BASICS CONCEPTS AND APPLICATIONS OF AGROCHEMICALS			
Course Code	**21AG51**	CIE Marks	50
Teaching Hours/Week (L:T:P: S)	(2:2:0:0)	SEE Marks	50
Total Hours of Pedagogy	40	Total Marks	100
Credits	03	Exam Hours	03

Course Objectives:

- To understand the basic concepts of agrochemicals and their applications in agriculture.
- To study naturally occurring and synthetic chemical agents used for protecting crops in field as well as in storage.
- To understand the role of naturally occurring crop protecting chemical agents in fostering organic farming.
- To understand the impact of agrochemicals on environmental, animal, and human health
- To understand the regulatory mechanism of agrochemicals at national and international levels
- To acquire necessary basic knowledge on agrochemicals so as to evolve engineering strategy for their optimal and judicial applications in field as well as storage conditions, based on integrated learning outcomes from other courses.

Pedagogy (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

Naturally Occurring Crop Protection Agents

Economic loss of agricultural produce due to pest problems: insects, diseases, rodents and weeds; Sources and utility of naturally occurring insecticides, bactericides, fungicides, nematicides, rodenticides; Role of naturally occurring pesticides in fostering organic farming; Working principles of botanical insecticides such as natural pyrethroids, nicotine, rotenone, neem and karanj; Pest control properties of plant hormones, phytoalexins and essential oils; Advantage and limitations of naturally occurring crop protection agents, chemosterilants, insect antifeedants, insect attractants and repellents; microbial pesticides and biocontrol agents.

Pedagogy	1. PowerPoint Presentation 2. Chalk and Talk are used for Problem Solving (In-general) 3. Video demonstration or Simulations

Module-2

Synthetic Crop Protection Agents

History, scope and principles of chemical insect control; Synthetic insecticides, bactericides, fungicides, nematicides, rodenticides, weedicides; Classification of major groups of insecticides (organo-chlorine, organo-phosphorus, organo-carbamates, synthetic pyrethroids, neonicotinoids), fungicides (inorganics, dithiocarbamates, OP's, phenols, quinines, carboxamides, azoles, methoxyacrylates); Mode of action of different groups of insecticides, fungicides and nematicides; Chitin synthesis inhibitors, insecticide synergists, and fumigants; Plant growth regulators – auxins, gibberellins, cytokinins, ethylene, abscisic acid; Brassinolides;

Pedagogy	1. PowerPoint Presentation 2. Chalk and Talk are used for Problem Solving (In-general) 3. Video demonstration or Simulations

Module-3

Chemicals used for storage and preservation

Major storage pests of economic importance causing damage during storage of food grains; Strategies involving storage bags, storage structures, and storage conditions; Pesticides and fumigants used in controlling insects and rodents during storage; Chemicals used for preserving freshness and promoting ripening in vegetables and fruits,

respectively.	
Pedagogy	1. PowerPoint Presentation 2. Chalk and Talk are used for Problem Solving (In-general) 3. Video demonstration or Simulations

Module-4

Agrochemical Formulations

Basic concepts of pesticide formulation - classification, solid and liquid formulations; preparation, properties, uses; controlled release formulations; Formulants - carriers/ diluents, surfactants, encapsulants, binders, anti-oxidants, stabilizers; Application - devices and quality of deposits; Types of spray appliances, seed treatment and dressing; nanotechnology in crop protection, Tools to develop and measure nanoparticles. Basic concepts of fertilizer formulations: enhancing fertilizer use efficiency and reducing environmental pollutions

Pedagogy	1. PowerPoint Presentation 2. Chalk and Talk are used for Problem Solving (In-general) 3. Video demonstration or Simulations

Module-5

Agrochemicals – Regulation and Quality Control

Production, consumption and trade statistics of pesticides and fertilizers; banned and restricted pesticides, registration and quality control of insecticides; Laws, Acts and Rules governing registration and regulations of agrochemical production and use; key provisions of the Insecticides Act (1968), Environmental Protection Act (1986). Food Safety and Standards Act, WHO, FAO, CODEX and national/international guidelines.

Pedagogy	1. PowerPoint Presentation 2. Chalk and Talk are used for Problem Solving (In-general) 3. Video demonstration or Simulations

Course outcome (Course Skill Set)

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

- Understand the basic concepts of agrochemicals and their applications in agriculture.
- Understand naturally occurring and synthetic chemical agents used for protecting crops in field as well as in storage.
- Understand the role of naturally occurring crop protecting chemical agents in fostering organic farming.
- Understand the impact of agrochemicals on environmental, animal, and human health
- Understand the regulatory mechanism of agrochemicals at national and international levels
- Acquire necessary basic knowledge on agrochemicals so as to evolve engineering strategies for their optimal and judicial applications in field as well as storage conditions, based on learning outcomes from other courses

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). A student shall be deemed to have satisfied the academic requirements and earned the credits allotted to each subject/ course if the student secures not less than 35% (18 Marks out of 50)in the semester-end examination(SEE), and 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:

Three Unit Tests each of **20 Marks (duration 01 hour**)

1. First test at the end of 5th week of the semester
2. Second test at the end of the 10th week of the semester
3. Third test at the end of the 15th week of the semester

Two assignments each of **10 Marks**

4. First assignment at the end of 4th week of the semester
5. Second assignment at the end of 9th week of the semester

Group discussion/Seminar/quiz any one of three suitably planned to attain the COs and POs for **20 Marks** (**duration 01 hours**)

6. At the end of the 13th week of the semester

The sum of three tests, two assignments, and quiz/seminar/group discussion will be out of 100 marks and will be **scaled down to 50 marks**

(to have less stressed CIE, the portion of the syllabus should not be common /repeated for any of the methods of the CIE. Each method of CIE should have a different syllabus portion of the course).

CIE methods /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 subject (**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.

The students have to answer 5 full questions, selecting one full question from each module

Suggested Learning Resources:

Books

1. **"Agrochemicals and Pest Management"** by T.V. Sathe. Daya Publishing House (2003)

ISBN: 8170353092, 9788170353096

2. "**Agrochemicals and Sustainable Agriculture**" By N.K. Roy. Associated Publishing Company (2021). **ISBN:** 9788186580110
3. "**Sittig's Handbook of Pesticides and Agricultural Cheamicals**" Editted By Stanley A. Greene and Richard P. Pohanish. Elsevier (2005). ISBN: 978-0-8155-1516-6
4. "**Agrochemicals**" By Singh Ranjit. LAP Lambert Academic Publishing. ISBN: 9786139851997
5. "The Complete Technology Book on Pesticides, Fungicides, Herbicides (Agrochemicals) with Formulae, manufacturing Process, Machinery and Equipment Details" By Himadri Panda. 2nd Revised Edition. Published by NIIR Project Consultancy Services (2022), ISBN: 9788195577538
6. "**A textbook of Fertilizers**" By Deepak Ranjan Biswas. New India Publishing Agency, New Delhi.
7. "**Pesticide Regulation Handbook**" By Greene Jan. Taylor and Francis Ltd, ISBN: 9781315896366, 9781315896366

Web links and Video Lectures (e-Resources):

Activity Based Learning (Suggested Activities in Class Based learning)

- Quizzes
- Assignments
- Seminars
- Mini Projects

Farm Machinery & Equipment (IPCC)			
Course Code	**21AG52**	CIE Marks	50
Teaching Hours/Week (L:T:P: S)	3:0:2:0	SEE Marks	50
Total Hours of Pedagogy	40 hours Theory + 12 Lab slots	Total Marks	100
Credits	04	Exam Hours	03

**** Additional one hour may be considered for Instructions if required***

Course objectives:

- To recognize the importance of tillage operation in agricultural production.
- To explain the role of earth moving machinery during land preparation process.
- To identify the various types of seeding, inter cultivation tools and plant protection equipment used in agricultural production.
- To know about 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.

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 skills such as evaluating, generalizing, and analyzing information.
6. Conduct Laboratory Demonstrations and Practical Experiments to enhance experiential skills

MODULE-1 **8 HOURS**

Objectives of farm mechanization. Classification of farm machines. Materials of construction & heat treatment. Principles of operation and selection of machines used for production of crops. Field capacities & economics.

