Industrial Management & Entrepreneurship		Semester	V
Course Code	**BAG501**	CIE Marks	50
Teaching Hours/Week (L:T:P: S)	3:0:0:0	SEE Marks	50
Total Hours of Pedagogy	40	Total Marks	100
Credits	03	Exam Hours	3
Examination nature (SEE)	**Theory**		

Course Objectives:

- Understand the concept of Industrial Management and entrepreneurship in Indian and global economy; planning and execution of ventures; government report for industry & innovation, contract & joint ventures in horticulture and will be motivated for becoming entrepreneur.

Teaching-Learning Process (General Instructions)

These are sample Strategies, which teacher can use to accelerate the attainment of the various course outcomes.

1. Adopt different types of teaching methods to develop the outcomes through PowerPoint presentations and Video demonstrations or Simulations.
2. Chalk and Talk method for teaching basic concepts.
3. Arranging visits to farmers' fields to expose pupils to real time farming situations.
4. Adopt collaborative (Group Learning) Learning in the class.
5. By giving assignments and presentation tasks to students.
6. Exploring information from research publications and regulatory documents

Module-1

Management: Introduction Meaning nature and characteristics of Management, Scope and Functional areas of management Management as a science, art of profession Management & Administration Roles of Management, Levels of Management, Development of Management Thought early management approaches – Modern management approaches.

Planning: Nature, importance and purpose of planning process Objective Types of plans (Meaning Only) Decision making Importance of planning steps in planning & planning premises Hierarchy of plans.

Module-2

Organizing and Staffing: Nature and purpose of organization Principles of organization Types of organization Departmentation Committees Centralization Vs Decentralization of authority and responsibility Span of control MBO and MBE (Meaning Only) Nature and importance of staffing Process of Selection & Recruitment (in brief).

Directing & Controlling: Meaning and nature of directing Leadership styles, Motivation Theories, Communication Meaning and importance coordination, meaning and importance and Techniques of Co Ordination. Meaning and steps in controlling Essentials of a sound control system Methods of establishing control (in brief).

Module-3

Entrepreneur: Meaning of Entrepreneur; Evolution of the Concept; Functions of an Entrepreneur, Types of Entrepreneurs, Entrepreneur an emerging. Class. Concept of Entrepreneurship Evolution of Entrepreneurship, Development of Entrepreneurship; Stages in entrepreneurial process; Role of entrepreneurs in Economic Development; Entrepreneurship in India; Entrepreneurship – its Barriers.

Module-4

Small Scale Industries: Definition; Characteristics; Need and rationale; Objectives; Scope; role of SSI in Economic Development. Advantages of SSI Steps to start and SSI Government policy towards SSI; Different Policies of SSI; Government Support for SSI during 5 year plans. Impact of Liberalization, Privatization, Globalization on SSI Effect of WTO/GA TT Supporting Agencies of Government for SSI, Meaning, Nature of support; Objectives; Functions; Types of Help; Ancillary Industry and Tiny Industry

Module-5

Institutional Support: Different Schemes; TECKSOK; KIADB; KSSIDC; KSIMC; DIC Single Window Agency; SISI; NSIC; SIDBI; KSFC.

Preparation of Project: Meaning of Project; Project Identification; Project Selection; Project Report; Need and Significance of Report; Contents; Formulation; Guidelines by Planning Commission for Project report; Network Analysis; Errors of Project Report; Project Appraisal. Identification of business opportunities: Market Feasibility Study; Technical Feasibility Study; Financial Feasibility Study & Social Feasibility Study

Course outcome (Course Skill Set)

At the end of the course the student will be able to :

CO1: Explain the concepts of management and Explore the management practices in their domain area within society.

CO2: Evaluate different types of organizational structures and Design them.

CO3: Apply the techniques of PERT/CPM in project.

CO4: Explain about method study and Use various work measurement methods.

CO5 : Understand the concept of entrepreneurship in Indian and global economy; planning and execution of ventures

Assessment Details (both CIE and SEE)

The weightage of Continuous Internal Evaluation (CIE) is 50% and for Semester End Exam (SEE) is 50%. The minimum passing mark for the CIE is 40% of the maximum marks (20 marks out of 50) and for the SEE minimum passing mark is 35% of the maximum marks (18 out of 50 marks). A student shall be deemed to have satisfied the academic requirements and earned the credits allotted to each subject/ course if the student secures a minimum of 40% (40 marks out of 100) in the sum total of the CIE (Continuous Internal Evaluation) and SEE (Semester End Examination) taken together.

Continuous Internal Evaluation:

- For the Assignment component of the CIE, there are 25 marks and for the Internal Assessment Test component, there are 25 marks.
- The first test will be administered after 40-50% of the syllabus has been covered, and the second test will be administered after 85-90% of the syllabus has been covered
- Any two assignment methods mentioned in the 22OB2.4, if an assignment is project-based then only one assignment for the course shall be planned. The teacher should not conduct two assignments at the end of the semester if two assignments are planned.
- For the course, CIE marks will be based on a scaled-down sum of two tests and other methods of assessment.

Internal Assessment Test question paper is designed to attain the different levels of Bloom's taxonomy as per the outcome defined for the course.

Semester-End Examination:

Theory SEE will be conducted by University as per the scheduled timetable, with common question papers for the course (**duration 03 hours).**

1. The question paper will have ten questions. Each question is set for 20 marks.
2. There will be 2 questions from each module. Each of the two questions under a module (with a maximum of 3 sub-questions), **should have a mix of topics** under that module.
3. The students have to answer 5 full questions, selecting one full question from each module.
4. Marks scored shall be proportionally reduced to 50 marks

Suggested Learning Resources:

Books

1. Principles of Management, P. C.Tripathi,P.N. Reddy, Tata McGraw Hill,
2. Dynamics of Entrepreneurial Development & Management, Vasant Desai, Publishing House.
3. Entrepreneurship Development, Poornima. M.Charantimath, Small Business Enterprises – Pearson, 2006 (2 & 4).
4. Management Fundamentals Concepts, Application , Skill , RobersLusier –Thomson
5. Entrepreneurship Development, S.S.Khanka, S.Chand& Co
6. Management, Stephen Robbins, Pearson Education/PHI, 17th Edition, 2003

Web links and Video Lectures (e-Resources):
• www.nptel.ac.in • https://onlinecourses.nptel.ac.in/noc23_mg74/preview • https://onlinecourses.nptel.ac.in/noc23_mg70/preview • https://cleartax.in/s/smallscaleindustriesssi#:~:text=Small%20Scale%20Industries%20(SSI)%20are,50%20crore • https://www.startupindia.gov.in/content/sih/en/startupscheme.html
Activity Based Learning (Suggested Activities in Class)/ Practical Based learning • Quizzes • Assignments • Seminars • Mini Projects

Farm Machinery & Equipment-I		Semester	**V**
Course Code	**BAG502**	CIE Marks	50
Teaching Hours/Week (L:T:P: S)	3:0:2:0	SEE Marks	50
Total Hours of Pedagogy	40 hours Theory + 8-10 Lab slots	Total Marks	100
Credits	04	Exam Hours	3
Examination nature (SEE)	Theory		

Course objectives:

- To understand primary and secondary tillage implements along with earth moving machinery, seeding and plant protection equipment will be discussed to get awareness on the mechanical area of the agricultural engineering.

Teaching-Learning Process (General Instructions)

These are sample Strategies, which teachers can use to accelerate the attainment of the various course outcomes.

1. Adopt different types of teaching methods to develop the outcomes through PowerPoint presentations and Video demonstrations or Simulations.
2. Chalk and Talk method for Problem Solving.
3. Arrange visits to show the live working models other than laboratory topics.
4. Adopt collaborative (Group Learning) Learning in the class.
5. Adopt Problem Based Learning (PBL), which fosters students Analytical skills and develops thinking skill such as evaluating, generalizing, and analysing information.
6. Conduct Laboratory Demonstrations and Practical Experiments to enhance experiential skills.

MODULE-1

Objectives of Farm Mechanization, sources of farm power, classification of farm machines. Materials of construction and heat treatment. Principles of operation and selection of machines used for production of crops -Field capacities of different implements and their economics. Problems on field capacities and cost of cultivation.

MODULE-2

Classification and types of tillage, Primary tillage implements - Mould board plough and its parts, Disc plough, and other ploughs, Secondary tillage equipment - Disc harrows, implements- Cultivators, and intercultural implements. Forces acting on tillage tools, Problems on forces analysis, Draft measurement of tillage equipment, Draft and unit draft related problems.

MODULE-3

Earth moving equipment-terminology, Earth moving equipment, construction and their working principles, Earth moving equipment-shovels, Bulldozers, Earth moving equipment - Trenches and elevators

MODULE-4

Seeding methods, Different types of seed metering mechanism, different types of furrow openers. Calibration of Seed drills. Adjustment of Seed Drills -Objectives and uses of plant protection equipment. Types of sprayers and dusters. Sprayer's calibration and selection. Constructional features of different components of sprayers and dusters and their adjustments.
MODULE-5
Transplanting methods, different types of Transplanting machinery and their working principle, adjustments in Transplanting equipment. Fertilizer application equipment – fertilizer meeting mechanism calibration of fertilizer equipment.

PRACTICAL COMPONENT OF IPCC*(May cover all / major modules)*

Sl.NO	Experiments
1	Introduction to various farm machines and equipment used on the farm
2	To measure Field capacity and field efficiency of Farm implements
3	Draft & fuel consumption measurement for different implements under different soil conditions.
4	Study of construction details, adjustments and working of M.B. plough
5	Study of construction details, adjustments and working of Disc plough
6	Study of construction details, adjustments and working of Disc Harrow
7	Study of construction details, adjustments and working of Cultivator
8	To study the Construction details and working of earth moving machinery
9	To study the Construction details and working of rotavator
10	Study of seed cum fertilizer drill and its calibration
11	Study of different type of mechanical paddy transplanter
12	Study of different weeding equipments and their use
13	Study of sprayers & dusters and measurement of nozzle discharge

Course outcomes (Course Skill Set):

At the end of the course, the student will be able to:

CO1: Apply Principles of Farm Mechanization to calculate field capacities and cost of cultivation.

CO2: Calculate the forces acting on tillage tools, Draft and Unit draft.

CO3: Explain Earth moving Equipment.

CO4: Analyze Seeding methods, Plant protection Equipment

CO5: Discuss the features of Transplanting machinery and Fertilizer application equipment.

Assessment Details (both CIE and SEE)

The weightage of Continuous Internal Evaluation (CIE) is 50% and for Semester End Exam (SEE) is 50%. The minimum passing mark for the CIE is 40% of the maximum marks (20 marks out of 50) and for the SEE minimum passing mark is 35% of the maximum marks (18 out of 50 marks). A student shall be deemed to have satisfied the academic requirements and earned the credits allotted to each subject/ course if the student secures a minimum of 40% (40 marks out of 100) in the sum total of the CIE (Continuous Internal Evaluation) and SEE (Semester End Examination) taken together.

CIE for the theory component of the IPCC (maximum marks 50)

- IPCC means practical portion integrated with the theory of the course.
- CIE marks for the theory component are **25 marks** and that for the practical component is **25 marks**.
- 25 marks for the theory component are split into **15 marks** for two Internal Assessment Tests (Two Tests, each of

15 Marks with 01-hour duration, are to be conducted) and **10 marks** for other assessment methods mentioned in 22OB4.2. The first test at the end of 40-50% coverage of the syllabus and the second test after covering 85-90% of the syllabus.

- Scaled-down marks of the sum of two tests and other assessment methods will be CIE marks for the theory component of IPCC (that is for **25 marks)**.
- The student has to secure 40% of 25 marks to qualify in the CIE of the theory component of IPCC.

CIE for the practical component of the IPCC

- **15 marks** for the conduction of the experiment and preparation of laboratory record, and **10 marks** for the test to be conducted after the completion of all the laboratory sessions.
- On completion of every experiment/program in the laboratory, the students shall be evaluated including viva-voce and marks shall be awarded on the same day.
- The CIE marks awarded in the case of the Practical component shall be based on the continuous evaluation of the laboratory report. Each experiment report can be evaluated for 10 marks. Marks of all experiments' write-ups are added and scaled down to **15 marks**.
- The laboratory test **(duration 02/03 hours)** after completion of all the experiments shall be conducted for 50 marks and scaled down to **10 marks.**
- Scaled-down marks of write-up evaluations and tests added will be CIE marks for the laboratory component of IPCC for **25 marks**.
- The student has to secure 40% of 25 marks to qualify in the CIE of the practical component of the IPCC.

SEE for IPCC

Theory SEE will be conducted by University as per the scheduled timetable, with common question papers for the course (**duration 03 hours**)

1. The question paper will have ten questions. Each question is set for 20 marks.
2. There will be 2 questions from each module. Each of the two questions under a module (with a maximum of 3 sub-questions), **should have a mix of topics** under that module.
3. The students have to answer 5 full questions, selecting one full question from each module.
4. Marks scored by the student shall be proportionally scaled down to 50 Marks

The theory portion of the IPCC shall be for both CIE and SEE, whereas the practical portion will have a CIE component only. Questions mentioned in the SEE paper may include questions from the practical component.

Suggested Learning Resources:

Books

1. Farm Machinery, Stone A A 1958. John Wiley and sons, New York.
2. Farm Machinery and Equipment, Smith H P 1971. Tata McGraw Hill Publishing Co. Ltd., New Delhi.
3. Principals of Agricultural Engineering, Michael A M and OJha T P 1985 Vol. I, Jain Brothers, New Delhi.
4. Principals of Farm Machinery, Kepner R A, Bainer R and Barger E L 1987. CBS Publishers and Distributors, Delhi.
5. Elements of Agricultural Engineering, Jagadeshwar Sahay 1992. Agro Book Agency, Patna.
6. Land Reclamation Machinery, Borshahov Mansurov Sergecv 1988. Mir Publishers, Moscow.

Web links and Video Lectures (e-Resources):

Activity Based Learning (Suggested Activities in Class)/ Practical Based learning

- Quizzes
- Assignments
- Seminars
- Field Experiments
- Mini Projects

Thermal Engineering		Semester	V
Course Code	**BAG503**	CIE Marks	50
Teaching Hours/Week (L:T:P: S)	4:0:0:0	SEE Marks	50
Total Hours of Pedagogy	52	Total Marks	100
Credits	04	Exam Hours	3
Examination nature (SEE)	**Theory**		

Course objectives:

- To make students to understand the heat transfer mechanisms and apply them to various engineering problems.
- To enable students to develop the skills to evaluate and design heat exchangers and refrigeration systems based on thermodynamic principles.
- To make students to understand psychrometric properties and use of psychrometric charts to analyze and design air-conditioning systems.

Teaching-Learning Process (General Instructions)

These are sample Strategies, which teacher can use to accelerate the attainment of the various course outcomes.

1. Adopt different types of teaching methods to develop the outcomes through PowerPoint presentations and Video demonstrations or Simulations.
2. Chalk and Talk method for teaching basic concepts.
3. Arranging visits to farmers' fields to expose pupils to real time farming situations.
4. Adopt collaborative (Group Learning) Learning in the class.
5. By giving assignments and presentation tasks to students.

   Exploring information from research publications and regulatory documents

Module-1

Introduction: Heat transfer, mode of heat transfer, thermal conductivity, Fourier's law, One dimensional steady state heat conduction and thermal resistance in walls, cylinders and spheres without heat generation. Thermal contact resistance. Overall heat transfer coefficient.

Module-2

Fundamentals of convection: Free and forced convection. Newton's law of cooling, heat transfer coefficient in convection, Dimensional analysis of free and forced convection.

Thermal radiation- Introduction, Emission of radiation, absorptivity, reflectivity and transmissivity. Black body. Plank's law, Kirchhoff's law, Stefan Boltzmann's law.

Module-3

Heat Exchanger: Type of heat exchangers, Analysis of parallel flow and counter flow heat exchanger, fouling factor, the log mean temperature difference method, The effectiveness-NTU method. Thermodynamics- Definition, systems, laws of thermodynamics. Ideal gases, real gases.

