyalaya,Indore	Chairperson Faculty of Studies Shri Vaishnav Vidyapeeth Vishwavidyalaya,Indore	Controller of Examination Shri Vaishnav Vidyapeeth Vishwavidyalaya,Indore	Joint Registrar Shri Vaishnav Vidyapeeth Vishwavidyalaya,Indore

UNIT II **9HRS**

Different processing methods of milk : operation of various dairy and food processing systems. Principles and equipment related to receiving of milk, pasteurization, sterilization, homogenization, centrifugation and cream separation. Evaporation of food products: principle, types of evaporators, steam economy, multiple effect evaporation, vapour recompression.

UNIT III **8HRS**

Value addition and filling of milk : Preparation methods and equipment for manufacture of cheese, paneer, butter and ice cream, Filling and packaging of milk and milk products; Dairy plant design and layout, Plant utilities; Principles of operation and equipment for thermal processing, Canning, Aseptic processing

UNIT IV **7HRS**

Drying and separation methods : Drying of liquid and perishable foods: principles of drying, spray drying, drum drying, freeze - drying, Filtration: principle, types of filters; Membrane separation, RO, Nano-filtration, Ultra filtration and Macro-filtration, equipment and applications, Non-thermal and other alternate thermal processing in Food processing.

UNIT V **8HRS**

Packaging of milk : Nanotechnology: History, fundamental concepts, tools and techniques nanomaterials, applications in food packaging and products, implications, environmental impact of nanomaterials and their potential effects on global economics, regulation of nanotechnology.

Text Books:

1. Subbulakshmi.G., and Shobha A. Udipi, Food Processing and Preservation, New Age International Publications, New Delhi, 2007.
2. Chandra Gopala Rao. Essentials of Food Process Engineering. B.S. Publications, Hyderabad, 2006.
3. Walstra. P., Jan T. M. Wouters., Tom J. Geurts Dairy Science and Technology, CRC press, 2005.
4. Ananthakrishnan, C.P., and Sinha, N.N., Technology and Engineering of Dairy Plant Operations, Laxmi Publications, New Delhi, 1999.
5. Dairy Science and Technology Handbook, Volumes 1-3, John Wiley and Sons,1993.

Chairperson
Board of Studies
Shri Vaishnav Vidyapeeth
Vishwavidyalaya,Indore

Chairperson
Faculty of Studies
Shri Vaishnav Vidyapeeth
Vishwavidyalaya,Indore

Controller of Examination
Shri Vaishnav Vidyapeeth
Vishwavidyalaya,Indore

Joint Registrar
Shri Vaishnav Vidyapeeth
Vishwavidyalaya,Indore

Reference Books:

1. Ahmed, T. 1997. Dairy Plant Engineering and Management. 4th Ed. Kitab Mahal.
2. McCabe, W.L. and Smith, J. C. 1999. Operations of Chemical Engineering. McGraw Hill.
3. Rao, D.G. Fundamentals of Food Engineering. PHI learning Pvt. Ltd. New Delhi.
4. Singh, R.P. & Heldman, D.R. 1993. Introduction to Food Engineering. Academic Press.
5. Toledo, R. T. 1997. Fundamentals of Food Process Engineering. CBS Publisher.

List of Practical's:

1. Study of pasteurizers for milk product in dairy firm.
2. Study of sterilizers and homogenizers for dairy products.
3. Study of separators for dairy products in food engineering.
4. Study of butter churns for milk products in dairy firm for food engineering,
5. Study of evaporators, milk dryers, freezers and filtration of milk.
6. Design of food processing plants & preparation of layout.
7. Visit to multi-product dairy plant for Estimation of steam requirements, Estimation of refrigeration requirements in dairy & food plant.
8. Visit to Food industry.

Chairperson
Board of Studies
Shri Vaishnav Vidyapeeth
Vishwavidyalaya,Indore

Chairperson
Faculty of Studies
Shri Vaishnav Vidyapeeth
Vishwavidyalaya,Indore

Controller of Examination
Shri Vaishnav Vidyapeeth
Vishwavidyalaya,Indore

Joint Registrar
Shri Vaishnav Vidyapeeth
Vishwavidyalaya,Indore

Shri Vaishnav Vidyapeeth Vishwavidyalaya

Shri Vaishnav Institute of Technology and Science

B.Tech in Agricultural Engineering

SEMESTER VI

COURSE CODE	CATEGORY	COURSE NAME	L	T	P	CREDITS	TEACHING & EVALUATION SCHEME				
							THEORY		PRACTICAL		
							END SEM University Exam	Two Term Exam	Teachers Assessment*	END SEM University Exam	Teachers Assessment*
BTAE606	**DCS**	**Bio-Energy Systems: Design and Applications**	2	0	1	3	50	30	0	15	5

Legends: **L** - Lecture; **T** - Tutorial/Teacher Guided Student Activity; **P** – Practical; **C** - Credit;
***Teacher Assessment** shall be based following components: Quiz/Assignment/ Project/Participation in Class.