Teaching-Learning Process	1. PowerPoint Presentation 2. Chalk and Talk are used for Problem Solving (In-general) 3. Video demonstration or Simulations 4. Laboratory Demonstrations and Practical Experiments

MODULE-2 **8 HOURS**

Tillage: Classification and types of tillage, Primary tillage implements- Mould board plough and its parts, Disc plough, and other ploughs, Secondary tillage equipment's -Disc harrows, Cultivators, and intercultural implements., Draft and unit draft related problems.

Teaching-Learning Process	1. PowerPoint Presentation 2. Chalk and Talk are used for Problem Solving (In-general) 3. Video demonstration or Simulations 4. Laboratory Demonstrations and Practical Experiments

MODULE-3 **8 HOURS**

Seeding Methods

Seeding methods, Different types of seed metering mechanism, different types of furrow openers. Calibration of Seed drills. Transplanting methods, different types of Transplanting machinery and their working principle. Fertilizer application equipment –fertilizer meeting mechanism.

Teaching-Learning Process	1. PowerPoint Presentation 2. Chalk and Talk are used for Problem Solving (In-general) 3. Video demonstration or Simulations 4. Laboratory Demonstrations and Practical Experiments

MODULE-4 **8 HOURS**

Plant Protection Equipment Weed control and Plant protection equipment - sprayers and dusters, their calibration, selection, constructional features of different components and adjustments.	
Teaching-Learning Process	1. PowerPoint Presentation 2. Chalk and Talk are used for Problem Solving (In-general) 3. Video demonstration or Simulations 4. Laboratory Demonstrations and Practical Experiments
MODULE 5	**8 HOURS**
Harvesting Machinery Crop harvesting machinery: mowers, windrowers, reapers, reaper binders and forage harvesters. Fruit harvesting tools and machines. Threshers - various types of threshers, grain combine, maize harvester, root crop harvesting equipment-potato, groundnut etc., Cotton picker & Sugarcane harvesting equipment. Testing of farm machine.	
Teaching-Learning Process	1. PowerPoint Presentation 2. Chalk and Talk are used for Problem Solving (In-general) 3. Video demonstration or Simulations 4. Laboratory Demonstrations and Practical Experiments

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

Sl.NO	Experiments
1	Study the constructional details and performance testing of Mould board plough
2	Study the constructional details and performance testing of Disc plough
3	Study the constructional details of Disc harrows and cultivators.
4	Study the constructional details of rotavator
5	Maintenance and adjustments of primary and secondary tillage implements.
6	Numerical problems related to tillage implements – Field capacity, field efficiency and size of Tractor etc.
7	Study the constructional details of different types of seed drills.
8	Numerical problems on seed cum fertilizer drills – calibration, cost of operation and field capacity etc.
9	Demonstrate the performances testing of inter cultivation implements.
10	Demonstrate the working of sprayers and measurement of nozzle discharge and field capacity
11	Demonstrate the working of Mower and Reaper
12	Familiarization with various farm machines related to grain harvesting, root crop harvesting, forage harvester and threshing operation.

Course outcomes (Course Skill Set):

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

- Classify the types of tillage and tillage tools.
- Determine the various forces acting on tillage tools
- Distinguish the various methods involved in sowing, inter cultivation and plant protection operation
- Categorize the various types of sowing, inter cultivation and plant protection equipment
- Apply basic knowledge of the crop harvesting machineries
- Understand about testing of farm machine

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). A student shall be deemed to have

satisfied the academic requirements and earned the credits allotted to each subject/ course if the student secures not less than 35% (18 Marks out of 50) in the semester-end examination(SEE), and 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 IPCC

Two Tests each of **20 Marks (duration 01 hour**)

- First test at the end of 5th week of the semester
- Second test at the end of the 10th week of the semester

Two assignments each of **10 Marks**

- First assignment at the end of 4th week of the semester
- Second assignment at the end of 9th week of the semester

Scaled-down marks of two tests and two assignments added will be CIE marks for the theory component of IPCC for **30 marks**.

CIE for the practical component of IPCC

- On completion of every experiment/program in the laboratory, the students shall be evaluated and marks shall be awarded on the same day. The**15 marks** are for conducting the experiment and preparation of the laboratory record, the other **05 marks shall be for the test** conducted at the end of the semester.
- 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 03 hours)** at the end of the 15th week of the semester /after completion of all the experiments (whichever is early) shall be conducted for 50 marks and scaled down to 05 marks**.**

Scaled-down marks of write-up evaluations and tests added will be CIE marks for the laboratory component of IPCC for **20 marks**.

.

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.

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 shall include questions from the practical component).

- The minimum marks to be secured in CIE to appear for SEE shall be the 12 (40% of maximum marks-30) in the theory component and 08 (40% of maximum marks -20) in the practical component. The laboratory component of the IPCC shall be for CIE only. However, in SEE, the questions from the laboratory component shall be included**.** The maximum of 04/05 questions to be set from the practical component of IPCC, the total marks of all questions should not be more than the 20 marks.
  SEE will be conducted for 100 marks and students shall secure 35% of the maximum marks to qualify in the SEE. Marks secured will be scaled down to 50.

Suggested Learning Resources:

Books

TEXT BOOKS:

1. Bosoi, E.S. (1990). Theory, Construction and Calculation of Agricultural Machines (Vol. 1 and 2). Oxonion Press Pvt. Ltd., New Delhi.

2. Donnel Hunt. Farm Machinery and management. Iowa State University Press, Ames, USA.

3. Ghosh, P.K, and Swain, S. (1993). Practical Agricultural Engineering. NayaProkash, Calcutta. 4. Kelnin, N.I.,Popov, I.F., and Sakun, V.A. (1985). Agricultural Machines. Amerind Publishers, New Delhi. 5. Srivastava, A.C. (1990). Elements of Farm Machinery. Oxford & IBH Publishing Co. Pvt. Ltd, New Delhi.

REFERENCE BOOKS:

1. Kepner, R.A., Bainer Roy, and Barges, E.C. Principals of Farm Machinery, . CBS Publishers and Distributors, Delhi-17.
2. Kurtz,G.L., Thompson and Claer, P. (1984). Design of Agricultural Machinery. John Wiley & Sons, New York.

3. Michael, A. M. and Ojha, T.P. (1985). Principles of Agricultural Engineering. (Vol. II). Jain brothers, New Delhi.

4. Smith Harris Pearson, H.E., and Lambent Herry Wilkes, M.S. (1977).

5. Farm Machinery and Equipment. Tata McGraw-Hill Publishing Company Ltd., New Delhi.

6. Kanafoshi, C.Z. and Karwawshi, T. (1976). Agricultural Machines, Theory and Construction (Vol. 1 and 2). USDA, Poland.

Web links and Video Lectures (e-Resources):

https://www.youtube.com/watch?v=PEojc_K7u9U&list=PLbRMhDVUMngfpJp_tkeFAy_qF20vlwn3k
https://www.youtube.com/watch?v=d5PTKHRw2FQ
https://www.youtube.com/watch?v=bep6esGP2XE
https://en.wikipedia.org/wiki/List_of_agricultural_machinery

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

- Quizzes
- Assignments
- Seminars
- Mini Projects

THERMAL ENGINEERING			
Course Code	**21AG53**	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	03

Course objectives:

- Understand the basic principle of refrigeration and air conditioning
- Study various refrigeration cycles and evaluate performance using Mollier charts or refrigerant property tables.
- Learn about the Vapour absorption system and Steam jet refrigeration
- Know the Psychrometric Properties and Processes
- Familiarize with Air Conditioning Systems and Distribution of Air

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. Adopt flipped classroom teaching method.
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 analysing information.

MODULE-1

Gas Power Cycles: Air standard cycles; Carnot, Otto, Diesel, Dual and Stirling cycles, p-v and T -s diagrams, description, efficiencies and mean effective pressures. Multi cylinder Engines testing, Morse test.

Air Compressors: Operation of a single stage reciprocating compressors: work input through p-v diagram, effect of clearance and volumetric efficiency, adiabatic, isothermal and mechanical efficiencies. Multi-stage compressor, saving in work, optimum intermediate pressure, inter-cooling, minimum work for compression.

Teaching-Learning Process	1. Power-point Presentation, 2. Video demonstration or Simulations, 3. Chalk and Talk are used for Problem Solving./White board

MODULE-2

Ideal gases: Ideal gas mixtures, Daltons law of partial pressures, Amagat's law of additive volumes, evaluation of properties of perfect and ideal gases, Air- Water mixtures and related properties.