Module-4

Refrigeration: Vapour compression refrigeration system; refrigerating effect, capacity, power required, units of refrigeration, COP, P-h diagram - enthalpy diagram. Refrigeration cycles- The Carnot principle, Reversed Carnot cycle and Bell Coleman cycle, Vapour & Gas as refrigerant in reversed Carnot cycle. Classification of Refrigerants. Desirable properties of refrigerants

Module-5

Psychrometrics and Air-Conditioning Systems: Atmospheric air and Psychrometric properties: DBT, WBT, DPT, partial pressure, specific and relative humidity and relation between the enthalpy and adiabatic saturation temperatures. Construction and use of psychrometric chart. Analysis of various processes: Heating, cooling, dehumidifying and humidifying. Adiabatic mixing of stream of moist air. Summer and winter air conditioning systems.

Course outcome (Course Skill Set)

At the end of the course the student will be able to :

CO1: Describe the basic modes of heat transfer and determine steady state heat conduction in varying geometries.

CO2: Determine heat transfer coefficient in free convection, forced convection and radiation.

CO3. Apply LMTD & NTU for designing of heat exchangers and explain basics of thermodynamics.

CO4. Explain the working of vapor compression and vapor absorption refrigeration cycle and analyze their performance.

CO5. Explain psychometric processes and principle involved in air conditioning.

Assessment Details (both CIE and SEE)

The weightage of Continuous Internal Evaluation (CIE) is 50% and for Semester End Exam (SEE) is 50%. The minimum passing mark for the CIE is 40% of the maximum marks (20 marks out of 50) and for the SEE minimum passing mark is 35% of the maximum marks (18 out of 50 marks). A student shall be deemed to have satisfied the academic requirements and earned the credits allotted to each subject/ course if the student secures a minimum of 40% (40 marks out of 100) in the sum total of the CIE (Continuous Internal Evaluation) and SEE (Semester End Examination) taken together.

Continuous Internal Evaluation:

- For the Assignment component of the CIE, there are 25 marks and for the Internal Assessment Test component, there are 25 marks.
- The first test will be administered after 40-50% of the syllabus has been covered, and the second test will be administered after 85-90% of the syllabus has been covered
- Any two assignment methods mentioned in the 22OB2.4, if an assignment is project-based then only one assignment for the course shall be planned. The teacher should not conduct two assignments at the end of the semester if two assignments are planned.
- For the course, CIE marks will be based on a scaled-down sum of two tests and other methods of assessment.

Internal Assessment Test question paper is designed to attain the different levels of Bloom's taxonomy as per the outcome defined for the course.

Semester-End Examination:

Theory SEE will be conducted by University as per the scheduled timetable, with common question papers for the course (**duration 03 hours).**

- The question paper will have ten questions. Each question is set for 20 marks.
- There will be 2 questions from each module. Each of the two questions under a module (with a maximum of 3 sub-questions), **should have a mix of topics** under that module.
- The students have to answer 5 full questions, selecting one full question from each module.
- Marks scored shall be proportionally reduced to 50 marks

Suggested Learning Resources:

Books

1. Thermal Engineering, R.S. Khurmi, J.K. Gupta, 2019.
2. Refrigeration and Air conditioning, C P Arora, McGraw Hill Education, 3rd edition, 2017.
3. Heat and Mass Transfer, R. K. Rajput, S. Chand Limited, Revised Edition 2014.

Web links and Video Lectures (e-Resources):

http://ecoursesonline.iasri.res.in/course/view.php?id=61
http://ecoursesonline.iasri.res.in/course/view.php?id=445

Activity Based Learning (Suggested Activities in Class)/ Practical Based learning

- Quizzes, Assignments, Seminars, Mini Projects

Manufacturing Process Lab		Semester	V
Course Code	**BAGL504**	CIE Marks	50
Teaching Hours/Week (L:T:P: S)	(0:0:2:0)	SEE Marks	50
Total Hours of Pedagogy	12 sessions	Total Marks	100
Credits	01	Exam Hours	3
Examination nature (SEE)	**Practical**		

Course objectives:

- To provide an insight to different machine tools, accessories and attachments.
- Hands on training on machine tools to build the knowledge and confidence which aids the students to enhance their manufacturing skills during the period of their project works.
- To expose the students to CNC Machine Tools, CNC part programming, and industrial robots.
- To provide an insight into different sand preparation and foundry equipment.
- To provide training to students to enhance their practical skills in milling, shaping and hand moulding operations.

Sl.NO	Experiments
1	**Lathe:** Introduction, Lathe machine, types of lathe machine, working principle of lathe, parts, Cutting tools, accessories & attachment
2	**Lathe operations:** Jobs involving plane turning, facing, taper turning, thread cutting, groove cutting, knurling, chamfering & centre drilling.
3	**Shaper machine:** Introduction, classification of shaper, working principle & parts of shaper
4	**Shaper operations:** Jobs involving in cutting of V-Groove/ dovetail / Rectangular groove using a shaper
5	**Milling machine:** Introduction, types, working principle, tools & equipment's used
6	**Milling operations :** Jobs involving in Cutting of Gear Teeth using Milling Machine, indexing for preparation of hexagon
7	**Computer Numerical Control(CNC):** Introduction, components of CNC, CNC programming, manual part programming, G Codes, M Codes, programming of simple components in turning, drilling and milling systems, programming with canned cycles. Cutter radius compensations. Programming with canned cycles. Cutter radius compensations.
8	**Foundry shop :** Introduction to foundry materials, moulds, uses of cores, tools & equipment used in Foundry shop
9	**Foundry shop :** Mould making using single piece pattern (step block-round)
10	**Foundry shop :** Mould making using split piece pattern

Course outcomes (Course Skill Set):

At the end of the course the student will be ablet o:

1. Understand integral parts of lathe, shaping and milling machines and various accessories and attachments used.
2. Select cutting parameters like cutting speed, feed, depth of cut, and tooling for various machining operations.
3. Perform cylindrical turning operations such as plain turning, taper turning, step turning, thread Cutting, facing, knurling, internal thread cutting, eccentric turning and estimate cutting time.
4. Perform machining operations such as plain shaping, inclined shaping, keyway cutting and Indexing etc.
5. Explain the use of different computer applications in manufacturing, and able to prepare part Programs for simple jobs on CNC machine tools and robot programming.

Assessment Details (both CIE and SEE)

The weightage of Continuous Internal Evaluation (CIE) is 50% and for Semester End Exam (SEE) is 50%. The minimum passing mark for the CIE is 40% of the maximum marks (20 marks out of 50) and for the SEE minimum passing mark

is 35% of the maximum marks (18 out of 50 marks). A student shall be deemed to have satisfied the academic requirements and earned the credits allotted to each subject/ course if the student secures a minimum of 40% (40 marks out of 100) in the sum total of the CIE (Continuous Internal Evaluation) and SEE (Semester End Examination) taken together

Continuous Internal Evaluation (CIE):

CIE marks for the practical course are **50 Marks**.

The split-up of CIE marks for record/ journal and test are in the ratio **60:40**.

- Each experiment is to be evaluated for conduction with an observation sheet and record write-up. Rubrics for the evaluation of the journal/write-up for hardware/software experiments are designed by the faculty who is handling the laboratory session and are made known to students at the beginning of the practical session.
- Record should contain all the specified experiments in the syllabus and each experiment write-up will be evaluated for 10 marks.
- Total marks scored by the students are scaled down to **30 marks** (60% of maximum marks).
- Weightage to be given for neatness and submission of record/write-up on time.
- Department shall conduct a test of 100 marks after the completion of all the experiments listed in the syllabus.
- In a test, test write-up, conduction of experiment, acceptable result, and procedural knowledge will carry a weightage of 60% and the rest 40% for viva-voce.
- The suitable rubrics can be designed to evaluate each student's performance and learning ability.
- The marks scored shall be scaled down to **20 marks** (40% of the maximum marks).

The Sum of scaled-down marks scored in the report write-up/journal and marks of a test is the total CIE marks scored by the student.

Semester End Evaluation (SEE):

- SEE marks for the practical course are 50 Marks.
- SEE shall be conducted jointly by the two examiners, an internal examiner from the same institute and an external examiner from other institute, are appointed by the University.
- The examination schedule and names of examiners are informed to the university before the conduction of the examination. These practical examinations are to be conducted between the schedule mentioned in the academic calendar of the University.
- All laboratory experiments are to be included for practical examination.
- (Rubrics) Breakup of marks and the instructions printed on the cover page of the answer script to be strictly adhered to by the examiners. **OR** based on the course requirement evaluation rubrics shall be decided jointly by examiners.
- Students can pick one question (experiment) from the questions lot prepared by the examiners jointly.
- Evaluation of test write-up/ conduction procedure and result/viva will be conducted jointly by examiners.

General rubrics suggested for SEE are mentioned here, writeup-20%, Conduction procedure and result in -60%, Viva-voce 20% of maximum marks. SEE for practical shall be evaluated for 100 marks and scored marks shall be scaled down to 50 marks (however, based on course type, rubrics shall be decided by the examiners)

Change of experiment is allowed only once and 15% of Marks allotted to the procedure part are to be made zero.

The minimum duration of SEE is 02 hours

Suggested Learning Resources:

Books

1. Elements of Mechanical Engineering - Hajra Choudhury & others, Media Promoters 2010.
2. The Elements of Workshop Technology - Vol I & II, S.K. Hajra Choudhury, A.K. Hajra Choudhury, Nirjhar Roy, 11th edition 2001 others, Media Promoters and Publishers, Mumbai.
3. Mikell P, Groover. 2015. Automation, Production Systems and Computer-Integrated Manufacturing. 4th Edition, Pearson Learning.
4. P N Rao, 2015, CAD / CAM Principles and Applications, 3rd Edition, Tata McGraw-Hill.
5. Dr. P. Radhakrishnan, CAD/CAM/CIM, 3rd edition New Age International Publishers, New Delhi.

Precision Farming Techniques for Protected Cultivation		Semester	V
Course Code	**BAG515A**	CIE Marks	50
Teaching Hours/Week (L:T:P: S)	3:0:0:0	SEE Marks	50
Total Hours of Pedagogy	40	Total Marks	100
Credits	03	Exam Hours	3
Examination nature (SEE)	**Theory**		

Course Objectives:

- To familiarize the students with the relevance and scope of precision farming and protected cultivation.
- To impart knowledge about the various modern precision farming techniques and their application in protected cultivation.

Teaching-Learning Process (General Instructions)

These are sample Strategies, which teacher can use to accelerate the attainment of the various course outcomes.

1. Adopt different types of teaching methods to develop the outcomes through PowerPoint presentations and Video demonstrations or Simulations.
2. Chalk and Talk method for teaching basic concepts.
3. Arranging visits to farmers' fields to expose pupils to real time farming situations.
4. Adopt collaborative (Group Learning) Learning in the class.
5. By giving assignments and presentation tasks to students.
6. Exploring information from research publications and regulatory documents

Module-1

Greenhouse: History, greenhouse effect, advantages of greenhouse. **Classification of greenhouses**: based on shape, utility, and covering materials. **Plant response to greenhouse environment**: light, temperature, relative humidity, ventilation and carbon dioxide. **Environmental control inside greenhouse**: Manual controlling, thermostats, active summer cooling, active winter cooling and carbon dioxide enrichment methods.

Module-2

Greenhouse ventilation and computerized control systems: Natural ventilation, forced ventilation, microprocessors and computers**, Planning of greenhouse facility:** site selection and orientation, structural design and conversion materials. Greenhouse construction materials, Greenhouse covering materials. **Construction of typical greenhouses:** Design criteria for construction, construction of Glass greenhouse and construction of pipe frame greenhouse.

Module-3

Construction of low cost wooden framed plastic film greenhouse: Material requirement, preparation of materials and construction procedure. **Greenhouse cooling:** Design of active summer cooling system, Design of active winter cooling system. **Greenhouse heating:** modes of heat loss, heating systems, heat distribution system, solar heating system, water and rock storage, heat conversion practices, heat requirement calculations.

Module-4

Environmental requirement of crops and pest control: Temperature requirements of horticultural crops, light requirements of crops and lightening control methods, floricultural crops, pest and diseases control, integrated pest management. **Greenhouse irrigation systems:** Rules of watering, Hand watering, Perimeter watering, Overhead sprinklers, boom watering and drip irrigation.

Module-5

Advanced protected agricultural systems liquid hydroponics: Hydroponic system, Nutrient film technique, NFT system cultural procedures, Deep flow hydroponics, Dynamic root floating hydroponic system. Aeroponics. **Advanced protected agriculture systems- aggregate hydroponics:** open systems, closed systems, whole film recirculation. **Economics of greenhouse production:** Capital requirements, Economics of production, Conditions influencing Returns.

Course outcome (Course Skill Set)

At the end of the course the student will be able to :

CO1: Understand the importance of protected cultivation in precision farming

CO2: Explain various components, shape, types of green houses

CO3: Explain the design and construction of green houses in different agro-climatic zones

CO4: Discuss about greenhouse cooling and heating systems, environmental parameter and control, ventilation systems

CO5: Assess different root media, micro-irrigation, fustigation, planting techniques in green house cultivation Hydroponics, post-harvest management, pest management and economic aspects of a green house.

Assessment Details (both CIE and SEE)

The weightage of Continuous Internal Evaluation (CIE) is 50% and for Semester End Exam (SEE) is 50%. The minimum passing mark for the CIE is 40% of the maximum marks (20 marks out of 50) and for the SEE minimum passing mark is 35% of the maximum marks (18 out of 50 marks). A student shall be deemed to have satisfied the academic requirements and earned the credits allotted to each subject/ course if the student secures a minimum of 40% (40 marks out of 100) in the sum total of the CIE (Continuous Internal Evaluation) and SEE (Semester End Examination) taken together.

Continuous Internal Evaluation:

- For the Assignment component of the CIE, there are 25 marks and for the Internal Assessment Test component, there are 25 marks.
- The first test will be administered after 40-D0% of the syllabus has been covered, and the second test will be administered after 85-90% of the syllabus has been covered
- Any two assignment methods mentioned in the 22OB2.4, if an assignment is project-based then only one assignment for the course shall be planned. The teacher should not conduct two assignments at the end of the semester if two assignments are planned.
- For the course, CIE marks will be based on a scaled-down sum of two tests and other methods of assessment.

Internal Assessment Test question paper is designed to attain the different levels of Bloom's taxonomy as per the outcome defined for the course.

Semester-End Examination:

Theory SEE will be conducted by University as per the scheduled timetable, with common question papers for the course (**duration 03 hours).**

- The question paper will have ten questions. Each question is set for 20 marks.
- There will be 2 questions from each module. Each of the two questions under a module (with a maximum of 3 sub-questions), **should have a mix of topics** under that module.
- The students have to answer 5 full questions, selecting one full question from each module.
- Marks scored shall be proportionally reduced to 50 marks

Suggested Learning Resources:

1. Greenhouse Technology and Management by K Radha Manohar and C. Igathinathane. BS publishers.
2. 2. Protected Cultivation Ernst van Heurn and Kees Van der Post Digigrafi, Wageningan, The Netherlands 2004
3. 3. Protected Cultivation of Horticulture Crops Peter, K.V. and Sing D.K. New India Publishing Company. 2013
4. 4. Sustainable Crop Protection under Protected Cultivation Reddy P.P Springer Singapore 2016
5. 5. Precision Farming Sharma P. Daya Publishing House New Delhi.

Web links and Video Lectures (e-Resources):

Activity Based Learning (Suggested Activities in Class)/ Practical Based learning

- Quizzes
- Assignments
- Seminars
- Mini Projects

Landscape Irrigation Design and Management		Semester	V
Course Code	**BAG515B**	CIE Marks	50
Teaching Hours/Week (L:T:P: S)	3:0:0:0	SEE Marks	50
Total Hours of Pedagogy	40	Total Marks	100
Credits	03	Exam Hours	3
Examination nature (SEE)	**Theory**		

Course Objectives:

- Impart Knowledge on historical importance of Indian gardens and conventional methods of landscape irrigation
- To train the students on different types of modern landscape irrigation methods and their design unit operations of agricultural process engineering
- Also to enrich the students and familiarize the students in modern landscape irrigation methods and their design

Teaching-Learning Process (General Instructions)

These are sample Strategies, which teacher can use to accelerate the attainment of the various course outcomes.

1. Adopt different types of teaching methods to develop the outcomes through PowerPoint presentations and Video demonstrations or Simulations.
2. Chalk and Talk method for teaching basic concepts.
3. Arranging visits to farmers' fields to expose pupils to real time farming situations.
4. Adopt collaborative (Group Learning) Learning in the class.
5. By giving assignments and presentation tasks to students.
6. Exploring information from research publications and regulatory documents

Module-1

Conventional Landscape Irrigation- Methods: Conventional method of landscape irrigation- hose irrigation system, quick release coupling system and portable sprinkler with hose pipes.