Course Objectives:

1. To provide students of basic knowledge about fermentation and its their industrial application.
2. To provide students of basics about heat transfer processes in anaerobic digestion systems.
3. To learn general consideration, classification, and gas producer engine systems.
4. To understand of Chemistry of gasification and operating principle.
5. To understand various modern greenhouse technologies.

Course Outcomes:

1. The students will be able to familiar with fermentation process and its applications.
2. The students will be able to understand Biomass Production systems.
3. The students will be able to understand Biomass preparation techniques for harnessing and biomass densification techniques.
4. Students will be able to understand Gasifier fuels, properties, and its industrial applications.
5. Students will be able to understand modern greenhouse technologies.

Syllabus:

10HRS

UNIT I

Introduction: Basic concept of fermentation; Fermentation processes and its general requirements, An overview of aerobic and anaerobic fermentation processes and their industrial application

UNIT II **9HRS**

Heat transfer process: Heat transfer processes in anaerobic digestion systems, land fill gas technology and potential. Biomass Production: Wastelands, classification and their use through energy plantation, selection of species, methods of field preparation and transplanting.

Chairperson Board of Studies Shri Vaishnav Vidyapeeth Vishwavidyalaya,Indore	Chairperson Faculty of Studies Shri Vaishnav Vidyapeeth Vishwavidyalaya,Indore	Controller of Examination Shri Vaishnav Vidyapeeth Vishwavidyalaya,Indore	Joint Registrar Shri Vaishnav Vidyapeeth Vishwavidyalaya,Indore

UNIT III

Biomass and its Techniques: Harvesting of biomass and coppicing characteristics. Biomass preparation techniques for harnessing (size reduction, densification and drying) and biomass densification technique (briquetting, pelletization, and cubing). Thermo- chemical degradation. Measuring efficiency of different insulation technique. **8HRS**

UNIT IV

Gas producer engine systems and its application: History of small gas producer engine system. History of small gas producer engine system. Chemistry of gasification; Gas producer - type, operating principle. Gasifier fuels, properties, preparation, conditioning of producer gas. **7HRS**

UNIT V

Application, shaft power generation, thermal application and economics. Trans-esterification for biodiesel production. A range of bio-hydrogen production routes. Environmental aspect of bio-energy, assessment of greenhouse gas mitigation potential and modern greenhouse technologies. **8HRS**

Text Books:

1. British BioGen 1997, Anaerobic digestion of farm and food processing practices- Good practice guidelines, London.
2. Butler, S. 2005. Renewable Energy Academy: Training wood energy professionals.
3. Centre for biomass energy 1998. Straw for energy production; Technology-Environment-Ecology.
4. CRS Press 2016, Introduction to Bioenergy (Energy and the Environment) by Vaughn C. Nelson and Kenneth L. Starcher
5. Academic Press 2014, Bioenergy: Biomass to Biofuels by Anju Dahiya.
6. Woodhead Publishing 2017, Bioenergy Systems for the Future 1st Edition by Francesco Dalena Angelo Basile Claudio Rossi.

List of Practical's:

1. Study of anaerobic fermentation system for industrial application
2. Study of gasification for industrial process heat
3. Study of biodiesel production unit
4. Study of biomass densification technique (briquetting, pelletization, and cubing)
5. Integral bio energy system for industrial application
6. Study of bio energy efficiency in industry and commercial buildings
7. Study and demonstration of energy efficiency in building
8. Measuring efficiency of different insulation technique
9. Study of Brayton, Striling and Rankine cycles
10. Study of modern greenhouse technologies

Chairperson
Board of Studies
Shri Vaishnav Vidyapeeth
Vishwavidyalaya,Indore

Chairperson
Faculty of Studies
Shri Vaishnav Vidyapeeth
Vishwavidyalaya,Indore

Controller of Examination
Shri Vaishnav Vidyapeeth
Vishwavidyalaya,Indore

Joint Registrar
Shri Vaishnav Vidyapeeth
Vishwavidyalaya,Indore

Shri Vaishnav Vidyapeeth Vishwavidyalaya

Shri Vaishnav Institute of Technology and Science

B.Tech in Agricultural Engineering

SEMESTER VI

COURSE CODE	CATEGORY	COURSE NAME	L	T	P	CREDITS	TEACHING & EVALUATION SCHEME				
							THEORY		PRACTICAL		
							END SEM University Exam	Two Term Exam	Teachers Assessment*	END SEM University Exam	Teachers Assessment*
BTCEAE601	ODS	WATER HARVESTING AND SOIL CONSERVATION STRUCTURES	2	0	1	3	50	15	0	30	5

Legends: L - Lecture; T - Tutorial/Teacher Guided Student Activity; P – Practical; C - Credit;
***Teacher Assessment** shall be based following components: Quiz/Assignment/ Project/Participation in Class, given that no component shall exceed more than 10 marks.