Real gases – Introduction, Van-der Waal's Equation of state, Van-der Waal's constants in terms of critical properties, Beattie-Bridgeman equation, Law of corresponding states, compressibility factor; compressibility chart. Difference between Ideal and real gases.

Teaching-Learning Process	. 1. Power-point Presentation, 2. Video demonstration or Simulations, 3. Chalk and Talk are used for Problem Solving./White board

MODULE-3

Refrigeration: Vapour compression refrigeration system; description, analysis, refrigerating effect, capacity, power required, units of refrigeration, COP, reversed Carnot cycle, vapour absorption refrigeration system and Air refrigeration system. Use of refrigeration tables and p-h chart. Classification of Refrigerants. Desirable properties of refrigerants.

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. Analysis of summer and winter air-conditioning systems.

Teaching-Learning Process	1. Power-point Presentation, 2. Video demonstration or Simulations, 3. Chalk and Talk are used for Problem Solving./White board

MODULE-4

Introduction to Turbo machines: Classification of Turbomachines, Basic constructional details, Euler's equation for a Turbo machine, Impulse & Reaction machine - Axial flow and radial flow machines, utilization factor, degree of reaction & efficiencies of Turbo machines,

Introduction to positive displacement machines: Classification, comparison with turbomachines. Construction and working of reciprocating pump, gear and vane pumps,

Teaching-Learning Process	1. Power-point Presentation, 2. Video demonstration or Simulations, 3. Chalk and Talk are used for Problem Solving./White board

MODULE 5

Centrifugal Pumps: Main Parts of centrifugal pump, basic terms and definitions, work done, minimum speed for starting centrifugal pump, Classifications- Performance characteristics of centrifugal pumps, Cavitation in pumps and NPSH.

Centrifugal Blowers & Compressors: Centrifugal blower; types; size & speed; vane shape & efficiency; vane shape & characteristics; actual performances characteristics; Concept of slip and slip coefficient

Teaching-Learning Process	1. Power-point Presentation, 2. Video demonstration or Simulations, 3. Chalk and Talk are used for Problem Solving./White board

Course outcomes (Course Skill Set):

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

- Apply thermodynamic concepts to analyse the performance of gas power cycles
- Understand the working principle of Air compressors
- Recognize differences between ideal and real gases and evaluate thermodynamic properties of ideal and real gas mixtures using various relations.
- Analyze air-conditioning processes using the principles of psychometry and Evaluate cooling and heating loads in an air-conditioning system.
- Able to give precise definition of turbomachinery and identify various types of turbo machinery.
- Understand the principle of operation of pumps, fans, compressors and turbines.

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). A student shall be deemed to have satisfied the academic requirements and earned the credits allotted to each subject/ course if the student secures not less than 35% (18 Marks out of 50)in the semester-end examination (SEE), and 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:

Three Unit Tests each of **20 Marks (duration 01 hour**)

1. First test at the end of 5th week of the semester
2. Second test at the end of the 10th week of the semester
3. Third test at the end of the 15th week of the semester

Two assignments each of **10 Marks**

4. First assignment at the end of 4th week of the semester
5. Second assignment at the end of 9th week of the semester

Group discussion/Seminar/quiz any one of three suitably planned to attain the COs and POs for **20 Marks**

(**duration 01 hours**)

6. At the end of the 13th week of the semester

The sum of three tests, two assignments, and quiz/seminar/group discussion will be out of 100 marks and will be **scaled down to 50 marks**

(to have less stressed CIE, the portion of the syllabus should not be common /repeated for any of the methods of the CIE. Each method of CIE should have a different syllabus portion of the course).

CIE methods /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 subject (**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.

The students have to answer 5 full questions, selecting one full question from each module.

Suggested Learning Resources:

Books

1. Refrigeration and Air conditioning, C.P. Arora & Domkundwar, McGraw Hill, 3rd edition, 2010.
2. Refrigeration and Air conditioning, R.S. Khurmi., S. Chand Publishers, .5th edition, 2006
3. Principles of Refrigeration, Roy J. Dossat, Pearson Education Asia, 4th edition, 2009.
4. Refrigeration and Air Conditioning, Stoecker, W.F. and Jones J. W., McGraw Hill, 2nd edition, 1982.
5. Ashrae Handbook: Refrigeration, American Society of Heating, Refrigerating and Air- Conditioning Engineers, Har/Cdr edition, 2010
6. Air conditioning engineering, Jones W.P., Elsevier Butterworth-Heinemann, 5thedition, 2001.

Web links and Video Lectures (e-Resources):

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

SOIL AND WATER CONSERVATION ENGINEERING			
Course Code	**21AG54**	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	03

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 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 skills such as evaluating, generalizing, and analyzing information.
6. Conduct Laboratory Demonstrations and Practical Experiments to enhance experiential skills.

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.

Teaching-Learning Process	1. PowerPoint Presentation 2. Chalk and Talk are used for Problem Solving (In-general) 3. Video demonstration or Simulations 4. Laboratory Demonstrations and Practical Experiments

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.

Teaching-Learning Process	1. PowerPoint Presentation 2. Chalk and Talk are used for Problem Solving (In-general) 3. Video demonstration or Simulations 4. Laboratory Demonstrations and Practical Experiments

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.

Teaching-Learning Process	1. PowerPoint Presentation 2. Chalk and Talk are used for Problem Solving (In-general) 3. Video demonstration or Simulations 4. Laboratory Demonstrations and Practical Experiments

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.

Teaching-Learning	1. PowerPoint Presentation 2. Chalk and Talk are used for Problem Solving (In-general)

Process	3. Video demonstration or Simulations 4. Laboratory Demonstrations and Practical Experiments
Module-5	
Design Principle of Channel: Most Economical trapezoidal, introduction to water harvesting techniques; introduction to stream water quality and pollution.	
Teaching-Learning Process	1. Power Point Presentation 2. Chalk and Talk are used for Problem Solving (In-general) 3. Video demonstration or Simulations 4. Laboratory Demonstrations and Practical Experiments

Course outcome (Course Skill Set)

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

1. Various basic terms related to Soil Erosions, Rainfall-Runoff relationships.
2. Some of the basic concepts related to soil conservation.
3. 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). A student shall be deemed to have satisfied the academic requirements and earned the credits allotted to each subject/ course if the student secures not less than 35% (18 Marks out of 50)in the semester-end examination(SEE), and 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:

Three Unit Tests each of **20 Marks (duration 01 hour**)

1. First test at the end of 5th week of the semester
2. Second test at the end of the 10th week of the semester
3. Third test at the end of the 15th week of the semester

Two assignments each of **10 Marks**

4. First assignment at the end of 4th week of the semester
5. Second assignment at the end of 9th week of the semester

Group discussion/Seminar/quiz any one of three suitably planned to attain the COs and POs for **20 Marks** (**duration 01 hours**)

6. At the end of the 13th week of the semester

The sum of three tests, two assignments, and quiz/seminar/group discussion will be out of 100 marks and will be **scaled down to 50 marks**

(to have less stressed CIE, the portion of the syllabus should not be common /repeated for any of the methods of the CIE. Each method of CIE should have a different syllabus portion of the course).

CIE methods /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 subject (**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.

The students have to answer 5 full questions, selecting one full question from each module

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

-

Manufacturing Process LAB			
Course Code	**21AGL55**	CIE Marks	50
Teaching Hours/Week (L:T:P: S)	(0:0:2:0)	SEE Marks	50
Credits	01	Exam Hours	03

Course objectives:

1. To provide an insight to different machine tools, accessories and attachments.
2. 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.
3. To expose the students to CNC Machine Tools, CNC part programming, and industrial robots.
4. To provide an insight into different sand preparation and foundry equipment.
5. To provide training to students to enhance their practical skills in milling, shaping and hand moulding operations.