Module-2

MODERN LANDSCAPE IRRIGATION-METHODS: Modern methods of landscape irrigation- popup sprinklers, spray pop-up sprinkler, shrub adopter, drip irrigation and bubblers; Merits and demerits of conventional and modern irrigation systems.

Module-3

TYPES AND SEGMENTS OF LANDSCAPE IRRIGATION: Types of landscapes and suitability of different irrigation methods, water requirement for different landscapes, Segments of landscape irrigation systems

Module-4

COMPONENTS OF MODERN LANDSCAPE IRRIGATIONANDTYPES OF PIPES: Main components of modern landscape irrigation systems and their selection criteria; Types of pipes, pressure ratings, sizing and selection criteria. Determination of power requirement, pump selection. Irrigation scheduling of landscapes, Study of irrigation controllers and other equipments.

Module-5

AUTOMATION SYSTEMS IN LANDSCAPE IRRIGATION: - main components, types of controllers and their application, Design of modern landscape irrigation systems, operation and maintenance of landscape irrigation systems. Design and installation of irrigation system for landscape, Use of Auto CAD in irrigation design: blocks & symbols, head layout, zoning and valves layout, pipe sizing, Pressure calculations etc., Visit to landscape irrigation system and its evaluation.

Course outcome (Course Skill Set)

At the end of the course the student will be able to :

CO1: Acquire knowledge on historical importance of Indian gardens and conventional methods of landscape irrigation

CO2: Be proficient in types of modern landscape irrigation methods and their design

CO3: Understand the types of drip irrigation methods adopted in landscaping and their design

CO4: Discuss Some of the basic concepts related to landscape and its suitability

CO5: Explore the knowledge acquaint on modern landscape irrigation system and its economics

Assessment Details (both CIE and SEE)

The weightage of Continuous Internal Evaluation (CIE) is 50% and for Semester End Exam (SEE) is 50%. The minimum passing mark for the CIE is 40% of the maximum marks (20 marks out of 50) and for the SEE minimum passing mark is 35% of the maximum marks (18 out of 50 marks). A student shall be deemed to have satisfied the academic requirements and earned the credits allotted to each subject/ course if the student secures a minimum of 40% (40 marks out of 100) in the sum total of the CIE (Continuous Internal Evaluation) and SEE (Semester End Examination) taken together.

Continuous Internal Evaluation:

- For the Assignment component of the CIE, there are 25 marks and for the Internal Assessment Test component, there are 25 marks.
- The first test will be administered after 40-50% of the syllabus has been covered, and the second test will be administered after 85-90% of the syllabus has been covered
- Any two assignment methods mentioned in the 22OB2.4, if an assignment is project-based then only one assignment for the course shall be planned. The teacher should not conduct two assignments at the end of the semester if two assignments are planned.
- For the course, CIE marks will be based on a scaled-down sum of two tests and other methods of assessment.

Internal Assessment Test question paper is designed to attain the different levels of Bloom's taxonomy as per the outcome defined for the course.

Semester-End Examination:

Theory SEE will be conducted by University as per the scheduled timetable, with common question papers for the course (**duration 03 hours).**

- The question paper will have ten questions. Each question is set for 20 marks.
- There will be 2 questions from each module. Each of the two questions under a module (with a maximum of 3 sub-questions), **should have a mix of topics** under that module.
- The students have to answer 5 full questions, selecting one full question from each module.
- Marks scored shall be proportionally reduced to 50 marks

Suggested Learning Resources:

Books

1. Michael A.M. 2012. Irrigation: Theory and Practice. Vikas PublishingVikasPubl.House New Delhi.
2. Singh Neeraj Partap. 2010. Landscape Irrigation and Floriculture Terminology,Bangalore
3. Smith Stepehen W. Landscape Irrigation and Management. Amazon. com.

Web links and Video Lectures (e-Resources):

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Activity Based Learning (Suggested Activities in Class)/ Practical Based learning

- Quizzes
- Assignments
- Seminars
- Mini Projects

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Storage & Packaging Technology		Semester	V
Course Code	**BAG515C**	CIE Marks	50
Teaching Hours/Week (L:T:P: S)	3:0:0:0	SEE Marks	50
Total Hours of Pedagogy	40	Total Marks	100
Credits	03	Exam Hours	3
Examination nature (SEE)	**Theory**		

Course Objectives:

- To impart knowledge to the students on spoilage, storage methods food packaging principles, technology and equipment

Teaching-Learning Process (General Instructions)

These are sample Strategies, which teacher can use to accelerate the attainment of the various course outcomes.

1. Adopt different types of teaching methods to develop the outcomes through PowerPoint presentations and Video demonstrations or Simulations.
2. Chalk and Talk method for teaching basic concepts.
3. Arranging visits to farmers' fields to expose pupils to real time farming situations.
4. Adopt collaborative (Group Learning) Learning in the class.
5. By giving assignments and presentation tasks to students.
6. Exploring information from research publications and regulatory documents

Module-1

Spoilage and storage: Factors affecting shelf life of food material during storage, causes of spoilage in storage(moisture, temperature, humidity, respiration loss, heat of respiration, sprouting), destructive agents (rodents, birds, insects, etc.), sources of infestation and control; moisture and temperature changes in stored grains.

Module-2

Storage methods: Traditional storage structures- Morai, Bhukari, Kanaja, Muda, Mudkothi; Improved storage structures- Pusa bin, Brick and Cement, CAP (cover and plinth); Modern storage structures- Bins, Silos, Sheds. Storage of perishables: cold storage, controlled and modified atmospheric storage, hypobaric storage.

Module-3

Food Packaging- Definition - Package, Packaging, Packing. Levels of packaging - Functions of packaging, Packaging environments. Packaging materials-Classification of packages – Paper as packaging material - Paper manufacture, types, advantages of corrugated and paper board boxes.

Module-4

Glass as package material, manufacture, advantages, disadvantages. Metal (Aluminium/tin/SS)as package material-manufacture, advantages, disadvantages, plastic as package material, classification of polymers.

Module-5

Special Packaging Techniques: Vacuum and gas packaging, aseptic packaging, retort pouching, edible film packaging, tetra packaging, antimicrobial packaging, shrink and stretch packaging. Package Testing - Thickness, Paper density, Basis weight, Grammage, Burst Strength, Tear Resistance, Tensile Strength, Grease Resistance, Gas Transmission Rate (GTR), Water Vapour Transmission Rate (WVTR)

Course outcome (Course Skill Set)

At the end of the course the student will be able to :

CO1: Understand the various packaging methods

CO2: Understand the importance of packaging of food

CO3: Understand the interaction of food, packaging and environment

CO4: Understand the different methods of package development and packaging

CO5: Select the best type and form of packaging of specific food for specific end users

Assessment Details (both CIE and SEE)

The weightage of Continuous Internal Evaluation (CIE) is 50% and for Semester End Exam (SEE) is 50%. The minimum passing mark for the CIE is 40% of the maximum marks (20 marks out of 50) and for the SEE minimum passing mark is 35% of the maximum marks (18 out of 50 marks). A student shall be deemed to have satisfied the academic requirements and earned the credits allotted to each subject/ course if the student secures a minimum of 40% (40 marks out of 100) in the sum total of the CIE (Continuous Internal Evaluation) and SEE (Semester End Examination) taken together.

Continuous Internal Evaluation:

- For the Assignment component of the CIE, there are 25 marks and for the Internal Assessment Test component, there are 25 marks.
- The first test will be administered after 40-50% of the syllabus has been covered, and the second test will be administered after 85-90% of the syllabus has been covered
- Any two assignment methods mentioned in the 22OB2.4, if an assignment is project-based then only one assignment for the course shall be planned. The teacher should not conduct two assignments at the end of the semester if two assignments are planned.
- For the course, CIE marks will be based on a scaled-down sum of two tests and other methods of assessment.

Internal Assessment Test question paper is designed to attain the different levels of Bloom's taxonomy as per the outcome defined for the course.

Semester-End Examination:

Theory SEE will be conducted by University as per the scheduled timetable, with common question papers for the course (**duration 03 hours).**

- The question paper will have ten questions. Each question is set for 20 marks.
- There will be 2 questions from each module. Each of the two questions under a module (with a maximum of 3 sub-questions), **should have a mix of topics** under that module.
- The students have to answer 5 full questions, selecting one full question from each module.
- Marks scored shall be proportionally reduced to 50 marks

Suggested Learning Resources:

Books

1. Chakaraverty, A. 2000. 3rd edition. Post harvest technology of cereals, pulses and oil seeds. Oxford and IBH publishing and Co.Pvt.Ltd. New Delhi.
2. Unit Operations of Agricultural Processing, Sahay KM and Singh KK 1994, Vikas Publishing House Pvt.Ltd., New Delhi
3. Principles of Agricultural Engineering Volume-I, T.P.Ojha and A.M. Michael, 2023. Jain Brothers, New Delhi.
4. Food Packaging: Principles and practice, Gordon L. Robertson, 2012. CRC Press Inc. Boca Raton London, New York.
5. Food packaging study material, Prepared by Dr. S.Kaleemullah, College of Food Science and Technology, Pulivendula, Acharya N. G. Ranga Agricultural University, Andhra Pradesh.

Web links and Video Lectures (e-Resources):

- . http://www.post-gazette.com/
- http://www.patentstrom.us/patents/6586036.htm

Activity Based Learning (Suggested Activities in Class)/ Practical Based learning

- Quizzes
- Assignments
- Seminars
- Mini Projects

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Water Harvesting and Soil Conservation Structures		Semester	V
Course Code	**BAG515D**	CIE Marks	50
Teaching Hours/Week (L:T:P: S)	3:0:0:0	SEE Marks	50
Total Hours of Pedagogy	40	Total Marks	100
Credits	03	Exam Hours	3
Examination nature (SEE)	**Theory**		

Course Objectives:

- This course deals with water harvesting techniques, runoff harvesting techniques and design of different farm ponds, embankments and spillways.
- It also helps student to acquaint knowledge in designing and constructing different permanent gully control structures

Teaching-Learning Process (General Instructions)

These are sample Strategies, which teacher can use to accelerate the attainment of the various course outcomes.

1. Adopt different types of teaching methods to develop the outcomes through PowerPoint presentations and Video demonstrations or Simulations.
2. Chalk and Talk method for teaching basic concepts.
3. Arranging visits to farmers' fields to expose pupils to real time farming situations.
4. Adopt collaborative (Group Learning) Learning in the class.
5. By giving assignments and presentation tasks to students.
6. Exploring information from research publications and regulatory documents

Module-1

WATER HARVESTING: 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. Structures - farm ponds - dug-out and embankment reservoir types, tanks and subsurface dykes

Module-2

FARM POND AND EMBANKMENTS: 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. Soil erosion control structures - introduction, classification and functional requirements.

Module-3

PERMANENT GULLY CONTROL STRUCTURES: 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. 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.

Module-4

DESIGN OF PERMANENT GULLY STRUCTURES: 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.

Module-5

DESIGN OF PERMANENT GULLY STRUCTURES: 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.

Course outcome (Course Skill Set)

At the end of the course the student will be able to :

CO1: Apply the knowledge of short term and long term water harvesting techniques to conserve water

CO2: Analyze runoff in watershed and different forces acting on different gully control structures.

CO3: Design and develop farm pond and embankments and optimize its cost.

CO4: Propose and estimate hydrologic design and structural design of different gully control structures

Assessment Details (both CIE and SEE)

The weightage of Continuous Internal Evaluation (CIE) is 50% and for Semester End Exam (SEE) is 50%. The minimum passing mark for the CIE is 40% of the maximum marks (20 marks out of 50) and for the SEE minimum passing mark is 35% of the maximum marks (18 out of 50 marks). A student shall be deemed to have satisfied the academic requirements and earned the credits allotted to each subject/ course if the student secures a minimum of 40% (40 marks out of 100) in the sum total of the CIE (Continuous Internal Evaluation) and SEE (Semester End Examination) taken together.

Continuous Internal Evaluation:

- For the Assignment component of the CIE, there are 25 marks and for the Internal Assessment Test component, there are 25 marks.
- The first test will be administered after 40-50% of the syllabus has been covered, and the second test will be administered after 85-90% of the syllabus has been covered
- Any two assignment methods mentioned in the 22OB2.4, if an assignment is project-based then only one assignment for the course shall be planned. The teacher should not conduct two assignments at the end of the semester if two assignments are planned.
- For the course, CIE marks will be based on a scaled-down sum of two tests and other methods of assessment.

Internal Assessment Test question paper is designed to attain the different levels of Bloom's taxonomy as per the outcome defined for the course.

Semester-End Examination:

Theory SEE will be conducted by University as per the scheduled timetable, with common question papers for the course (**duration 03 hours).**

- The question paper will have ten questions. Each question is set for 20 marks.
- There will be 2 questions from each module. Each of the two questions under a module (with a maximum of 3 sub-questions), **should have a mix of topics** under that module.
- The students have to answer 5 full questions, selecting one full question from each module.
- Marks scored shall be proportionally reduced to 50 marks

Suggested Learning Resources:

Books

1. Suresh, R. "Soil and Water Conservation Engineering" Standard Publisher Distributors, New Delhi, 2014.
2. Michael, A.M. and T.P. Ojha. "Principles of Agricultural Engineering" Volume II. 4th Edition, Jain Brothers, New Delhi, 2003.
3. Murthy, V.V.N. "Land and Water Management Engineering" 4th Edition, Kalyani Publishers, New Delhi, 2002.

Web links and Video Lectures (e-Resources):

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Activity Based Learning (Suggested Activities in Class)/ Practical Based learning

- Quizzes
- Assignments
- Seminars
- Mini Projects

Farm Machinery & Equipment-II		Semester	VI
Course Code	**BAG601**	CIE Marks	50
Teaching Hours/Week (L:T:P: S)	3:0:2:0	SEE Marks	50
Total Hours of Pedagogy	40 hours Theory + 8-10 Lab slots	Total Marks	100
Credits	04	Exam Hours	3
Examination nature (SEE)	Theory		

Course objectives:

- To enable the students to understand the basic principles of cutting mechanisms and to know the various available harvesting machines.
- To know the working principle and functions of various machine parts of mowers, reapers, windrowers, forage harvesters, threshers, combine harvesters, cotton strippers, cotton pickers, groundnut and potato and sugarcane harvesters.
- Students can also understand the importance of testing and evaluation of agricultural machines and different standard codes (BIS Codes) available in India for testing of machinery.

Teaching-Learning Process (General Instructions)

These are sample Strategies, which teachers can use to accelerate the attainment of the various course outcomes.

1. Adopt different types of teaching methods to develop the outcomes through PowerPoint presentations and Video demonstrations or Simulations.
2. Chalk and Talk method for Problem Solving.
3. Arrange visits to show the live working models other than laboratory topics.
4. Adopt collaborative (Group Learning) Learning in the class.
5. Adopt Problem Based Learning (PBL), which fosters students Analytical skills and develops thinking skill such as evaluating, generalizing, and analysing information.
6. Conduct Laboratory Demonstrations and Practical Experiments to enhance experiential skills.

MODULE-1

Harvesting – Crop harvesting machinery, manual harvesting and its classification. Principles and types of cutting mechanisms – principle of cutting mechanism, impact cutting, types of impact cutting, shear cutting Construction and adjustments of shear and impact type cutting mechanisms. Mowers –tractor mounted mowers, Trail behind tractor mower, integral Rear mounted mowers, side or central mounted tractor mower, semi-mounted mowers, safety precautions in operation and adjustments of mowers, Knife drives, cutter bar and its parts and various parts of cutter bar assembly, alignment and registration of cutter bar. Windrowing – Methods of windrowing.

MODULE-2

Animal drawn reaper, Tractor mounted Vertical conveyer reaper Repairs & maintenance of Harvesting equipment, Power operated vertical conveyer reapers – Reaper binders – Care and maintenance, types Forage harvesting equipment – row forage harvesting equipment, field forage harvesters, types of field forage harvesters. Field chopper harvesters, forage wagons and boxes, field flail forage harvesters, the self-propelled forage harvester, silo forage blowers, silo unloaders.

MODULE-3

Threshing – Principal of threshing, threshing methods, threshing by manual, threshing by animals, threshing by machines, Olpad threshers, Power thresher – types of power threshers, hammer mill type, rasp bar, spike tooth, syndicator, Classification threshers based on feeding type, components of power thresher. Cleaning unit- Aspirator, blower, winnower, winnowing fan, cylinder adjustment, wheat thresher, groundnut thresher, and terminology connected with power thresher.