Course Objectives:

1. To familiarize the concepts of Water harvesting techniques and structures
2. To understand the Soil erosion and its control structures.
3. To Design different Conservation Structures according to condition and nature of work

Course Outcomes:

1. The student will understand the concepts of Water harvesting techniques and structures
2. The student will have knowledge of the Soil erosion and its control structures.
3. The student will be able to design different Conservation Structures according to condition and nature of work

Syllabus:

UNIT I **10HRS**

Water harvesting -principles, importance, and issues. Water harvesting techniques – classification based on source, storage, and use. Runoff harvesting – short-term and long-term techniques. Short-term harvesting techniques - terracing and bunding, rock and ground catchments. Long-term harvesting techniques - purpose and design criteria.

UNIT II **9HRS**

Structures - farm ponds - dug-out and embankment reservoir types, tanks and subsurface dykes. Farm pond - components, site selection, design criteria, capacity, embankment, mechanical and emergency spillways, cost estimation and construction. Percolation pond - site selection, design and construction details. Design considerations of nala bunds.

Chairperson
Board of Studies
Shri Vaishnav Vidyapeeth
Vishwavidyalaya,Indore

Chairperson
Faculty of Studies
Shri Vaishnav Vidyapeeth
Vishwavidyalaya,Indore

Controller of Examination
Shri Vaishnav Vidyapeeth
Vishwavidyalaya,Indore

Joint Registrar
Shri Vaishnav Vidyapeeth
Vishwavidyalaya,Indore

8HRS

UNIT III

Soil erosion control structures - introduction, classification, and functional requirements. Permanent structures for soil conservation and gully control – check dams, drop, chute and drop inlet spillways - design requirements, planning for design, design procedures - hydrologic, hydraulic and structural design and stability analysis.

7HRS

UNIT IV

Hydraulic jump and its application. Drop spillway - applicability, types - straight drop, box-type inlet spillways -description, functional use, advantages and disadvantages, straight apron and stilling basin outlet, structural components, and functions.

8HRS

UNIT V

Loads on head wall, variables affecting equivalent fluid pressure, triangular load diagram for various flow conditions, creep line theory, uplift pressure estimation, safety against sliding, overturning, crushing and tension. Chute spillway - description, components, energy dissipaters, design criteria of Saint Antony Falls (SAF) stilling basin and its limitations. Drop inlet spillway - description, functional use and design criteria.

Text Books:

1. Singh Gurmel, C. Venkataraman, G. Sastry and B.P. Joshi. 1996. Manual of Soil and Water Conservation Practices. Oxford and IBH Publishing Co. Pvt. Ltd., New Delhi.
2. Michael, A.M. and T.P. Ojha. 2003. Principles of Agricultural Engineering. Volume II. 4th Edition, Jain Brothers, New Delhi.
3. Murthy, V.V.N. 2002. Land and Water Management Engineering. 4th Edition, Kalyani Publishers, New Delhi.

Reference Books:

1. Schwab, G.O., D.D. Fangmeier, W.J. Elliot, R.K. Frevert. 1993. Soil and Water Conservation Engineering.4th Edition, John Wiley and Sons Inc. New York.
2. Suresh, R. 2014. Soil and Water Conservation Engineering. Standard Publisher Distributors, New Delhi.
3. Samra, J.S., V.N. Sharda and A.K. Sikka. 2002. Water Harvesting and Recycling: Indian Experiences. CSWCR&TI, Dehradun, Allied Printers, Dehradun.
4. Theib Y. Oweis, Dieter Prinz and Ahmed Y. Hachum. 2012. Rainwater Harvesting for Agriculture in the Dry Areas. CRC Press, Taylor and Francis Group, London.
5. Studer Rima Mekdaschi and Hanspeter Liniger. 2013. Water Harvesting - Guidelines to Good Practice. Centre for Development and Environment, University of Bern, Switzerland.