Sl.NO	Experiments

1. **Machine shop:**
   - I. Introduction, Lathe machine, types of lathe machine, working principle of lathe, parts, Cutting tools, accessories & attachment
   - II. Jobs involving in thread cutting, groove cutting & plane turning
   - III. Jobs involving in taper turn, knurling, chamfering & centre drilling
2. **Shaper**
   - I. Introduction, classification of shaper, working principle & parts of shaper
   - II. Jobs involving in cutting of V Groove/ dovetail / Rectangular groove using a shaper
3. **Milling machine**
   - I. Introduction, types, working principle, tools & equipment's used
   - II. Jobs involving in Cutting of Gear Teeth using Milling Machine
   - III. Jobs involved to use indexing for preparation of hexagon
4. **Computer Numerical Control (CNC):**
   - I. 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.
5. **Foundry shop**
   - I. Introduction to foundry materials, moulds, uses of cores, melting furnaces, tools & equipment used in Foundry shop
   - II. Mould making using single piece pattern (step block-round)
   - III. Mould making using split piece pattern

Course outcomes (Course Skill Set):

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

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). A student shall be deemed to have satisfied the academic requirements and earned the credits allotted to each course. The student has to secure not less than 35% (18 Marks out of 50) in the semester-end examination (SEE).

Continuous Internal Evaluation (CIE):

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 Evaluation (SEE):

SEE marks for the practical course is 50 Marks.

SEE shall be conducted jointly by the two examiners, ***one internal and another external examiner from other institution***, 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:

Text 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.

Introduction to Augmented Reality and Web design			
Course Code	**21AG581**	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	01

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 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. Adopt flipped classroom teaching method.
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 analysing information.

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.

Teaching-Learning Process	1. Power-point Presentation, 2. Video demonstration or Simulations, 3. Chalk and Talk are used for Problem Solving./White board

Module-2

Augmented Reality Hardware:

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.

Teaching-Learning Process	1. Power-point Presentation, 2. Video demonstration or Simulations, 3. Chalk and Talk are used for Problem Solving./White board

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.

Teaching-Learning Process	1. Power-point Presentation, 2. Video demonstration or Simulations, 3. Chalk and Talk are used for Problem Solving./White board

Module-4

AR Techniques- Marker based & Markerless 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.

Teaching-Learning Process	1. Power-point Presentation, 2. Video demonstration or Simulations, 3. Chalk and Talk are used for Problem Solving./White board

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

Teaching-Learning Process	1. Power-point Presentation, 2. Video demonstration or Simulations, 3. Chalk and Talk are used for Problem Solving./White board

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: Use computer vision concepts for AR and describe AR techniques

CO4: Analyse and understand the working of various state of the art AR devices

CO5: Acquire knowledge of 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). A student shall be deemed to have satisfied the academic requirements and earned the credits allotted to each subject/ course if the student secures not less than 35% (18 Marks out of 50)in the semester-end examination(SEE), and 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)

Three Tests (preferably in MCQ pattern with 20 questions) each of **20 Marks (duration 01 hour**)

1. First test at the end of 5th week of the semester
2. Second test at the end of the 10th week of the semester
3. Third test at the end of the 15th week of the semester

Two assignments each of **10 Marks**

1. First assignment at the end of 4th week of the semester
2. Second assignment at the end of 9th week of the semester

Quiz/Group discussion/Seminar, any two of three suitably planned to attain the COs and POs for **20 Marks** (**duration 01 hours**)

The sum of total marks of three tests, two assignments, and quiz /seminar/ group discussion will be out of 100 marks and shall be **scaled down to 50 marks**

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. Allan Fowler-AR Game Development||, 1st Edition, A press Publications, 2018, ISBN 978-1484236178

2. Augmented Reality: Principles & Practice by Schmalstieg / Hollerer, Pearson Education India; First edition (12 October 2016),ISBN-10: 9332578494

Reference Books:

1. Designing for Mixed Reality, Kharis O'Connell Published by O'Reilly Media, Inc., 2016, ISBN: 9781491962381

2. Sanni Siltanen- Theory and applications of marker-based augmented reality. Julkaisija – Utgivare Publisher. 2012. ISBN 978-951-38-7449-0

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/mixed-reality/
- https://docs.microsoft.com/en-us/archive/msdn-magazine/2016/november/hololens-introduction-to-the-hololens

MOOC Courses:

- https://www.coursera.org/learn/ar
- https://www.udemy.com/share/101XPi/

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

- Course seminar
- Term project

DIGITAL MARKETING			
Course Code	**21AG582**	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	01

Course objectives:

- To provide with the knowledge about business advantages of the digital marketing and its importance for marketing success;
- To develop a digital marketing plan;
- To make SWOT analysis;
- To define a target group;
- To get introduced to various digital channels, their advantages and ways of integration;
- To integrate different digital media and create marketing content;
- To optimize a Website and SEO optimization;
- To create Google AdWords campaigns; social media planning;
- To get basic knowledge of Google Analytics for measuring effects of digital marketing and getting insight of future trends that will affect the future development of the digital marketing.

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. Adopt flipped classroom teaching method.
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 analysing information.

Module-1

Introduction to the Course and Work plan, Introduction of the digital marketing, Digital vs. Real Marketing, Digital Marketing Channels, Creating initial digital marketing plan, Content management, SWOT analysis, Target group analysis, Web design, Optimization of Web sites, MS Expression Web

Teaching-Learning Process	1. Power-point Presentation, 2. Video demonstration or Simulations, 3. Chalk and Talk

Module-2

SEO Optimization, Writing the SEO content
Google AdWords- creating accounts, Google AdWords- types
Introduction to CRM, CRM platform, CRM models

Teaching-Learning Process	. 1. Power-point Presentation, 2. Video demonstration or Simulations, 3. Chalk and Talk

Module-3

Introduction to Web analytics, Web analytics – levels, Introduction of Social Media Marketing
Creating a Facebook page, Visual identity of a Facebook page, Types of publications
Business opportunities and Instagram options, Optimization of Instagram profiles, Integrating Instagram with a Web Site and other social networks, keeping up with posts

Teaching-Learning Process	1. Power-point Presentation, 2. Video demonstration or Simulations, 3. Chalk and Talk

Module-4

Business tools on LinkedIn, Creating campaigns on LinkedIn, Analyzing visitation on LinkedIn
Creating business accounts on YouTube, YouTube Advertising, YouTube Analytics
Facebook Ads, Creating Facebook Ads, Ads Visibility

Teaching-Learning Process	1. Power-point Presentation, 2. Video demonstration or Simulations, 3. Chalk and Talk

Module-5

E-mail marketing, E-mail marketing plan, E-mail marketing campaign analysis, Keeping up with conversions Digital Marketing Budgeting- resource planning, cost estimating, cost budgeting, cost control

Teaching-Learning Process	1. Power-point Presentation, 2. Video demonstration or Simulations, 3. Chalk and Talk

Course outcome (Course Skill Set)

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

- to identify the importance of the digital marketing for marketing success,
- to manage customer relationships across all digital channels and build better customer relationships,
- to create a digital marketing plan, starting from the SWOT analysis and defining a target group, then identifying digital channels, their advantages and limitations,
- to perceive ways of the integration taking into consideration the available budget.

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). A student shall be deemed to have satisfied the academic requirements and earned the credits allotted to each subject/ course if the student secures not less than 35% (18 Marks out of 50)in the semester-end examination(SEE), and 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)

Three Tests (preferably in MCQ pattern with 20 questions) each of **20 Marks (duration 01 hour**)

1. First test at the end of 5th week of the semester
2. Second test at the end of the 10th week of the semester
3. Third test at the end of the 15th week of the semester

Two assignments each of **10 Marks**

1. First assignment at the end of 4th week of the semester
2. Second assignment at the end of 9th week of the semester

Quiz/Group discussion/Seminar, any two of three suitably planned to attain the COs and POs for **20 Marks** (**duration 01 hours**)

The sum of total marks of three tests, two assignments, and quiz /seminar/ group discussion will be out of 100 marks and shall be **scaled down to 50 marks**

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. Ryan, D. (2014). Understanding Digital Marketing
2. Marketing Strategies for Engaging the Digital Generation, Kogan Page Limited
3. The Beginner's Guide to Digital Marketing (2015). Digital Marketer
4. Pulizzi,J.(2014) Epic Content Marketing, Mc-graw Hill Education.

Web links and Video Lectures (e-Resources):

-

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

Define a Target Group; Creating Web Sites; Writing the SEO content; SEO Optimizacija;Google AdWords; CRM Platform; Social Media Marketing Plan; Making a Facebook page; Budgeting; Final presentation.