MODULE-4

Combine Harvester, advantages and disadvantages of combines, types of combines – Tractor drawn and self-propelled combines. Functions performed by a combine, cutting mechanism, threshing harvesting equipment- types of corn pickers, snappers, picker husker, Picker Sheller, power transmission, gathering and snapping mechanism, conveying and elevating mechanism. Husking mechanism, shelling mechanism, factors affecting performance of corn pickers,

safety rules for operating corn pickers - Root crop harvesting equipment – groundnut harvester, groundnut diggers, digger operation and adjustments – groundnut shakers, groundnut threshers and pickers, groundnut combines different units and its operation. Potato harvesters – harvesting methods and equipment, one-row harvester, two-row harvester, digging and soil separation, vine removal by harvesters, separation of stones and clods.

MODULE-5

Cotton harvesting equipment – cotton stripper, types of cotton strippers, factors affecting the performance of the cotton strippers, plant characteristics – thickness of plants – conveying system. Cotton pickers – types of pickers, drum type and chain belt spindle arrangements in cotton pickers, methods of mounting spindles, doffing of the cotton, conveying systems, working, factors affecting performance of cotton pickers. Sugar cane harvesters – self-propelled sugar cane harvester, cleaning and special sugar cane wagon. Sugar cane harvesters – Self-propelled sugar cane harvester, conveying and special sugar cane wagon. Principles of fruit harvesting tools and machines – Harvesting methods – manual harvesters – hold on and twist type – Horticultural tools and gadgets. Testing of farm machine-Introduction, Standardization efforts, Testing programme and Procedure, Type of testing systems, national testing, prototype testing, testing for quality marketing.

PRACTICAL COMPONENT OF IPCC*(May cover all / major modules)*

Sl.NO	Experiments
1	To study the various types of mowers, constructional details, materials and working.
2	To practice the alignment and registration of mower.
3	To study the various types of reaper, constructional details, materials used, working and performance
4	To measure the different losses in thresher and threshing efficiency of a thresher
5	To study about the various types of chaff cutters and their capacity
6	To study about constructional details, materials used and working of potato harvesters
7	To study about constructional details, materials used and working of groundnut harvesters
8	To study the various types of cotton strippers, constructional details, materials used and working
9	To study about safety rules for operating the harvesters, threshers and combiners based on IS standards
10	To study about different horticultural tools.
11	To visit the machinery production industry and Research Stations

Course outcomes (Course Skill Set):

At the end of the course, the student will be able to:

CO1: Describe Crop harvesting machinery

CO2: Analyze the Power operated vertical conveyer reapers

CO3: Apply the threshing principles for all types of threshers

CO4: Analyze the factors affecting the harvesters.

CO5: Explain the features of cotton harvesting equipment.

Assessment Details (both CIE and SEE)

The weightage of Continuous Internal Evaluation (CIE) is 50% and for Semester End Exam (SEE) is 50%. The minimum passing mark for the CIE is 40% of the maximum marks (20 marks out of 50) and for the SEE minimum passing mark is 35% of the maximum marks (18 out of 50 marks). A student shall be deemed to have satisfied the academic requirements and earned the credits allotted to each subject/ course if the student secures a minimum of 40% (40 marks out of 100) in the sum total of the CIE (Continuous Internal Evaluation) and SEE (Semester End Examination) taken together.

CIE for the theory component of the IPCC (maximum marks 50)

- IPCC means practical portion integrated with the theory of the course.
- CIE marks for the theory component are **25 marks** and that for the practical component is **25 marks**.
- 25 marks for the theory component are split into **15 marks** for two Internal Assessment Tests (Two Tests, each

of 15 Marks with 01-hour duration, are to be conducted) and **10 marks** for other assessment methods mentioned in 22OB4.2. The first test at the end of 40-50% coverage of the syllabus and the second test after covering 85-90% of the syllabus.

- Scaled-down marks of the sum of two tests and other assessment methods will be CIE marks for the theory component of IPCC (that is for **25 marks)**.
- The student has to secure 40% of 25 marks to qualify in the CIE of the theory component of IPCC.

CIE for the practical component of the IPCC

- **15 marks** for the conduction of the experiment and preparation of laboratory record, and **10 marks** for the test to be conducted after the completion of all the laboratory sessions.
- On completion of every experiment/program in the laboratory, the students shall be evaluated including viva-voce and marks shall be awarded on the same day.
- The CIE marks awarded in the case of the Practical component shall be based on the continuous evaluation of the laboratory report. Each experiment report can be evaluated for 10 marks. Marks of all experiments' write-ups are added and scaled down to **15 marks**.
- The laboratory test **(duration 02/03 hours)** after completion of all the experiments shall be conducted for 50 marks and scaled down to **10 marks.**
- Scaled-down marks of write-up evaluations and tests added will be CIE marks for the laboratory component of IPCC for **25 marks**.
- The student has to secure 40% of 25 marks to qualify in the CIE of the practical component of the IPCC.

SEE for IPCC

Theory SEE will be conducted by University as per the scheduled timetable, with common question papers for the course (**duration 03 hours**)

- The question paper will have ten questions. Each question is set for 20 marks.
- There will be 2 questions from each module. Each of the two questions under a module (with a maximum of 3 sub-questions), **should have a mix of topics** under that module.
- The students have to answer 5 full questions, selecting one full question from each module.
- Marks scored by the student shall be proportionally scaled down to 50 Marks

The theory portion of the IPCC shall be for both CIE and SEE, whereas the practical portion will have a CIE component only. Questions mentioned in the SEE paper may include questions from the practical component.

Suggested Learning Resources:

Books

1. Principals of Farm Machinery. Kepner R.A., Bainer R and Barger E.L, 1987. CBS Publishers and Distributors, Delhi.
2. Engineering principles of Agricultural machines, Ajith k Srivatsava, Carrol E. Goering, Roger P. Rohrbach, 1993, ASAE Publishers.
3. Pesticide Application Equipment. Bindra O S and Hari Charansingh 1971. Oxford and IBH Publishing Co. Ltd., New Delhi.
4. Testing and Evaluation of Agricultural Machinery. Mehta M.L., Verma S.R. Misra S.K. and Sharma V.K. Daya Publishing House, New Delhi.

Web links and Video Lectures (e-Resources):

Activity Based Learning (Suggested Activities in Class)/ Practical Based learning

- Quizzes
- Assignments
- Seminars
- Field Experiments
- Mini Projects

Soil & Water Conservation Engineering		Semester	VI
Course Code	**BAG602**	CIE Marks	50
Teaching Hours/Week (L:T:P: S)	4:0:0:0	SEE Marks	50
Total Hours of Pedagogy	52	Total Marks	100
Credits	04	Exam Hours	3
Examination nature (SEE)	Theory		

Course Objectives:

- To enable the students to acquire knowledge on different soil loss estimation models, runoff estimation, by rational, curve number, Cook's formulae, land use capability classification, land treatment works like contour bunding, terracing, bench terraces, contour trenches and their types and complete design calculations.
- To enrich and familiarize the students in the design of various gully control structures, temporary and permanent, their designs with a due importance to hydrologic, hydraulic and structural phases of design

Teaching-Learning Process (General Instructions)

These are sample Strategies, which teacher can use to accelerate the attainment of the various course outcomes.

1. Adopt different types of teaching methods to develop the outcomes through PowerPoint presentations and Video demonstrations or Simulations.
2. Chalk and Talk method for teaching basic concepts.
3. Arranging visits to farmers' fields to expose pupils to real time farming situations.
4. Adopt collaborative (Group Learning) Learning in the class.
5. By giving assignments and presentation tasks to students.
6. Exploring information from research publications and regulatory documents

Module-1

Introduction: Soil erosion - causes, types and agents of soil erosion; water erosion – forms of water erosion, mechanics of erosion; gullies and their classification, stages of gully development; characteristics of contours and preparation of contour maps.

Module-2

Erosion Control Measures: Agronomical measures - contour cropping, strip cropping, mulching; mechanical measures - terraces – level and graded broad base terraces and their design, bench terraces & their design, layout procedure, terrace planning, bunds - contour bunds, graded bunds and their design; gully and ravine reclamation.

Module-3

Wind Erosion: Factors affecting wind erosion, mechanics of wind erosion, soil loss estimation, wind erosion control measures - vegetative, mechanical measures, wind breaks and shelter belts, sand dunes stabilization.

Module-4

Soil Loss Estimation: Universal soil loss equation and modified soil loss equation, determination of their various parameters, Sedimentation - sedimentation in reservoirs and streams, estimation and measurement, sediment delivery ratio, trap efficiency.

Module-5

Design Principle of Channel: Most Economical trapezoidal channel, Introduction to water harvesting-Rain water harvesting, Runoff harvesting techniques. Farm pond – components, site selection, computation of storage capacity of embankment type of farm ponds, design of dugout farm ponds. Introduction to stream water quality and pollution

Course outcome (Course Skill Set)

At the end of the course the student will be able to :

1. Explain Various basic terms related to Soil Erosions, Rainfall-Runoff relationships.
2. Understand Some of the basic concepts related to soil conservation.
3. Discuss Simple terms related to soil loss estimation models.
4. Recognize importance of various soil conservation structures and their designs.
5. Understand the importance of hydrometry.

Assessment Details (both CIE and SEE)

The weightage of Continuous Internal Evaluation (CIE) is 50% and for Semester End Exam (SEE) is 50%. The minimum passing mark for the CIE is 40% of the maximum marks (20 marks out of 50) and for the SEE minimum passing mark is 35% of the maximum marks (18 out of 50 marks). A student shall be deemed to have satisfied the academic requirements and earned the credits allotted to each subject/ course if the student secures a minimum of 40% (40 marks out of 100) in the sum total of the CIE (Continuous Internal Evaluation) and SEE (Semester End Examination) taken together.

Continuous Internal Evaluation:

- For the Assignment component of the CIE, there are 25 marks and for the Internal Assessment Test component, there are 25 marks.
- The first test will be administered after 40-50% of the syllabus has been covered, and the second test will be administered after 85-90% of the syllabus has been covered
- Any two assignment methods mentioned in the 22OB2.4, if an assignment is project-based then only one assignment for the course shall be planned. The teacher should not conduct two assignments at the end of the semester if two assignments are planned.
- For the course, CIE marks will be based on a scaled-down sum of two tests and other methods of assessment.

Internal Assessment Test question paper is designed to attain the different levels of Bloom's taxonomy as per the outcome defined for the course.

Semester-End Examination:

Theory SEE will be conducted by University as per the scheduled timetable, with common question papers for the course (**duration 03 hours).**

- The question paper will have ten questions. Each question is set for 20 marks.
- There will be 2 questions from each module. Each of the two questions under a module (with a maximum of 3 sub-questions), **should have a mix of topics** under that module.
- The students have to answer 5 full questions, selecting one full question from each module.
- Marks scored shall be proportionally reduced to 50 marks

Suggested Learning Resources:

Books

1. Michael, 'Principles of Agricultural Engineering', Vol.-2, Jain Brothers, 2013.
2. R. Suresh, 'Soil & Water Conservation Engineering', Standard Publishers Distributors.
3. Ghanshyam Das, 'Hydrology and Soil Conservation Engineering: Including Watershed Management', 2 nd Edn., PHI Publication, 2009.
4. V.V.N. Murthy, 'Land and Water Management Engineering', Kalyani Publishers, 2013.
5. R.P. Tripathi and H.P. Singh, 'Soil Erosion and Conservation', 1 st Edn., New Age Publishers, 1993.
6. Bimal Chandra Mal, 'Introduction to Soil and Water Conservation Engineering', Kalyani Publishers, 2011.

Web links and Video Lectures (e-Resources):

Activity Based Learning (Suggested Activities in Class)/ Practical Based learning

- Quizzes
- Assignments
- Seminars
- Mini Projects

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IOT Architecture & Protocols		Semester	VI
Course Code	BAG613A	CIE Marks	50
Teaching Hours/Week (L:T:P: S)	3:0:0:0	SEE Marks	50
Total Hours of Pedagogy	40	Total Marks	100
Credits	03	Exam Hours	3
Examination nature (SEE)	**Theory**		

Course Objectives:

- To understanding the basic fundamentals of IOT Architecture and Protocols
- To understand the various layers in the IOT protocols

Teaching-Learning Process (General Instructions)

These are sample Strategies, which teacher can use to accelerate the attainment of the various course outcomes.

1. Adopt different types of teaching methods to develop the outcomes through PowerPoint presentations and Video demonstrations or Simulations.
2. Chalk and Talk method for teaching basic concepts.
3. Arranging visits to farmers' fields to expose pupils to real time farming situations.
4. Adopt collaborative (Group Learning) Learning in the class.
5. By giving assignments and presentation tasks to students.
6. Exploring information from research publications and regulatory documents

Module-1

INTRODUCTION : IoT architecture outline, standards - IoT Technology , Fundamentals- Devices and gateways, Local and wide area networking, Data management, Business processes in IoT, Everything as a Service(XaaS), M2M and IoT Analytics

Module-2

IOT REFERENCE ARCHITECTURE: Introduction, Functional View, Information View, Deployment and Operational View, Other Relevant architectural views. Real-World Design Constraints- Introduction, Technical Design constraints

Module-3

IoT DATA LINK LAYER & NETWORK LAYER PROTOCOLS : PHY/MAC Layer(3GPP MTC, IEEE 802.11, IEEE 802.15), Wireless HART, ZWave, Bluetooth Low Energy, Zigbee Smart Energy, DASH7 - Network Layer-IPv4,IPv6, 6LoWPAN, 6TiSCH,ND, DHCP, ICMP, RPL, CORPL, CARP

Module-4

IoT TRANSPORT & SESSION LAYER PROTOCOLS: Transport Layer (TCP, MPTCP, UDP, DCCP, SCTP)-(TLS, DTLS) – Session Layer-HTTP, CoAP, XMPP, AMQP, MQTT

Module-5

IoT SERVICE LAYER PROTOCOLS & SECURITY PROTOCOLS: Service Layer -oneM2M, ETSI M2M, OMA, BBF – Security in IoT Protocols – MAC802.15.4, 6LoWPAN, RPL, Application Layer, Smart City Security Architecture, Smart City Use-Case Examples.

Course outcome (Course Skill Set)

At the end of the course the student will be able to :

CO1: Comprehend the essentials of IOT and its applications

CO2: Understand the concepts of IOT Architecture Reference model and IOT reference architecture

CO3: Analyze various IOT Application layer Protocols.

CO4: Apply IP based protocols and Authentication Protocols for IOT

CO5: Design IOT-based systems for real-world problems.

Assessment Details (both CIE and SEE)

The weightage of Continuous Internal Evaluation (CIE) is 50% and for Semester End Exam (SEE) is 50%. The minimum passing mark for the CIE is 40% of the maximum marks (20 marks out of 50) and for the SEE minimum passing mark is 35% of the maximum marks (18 out of 50 marks). A student shall be deemed to have satisfied the academic requirements and earned the credits allotted to each subject/ course if the student secures a minimum of 40% (40 marks out of 100) in the sum total of the CIE (Continuous Internal Evaluation) and SEE (Semester End Examination) taken together.

Continuous Internal Evaluation:

- For the Assignment component of the CIE, there are 25 marks and for the Internal Assessment Test component, there are 25 marks.
- The first test will be administered after 40-50% of the syllabus has been covered, and the second test will be administered after 85-90% of the syllabus has been covered
- Any two assignment methods mentioned in the 22OB2.4, if an assignment is project-based then only one assignment for the course shall be planned. The teacher should not conduct two assignments at the end of the semester if two assignments are planned.
- For the course, CIE marks will be based on a scaled-down sum of two tests and other methods of assessment.

Internal Assessment Test question paper is designed to attain the different levels of Bloom's taxonomy as per the outcome defined for the course.