Chairperson Board of Studies Shri Vaishnav Vidyapeeth Vishwavidyalaya,Indore	Chairperson Faculty of Studies Shri Vaishnav Vidyapeeth Vishwavidyalaya,Indore	Controller of Examination Shri Vaishnav Vidyapeeth Vishwavidyalaya,Indore	Joint Registrar Shri Vaishnav Vidyapeeth Vishwavidyalaya,Indore

Shri Vaishnav Vidyapeeth Vishwavidyalaya

Shri Vaishnav Institute of Technology and Science

B.Tech in Agricultural Engineering

SEMESTER VI

List of Practical's:

1. Study of different types of farm ponds.
2. Computation of storage capacity of embankment type of farm ponds.
3. Design of dugout farm ponds.
4. Design of percolation pond and nala bunds.
5. Runoff measurement using H-flume.
6. Exercise on hydraulic jump. Exercise on energy dissipation in water flow.
7. Hydrologic, hydraulic and structural design of drop spillway and stability analysis.
8. Design of SAF stilling basins in chute spillway.
9. Hydrologic, hydraulic and structural design of drop inlet spillway.
10. Design of small earthen embankment structures.
11. Practice on software for design of soil and water conservation structures.
12. Field visit to watershed project areas treated with soil and water conservation measures / structures.

Chairperson
Board of Studies
Shri Vaishnav Vidyapeeth
Vishwavidyalaya,Indore

Chairperson
Faculty of Studies
Shri Vaishnav Vidyapeeth
Vishwavidyalaya,Indore

Controller of Examination
Shri Vaishnav Vidyapeeth
Vishwavidyalaya,Indore

Joint Registrar
Shri Vaishnav Vidyapeeth
Vishwavidyalaya,Indore

Shri Vaishnav Vidyapeeth Vishwavidyalaya, Indore
Shri Vaishnav Institute of Infromation Technology
Choice Based Credit System (CBCS) in the Light of NEP-2020
Bsc. (Agriculture) (2021-2025)

COURSE CODE	CATEGORY	COURSE NAME	TEACHING&EVALUATION SCHEME								
			THEORY			PRACTICAL		L	T	P	CREDITS
			ENDSEM University Exam	Two Term Exam	Teachers Assessment*	ENDSEM University Exam	Teachers Assessment*				
BTCSAE601	ODC	Computer Programming and Data Structures	50	30	0	15	5	1	0	4	3

Legends: **L** - Lecture; **T** - Tutorial/Teacher Guided Student Activity; **P** – Practical; **C** - Credit;
***Teacher Assessment** shall be based following components: Quiz/Assignment/ Project/Participation in Class, given that no component shall exceed more than 10 marks.

Course Objectives:

1. To teach efficient storage mechanisms of data for an easy access.
2. To design and implementation of various basic and advanced data structures.
3. To introduce various techniques for representation of the data in the real world.
4. To develop application using data structures.
5. To teach the concept of protection and management of data.

Course Outcomes:

Upon completion of the subject, students will be able to:

1. Get a good understanding of applications of Data Structures.
2. Develop application using data structures.
3. Handle operations like searching, insertion, deletion, traversing mechanism etc. on Various data structures.
4. Decide the appropriate data type and data structure for a given problem.
5. Select the best algorithm to solve a problem by considering various problem characteristics, such as the data size, the type of operations, etc.

Syllabus:

UNIT I

Introduction, Overview of Data structures, Types of data structures, Primitive and Non-Primitive data structures and Operations, Algorithms.

UNIT II

Introduction to high level languages, Primary data types and user defined data types, Variables, typecasting.

Chairperson
Board of Studies
ShriVaishnavVidyapeeth
Vishwavidyalaya, Indore

Chairperson
Faculty of Studies
ShriVaishnavVidyapeeth
Vishwavidyalaya, Indore

Controller of Examination
ShriVaishnavVidyapeeth
Vishwavidyalaya, Indore

Joint Registrar
ShriVaishnavVidyapeeth
Vishwavidyalaya, Indore

Shri Vaishnav Vidyapeeth Vishwavidyalaya, Indore
Shri Vaishnav Institute of Infromation Technology
Choice Based Credit System (CBCS) in the Light of NEP-2020
Bsc. (Agriculture) (2021-2025)

COURSE CODE	CATEGORY	COURSE NAME	TEACHING&EVALUATION SCHEME								
			THEORY			PRACTICAL		L	T	P	CREDITS
			ENDSEM University Exam	Two Term Exam	Teachers Assessment*	ENDSEM University Exam	Teachers Assessment*				
BTCSAE601	ODC	Computer Programming and Data Structures	50	30	0	15	5	1	0	4	3

Legends: **L** - Lecture; **T** - Tutorial/Teacher Guided Student Activity; **P** – Practical; **C** - Credit;
***Teacher Assessment** shall be based following components: Quiz/Assignment/ Project/Participation in Class, given that no component shall exceed more than 10 marks.