BASICS OF MATLAB			
Course Code	**21AG583**	CIE Marks	50
Teaching Hours/Week (L:T:P: S)	0:0:2*:0	SEE Marks	50
Credits	01	Exam Hours	03

**** Additional one hour may be considered for instructions, if required***

Course objectives:

1. To know about fundamentals of MATLAB tool.
2. To provide an overview to program curve fitting & solve Linear and Nonlinear Equations.
3. To understand the concept and importance of Fourier transforms.
4. To gain knowledge about MATLAB Simulink & solve Electrical engineering problems.

Sl.NO	**Experiments**
1 2	**Introduction to MATLAB Programming:** Basics of MATLAB Programming, array operations in MATLAB, loops and execution of control, working with files: Scripts and functions**,** plotting and programming output, examples.
3 4	**Numerical Methods and their applications: Curve Fitting: Straight line fit, Polynomial fit.**
5 6	**Numerical Integration and Differentiation:** Trapezoidal method, Simpson method.
7 8	**Linear and Nonlinear Equations:** Eigen values, Eigen vectors, Solution of linear algebraic equations using Gauss Elimination and LU decomposition, Solution of nonlinear equation in single variable using Gauss-Siedal and Newton-Raphson method.
9 10	**Ordinary Differential Equations:** Introduction to ODE's, Euler's method, second order RungaKutta method, MATLAB ode45 algorithm in single variable and multivariables. **Transforms:** Discrete Fourier Transforms,
11 12 13	Application of MATLAB to analyse problems in basic engineering mechanics, mechanical vibrations, control system, statistics and dynamics of different circuits. **MATLAB Simulink:** Introduction to MATLAB Simulink, Simulink libraries, development of basic models in Simscape Power Systems

Course outcomes (Course Skill Set):

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

- Able to implement loops, branching, control instruction and functions in MATLAB programming environment.
- Able to program curve fitting, numerical differentiation and integration, solution of linear equations in MATLAB and solve electrical engineering problems.
- Able to understand implementation of ODE using ode 45 and execute Solutions of nonlinear equations and DFT in MATLAB.
- Able to simulate MATLAB Simulink examples

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). A student shall be deemed to have satisfied the academic requirements and earned the credits allotted to each course. The student has to secure not less than 35% (18 Marks out of 50) in the semester-end examination (SEE).

Continuous Internal Evaluation (CIE):

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 Evaluation (SEE):

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:

Text Books:

1. Agam Kumar Tyagi, "**MATLAB and Simulink for Engineers**", OXFORD Higher Education.

2. Dr. Shailendra Jain, "**Modeling& Simulation using MATLAB – Simulink**", Wiley – India.

Reference Books:

1. Won Y.Tang, Wemun Cao, Tae-Sang Ching and John Morris, "**Applied Numerical Methods Using MATLAB**", A John Wiley & Sons.

2. Steven T. Karris, "**Introduction to Simulink with Engineering Applications**", Orchard Publications.

ENTREPRENEURSHIP DEVELOPMENT AND BUSINESS MANAGEMENT			
Course Code	**21AG61**	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	03

Course Objectives:

- To familiarize students with various concepts used in understanding processes involved in entrepreneurship and business formation and development.
- To develop and strengthen entrepreneur qualities of students and understand the need for entrepreneur discipline.
- To equip students capable of analysing the environmental set up relating to small industry & small business and make them understand the procedure of small scale industries.
- To develop wide vision about the business and to inculcate in the minds of students the passion for honesty and integrity

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 skills such as evaluating, generalizing, and analyzing information.

Module-1

Entrepreneurship, management – Management functions – planning- Organizing -Directing – motivation – ordering – leading – supervision-Communication and control – Capital – Financial management – importance of financial statements – balance sheet – profit and loss statement, Analysis of financial statements – liquidity ratios – leverage ratios, Coverage ratios – turnover ratios – profitability ratios, Economic principles in management decisions. Agro-based industries – Project – project cycle – Project appraisal and evaluation techniques – undiscounted measures – payback period – proceeds per rupee of outlay, Discounted measures – Net Present Value (NPV) – Benefit-Cost Ratio (BCR) – Internal Rate of Return (IRR) – Net benefit investment ratio (N / K ratio)

Teaching-Learning Process	1. PowerPoint Presentation 2. Chalk and Talk are used for Problem Solving (In-general) 3. Video demonstration or Simulations 4. Laboratory Demonstrations and Practical Experiments

Module-2

Sensitivity analysis-Importance of agribusiness in Indian economy International trade-WTO agreements – Provisions related to agreements in agricultural and food commodities. Agreements on agriculture (AOA) – Domestic supply, market access, export subsidies agreements on sanitary and phyto-sanitary (SPS) measures, Trade related intellectual property rights (TRIPS). Marketing in business management. Development (ED): Concept of entrepreneur and entrepreneurship assessing overall business environment in Indian economy

Teaching-Learning Process	1. PowerPoint Presentation 2. Chalk and Talk are used for Problem Solving (In-general) 3. Video demonstration or Simulations 4. Laboratory Demonstrations and Practical Experiments

Module-3

Entrepreneurial and managerial characteristics- Entrepreneurship Development Programmes (EDP)- Generation incubation and commercialization of ideas and innovations- Motivation and entrepreneurship development- Globalization and the emerging business entrepreneurial environment- Managing an enterprise: Importance of

planning, budgeting, monitoring evaluation and follow-up managing competition. Role of ED in economic development of a country- Overview of Indian social, political systems and their implications for decision making by Individual entrepreneurs.	
Teaching-Learning Process	1. PowerPoint Presentation 2. Chalk and Talk are used for Problem Solving (In-general) 3. Video demonstration or Simulations 4. Laboratory Demonstrations and Practical Experiments
Module-4	
Economic system and its implications for decision making by individual entrepreneurs- Social responsibility of business.Morals and ethics in enterprise management- SWOT analysis- Government schemes and incentives for promotion of entrepreneurship. Government policy on small and medium enterprises (SMEs)/SSIs/MSME sectors- Venture capital (VC), contract farming (CF) and joint ventures (JV), public-private partnerships (PPP)- Overview of agricultural engineering industry, characteristics of Indian farm machinery industry.	
Teaching-Learning Process	1. PowerPoint Presentation 2. Chalk and Talk are used for Problem Solving (In-general) 3. Video demonstration or Simulations 4. Laboratory Demonstrations and Practical Experiments
Module-5	
Preparation of business – Strengths Weaknesses Opportunities and Threats (SWOT) analysis, Analysis of financial statements (Balance Sheet, Profit loss statement). Compounding and discounting, Break-even analysis Visit to agro-based industries – I, Visit to agro-based industries – II Study of Agro-industries Development Corporation , Ratio analysis – I, Ratio analysis – II, Application of project appraisal technique – I(Undiscounted measures), Application of project appraisal technique – II(Discounted Measures), Formulation of project feasibility reports – Farm Machinery Project proposals as entrepreneur – individual and group - Presentation of project proposals in the class.	
Teaching-Learning Process	1. PowerPoint Presentation 2. Chalk and Talk are used for Problem Solving (In-general) 3. Video demonstration or Simulations 4. Laboratory Demonstrations and Practical Experiments

Course outcome (Course Skill Set)

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

1. To understand processes involved in entrepreneurship and business formation and development.
2. To understand the need for entrepreneur discipline.
3. To analyse environmental set up relating to small industry & small business and make them understand the procedure of small scale industries.
4. To develop wide vision about the business.

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). A student shall be deemed to have satisfied the academic requirements and earned the credits allotted to each subject/ course if the student secures not less than 35% (18 Marks out of 50)in the semester-end examination(SEE), and 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:

Three Unit Tests each of **20 Marks (duration 01 hour**)

1. First test at the end of 5th week of the semester
2. Second test at the end of the 10th week of the semester
3. Third test at the end of the 15th week of the semester

Two assignments each of **10 Marks**

1. First assignment at the end of 4th week of the semester
2. Second assignment at the end of 9th week of the semester

Group discussion/Seminar/quiz any one of three suitably planned to attain the COs and POs for **20 Marks** (**duration 01 hours**)

3. At the end of the 13th week of the semester

The sum of three tests, two assignments, and quiz/seminar/group discussion will be out of 100 marks and will be **scaled down to 50 marks**

(to have less stressed CIE, the portion of the syllabus should not be common /repeated for any of the methods of the CIE. Each method of CIE should have a different syllabus portion of the course).

CIE methods /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 subject (**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.