Semester-End Examination:

Theory SEE will be conducted by University as per the scheduled timetable, with common question papers for the course (**duration 03 hours).**

- The question paper will have ten questions. Each question is set for 20 marks.
- There will be 2 questions from each module. Each of the two questions under a module (with a maximum of 3 sub-questions), **should have a mix of topics** under that module.
- The students have to answer 5 full questions, selecting one full question from each module.
- Marks scored shall be proportionally reduced to 50 marks

Suggested Learning Resources:

Books

1. Daniel Minoli, "Building the Internet of Things with IPv6 and MIPv6: The EvolvingWorld of M2M Communications", ISBN: 978-1-118-47347-4, Willy Publications ,2016
2. Jan Holler, VlasiosTsiatsis, Catherine Mulligan, Stefan Avesand,StamatisKarnouskos, David Boyle, "From Machine-to-Machine to the Internet ofThings: Introduction to a New Age of Intelligence", 1st Edition, Academic Press, 2015
3. Bernd Scholz-Reiter, Florian Michahelles, "Architecting the Internet of Things",ISBN 978-3-642-19156-5 e-ISBN 978-3-642-19157-2, Springer, 2016
4. N. Ida, Sensors, Actuators and Their Interfaces, Scitech Publishers, 2014.

Web links and Video Lectures (e-Resources):

Activity Based Learning (Suggested Activities in Class)/ Practical Based learning

- Quizzes
- Assignments
- Seminars
- Mini Projects

Agricultural Structures and Environmental Control		Semester	VI
Course Code	**BAG613B**	CIE Marks	50
Teaching Hours/Week (L:T:P: S)	3:0:0:0	SEE Marks	50
Total Hours of Pedagogy	40	Total Marks	100
Credits	03	Exam Hours	3
Examination nature (SEE)	**Theory**		

Course Objectives:

- To enable the student to understand the principles and acquire the knowledge on various aspects in farmstead design and construction
- Design and construction of farm structures like dairy barns, barn for poultry, compost pit, fodder silos, farm fencing, implement sheds
- Grain storage structures and the design and construction of silos and farm roads, sewage system, rural living and development
- To make students familiar with different farm structures with environmental control Parameters

Teaching-Learning Process (General Instructions)

These are sample Strategies, which teacher can use to accelerate the attainment of the various course outcomes.

1. Adopt different types of teaching methods to develop the outcomes through PowerPoint presentations and Video demonstrations or Simulations.
2. Chalk and Talk method for teaching basic concepts.
3. Arranging visits to farmers' fields to expose pupils to real time farming situations.
4. Adopt collaborative (Group Learning) Learning in the class.
5. By giving assignments and presentation tasks to students.
6. Exploring information from research publications and regulatory documents

Module-1

Planning and layout of farmstead, Physiological reactions of livestock to solar radiation and other environmental factors, Livestock production facilities, BIS, Standards for dairy, piggery, poultry and other farm structures.

Module-2

Design, construction and cost estimation of farm structures; animal shelters, compost pit, fodder silo, fencing and implement sheds, barn for cows, buffalo, poultry, etc.,: Design and construction of rural grain storage system, Engineering for rural living and development, rural roads, their construction cost and repair and maintenance

Module-3

Traditional storage structures and their improvements, Improved storage structures (CAP, hermetic storage, Pusa bin, RCC ring bins), Design consideration for grain storage godowns, Bag storage structures, Shallow and Deep bin, Calculation of pressure in bins, Storage of seeds.

Module-4

Sources of water supply, Norms of water supply for human being and animals, drinking water standards and water treatment suitable to rural community, Site and orientation of building in regard to sanitation, community sanitation system; sewage system its design, cost and maintenance, design of septic tank for small family

Module-5

Estimation of power requirement for domestic and irrigation, source of power supply, use of alternate source of energy, electrification of rural Housing, Scope, importance and need for environmental control, Renewable and non-renewable resources and their equitable use, concept of eco system, biodiversity of its conservation, environmental pollution and their control, solid waste management system, BOD and COD of food plant waste, primary and secondary treatment of food plant waste.

Course outcome (Course Skill Set)

At the end of the course the student will be able to :

1. Understand the importance of planning and lay out of a farmstead
2. Discuss on various standards for various dairy, piggery, poultry and other farm structures.

3. Understand about the different farm storage structures, silos, compost pit, implement sheds, farmhouses, threshing floors, farm roads, fencing, water supply, sewage systems, and septic tanks
4. Explain on rural electrification, concepts of eco system, biodiversity, environmental pollution and control, solid waste, plant waste management
5. Prepare estimate for different farm buildings, structures, roads, fencing and construction, repair and maintenance of farm structures

Assessment Details (both CIE and SEE)

The weightage of Continuous Internal Evaluation (CIE) is 50% and for Semester End Exam (SEE) is 50%. The minimum passing mark for the CIE is 40% of the maximum marks (20 marks out of 50) and for the SEE minimum passing mark is 35% of the maximum marks (18 out of 50 marks). A student shall be deemed to have satisfied the academic requirements and earned the credits allotted to each subject/ course if the student secures a minimum of 40% (40 marks out of 100) in the sum total of the CIE (Continuous Internal Evaluation) and SEE (Semester End Examination) taken together.

Continuous Internal Evaluation:

- For the Assignment component of the CIE, there are 25 marks and for the Internal Assessment Test component, there are 25 marks.
- The first test will be administered after 40-50% of the syllabus has been covered, and the second test will be administered after 85-90% of the syllabus has been covered
- Any two assignment methods mentioned in the 22OB2.4, if an assignment is project-based then only one assignment for the course shall be planned. The teacher should not conduct two assignments at the end of the semester if two assignments are planned.
- For the course, CIE marks will be based on a scaled-down sum of two tests and other methods of assessment.

Internal Assessment Test question paper is designed to attain the different levels of Bloom's taxonomy as per the outcome defined for the course.

Semester-End Examination:

Theory SEE will be conducted by University as per the scheduled timetable, with common question papers for the course (**duration 03 hours).**

- The question paper will have ten questions. Each question is set for 20 marks.
- There will be 2 questions from each module. Each of the two questions under a module (with a maximum of 3 sub-questions), **should have a mix of topics** under that module.
- The students have to answer 5 full questions, selecting one full question from each module.
- Marks scored shall be proportionally reduced to 50 marks

Suggested Learning Resources:

Books

1. Pandey, P.H. Principles and practices of Agricultural Structures and Environmental Control, Kalyani Publishers, Ludhiana
2. Ojha, T.P. and Michael, A.M. Principles of Agricultural Engineering, Vol.1, Jain Brothers, Karol Bag, New Delhi
3. Nathonson, J.A. Basic Environmental Technology, Prentice Hall of India, New Delhi
4. Garg, S.K. Water Supply Engineering, Khanna Publishers, New Delhi
5. Dutta, B.N. Estimating and Costing in Civil Engineering, Dutta & Co, Luc know
6. Sahay, K.M. and Singh, K.K. Unit Operations of Agricultural Processing, Vikas pub.pvt. Ltd, Noida
7. Banerjee, G.C. A Text Book of Animal Husbandry, Oxford IBH Pub. Co., New Delhi

Web links and Video Lectures (e-Resources):

Activity Based Learning (Suggested Activities in Class)/ Practical Based learning

- Quizzes
- Assignments
- Seminars
- Mini Projects

Waste Land Development		Semester	VI
Course Code	**BAG613C**	CIE Marks	50
Teaching Hours/Week (L:T:P: S)	3:0:0:0	SEE Marks	50
Total Hours of Pedagogy	40	Total Marks	100
Credits	03	Exam Hours	3
Examination nature (SEE)	**Theory**		

Course Objectives:

- To impart knowledge on concept and causes of land degradation, assessment of land degradation and wasteland development.
- To study about socio-economic perspectives of sustainable wasteland development, government policies and participatory approach

Teaching-Learning Process (General Instructions)

These are sample Strategies, which teacher can use to accelerate the attainment of the various course outcomes.

1. Adopt different types of teaching methods to develop the outcomes through PowerPoint presentations and Video demonstrations or Simulations.
2. Chalk and Talk method for teaching basic concepts.
3. Arranging visits to farmers' fields to expose pupils to real time farming situations.
4. Adopt collaborative (Group Learning) Learning in the class.
5. By giving assignments and presentation tasks to students.
6. Exploring information from research publications and regulatory documents

Module-1

Land degradation – concept, classification - arid, semiarid, humid and sub-humid regions, denuded range land and marginal lands and assessment. Wastelands - factors causing, classification and mapping of wastelands, planning of wastelands development - constraints, agro-climatic conditions, development options, contingency plans.

Module-2

Conservation structures - gully stabilization, ravine rehabilitation, sand dune stabilization, water harvesting and recycling methods. Afforestation - agro-horti-forestry-silvipasture methods, forage and fuel crops - socioeconomic constraints

Module-3

Shifting cultivation, optimal land use options. Wasteland development – hills, semi-arid, coastal areas, water scarce areas, reclamation of waterlogged and salt-affected lands.

Module-4

Mine spoils- impact, land degradation and reclamation and rehabilitation, slope stabilization and mine environment management. Micro-irrigation in wastelands development

Module-5

Sustainable wasteland development - drought situations, socio-economic perspectives. Government policies. Participatory approach. Preparation of proposal for wasteland development and benefit-cost analysis

Course outcome (Course Skill Set)

At the end of the course the student will be able to :

1. Impart knowledge on concept and causes of land degradation, assessment of land degradation and wasteland development.
2. Study about socio-economic perspectives of sustainable wasteland development, government policies and participatory approach.
3. Recognize importance of watershed.
4. To understand the Geomorphology of watershed and watershed management
5. Be proficient about the Integrated watershed management practices
6. Formulation of project proposal for watershed management programme

Assessment Details (both CIE and SEE)

The weightage of Continuous Internal Evaluation (CIE) is 50% and for Semester End Exam (SEE) is 50%. The minimum passing mark for the CIE is 40% of the maximum marks (20 marks out of 50) and for the SEE minimum passing mark is 35% of the maximum marks (18 out of 50 marks). A student shall be deemed to have satisfied the academic requirements and earned the credits allotted to each subject/ course if the student secures a minimum of 40% (40 marks out of 100) in the sum total of the CIE (Continuous Internal Evaluation) and SEE (Semester End Examination) taken together.

Continuous Internal Evaluation:

- For the Assignment component of the CIE, there are 25 marks and for the Internal Assessment Test component, there are 25 marks.
- The first test will be administered after 40-50% of the syllabus has been covered, and the second test will be administered after 85-90% of the syllabus has been covered
- Any two assignment methods mentioned in the 22OB2.4, if an assignment is project-based then only one assignment for the course shall be planned. The teacher should not conduct two assignments at the end of the semester if two assignments are planned.
- For the course, CIE marks will be based on a scaled-down sum of two tests and other methods of assessment.

Internal Assessment Test question paper is designed to attain the different levels of Bloom's taxonomy as per the outcome defined for the course.

Semester-End Examination:

Theory SEE will be conducted by University as per the scheduled timetable, with common question papers for the course (**duration 03 hours).**

- The question paper will have ten questions. Each question is set for 20 marks.
- There will be 2 questions from each module. Each of the two questions under a module (with a maximum of 3 sub-questions), **should have a mix of topics** under that module.
- The students have to answer 5 full questions, selecting one full question from each module.
- Marks scored shall be proportionally reduced to 50 marks

Suggested Learning Resources:

Books

1. Panda S.C., 2007. Soil water conservation and dry farming. Agrobiospublishers. India
2. Jat M. L., Bhakar, S.R., Sharma, S.K. and Khotari, A.K. 2013. Dry land technology. Scientific publishers., Jhodpur
3. Mahnot, S.C., Songh P. K. and Chaplot P.C. (2012). Soil and water conservation & Watershed Management. Apex Publishing House., Udaipur .
4. Suresh , R.,2014. Soil and water conservation Engineering. Standard Publishers Distributors Delhi.
5. Jaume Bech., Claudio Bini and Mariya A Pashkevich.,2017. Assessment, Restoration and Reclamation of Mining Influenced Soils. Candice Janco – Elseveir publisher., UK.
6. Shankaranarayan.K.A.,1962.Wasteland Development and Their Utilisation, Scientific Publishers, Jodhpur
7. Karthikeyan, C., K. Thangaraja, C. Cinthia Fernandez and K. Chandrakandon. 2009. Dryland Agriculture and Wasteland Management. Atlantic Publishers and Distributors Pvt. Ltd., New Delhi.

Web links and Video Lectures (e-Resources):

Activity Based Learning (Suggested Activities in Class)/ Practical Based learning

- Quizzes
- Assignments
- Seminars
- Mini Projects

Sustainable Agriculture and Food Security		Semester	VI
Course Code	BAG613D	CIE Marks	50
Teaching Hours/Week (L:T:P: S)	3:0:0:0	SEE Marks	50
Total Hours of Pedagogy	40	Total Marks	100
Credits	03	Exam Hours	3
Examination nature (SEE)	**Theory**		

Course Objectives:

1. Adopt different types of teaching methods to develop the outcomes through PowerPoint presentations and Video demonstrations or Simulations.
2. Chalk and Talk method for Problem Solving.
3. Arrange visits to show the live working models other than laboratory topics.
4. Adopt collaborative (Group Learning) Learning in the class.
5. Adopt Problem Based Learning (PBL), which fosters students Analytical skills and develops thinking skills such as evaluating, generalizing, and analyzing information.
6. Conduct Laboratory Demonstrations and Practical Experiments to enhance experiential skills

Teaching-Learning Process (General Instructions)

These are sample Strategies, which teacher can use to accelerate the attainment of the various course outcomes.

1. Adopt different types of teaching methods to develop the outcomes through PowerPoint presentations and Video demonstrations or Simulations.
2. Chalk and Talk method for teaching basic concepts.
3. Arranging visits to farmers' fields to expose pupils to real time farming situations.
4. Adopt collaborative (Group Learning) Learning in the class.
5. By giving assignments and presentation tasks to students.
6. Exploring information from research publications and regulatory documents

Module-1

LAND RESOURCE AND ITS SUSTAINABILITY: Land Resources of India, Population and land, Land utilization, Net Area Sown, changes in cropping pattern, land degradation.

Module-2

WATER RESOURCE AND ITS SUSTAINABILITY : Rainfall forecasting - Adequacy of Rainfall for crop growth – Rainfall, Drought and production instability – Irrigation potential – Available, created and utilized – River basins; Watersheds and Utilizable surface water – Utilizable water in future (Ground water & Surface water)

Module-3

SUSTAINABLE AGRICULTURE & ORGANIC FARMING: Agro-ecosystems - Impact of climate change on Agriculture, Effect on crop yield, effect on Soil fertility – Food grain production at State Level – Indicators of Sustainable food availability – Indicators of food production sustenance – Natural farming principles – Sustainability in rainfed farming – organic farming – principles and practices.

Module-4

FOOD PRODUCTION AND FOOD SECURITY: Performance of Major Food Crops over the past decades – trends in food production – Decline in total factor productivity growth – Demand and supply projections – Impact of market force – Rural Land Market – Emerging Water market – Vertical farming - Sustainable food security indicators and index – Indicator of sustainability of food Security – Path to sustainable development.

Module-5

POLICIES AND PROGRAMMES FOR SUSTAINABLE AGRICULTURE AND FOOD SECUIRTY

Food and Crop Production polices – Agricultural credit Policy – Crop insurance –Policies of Natural Resources Use – Policies for sustainable Livelihoods – Virtual water and trade - Sustainable food Security Action Plan.

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Course outcome (Course Skill Set)

At the end of the course the student will be able to :

CO1: Gain knowledge on the need for sustainable agriculture

CO2: Comprehend the need for food security on global level and the Nutritional Security.

CO3: Demonstrate how ecological balance is required for sustainability of agriculture.

Assessment Details (both CIE and SEE)

The weightage of Continuous Internal Evaluation (CIE) is 50% and for Semester End Exam (SEE) is 50%. The minimum passing mark for the CIE is 40% of the maximum marks (20 marks out of 50) and for the SEE minimum passing mark is 35% of the maximum marks (18 out of 50 marks). A student shall be deemed to have satisfied the academic requirements and earned the credits allotted to each subject/ course if the student secures a minimum of 40% (40 marks out of 100) in the sum total of the CIE (Continuous Internal Evaluation) and SEE (Semester End Examination) taken together.

Continuous Internal Evaluation:

- For the Assignment component of the CIE, there are 25 marks and for the Internal Assessment Test component, there are 25 marks.
- The first test will be administered after 40-50% of the syllabus has been covered, and the second test will be administered after 85-90% of the syllabus has been covered
- Any two assignment methods mentioned in the 22OB2.4, if an assignment is project-based then only one assignment for the course shall be planned. The teacher should not conduct two assignments at the end of the semester if two assignments are planned.
- For the course, CIE marks will be based on a scaled-down sum of two tests and other methods of assessment.