UNIT III

Operators, Building and evaluating expressions, Standard library functions, Managing input and output, Decision making, Branching, Looping.

UNIT IV

Arrays, Characteristic of Array, One Dimensional Array, Operation with Array, Two Dimensional Arrays, Three or Multi-Dimensional Arrays. Strings, Array of Structures, Drawbacks of linear arrays, User defined functions, passing arguments and returning values, recursion, scope and visibility of a variable, String functions.

UNIT V

Structures and union, Pointers, Stacks, Push/Pop operations, Queues, Insertion and deletion operations, Linked lists.

Text Books:

1. Ashok N. Kamthane, "Introduction to Data structures", Pearson Education India.
2. Tremblay &Sorenson, "Introduction to Data- Structure with applications", Tata Mc- Graw Hill.
3. Bhagat Singh & Thomas Naps, "Introduction to Data structure", Tata Mc- Graw Hill.
4. Robert Kruse, "Data Structures and Program Design", PHI.
5. Aaron M. Tenenbaum& Moshe J. Augenstein, "Data Structure using PASCAL", PHI

Chairperson Board of Studies ShriVaishnavVidyapeeth Vishwavidyalaya, Indore	**Chairperson** Faculty of Studies ShriVaishnavVidyapeeth Vishwavidyalaya, Indore	**Controller of Examination** ShriVaishnavVidyapeeth Vishwavidyalaya, Indore	**Joint Registrar** ShriVaishnavVidyapeeth Vishwavidyalaya, Indore

Shri Vaishnav Vidyapeeth Vishwavidyalaya, Indore
Shri Vaishnav Institute of Infromation Technology
Choice Based Credit System (CBCS) in the Light of NEP-2020
Bsc. (Agriculture) (2021-2025)

COURSE CODE	CATEGORY	COURSE NAME	TEACHING&EVALUATION SCHEME								
			THEORY			PRACTICAL		L	T	P	CREDITS
			ENDSEM University Exam	Two Term Exam	Teachers Assessment*	ENDSEM University Exam	Teachers Assessment*				
BTCSAE601	ODC	Computer Programming and Data Structures	50	30	0	15	5	1	0	4	3

Legends: **L** - Lecture; **T** - Tutorial/Teacher Guided Student Activity; **P** – Practical; **C** - Credit;
***Teacher Assessment** shall be based following components: Quiz/Assignment/ Project/Participation in Class, given that no component shall exceed more than 10 marks.

Reference Books:

1. Data Structures Using C & C++, Rajesh K. Shukla, Wiley- India.
2. Data Structures Using C, ISRD Group, Second Edition, Tata McGraw-Hill.
3. Data Structure Using C, Balagurusamy.
4. C & Data Structures, Prof. P.S. Deshpande, Prof. O.G. Kakde, Dreamtech press.
5. Data Structures, Adapted by: GAV PAI, Schaum's Outlines.

List of Practical's:

Familiarizing with Turbo C IDE; Building an executable version of C program; Debugging a C program; Developing and executing simple programs; Creating programs using decision making statements such as if, go to & switch; Developing program using loop statements while, do & for; Using nested control structures; Familiarizing with one and two dimensional arrays; Using string functions; Developing structures and union; Creating user defined functions; Using local, global & external variables; Using pointers; Implementing Stacks; Implementing push/pop functions; Creating queues; Developing linked lists in C language; Insertion/Deletion in data structures.

1. To develop a C program to perform addition, subtraction, division and multiplication of two numbers.
2. Creating programs using decision making statements such as if, go to & switch.
3. Write a program to find the factorial of a number.
4. To develop a program to find an average of an array using AVG function.
5. To implement a program that can insert, delete and edit an element in array.
6. Write a Program to access an element in 2-D Array.
7. Write a menu driven program to implement the push, pop and display option of the stack with the help of static memory allocation.
8. Write a menu driven program to implementing the various operations on a linear queue with the help of dynamic memory allocation.
9. To implement an algorithm for insert and delete operations of circular queue and implement the same using array.
10. Write a menu driven program to implement various operations on a circular linked list.

Chairperson
Board of Studies
ShriVaishnavVidyapeeth
Vishwavidyalaya, Indore

Chairperson
Faculty of Studies
ShriVaishnavVidyapeeth
Vishwavidyalaya, Indore

Controller of Examination
ShriVaishnavVidyapeeth
Vishwavidyalaya, Indore

Joint Registrar
ShriVaishnavVidyapeeth
Vishwavidyalaya, Indore