The students have to answer 5 full questions, selecting one full question from each module

Suggested Learning Resources:

Books

1. Gittenger Price, J. 1989. Economic Analysis of Agricultural Projects. John Hopkins University, Press, London.
2. Harsh, S.B., Conner, U.J. and Schwab, G.D. 1981.Management of the Farm Business. Prentice Hall Inc., New Jersey.
3. Joseph, L. Massie. 1995. Essentials of Management. Prentice Hall of India Pvt. Ltd., New Delhi.
4. Khanka S S. 1999. Entrepreneurial Development. S. Chand and Co. New Delhi.
5. Mark J Dollinger. 1999. Entrepreneurship Strategies and Resources. Prentice-Hall, Upper Saddal, Rover, New Jersey.
6. Mohanty S K. 2007. Fundamentals of Entrepreneurship. Prentice Hall India Ltd., New Delhi.
7. Omri Rawlins, N. 1980. Introduction to Agribusiness. Prentice Hall Inc., New Jersey
8. Thomas W Zimmer and Norman M Scarborough. 1996. Entrepreneurship. Prentice-Hall, New Jersey.

Web links and Video Lectures (e-Resources):

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

- Quizzes
- Assignments
- Seminars
- Mini Projects

DAIRY AND FOOD ENGINEERING (IPCC)			
Course Code	**21AG62**	CIE Marks	50
Teaching Hours/Week (L:T:P: S)	(3:0:2:0)	SEE Marks	50
Total Hours of Pedagogy	40 hours Theory + 10 Lab slots	Total Marks	100
Credits	04	Exam Hours	03

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 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 skills such as evaluating, generalizing, and analyzing information.
6. Conduct Laboratory Demonstrations and Practical Experiments to enhance experiential skills.

Module-1 **8 Hours**

Deterioration in food product and their controls- causes of food spoilage and classification of food with respect to spoilage and consumption. Principles of food preservation, effect pH and water content on growth of microorganisms. Physical, chemical and biological methods of food preservation.

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.

Teaching-Learning Process	1. PowerPoint Presentation 2. Chalk and Talk are used for Problem Solving (In-general) 3. Video demonstration or Simulations 4. Laboratory Demonstrations and Practical Experiments

Module-2 **8 Hours**

Principle and equipment related to 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.

Pasteurization- Purpose, Methods of heating, design and mode of operation heating equipment (tubular heat exchanger, plate heat exchanger), **Sterilization** – UHT method (Direct and indirect heating), sterilization in the package (temperature and pressure patterns), equipment for sterilizing goods in the package (Batch autoclaves).

Thermal processing - Thermal death time curve, reaction kinetics of the heat treatment of milk.

Teaching-Learning Process	1. PowerPoint Presentation 2. Chalk and Talk are used for Problem Solving (In-general) 3. Video demonstration or Simulations 4. Laboratory Demonstrations and Practical Experiments

Module-3 **8 Hours**

Homogenization – Emulsifying, types of emulsions, emulsifiers, application, mode of operation, effect on the product. Centrifugation and cream separation- working of disc centrifuge, working of cyclone separator.

Preparation methods and equipment- Manufacture of cheese, paneer, butter and ice cream.

Dairy plant design and layout – factors in planning, importance of site selection. Location of building, size and type of dairy building, advantages of good plant layout, functional design, plant utilities requirement – electricity, water and power requirement.

Teaching-	1. PowerPoint Presentation

Learning Process	2. Chalk and Talk are used for Problem Solving (In-general) 3. Video demonstration or Simulations 4. Laboratory Demonstrations and Practical Experiments

Module-4	**8 Hours**

Canning and aseptic processing. Evaporation – Applications, functions, factors affecting rate of evaporation, basic evaporator construction, factors affecting liquid boiling point, thermodynamics of evaporation (phase change, boiling point elevation, Duhring plot.

Types of evaporation equipment- Natural circulation evaporators – Batch type, horizontal short tube, vertical short tube, natural circulation with external calendria, long tube, forced circulation.

Drying – Drying methods

Teaching-Learning Process	1. PowerPoint Presentation 2. Chalk and Talk are used for Problem Solving (In-general) 3. Video demonstration or Simulations 4. Laboratory Demonstrations and Practical Experiments

Module-5	**8 Hours**

Freezing – Introduction, freezing point curve for food, freezing time calculation by using Planks equation, types of freezing equipment, **Filtration** - ultra-filtration, processing variables, applications or ultra-filtration in milk processing, reverse osmosis, Membrane separation – Membrane separation methods. Composition and proximate analysis of food products- Carbohydrates, protein, lipids, methods of controlling water content, effect of water activity, methods of measuring a oxidation reduction potential effect on microorganisms, effect of nutrient content and effect of inhibitory substances Change undergone by food components during processing –Changes during heating, evaporation, drying, freezing, filtration and separation.

Teaching-Learning Process	1. PowerPoint Presentation 2. Chalk and Talk are used for Problem Solving (In-general) 3. Video demonstration or Simulations 4. Laboratory Demonstrations and Practical Experiments

PRACTICAL COMPONENT OF IPCC

Course objectives:

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

Sl.NO	Experiments
1	To study the Vat pasteurizer
2	To study the HTST pasteurizer
3	To study and evaluate the performance of the Homogenizers
4	To study the Sterilization
5	To study and evaluate the performance of the Butter churns
6	To study the Spray dryers
7	To study and evaluate the performance of the Freezers
8	To study the different food preservative used in food industry
9	To study the various Drying methods of food products
10	Demonstrate the working of the Evaporators
11	Demonstrate the working of the Cyclone separator
12	Demonstrate the working of the Heat exchangers

Course outcome (Course Skill Set)

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

1. Enable the students to understand the methods of food preservation and the dairy development
2. Developed the understanding of physic – chemical properties of milk
3. Summarizing the methods of pasteurization and its importance
4. To acquaint the students with various dairy engineering operations such as homogenization, pasteurization, thermal processing, evaporation, freezing and drying of milk
5. Understanding the design and layout of a dairy plant
6. Control spoilage of food through process operations such as evaporation, freezing, membrane processing etc.

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). A student shall be deemed to have satisfied the academic requirements and earned the credits allotted to each subject/ course if the student secures not less than 35% (18 Marks out of 50) in the semester-end examination(SEE), and 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 IPCC

Two Tests each of **20 Marks (duration 01 hour**)

- First test at the end of 5th week of the semester
- Second test at the end of the 10th week of the semester

Two assignments each of **10 Marks**

1. First assignment at the end of 4th week of the semester
2. Second assignment at the end of 9th week of the semester

Scaled-down marks of two tests and two assignments added will be CIE marks for the theory component of IPCC for **30 marks**.

CIE for the practical component of IPCC

- On completion of every experiment/program in the laboratory, the students shall be evaluated and marks shall be awarded on the same day. The**15 marks** are for conducting the experiment and preparation of the laboratory record, the other **05 marks shall be for the test** conducted at the end of the semester.
- 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 03 hours)** at the end of the 15th week of the semester /after completion of all the experiments (whichever is early) shall be conducted for 50 marks and scaled down to 05 marks**.**

Scaled-down marks of write-up evaluations and tests added will be CIE marks for the laboratory component of IPCC for **20 marks**.

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.

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 shall include questions from the practical component).

- The minimum marks to be secured in CIE to appear for SEE shall be the 12 (40% of maximum marks-30) in the theory component and 08 (40% of maximum marks -20) in the practical component. The laboratory component of the IPCC shall be for CIE only. However, in SEE, the questions from the laboratory component shall be included**.** The maximum of 04/05 questions to be set from the practical component of IPCC, the total marks of all questions should not be more than the 20 marks.
- SEE will be conducted for 100 marks and students shall secure 35% of the maximum marks to qualify in the SEE. Marks secured will be scaled down to 50.

Suggested Learning Resources:

Books

1. Fundamentals of Food Engineering-Rao, D.G. 2010. PHI learning Pvt. Ltd. New Delhi.
2. Introduction to Food Engineering - Singh, R.P. & Heldman, D.R. 2001. Academic Press.
3. Ahmed, T. 1997. Dairy Plant Engineering and Management. 4th Ed. Kitab Mahal
4. McCabe, W.L. and Smith, J. C. 1999. Unit Operations of Chemical Engineering. McGraw Hill.
5. Rao, D.G. Fundamentals of Food Engineering. PHI learning Pvt. Ltd. New Delhi. 171
6. Singh, R.P. & Heldman, D.R. 1993. Introduction to Food Engineering. Academic Press
7. Principles of foundry technology, 4th edition, P L Jain, Tata McGraw Hill, 2006.
8. Advanced Welding Processes technology and process control, John Norrish, Wood Head Publishing, 2006.