Internal Assessment Test question paper is designed to attain the different levels of Bloom's taxonomy as per the outcome defined for the course.

Semester-End Examination:

Theory SEE will be conducted by University as per the scheduled timetable, with common question papers for the course (**duration 03 hours).**

- The question paper will have ten questions. Each question is set for 20 marks.
- There will be 2 questions from each module. Each of the two questions under a module (with a maximum of 3 sub-questions), **should have a mix of topics** under that module.
- The students have to answer 5 full questions, selecting one full question from each module.
- Marks scored shall be proportionally reduced to 50 marks

Suggested Learning Resources:

Books

1. B.K.Desai and Pujari, B.T. Sustainable Agriculture : A vision for future, New India Publishing Agency, New Delhi, 2007.
2. Saroja Raman, Agricultural Sustainability – Principles, Processes and Prospects, CRC Press, 2013
3. Swarna S.Vepa etal., Atlas of the sustainability of food security. MSSRF, Chennai, 2004.
4. Sithamparanathan, J., Rengasamy, A., Arunachalam, N. Ecosystem principles and sustainable agriculture, Scitech Publications, Chennai, 1999.
5. Gangadhar Banerjee and Srijeet Banerji, Economics of sustainable agriculture and alternate production systems, Ane Books Pvt Ltd., 2017
6. M.S.Swaminathan, Science and sustainable food security, World Scientific Publishing Co., Singapore, 2010

Web links and Video Lectures (e-Resources):

Activity Based Learning (Suggested Activities in Class)/ Practical Based learning

- Quizzes, Assignments
- Seminars, Mini Projects

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Micro Irrigation Engineering		Semester	VI
Course Code	**BAG654A**	CIE Marks	50
Teaching Hours/Week (L:T:P:S)	3:0:0:0	SEE Marks	50
Total Hours of Pedagogy	40	Total Marks	100
Credits	03	Exam Hours	3
Examination nature (SEE)	**Theory**		

Course Objectives:

- To impart knowledge and skills to students to design micro irrigation systems to improve water productivity of different crops and to perform economic analysis and to prepare project proposals and cost estimates of Micro – Irrigation Systems.

Teaching-Learning Process (General Instructions)

These are sample Strategies, which teacher can use to accelerate the attainment of the various course outcomes.

1. Adopt different types of teaching methods to develop the outcomes through PowerPoint presentations and Video demonstrations or Simulations.
2. Chalk and Talk method for teaching basic concepts.
3. Arranging visits to farmers' fields to expose pupils to real time farming situations.
4. Adopt collaborative (Group Learning) Learning in the class.
5. By giving assignments and presentation tasks to students.
6. Exploring information from research publications and regulatory documents

Module-1

Sprinkler Irrigation: Historical development, Scenario in the World, Country and State, adoptability and limitations, Components of the sprinkler system, pump set, (Centrifugal, turbines and Submersible), Main lines, Lateral lines, Sprinkler heads, Debris screens, Desalting basins, booster pumps, Take-off valves, Flow control valves (individual sprinkler).

Module-2

Types of sprinkler Irrigation systems: A. Based on mechanism: i) Rotating head system, ii) Perforated pipe system, B. Based on portability: i) Portable systems, ii) Semi-portable systems, iii) Semi-permanent systems, iv) Permanent systems and v) Solid set systems. Precipitation profiles and Moisture distribution patterns, Recommended sprinkler spacings, Effects of wind speed on working of the system, Importance of distribution uniformity, Christiansen Uniformity coefficient, Distribution uniformity. Suitability of crops under sprinkler irrigation.

Module-3

Design of Sprinkler system, layout, laterals and mains: i) Inventory of Resources and Conditions, ii) Types of system and Layout, iii) Sprinkler Selection and Spacing, iv) Capacity of Sprinkler Systems, v) Hydraulic Design of Sprinkler Systems, vi) Selection of pump, Operation and maintenance of system, Field evaluation of the system, Cost analysis

Module-4

Drip Irrigation, Historical development, Scenario in the World, Country and State, Advantages and Limitations, Components of drip irrigation: A. Head Control- Non return valve, Air release & Vacuum breaker, Filter, Fertigation Tank, Throttle valve, Pressure gauge, other fittings, venture type Fertilizer injection pumps. B. Wayer carrier systems- PVC pipeline, Control valve, Flush valve, other fittings, C. Water distribution systems- Drip lateral, Drippers, Emitting pie, Grommet, Start connector, Nipple, End cap, Micro tube, Barbed connector, Drip Hydraulics, Pipe section, Water flow in pipes, Velocity recommended pressure,

Module-5

Types of Emitters: A) Based on Floe regime (Reynolds number): i) Laminar Flow, ii)Partially turbulent flow, iii) Fully turbulent flow and B) Based on Lateral connection: i) in-line and ii)online, Emitter flow equation, Emitter constants, Pressure variations (%) for different emitter flow variations and x-values, Emission uniformity (EU), Distribution Uniformity and Irrigation efficiency. Planning and design of drip system- Collection of primary data, Layout, crop water requirements, hydraulic design, selection of components, Economic pipe size selection, Pressure variation Along drip Irrigation and design criteria of lateral, sub-main and mail lines, Installation, operation and Maintenance of drip

irrigation systems, testing and field evaluation of the system, Computer Software programs for design of drip irrigation systems, Automation of drip irrigation systems – i) Volume based, ii) time based and iii) Soil moisture bases systems.

Course outcome (Course Skill Set)

At the end of the course the student will be able to :

CO1: Explain the concept of Sprinkler Irrigation and its components.
CO2: Discuss Precipitation profiles and Moisture distribution patterns, sprinkler spacings.
CO3: Design Sprinkler system, layout, laterals and mains.
CO4: Describe drip Irrigation and its components.
CO5: Plan for installation of drip irrigation system.

Assessment Details (both CIE and SEE)

The weightage of Continuous Internal Evaluation (CIE) is 50% and for Semester End Exam (SEE) is 50%. The minimum passing mark for the CIE is 40% of the maximum marks (20 marks out of 50) and for the SEE minimum passing mark is 35% of the maximum marks (18 out of 50 marks). A student shall be deemed to have satisfied the academic requirements and earned the credits allotted to each subject/ course if the student secures a minimum of 40% (40 marks out of 100) in the sum total of the CIE (Continuous Internal Evaluation) and SEE (Semester End Examination) taken together.

Continuous Internal Evaluation:

- For the Assignment component of the CIE, there are 25 marks and for the Internal Assessment Test component, there are 25 marks.
- The first test will be administered after 40-50% of the syllabus has been covered, and the second test will be administered after 85-90% of the syllabus has been covered
- Any two assignment methods mentioned in the 22OB2.4, if an assignment is project-based then only one assignment for the course shall be planned. The teacher should not conduct two assignments at the end of the semester if two assignments are planned.
- For the course, CIE marks will be based on a scaled-down sum of two tests and other methods of assessment.

Internal Assessment Test question paper is designed to attain the different levels of Bloom's taxonomy as per the outcome defined for the course.

Semester-End Examination:

Theory SEE will be conducted by University as per the scheduled timetable, with common question papers for the course (**duration 03 hours).**

- The question paper will have ten questions. Each question is set for 20 marks.
- There will be 2 questions from each module. Each of the two questions under a module (with a maximum of 3 sub-questions), **should have a mix of topics** under that module.
- The students have to answer 5 full questions, selecting one full question from each module.
- Marks scored shall be proportionally reduced to 50 marks

Suggested Learning Resources:

Books

1. Micro-Irrigation for Crop Production, Design, Operation and Management, Freddie R. Lamm,
2. James E. Ayars and Francis S, Nakayama, 2006, Elsevier Publications, Singapore.
3. Land and Water Management Principles, R. Suresh, 2008, Standard Publishers Distributors, Delhi.
4. Drip Irrigation & Sprinkler Irrigation, Sivanappan R K Padma Kumari O and Kumar V 1997
5. Keerthi Publishing House Pvt. Ltd., Coimbatore.
6. Drip and Sprinkler Irrigation Systems. Nakayama and Prucks

Web links and Video Lectures (e-Resources):

Activity Based Learning (Suggested Activities in Class)/ Practical Based learning

- Quizzes
- Assignments
- Seminars
- Mini Projects

Design of Agricultural Machinery		Semester	**VI**
Course Code	**BAG654B**	CIE Marks	50
Teaching Hours/Week (L:T:P: S)	3:0:0:0	SEE Marks	50

Total Hours of Pedagogy	40	Total Marks	100
Credits	03	Exam Hours	3
Examination nature (SEE)	**Theory**		

Course Objectives:

- To enable the students to understand the general procedure for designing any machine parts.
- To know the design of cotter and knuckle joints, leavers, springs, various types of shafts, couplings bearings and various IC engine parts.

Teaching-Learning Process (General Instructions)

These are sample Strategies, which teacher can use to accelerate the attainment of the various course outcomes.

1. Adopt different types of teaching methods to develop the outcomes through PowerPoint presentations and Video demonstrations or Simulations.
2. Chalk and Talk method for teaching basic concepts.
3. Arranging visits to farmers' fields to expose pupils to real time farming situations.
4. Adopt collaborative (Group Learning) Learning in the class.
5. By giving assignments and presentation tasks to students.
6. Exploring information from research publications and regulatory documents

Module-1

Machine Design – Definition, Classification of machine design, General considerations in machine design, General procedure in machine design. Fundamental units, Mass and Weight, inertia, laws of motion, force, moment of force, couple mass density, torque, work, power and energy. Simple stress in machine parts – Introduction, load, stress, strain, tensile stress and strain, compressive stress and strain, Young's modulus, shear stress and strain, shear modulus, bearing stress

Module-2

Stress strain diagram, working stress, Factor of safety and selection, stresses in composite bars, thermal stress, linear and lateral strain, Poisson's ratio, volumetric strain, bulk modulus and relations, impact stress, resilience. Principal stresses and principal planes – Theories of failure under static load, Rankine's theory, Guest's theory, maximum distortion theory, stress concentration, notch sensitivity - Important terms used in Limit System, fits, types of cotter joints, design of socket and spigot cotter joint. Knuckle joint, Dimensions of various parts of knuckles joint, methods of failure of knuckle joint, design procedure of knuckle joint.

Module-3

Levers – Introduction, application of levers in engineering practice, design of lever hand levers, foot lever, cranked lever. Springs – Introduction, types of springs, material for helical springs, spring wire, terminology, springs in series and parallel, flat spiral springs, leaf springs, construction of leaf springs.

Module-4

Shafts – Material used for shafts, types and sizes of shafts, stresses in shafts, maximum working stresses. Design of shafts, for twisting moment, bending moments, fluctuating loads, axial load in addition to combined twisting and bending loads, design of shafts on the basis of rigidity. Keys and coupling – Introduction, types of keys, sunk keys, saddle keys, tangent keys, round keys, splines, forces acting on sunk keys, strength of sunk key. Effect of key ways, shaft couplings, types of shaft couplings, muff coupling, design of flange coupling.

Module-5

Design of Machinery: Design of Tillage equipment –a. Cultivator (Manually Drawn and Power Operated); b. Rotavator (Power Operated); c. M.B Plough (Manually Drawn and Power Operated). Design of Sowing Machinery – Tractor Operated seed cum Fertilize drill. Design of harvesting equipment: a. Reaper, b. Mower. Design of Thresher: Power operated thresher (Spike tooth and Rasp bar), Design of spraying equipment – Tractor mounted Boom sprayer

Course outcome (Course Skill Set)

At the end of the course the student will be able to :

CO1: Analyze the general considerations in machine design.

CO2: Calculate the design Parameters of socket, spigot cotter joint and Knuckle joint.

CO3: Choose appropriate levers and springs for a given application.

CO4: Design shafts and keys for the specified conditions.

CO5: Design Tillage equipment.

Assessment Details (both CIE and SEE)

The weightage of Continuous Internal Evaluation (CIE) is 50% and for Semester End Exam (SEE) is 50%. The minimum passing mark for the CIE is 40% of the maximum marks (20 marks out of 50) and for the SEE minimum passing mark is 35% of the maximum marks (18 out of 50 marks). A student shall be deemed to have satisfied the academic requirements and earned the credits allotted to each subject/ course if the student secures a minimum of 40% (40 marks out of 100) in the sum total of the CIE (Continuous Internal Evaluation) and SEE (Semester End Examination) taken together.

Continuous Internal Evaluation:

- For the Assignment component of the CIE, there are 25 marks and for the Internal Assessment Test component, there are 25 marks.
- The first test will be administered after 40-50% of the syllabus has been covered, and the second test will be administered after 85-90% of the syllabus has been covered
- Any two assignment methods mentioned in the 22OB2.4, if an assignment is project-based then only one assignment for the course shall be planned. The teacher should not conduct two assignments at the end of the semester if two assignments are planned.
- For the course, CIE marks will be based on a scaled-down sum of two tests and other methods of assessment.

Internal Assessment Test question paper is designed to attain the different levels of Bloom's taxonomy as per the outcome defined for the course.

Semester-End Examination:

Theory SEE will be conducted by University as per the scheduled timetable, with common question papers for the course (**duration 03 hours).**

- The question paper will have ten questions. Each question is set for 20 marks.
- There will be 2 questions from each module. Each of the two questions under a module (with a maximum of 3 sub-questions), **should have a mix of topics** under that module.
- The students have to answer 5 full questions, selecting one full question from each module.
- Marks scored shall be proportionally reduced to 50 marks

Suggested Learning Resources:

Books

1. Machine Design – Khurmi R.S. and Gupta J.K. 1996, Eurasia Publishing House Pvt. Ltd., New Delhi.
2. Machine Design – Jain R.K. 1991. Khanna Publishers, New Delhi

Web links and Video Lectures (e-Resources):

Activity Based Learning (Suggested Activities in Class)/ Practical Based learning

- Quizzes
- Assignments
- Seminars
- Mini Projects

Hydrology, Ground Water & Well Engineering		Semester	VI
Course Code	**BAG654C**	CIE Marks	50
Teaching Hours/Week (L:T:P: S)	3:0:0:0	SEE Marks	50
Total Hours of Pedagogy	40	Total Marks	100
Credits	03	Exam Hours	3
Examination nature (SEE)	**Theory**		

Course Objectives:

- To enable the students to acquire knowledge on aquifers and estimation of their different properties like hydraulic conductivity, transmissibility, storage coefficient, specific yield, leakage factor, hydraulic resistance under steady and unsteady state conditions in wells dug under different aquifers, well drilling and development methods and equipment design of gravel pack in bore well. Further to make the students to acquire knowledge on various pumps available commercially, their selection, operation and maintenance with due importance to find out the cost of operation.

Teaching-Learning Process (General Instructions)

These are sample Strategies, which teacher can use to accelerate the attainment of the various course outcomes.

1. Adopt different types of teaching methods to develop the outcomes through PowerPoint presentations and Video demonstrations or Simulations.
2. Chalk and Talk method for teaching basic concepts.
3. Arranging visits to farmers' fields to expose pupils to real time farming situations.
4. Adopt collaborative (Group Learning) Learning in the class.
5. By giving assignments and presentation tasks to students.
6. Exploring information from research publications and regulatory documents

Module-1

Hydrologic cycle, Precipitation: Forms, Classification, Measurement, Data analysis, Presentation of Rainfall Data, Estimation of Mean Areal Rainfall, Frequency Analysis of Point Rainfall, Hydrological Abstractions-Evaporation and its measurement, Evapo-transpiration and its measurement. Infiltration: Factors affecting infiltration, infiltration models.

Module-2

Runoff- drainage basin characteristics, estimation of runoff, Hydrograph concepts, SCS- CN method, base flow separation methods, assumptions and limitations of unit hydrograph, Derivation of unit hydrograph, synthetic unit hydrograph, S- hydrograph, Flow duration curve. Flood routing- hydrologic flood routing

Module-3

Aquifer characteristics - Influencing yield of wells - Determination of aquifer parameters – Steady state and unsteady state conditions – Well interference and multiple well point systems in coastal areas

Module-4

Surface and subsurface exploitation and estimation of ground water potential – Artificial ground water recharge – Ground water project formulation – Classification of indigenous pumps – Wind powered water lifts – Solar powered and biogas operated water lifts – Reciprocating pumps.