Web links and Video Lectures (e-Resources):

-

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

- Quizzes
- Assignments
- Seminars
- Mini Projects

IOT ARCHITECTURE AND PROTOCOLS			
Course Code	**21AG63**	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	03

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 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 skills such as evaluating, generalizing, and analyzing information.
6. Conduct Laboratory Demonstrations and Practical Experiments to enhance experiential skills.

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

Teaching-Learning Process	1. PowerPoint Presentation 2. Chalk and Talk are used for Problem Solving (In-general) 3. Video demonstration or Simulations 4. Laboratory Demonstrations and Practical Experiments

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

Teaching-Learning Process	1. PowerPoint Presentation 2. Chalk and Talk are used for Problem Solving (In-general) 3. Video demonstration or Simulations 4. Laboratory Demonstrations and Practical Experiments

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

Teaching-Learning Process	1. PowerPoint Presentation 2. Chalk and Talk are used for Problem Solving (In-general) 3. Video demonstration or Simulations 4. Laboratory Demonstrations and Practical Experiments

Module-4

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

Teaching-Learning Process	1. PowerPoint Presentation 2. Chalk and Talk are used for Problem Solving (In-general) 3. Video demonstration or Simulations 4. Laboratory Demonstrations and Practical Experiments

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.	
Teaching-Learning Process	1. PowerPoint Presentation 2. Chalk and Talk are used for Problem Solving (In-general) 3. Video demonstration or Simulations 4. Laboratory Demonstrations and Practical Experiments

Course outcome (Course Skill Set)

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

1. Comprehend the essentials of IOT and its applications
2. Understand the concepts of IOT Architecture Reference model and IOT reference architecture
3. Analyze various IOT Application layer Protocols.
4. Apply IP based protocols and Authentication Protocols for IOT
5. 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). A student shall be deemed to have satisfied the academic requirements and earned the credits allotted to each subject/ course if the student secures not less than 35% (18 Marks out of 50)in the semester-end examination(SEE), and 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:

Three Unit Tests each of **20 Marks (duration 01 hour**)

1. First test at the end of 5th week of the semester
2. Second test at the end of the 10th week of the semester
3. Third test at the end of the 15th week of the semester

Two assignments each of **10 Marks**

4. First assignment at the end of 4th week of the semester
5. Second assignment at the end of 9th week of the semester

Group discussion/Seminar/quiz any one of three suitably planned to attain the COs and POs for **20 Marks** (**duration 01 hours**)

6. At the end of the 13th week of the semester

The sum of three tests, two assignments, and quiz/seminar/group discussion will be out of 100 marks and will be **scaled down to 50 marks**

(to have less stressed CIE, the portion of the syllabus should not be common /repeated for any of the methods of the CIE. Each method of CIE should have a different syllabus portion of the course).

CIE methods /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 subject (**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.

The students have to answer 5 full questions, selecting one full question from each module

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

PRECISION FARMING TECHNIQUES FOR PROTECTED CULTIVATION (PEC-I)			
Course Code	**21AG641**	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	03

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 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 skills such as evaluating, generalizing and analyzing information.

Module-1

Protected cultivation: Introduction, History, origin, development, National and International Scenario, components of green house, perspective, Types of green houses, polyhouses / shed nets, Cladding materials, Plant environment interactions – principles of limiting factors, solar radiation and transpiration, greenhouse effect, light, temperature, relative humidity, carbon dioxide enrichment, Design and construction of green houses – site selection, orientation, design, construction, design for ventilation requirement using exhaust fan system, selection of equipment, Greenhouse cooling system – necessity, methods – ventilation with roof and side ventilators, evaporative cooling, different shading material fogging, combined fogging and fan-pad cooling system, design of cooling system, maintenance of cooling and ventilation systems, pad care etc.

Teaching-Learning Process	1. PowerPoint Presentation 2. Chalk and Talk are used for Problem Solving (In-general) 3. Video demonstration or Simulations

Module-2	
Greenhouse heating – necessity, components, methods, design of heating system. Root media – types – soil and soil less media, composition, estimation, preparation and disinfection, bed preparation. Planting techniques in green house cultivation. Irrigation in greenhouse and net house – Water quality, types of irrigation system, components, design, installation and material requirement. Fogging system for greenhouses and net houses – introduction, benefits, design, installation and material requirement. Maintenance of irrigation and fogging systems.	
Teaching-Learning Process	1. PowerPoint Presentation 2. Chalk and Talk are used for Problem Solving (In-general) 3. Video demonstration or Simulations
Module-3	
Fertilization – nutrient deficiency symptoms and functions of essential nutrient elements, principles of selection of proper application of fertilizers, fertilizer scheduling, rate of application of fertilizers, methods, automated fertilizer application. Greenhouse climate measurement, control and management.	
Teaching-Learning Process	1. PowerPoint Presentation 2. Chalk and Talk are used for Problem Solving (In-general) 3. Video demonstration or Simulations
Module-4	
Insect and disease management in greenhouse and net houses Selection of crops for greenhouse cultivation, major crops in greenhouse – irrigation requirement, fertilizer management, cultivation, harvesting and post-harvest techniques; Economic analysis.	
Teaching-Learning Process	1. PowerPoint Presentation 2. Chalk and Talk are used for Problem Solving (In-general) 3. Video demonstration or Simulations
Module-5	
Estimation of material requirement for construction of greenhouse ; Determination of fertilization schedule and rate of application for various crops; Estimation of material requirement for preparation of root media; Root media preparation, bed preparation and disinfections; Study of different planting techniques ; Design and installation of irrigation system; Design and installation of fogging system ; Greenhouse heating; Study of different greenhouse environment control instruments; Study of operation maintenance and fault detection in irrigation system; Study of operation maintenance and fault detection in fogging system; Economic analysis of greenhouses and net houses; Visit to greenhouses.	
Teaching-Learning Process	1. PowerPoint Presentation 2. Chalk and Talk are used for Problem Solving (In-general) 3. Video demonstration or Simulations

Course outcome (Course Skill Set)

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

1. Understand the importance of protected cultivation in precision farming
2. Know about various components, shape, types of green houses
3. Know about design and construction of green houses in different agro-climatic zones
4. Know about greenhouse cooling and heating systems, environmental parameter and control, ventilation systems
5. To assess different root media, micro-irrigation, fustigation, planting techniques in green house cultivation
6. 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). A student shall be deemed to have satisfied the academic requirements and earned the credits allotted to each subject/ course if the student secures not less than 35% (18 Marks out of 50)in the semester-end examination(SEE), and 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:

Three Unit Tests each of **20 Marks (duration 01 hour**)

1. First test at the end of 5th week of the semester
2. Second test at the end of the 10th week of the semester
3. Third test at the end of the 15th week of the semester

Two assignments each of **10 Marks**

4. First assignment at the end of 4th week of the semester
5. Second assignment at the end of 9th week of the semester

Group discussion/Seminar/quiz any one of three suitably planned to attain the COs and POs for **20 Marks** (**duration 01 hours**)

6. At the end of the 13th week of the semester

The sum of three tests, two assignments, and quiz/seminar/group discussion will be out of 100 marks and will be **scaled down to 50 marks**

(to have less stressed CIE, the portion of the syllabus should not be common /repeated for any of the methods of the CIE. Each method of CIE should have a different syllabus portion of the course).

CIE methods /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 subject (**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.

The students have to answer 5 full questions, selecting one full question from each module

Suggested Learning Resources:

Books

1. Protected Cultivation Ernst van Heurn and Kees Van der Post Digigrafi, Wageningan, The Netherlands 2004
2. Protected Cultivation of Horticulture Crops Peter, K.V. and Sing D.K. New India Publishing Company. 2013
3. Sustainable Crop Protection under Protected Cultivation Reddy P.P Springer Singapore 2016
4. 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

AGRICULTURAL STRUCTURES AND ENVIRONMENTAL CONTROL (PEC-I)			
Course Code	**21AG642**	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	03

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 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 skills such as evaluating, generalizing, and analysing information.
6. Conduct Laboratory Demonstrations and Practical Experiments to enhance experiential skills.

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.