Module-5

Centrifugal pumps – Terminology on horse power – Selection of pump installation and troubleshooting of pumps – Performance characteristic curves – Effect of change of impeller dimensions on performance characteristics. Hydraulic ram – Propeller pumps - Mixed flow pumps - Air lift pumps – Priming – Vertical turbine pumps – Submersible pumps – Cost economics

Course outcome (Course Skill Set)

At the end of the course the student will be able to :

CO1: Skill development on principles of ground water resources development, different acquaintance and their principles.

CO2: Imparting knowledge on theory of open well hydraulics and drilling methods

CO3: Skill development on aquifers characteristics under steady and unsteady state conditions, multiples well systems for coastal areas.
CO4: Knowledge development to students on artificial ground water recharge classification of indigenous pumps, solar pumps, wind mill pumps etc.
CO5: Skill development on principles of Centrifugal pumps, principles & characteristics, High lift pumps, mixed flow pumps and vertical turbine pump sets.

Assessment Details (both CIE and SEE)

The weightage of Continuous Internal Evaluation (CIE) is 50% and for Semester End Exam (SEE) is 50%. The minimum passing mark for the CIE is 40% of the maximum marks (20 marks out of 50) and for the SEE minimum passing mark is 35% of the maximum marks (18 out of 50 marks). A student shall be deemed to have satisfied the academic requirements and earned the credits allotted to each subject/ course if the student secures a minimum of 40% (40 marks out of 100) in the sum total of the CIE (Continuous Internal Evaluation) and SEE (Semester End Examination) taken together.

Continuous Internal Evaluation:

- For the Assignment component of the CIE, there are 25 marks and for the Internal Assessment Test component, there are 25 marks.
- The first test will be administered after 40-50% of the syllabus has been covered, and the second test will be administered after 85-90% of the syllabus has been covered
- Any two assignment methods mentioned in the 22OB2.4, if an assignment is project-based then only one assignment for the course shall be planned. The teacher should not conduct two assignments at the end of the semester if two assignments are planned.
- For the course, CIE marks will be based on a scaled-down sum of two tests and other methods of assessment.

Internal Assessment Test question paper is designed to attain the different levels of Bloom's taxonomy as per the outcome defined for the course.

Semester-End Examination:

Theory SEE will be conducted by University as per the scheduled timetable, with common question papers for the course (**duration 03 hours).**

- The question paper will have ten questions. Each question is set for 20 marks.
- There will be 2 questions from each module. Each of the two questions under a module (with a maximum of 3 sub-questions), **should have a mix of topics** under that module.
- The students have to answer 5 full questions, selecting one full question from each module.
- Marks scored shall be proportionally reduced to 50 marks

Suggested Learning Resources:

Books

1. Ground water and tube wells - Garg S P 1985. Oxford and IBH publish in companylimited, New Delhi.
2. Water Well land Pump Engineering – Michael A M and Khepar S T 1989 Tata McGraw-Hill Publishing company limited, New Delhi.
3. Irrigation Theory and Practice – Michael A M 2008 Vikas Publishing House Pvt. Ltd,New Delhi.

Web links and Video Lectures (e-Resources):

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Activity Based Learning (Suggested Activities in Class)/ Practical Based learning

- Quizzes
- Assignments
- Seminars
- Mini Projects

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Watershed Development		Semester	VI
Course Code	**BAG654D**	CIE Marks	50
Teaching Hours/Week (L:T:P: S)	3:0:0:0	SEE Marks	50
Total Hours of Pedagogy	40	Total Marks	100
Credits	03	Exam Hours	3
Examination nature (SEE)	**Theory**		

Course Objectives:

- To train the students in the multi-disciplinary subject of watershed management for effective conservation of land, using engineering and agronomic practices, control of soil loss in watershed participatory management teams in small as well as large watersheds for increasing the productivity and preparation of necessary proposals

Teaching-Learning Process (General Instructions)

These are sample Strategies, which teacher can use to accelerate the attainment of the various course outcomes.

1. Adopt different types of teaching methods to develop the outcomes through PowerPoint presentations and Video demonstrations or Simulations.
2. Chalk and Talk method for teaching basic concepts.
3. Arranging visits to farmers' fields to expose pupils to real time farming situations.
4. Adopt collaborative (Group Learning) Learning in the class.
5. By giving assignments and presentation tasks to students.
6. Exploring information from research publications and regulatory documents

Module-1

Watershed – introduction and characteristics. Watershed development – problems and prospects, investigation, topographical survey, soil characteristics, vegetative cover, present land use practices and socio-economic factors. Watershed atlas of India

Module-2

Watershed management – concept, objectives, factors affecting, watershed planning based on landcapability classes, hydrologic data for watershed planning, watershed codification, delineation andprioritization of watersheds, sediment yield index. Water budgeting in a watershed.

Module-3

Management measures – rainwater conservation technologies – in-situ and ec-situ storage, water harvesting and recycling. Dry farming techniques – inter-terrace and inter-bund land management. Integrated watershed management – concept, components, arable lands – agriculture and horticulture, non-arable lands – forestry, fishery and animal husbandry.

Module-4

Effect of cropping systems, land management and cultural practices on watershed hydrology. Watershed programme – execution, follow-up practices, maintenance, monitoring and evaluation.

Module-5

Watershed modelling: definition, benefits of watershed modelling. Classification of watershed model: based on based on nature of input and uncertainty, Based on Nature of Spatial Representation , Based on type of Storm Event , steps in watershed modelling. Geographic information system(GIS): definition, components, watershed delineation in GIS, application of GIS and RS in watershed modeling

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Course outcome (Course Skill Set)

At the end of the course the student will be able to :

CO1: Plan for watershed development

CO2: Analyze the factors affecting the watershed management.

CO3: Explain rainwater conservation technologies.

CO4: Estimate the Effect of cropping systems, land management and cultural practices on watershed hydrology.

CO5: Prepare project proposal for watershed management programme including cost-benefit analysis.

Assessment Details (both CIE and SEE)

The weightage of Continuous Internal Evaluation (CIE) is 50% and for Semester End Exam (SEE) is 50%. The minimum passing mark for the CIE is 40% of the maximum marks (20 marks out of 50) and for the SEE minimum passing mark is 35% of the maximum marks (18 out of 50 marks). A student shall be deemed to have satisfied the academic requirements and earned the credits allotted to each subject/ course if the student secures a minimum of 40% (40 marks out of 100) in the sum total of the CIE (Continuous Internal Evaluation) and SEE (Semester End Examination) taken together.

Continuous Internal Evaluation:

- For the Assignment component of the CIE, there are 25 marks and for the Internal Assessment Test component, there are 25 marks.
- The first test will be administered after 40-50% of the syllabus has been covered, and the second test will be administered after 85-90% of the syllabus has been covered
- Any two assignment methods mentioned in the 22OB2.4, if an assignment is project-based then only one assignment for the course shall be planned. The teacher should not conduct two assignments at the end of the semester if two assignments are planned.
- For the course, CIE marks will be based on a scaled-down sum of two tests and other methods of assessment.

Internal Assessment Test question paper is designed to attain the different levels of Bloom's taxonomy as per the outcome defined for the course.

Semester-End Examination:

Theory SEE will be conducted by University as per the scheduled timetable, with common question papers for the course (**duration 03 hours).**

- The question paper will have ten questions. Each question is set for 20 marks.
- There will be 2 questions from each module. Each of the two questions under a module (with a maximum of 3 sub-questions), **should have a mix of topics** under that module.
- The students have to answer 5 full questions, selecting one full question from each module.
- Marks scored shall be proportionally reduced to 50 marks

Suggested Learning Resources:

Books

1. Ghanshyam Das. 2008. Hydrology and Soil Conservation Engineering: Including Watershed
2. Management. 2nd Edition, Prentice-Hall of India Learning Pvt. Ltd., New Delhi.
3. Katyal, J.C., R.P. Singh, Shriniwas Sharma, S.K. Das, M.V. Padmanabhan and P.K. Mishra. 1995. Field Manual on Watershed Management. CRIDA, Hyderabad.
4. Mahnot, S.C. 2014. Soil and Water Conservation and Watershed Management. International Books and Periodicals Supply Service. New Delhi.
5. Sharda, V.N., A.K. Sikka and G.P. Juyal. 2006. Participatory Integrated Watershed Management: A Field Manual. Central Soil and Water Conservation Research and Training Institute, Dehradun.

Web links and Video Lectures (e-Resources):

Activity Based Learning (Suggested Activities in Class)/ Practical Based learning

- Quizzes, Assignments, Seminars
- Mini Projects

Digital Society		Semester	VI
Course Code	**BAG657A**	CIE Marks	50
Teaching Hours/Week (L:T:P: S)	0:2:0:0	SEE Marks	50
Total Hours of Pedagogy	30	Total Marks	100
Credits	01	Exam Hours	1
Examination nature (SEE)	**Theory**/practical/Viva-Voce /Term-work/Others		

Course Objectives: Utilize new opportunities for meaningful data collection from and using sophisticated forms of artificial intelligence and Identify knowledge and truth amongst the abundance of information

Teaching-Learning Process (General Instructions)

These are sample Strategies, which teacher can use to accelerate the attainment of the various course outcomes.

1. Adopt different types of teaching methods to develop the outcomes through PowerPoint presentations and Video demonstrations or Simulations.
2. Chalk and Talk method for teaching basic concepts.
3. Arranging visits to farmers' fields to expose pupils to real time farming situations.
4. Adopt collaborative (Group Learning) Learning in the class.
5. By giving assignments and presentation tasks to students.
6. Exploring information from research publications and regulatory documents

Module-1

Introduction to Digital Society:

Digital components of a connected society

Theorizing Digital Society:

New forms of power; Data as socio material objects; Archives; Digital veillance

Module-2

Digital Identities and Relationships:

Self and the Digital Society; Embodied Identities in Digital Society; Bias and Privilege Digital Inequalities; Marginalised Histories; Cyborgs

Module-3

Digital Spaces and Practices:

Rethinking space and surveillance in digital societies; Gender, Space, and Place in Digital Societies; Urban Informatics and Sociological Imagination – Smart cities; Digital Healthcare; Mobility in Digital Society; Digital Heritage

Module-4

Network Society:

The Internet as a Network; Networks and the Cultural Imaginary; Inequalities in the Network Society; Information Capital; Interface Design for Diverse Populations

Module-5

Re-conceptualizing Research in a Digital Age:

Information Management Data Analysis Software; Large Digital Systems; Data protection and the politics of data privacy.

Course outcome (Course Skill Set)

At the end of the course the student will be able to :

CO1: Identify the ways in which digital media shape identity

CO2: Utilize new opportunities for meaningful data collection from and using sophisticated forms of artificial intelligence

CO3: Identify knowledge and truth amongst the abundance of information

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Assessment Details (both CIE and SEE)

The weightage of Continuous Internal Evaluation (CIE) is 50% and for Semester End Exam (SEE) is 50%. The minimum passing mark for the CIE is 40% of the maximum marks (20 marks out of 50) and for the SEE minimum passing mark is 35% of the maximum marks (18 out of 50 marks). A student shall be deemed to have satisfied the academic requirements and earned the credits allotted to each subject/ course if the student secures a minimum of 40% (40 marks out of 100) in the sum total of the CIE (Continuous Internal Evaluation) and SEE (Semester End Examination) taken together.

Continuous Internal Evaluation:

- For the Assignment component of the CIE, there are 25 marks and for the Internal Assessment Test component, there are 25 marks.
- The first test will be administered after 40-50% of the syllabus has been covered, and the second test will be administered after 85-90% of the syllabus has been covered
- Any two assignment methods mentioned in the 22OB2.4, if an assignment is project-based then only one assignment for the course shall be planned. The teacher should not conduct two assignments at the end of the semester if two assignments are planned.
- For the course, CIE marks will be based on a scaled-down sum of two tests and other methods of assessment.

Internal Assessment Test question paper is designed to attain the different levels of Bloom's taxonomy as per the outcome defined for the course.

Semester End Examinations (SEE)

- SEE paper shall be set for 50 questions, each of 01 mark.
- The pattern of the question paper is MCQ (multiple choice questions).
- The time allotted for SEE is 01 hour.
- The student has to secure minimum of 35% of the maximum marks meant for SEE.

Suggested Learning Resources:

Books

1. Lupton,D.,(2015), Digital Sociology, London, New York: Routledge
2. Gere,C., (2008), Digital Culture, 2nd Edition, London: Reaktion Books Limited
3. Bentkowska-Kafel, A., Cashen, T., and Gardiner, H. (Eds.) (2009), Digital Visual Culture: Theory and Practice, Bristol and Chicago: Intellect Books
4. Karaganis, J. (Ed.), (2007), Structures of Participation in Digital Culture, Social Science Research Council,Columbia University Press
5. Tredinnick, L. (2008), Digital Information Culture: The Individual and Society in the Digital Age, Oxford: Chandos Publishing Limited

Web links and Video Lectures (e-Resources):

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Activity Based Learning (Suggested Activities in Class)/ Practical Based learning

- Quizzes,
- Assignments,
- Seminars ,
- Mini Projects

Fundamental of Virtual Reality ARP Development		Semester	VI
Course Code	**BAG657B**	CIE Marks	50
Teaching Hours/Week (L:T:P: S)	1:0:0:0	SEE Marks	50
Total Hours of Pedagogy	15	Total Marks	100
Credits	01	Exam Hours	1
Examination nature (SEE)	**Theory**/practical/Viva-Voce /Term-work/Others		

Course Objectives:

- Describe how VR systems work and list the applications of VR.
- Understand the design and implementation of the hardware that enables VR systems to be built.
- Understand the system of human vision and its implication on perception and rendering.
- Explain the concepts of motion and tracking in VR systems.
- Describe the importance of interaction and audio in VR systems.

Teaching-Learning Process (General Instructions)

These are sample Strategies, which teacher can use to accelerate the attainment of the various course outcomes.

1. Adopt different types of teaching methods to develop the outcomes through PowerPoint presentations and Video demonstrations or Simulations.
2. Chalk and Talk method for teaching basic concepts.
3. Arranging visits to farmers' fields to expose pupils to real time farming situations.
4. Adopt collaborative (Group Learning) Learning in the class.
5. By giving assignments and presentation tasks to students.
6. Exploring information from research publications and regulatory documents

Module-1

Introduction to Virtual Reality: Defining Virtual Reality, History of VR, Human Physiology and Perception, Key Elements of Virtual Reality Experience, Virtual Reality System, Interface to the Virtual WorldInput & output Visual, Aural & Haptic Displays, Applications of Virtual Reality.

Module-2

Representing the Virtual World : Representation of the Virtual World, Visual Representation in VR, Aural Representation in VR and Haptic Representation in VR

Module-3

The Geometry of Virtual Worlds &The Physiology of Human Vision: Geometric Models, Changing Position and Orientation, AxisAngle Representations of Rotation, Viewing Transformations, Chaining the Transformations, Human Eye, eye movements & implications for VR.

Module-4

Visual Perception & Rendering: Visual Perception Perception of Depth, Perception of Motion, Perception of Color, Combining Sources of Information Visual Rendering Ray Tracing and Shading Models, Rasterization, Correcting Optical Distortions, Improving Latency and Frame Rates.

Module-5

Motion & Tracking: Motion in Real and Virtual Worlds Velocities and Accelerations, The Vestibular System, Physics in the Virtual World, Mismatched Motion and Vection Tracking Tracking 2D & 3D Orientation, Tracking Position and Orientation, Tracking Attached Bodies

Course outcome (Course Skill Set)

At the end of the course the student will be able to :

CO1: Describe how VR systems work and list the applications of VR.
CO2: Understand the design and implementation of the hardware that enables VR systems to be built.
CO3: Understand the system of human vision and its implication on perception and rendering.
CO4: Explain the concepts of motion and tracking in VR systems.
CO5: Describe the importance of interaction and audio in VR systems.

Assessment Details (both CIE and SEE)

The weightage of Continuous Internal Evaluation (CIE) is 50% and for Semester End Exam (SEE) is 50%. The minimum passing mark for the CIE is 40% of the maximum marks (20 marks out of 50) and for the SEE minimum passing mark is 35% of the maximum marks (18 out of 50 marks). A student shall be deemed to have satisfied the academic requirements and earned the credits allotted to each subject/ course if the student secures a minimum of 40% (40 marks out of 100) in the sum total of the CIE (Continuous Internal Evaluation) and SEE (Semester End Examination) taken together.

Continuous internal Examination (CIE):

- The CIE is the sum of Average of Two Internal Assessment Tests each of 25 marks and Any two Assessment methods for 25 marks.
- The first test will be administered after 40-50% of the syllabus has been covered, and the second test will be administered after 85-90% of the syllabus has been covered Any two assessment methods mentioned in the 22OB4.2, if an assignment is project based then only one assignment for the course shall be planned.
- The teacher should not conduct two assignments at the end of the semester if two assignments are planned. For the course, CIE marks will be based on a scaled down sum of two tests and other methods of assessment for a total of 50 marks.
- Internal Assessment Test question paper is designed to attain the different levels of Bloom's taxonomy as per the outcome defined for the course.

Semester End Examinations (SEE)

- SEE paper shall be set for 50 questions, each of the 01 marks. The pattern of the question paper is MCQ (multiple choice questions).
- The time allotted for SEE is 01 hour.
- The student has to secure a minimum of 35% of the maximum marks meant for SEE.

OR

- MCQ (Multiple Choice Questions) are preferred for 01 credit courses, however, if course content demands the general question paper pattern that followed for 03 credit course, then

1. The question paper will have ten questions. Each question is set for 10 marks.
2. There will be 2 questions from each module. Each of the two questions under a module may or may not have the sub questions (with maximum sub questions of 02, with marks distributions 5+5, 4+6, 3+7).
3. The students have to answer 5 full questions, selecting one full question from each module.

Suggested Learning Resources:

Books

Text Books 1. Virtual Reality, Steven M. LaValle, Cambridge University Press, 2016 2. Understanding Virtual Reality: Interface, Application and Design, William R Sherman and Alan B Craig, (The Morgan Kaufmann Series in Computer Graphics)". Morgan Kaufmann Publishers, San Francisco, CA, 2002 3. Developing Virtual Reality Applications: Foundations of Effective Design, Alan B Craig, William R Sherman and Jeffrey D Will, Morgan Kaufmann, 2009.

Web links and Video Lectures (e-Resources):

- . http://lavalle.pl/vr/book.html https://nptel.ac.in/courses/106/106/106106138/ https://www.coursera.org/learn/introductionvirtualreality.

Activity Based Learning (Suggested Activities in Class)/ Practical Based learning

- Quizzes
- Assignments
- Seminars
- Mini Projects

Spread sheets for Engineers		Semester	VI
Course Code	**BAG657C**	CIE Marks	50
Teaching Hours/Week (L:T:P: S)	0:0:2:0	SEE Marks	50
Total Hours of Pedagogy	14 sessions	Total Marks	100
Credits	01	Exam Hours	3
Examination nature (SEE)	**Theory**/Practical/Viva-Voce /Term-work/Others		

Course objectives:

- To create different plots and charts
- To compute different functions, conditional functions and make regression analysis
- To carryout iterative solutions for roots, multiple roots, optimization and non-linear regression analysis
- To carryout matrix operations
- To Understand VBA and UDF
- To understand VBA subroutines and Macros
- To carryout numerical integration and solving differential equations using different methods

Teaching-Learning Process (General Instructions)

These are sample Strategies, which teacher can use to accelerate the attainment of the various course outcomes.

1. Adopt different types of teaching methods to develop the outcomes through PowerPoint presentations and Video demonstrations or Simulations.
2. Chalk and Talk method for teaching basic concepts.
3. Arranging visits to farmers' fields to expose pupils to real time farming situations.
4. Adopt collaborative (Group Learning) Learning in the class.
5. By giving assignments and presentation tasks to students.

Exploring information from research publications and regulatory documents

Sl.No.	Experiment
1.	Charting: Create an XY scatter graph, XY chart with two Y-Axes, add error bars to your plot, create a combination chart
2.	Functions: Computing Sum, Average, Count, Max and Min, Computing Weighted Average, Trigonometric Functions, Exponential Functions, Using The CONVERT Function to Convert Units
3.	Conditional Functions: Logical Expressions, Boolean Functions, IF Function, Creating a Quadratic Equation Solver, Table VLOOKUP Function, AND, OR and XOR functions.
4.	Regression Analysis: Trendline, Slope and Intercept, Interpolation and Forecast, The LINEST Function, Multilinear Regression, Polynomial Fit Functions, Residuals Plot, Slope and Tangent, Analysis ToolPack.
5.	Iterative Solutions Using Excel: Using Goal Seek in Excel, Using The Solver To Find Roots, Finding Multiple Roots, Optimization Using The Solver, Minimization Analysis, NonLinear Regression Analysis
6.	Matrix Operations Using Excel: Adding Two Matrices, Multiplying a Matrix by a Scalar, Multiplying Two Matrices, Transposing a Matrix, Inverting a Matrix and Solving System of Linear Equations.
7.	VBA User-Defined Functions (UDF): The Visual Basic Editor (VBE), The IF Structure, The Select Case Structure, The For Next Structure, The Do Loop Structure, Declaring Variables and Data Types, An Array Function The Excel Object Model, For Each Next Structure.
8.	VBA Subroutines or Macros: Recording a Macro, Coding a Macro Finding Roots by Bisection, Using Arrays, Adding a Control and Creating User Forms.
	Demonstration Exercises
9.	Numerical Integration Using Excel: The Rectangle Rule, The Trapezoid Rule, The Simpson's Rule, Creating a User-Defined Function Using the Simpson's Rule.
10	
11	Differential Equations: Euler's Method, Modified Euler's Method, The Runge Kutta Method, Solving a Second Order Differential Equation
12	

Course outcome (Course Skill Set)

At the end of the course the student will be able to:

- Create different plots and charts To compute different functions, conditional functions and make regression analysis
- Carryout iterative solutions for roots, multiple roots, optimization and non-linear regression analysis
- Carryout matrix operations
- Understand VBA and UDF
- Understand VBA subroutines and Macros
- Carryout numerical integration and solving differential equations using different methods

Assessment Details (both CIE and SEE)

The weightage of Continuous Internal Evaluation (CIE) is 50% and for Semester End Exam (SEE) is 50%. The minimum passing mark for the CIE is 40% of the maximum marks (20 marks out of 50) and for the SEE minimum passing mark is 35% of the maximum marks (18 out of 50 marks). A student shall be deemed to have satisfied the academic requirements and earned the credits allotted to each subject/ course if the student secures a minimum of 40% (40 marks out of 100) in the sum total of the CIE (Continuous Internal Evaluation) and SEE (Semester End Examination) taken together.

Continuous Internal Evaluation:

- CIE marks for the practical course is 50 Marks.
- The split-up of CIE marks for record/ journal and test are in the ratio 60:40.
- Each experiment to be evaluated for conduction with observation sheet and record write-up. Rubrics for the evaluation of the journal/write-up for hardware/software experiments designed by the faculty who is handling the laboratory session and is made known to students at the beginning of the practical session. Record should contain all the specified experiments in the syllabus and each experiment write-up will be evaluated for 10 marks.
- Total marks scored by the students are scaled downed to 30 marks (60% of maximum marks).
- Weightage to be given for neatness and submission of record/write-up on time. Department shall conduct 02 tests for 100 marks, the first test shall be conducted after the 8th week of the semester and the second test shall be conducted after the 14th week of the semester.
- In each test, test write-up, conduction of experiment, acceptable result, and procedural knowledge will carry a weightage of 60% and the rest 40% for viva-voce. The suitable rubrics can be designed to evaluate each student's performance and learning ability.
- Rubrics suggested in Annexure-II of Regulation book The average of 02 tests is scaled down to 20 marks (40% of the maximum marks).
- The Sum of scaled-down marks scored in the report write-up/journal and average marks of two tests is the total CIE marks scored by the student

Semester-End Examination:

- SEE marks for the practical course is 50 Marks.
- SEE shall be conducted jointly by the two examiners of the same institute; examiners are appointed by the University.
- All laboratory experiments are to be included for practical examination. (Rubrics) Breakup of marks and the instructions printed on the cover page of the answer script to be strictly adhered to by the examiners. OR based on the course requirement evaluation rubrics shall be decided jointly by examiners.
- Students can pick one question (experiment) from the questions lot prepared by the internal /external examiners jointly. Evaluation of test write-up/ conduction procedure and result/viva will be conducted jointly by examiners. General rubrics suggested for SEE are mentioned here, writeup-20%, Conduction procedure and result in -60%, Viva-voce 20% of maximum marks.
- SEE for practical shall be evaluated for 100 marks and scored marks shall be scaled down to 50 marks (however, based on course type, rubrics shall be decided by the examiners) Change of experiment is allowed only once and 15% Marks allotted to the procedure part to be made zero.
- The duration of SEE is 03 hours Rubrics suggested in Annexure-II of Regulation book

Suggested Learning Resources:

Books

1. McFedries Paul Microsoft Excel 2019 Formulas And Functions Microsoft Press, U.S, 2019 Edition
2. E. Joseph Bill0, Excel@ for Scientists and Engineers Numerical Methods, WILEY-INTERSCIENCE A John Wiley & Sons, Inc., Publication, 2007

Web links and Video Lectures (e-Resources):

- https://onlinelibrary.wiley.com/doi/pdf/10.1002/0471461296.app

Activity Based Learning (Suggested Activities in Class)/ Practical Based learning

- Quizzes
- Assignments
- Seminars
- Mini Projects

Introduction Augmented Reality		Semester	**VI**
Course Code	**BAG657D**	CIE Marks	50
Teaching Hours/Week (L:T:P: S)	0:2:0:0	SEE Marks	50
Total Hours of Pedagogy	30	Total Marks	100
Credits	01	Exam Hours	1
Examination nature (SEE)	**Theory**/practical/Viva-Voce /Term-work/Others		

Course Objectives:

- Describe how AR systems work and list the applications of AR.
- Understand and analyse the hardware requirement of AR.
- Use computer vision concepts for AR and describe AR techniques
- Analyse and understand the working of various state of the art AR devices
- Acquire knowledge of mixed reality

Teaching-Learning Process (General Instructions)

These are sample Strategies, which teacher can use to accelerate the attainment of the various course outcomes.

1. Adopt different types of teaching methods to develop the outcomes through PowerPoint presentations and Video demonstrations or Simulations.
2. Chalk and Talk method for teaching basic concepts.
3. Arranging visits to farmers' fields to expose pupils to real time farming situations.
4. Adopt collaborative (Group Learning) Learning in the class.
5. By giving assignments and presentation tasks to students.
6. Exploring information from research publications and regulatory documents

Module-1

Introduction to Augmented Reality (A.R): Defining augmented reality, history of augmented reality, The Relationship between Augmented Reality and Other Technologies Media, Technologies, Other Ideas Related to the Spectrum between Real and Virtual Worlds, applications of augmented reality Augmented Reality Concepts: Concepts Related to Augmented Reality, Ingredients of an Augmented Reality Experience

Module-2

Augmented Reality Hardware – Displays – Audio Displays, Haptic Displays, Visual Displays, Other sensory displays, Visual Perception, Requirements and Characteristics, Spatial Display Model. Processors – Role of Processors, Processor System Architecture, Processor Specifications. Tracking & Sensors Tracking, Calibration, and Registration, Characteristics of Tracking Technology, Stationary Tracking Systems, Mobile Sensors, Optical Tracking, Sensor Fusion.

Module-3
Computer Vision for Augmented Reality & A.R. Software: Computer Vision for Augmented Reality Marker Tracking, Multiple Camera Infrared Tracking, Natural Feature Tracking by Detection, Simultaneous Localization and Mapping, Outdoor Tracking Augmented Reality Software Introduction, Major Software Components for Augmented Reality Systems, Software used to Create Content for the Augmented Reality Application.
Module-4
AR Techniques Marker based & Marker less tracking: Marker based approach Introduction to marker-based tracking, types of markers, marker camera pose and identification, visual tracking, mathematical representation of matrix multiplication. Marker types Template markers, 2D barcode markers, imperceptible markers. Marker less approach Localization based augmentation, real world examples Tracking methods Visual tracking, feature based tracking, hybrid tracking, and initialization and recovery
Module-5
AR Devices & Components: AR Components – Scene Generator, Tracking system, monitoring system, display, Game scene AR Devices – Optical See through HMD, Virtual retinal systems, Monitor bases systems, Projection displays, and Video see-through systems
Course outcome (Course Skill Set) At the end of the course the student will be able to : CO1: Describe how AR systems work and list the applications of AR. CO2: Understand and analyse the hardware requirement of AR CO3: Apply computer vision concepts for AR and describe AR techniques CO4: Analyse and understand the working of various state of the art AR devices CO5: Explain the knowledge acquired on mixed reality
Assessment Details (both CIE and SEE) The weightage of Continuous Internal Evaluation (CIE) is 50% and for Semester End Exam (SEE) is 50%. The minimum passing mark for the CIE is 40% of the maximum marks (20 marks out of 50) and for the SEE minimum passing mark is 35% of the maximum marks (18 out of 50 marks). A student shall be deemed to have satisfied the academic requirements and earned the credits allotted to each subject/ course if the student secures a minimum of 40% (40 marks out of 100) in the sum total of the CIE (Continuous Internal Evaluation) and SEE (Semester End Examination) taken together. **Continuous internal Examination (CIE)**: • The CIE is the sum of Average of Two Internal Assessment Tests each of 25 marks and Any two Assessment methods for 25 marks. • The first test will be administered after 40-50% of the syllabus has been covered, and the second test will be administered after 85-90% of the syllabus has been covered Any two assessment methods mentioned in the 22OB4.2, if an assignment is project based then only one assignment for the course shall be planned. • The teacher should not conduct two assignments at the end of the semester if two assignments are planned. For the course, CIE marks will be based on a scaled down sum of two tests and other methods of assessment for a total of 50 marks. • Internal Assessment Test question paper is designed to attain the different levels of Bloom's taxonomy as per the outcome defined for the course. **Semester End Examinations (SEE)** • SEE paper shall be set for 50 questions, each of 01 mark. • The pattern of the question paper is MCQ (multiple choice questions). • The time allotted for SEE is 01 hour. The student has to secure a minimum of 35% of the maximum marks meant for SEE.

Suggested Learning Resources:

Books

1.Designing for Mixed Reality, Kharis O'Connell Published by O'Reilly Media, Inc., 2016

2. Sanni Siltanen Theory and applications of markerbased augmented reality. Julkaisija

Web links and Video Lectures (e-Resources):

https://www.vttresearch.com/sites/default/files/pdf/science/2012/S3.pdf https://docs.microsoft.com/en-us/windows/mixedreality/ https://docs.microsoft.com/en-us/archive/msdnmagazine/2016/november/hololensintroductiontotheholoLens MOOC Courses: https://www.coursera.org/learn/ar https://www.udemy.com/share/101XPi/

Activity Based Learning (Suggested Activities in Class)/ Practical Based learning

- Quizzes
- Assignments
- Seminars
- Mini Projects

DAIRY AND FOOD ENGINEERING		Semester	**VII**
Course Code	**BAG701**	CIE Marks	50
Teaching Hours/Week (L:T:P: S)	3:0:2:0	SEE Marks	50
Total Hours of Pedagogy	40 Hr + 8-10 sessions	Total Marks	100
Credits	04	Exam Hours	3
Examination nature (SEE)	**Theory**		

Course Objectives:

- Knowledge on milk and food processing unit operations offer strength to students
- To handle pasteurization, sterilization, packaging, etc. of dairy products
- Control spoilage of food through process operations such as evaporation, freezing, membrane processing etc.

Teaching-Learning Process (General Instructions)

These are sample Strategies, which teacher can use to accelerate the attainment of the various course outcomes.

1. Adopt different types of teaching methods to develop the outcomes through PowerPoint presentations and Video demonstrations or Simulations.
2. Chalk and Talk method for teaching basic concepts.
3. Arranging visits to farmers' fields to expose pupils to real time farming situations.
4. Adopt collaborative (Group Learning) Learning in the class.
5. By giving assignments and presentation tasks to students.
6. Exploring information from research publications and regulatory documents

Module-1

Dairy development in India and dairy technology- Indian dairy industry products Concentrated whole milk products, – Composition of milk, physico-chemical properties of milk, water content, acidity, pH, developed acidity, natural acidity, total acidity, density, specific gravity, freezing point of milk colour of milk, flavor.

Unit operations of various dairy and food processing systems- introduction, sampling, pasteurization, sterilization, packaging, cleaning grading, evaporation, drying, filtration and freezing.

Module-2

Receiving of milk, quality determination, cleaning and disinfection of milk cans and tankers. Process flow charts for product manufacture – Pasteurized milk, Pearson square method and mass balance method for making balances method for milk standardization.