Teaching-Learning Process	1. PowerPoint Presentation 2. Chalk and Talk are used for Problem Solving (In-general) 3. Video demonstration or Simulations 4. Laboratory Demonstrations and Practical Experiments

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.

Teaching-Learning Process	1. PowerPoint Presentation 2. Chalk and Talk are used for Problem Solving (In-general) 3. Video demonstration or Simulations 4. Laboratory Demonstrations and Practical Experiments

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.

Teaching-Learning Process	1. PowerPoint Presentation 2. Chalk and Talk are used for Problem Solving (In-general) 3. Video demonstration or Simulations 4. Laboratory Demonstrations and Practical Experiments

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.	
Teaching-Learning Process	1. PowerPoint Presentation 2. Chalk and Talk are used for Problem Solving (In-general) 3. Video demonstration or Simulations 4. Laboratory Demonstrations and Practical Experiments
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.	
Teaching-Learning Process	1. PowerPoint Presentation 2. Chalk and Talk are used for Problem Solving (In-general) 3. Video demonstration or Simulations 4. Laboratory Demonstrations and Practical Experiments

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. Know about various standards for various dairy, piggery, poultry and other farm structures.
3. Know about the different farm storage structures, silos, compost pit, implement sheds, farm houses, threshing floors, farm roads, fencing, water supply, sewage systems, and septic tanks
4. Know about rural electrification, concepts of eco system, bio-diversity, environmental pollution and control, solid waste, plant waste management
5. To 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). A student shall be deemed to have satisfied the academic requirements and earned the credits allotted to each subject/ course if the student secures not less than 35% (18 Marks out of 50)in the semester-end examination(SEE), and 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:

Three Unit Tests each of **20 Marks (duration 01 hour**)

1. First test at the end of 5th week of the semester
2. Second test at the end of the 10th week of the semester
3. Third test at the end of the 15th week of the semester

Two assignments each of **10 Marks**

4. First assignment at the end of 4th week of the semester
5. Second assignment at the end of 9th week of the semester

Group discussion/Seminar/quiz any one of three suitably planned to attain the COs and POs for **20 Marks** (**duration 01 hours**)

6. At the end of the 13th week of the semester

The sum of three tests, two assignments, and quiz/seminar/group discussion will be out of 100 marks and will be **scaled down to 50 marks**

(to have less stressed CIE, the portion of the syllabus should not be common /repeated for any of the methods of the CIE. Each method of CIE should have a different syllabus portion of the course).

CIE methods /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 subject (**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.

The students have to answer 5 full questions, selecting one full question from each module

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

SOLAR PHOTOVOLTAIC SYSTEM (PEC-I)			
Course Code	**21AG643**	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	03

Course Objectives:

- To develop a comprehensive technological understanding in solar PV system components
- To provide in-depth understanding of design parameters to help design and simulate the performance of a solar PV power plant
- To pertain knowledge about planning, project implementation and operation of solar PV power generation

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 skills such as evaluating, generalizing, and analyzing information.
6. Conduct Laboratory Demonstrations and Practical Experiments to enhance experiential skills.

Module-1

Introduction

Sources of renewable energy; global potential for solar electrical energy systems. Solar radiation. Extra terrestrial and terrestrial solar spectrum; clear sky direct-beam radiation; total clear sky insulation on a collecting surface; radiation on the collector in tracking systems; calculation of average monthly insolation from measured data

Teaching-Learning Process	1. PowerPoint Presentation 2. Chalk and Talk are used for Problem Solving (In-general) 3. Video demonstration or Simulations 4. Laboratory Demonstrations and Practical Experiments

Module-2

PV cells and modules

Solar Cell and its function, Solar Technologies, Solar Cell Parameters, Efficiency of Solar Cell, Solar PV Module, Rating of Solar PV Module, PV Module Parameters, Efficiency of PV Module, Measuring Module Parameters

Teaching-Learning Process	1. PowerPoint Presentation 2. Chalk and Talk are used for Problem Solving (In-general) 3. Video demonstration or Simulations 4. Laboratory Demonstrations and Practical Experiments

Module-3

Solar Photovoltaic Module Array

Connection of PV Module in Series and Parallel, Estimation and Measurement of PV Module Power, Selection of PV Module.

Teaching-Learning Process	1. PowerPoint Presentation 2. Chalk and Talk are used for Problem Solving (In-general) 3. Video demonstration or Simulations 4. Laboratory Demonstrations and Practical Experiments

Module-4

Solar PV System Design and Integration

Solar Radiation Energy Measurements, Estimating Energy requirement, Types of Solar PV System, Design methodology for SPV system, Design of Off Grid Solar Power Plant, Case studies of 3KWp Off grid Solar PV Power Plant, Design and Development of Solar Street Light and Solar Lantern, Off Grid Solar power Plant.

Teaching-Learning Process	1. PowerPoint Presentation 2. Chalk and Talk are used for Problem Solving (In-general) 3. Video demonstration or Simulations 4. Laboratory Demonstrations and Practical Experiments

Module-5

Solar collectors and Solar energy storage

Different types of solar collectors, Flat plate and concentrated type collectors, Fundamental Terminologies of thermal storage, Sensible heat storage materials, Latent heat storage materials, Solar thermo-chemical energy storage systems, Advantages and disadvantages of solar thermal storage, application of thermal storage.

Teaching-Learning Process	1. PowerPoint Presentation 2. Chalk and Talk are used for Problem Solving (In-general) 3. Video demonstration or Simulations 4. Laboratory Demonstrations and Practical Experiments

Course outcome (Course Skill Set)

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

1. Understand of renewable and non-renewable sources of energy
2. Gain knowledge about working principle of various solar energy systems
3. Analyse the solar power PV power generation
4. Applying the knowledge on to installation and integration of PV modules for different applications
5. Understand the operation of different solar collectors in the market
6. Understand the solar thermal energy storage 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). A student shall be deemed to have satisfied the academic requirements and earned the credits allotted to each subject/ course if the student secures not less than 35% (18 Marks out of 50)in the semester-end examination(SEE), and 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:

Three Unit Tests each of **20 Marks (duration 01 hour**)

1. First test at the end of 5th week of the semester
2. Second test at the end of the 10th week of the semester
3. Third test at the end of the 15th week of the semester

Two assignments each of **10 Marks**

4. First assignment at the end of 4th week of the semester
5. Second assignment at the end of 9th week of the semester

Group discussion/Seminar/quiz any one of three suitably planned to attain the COs and POs for **20 Marks** (**duration 01 hours**)

6. At the end of the 13th week of the semester

The sum of three tests, two assignments, and quiz/seminar/group discussion will be out of 100 marks and will be **scaled down to 50 marks**

(to have less stressed CIE, the portion of the syllabus should not be common /repeated for any of the methods of the CIE. Each method of CIE should have a different syllabus portion of the course).

CIE methods /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 subject (**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.

The students have to answer 5 full questions, selecting one full question from each module

Suggested Learning Resources:

Books

1. Chetansingh solanki *Solar Photovoltaic* PHI, Learning private ltd., New dehli- 2018
2. G.D Rai *Non-conventional Sources of Energy* Khanna Publishers, Delhi, 2012
3. Chetan Singh Solanki *Renewable Energy Technologies; A Practical Guide for Beginners* PHI School Books (2008)
4. Kothari D.P. and Signal K.C *Renewable Energy Sources and Emerging Technologies*, New Arrivals –PHI; 2 Edition (2011)

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 (PEC-I)			
Course Code	**21AG644**	CIE Marks	50
Teaching Hours/Week (L:T:P: S)	(3:0:0:0)	SEE Marks	50
Total Hours of Teaching-Learning Process	40	Total Marks	100
Credits	03	Exam Hours	03

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 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.

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.	
Teaching-Learning Process	1. PowerPoint Presentation 2. Chalk and Talk are used for Problem Solving (In-general) 3. Video demonstration or Simulations 4. Laboratory Demonstrations and Practical Experiments
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.	
Teaching-Learning Process	1. PowerPoint Presentation 2. Chalk and Talk are used for Problem Solving (In-general) 3. Video demonstration or Simulations 4. Laboratory Demonstrations and Practical Experiments
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.	
Teaching-Learning Process	1. PowerPoint Presentation 2. Chalk and Talk are used for Problem Solving (In-general) 3. Video demonstration or Simulations 4. Laboratory Demonstrations and Practical Experiments
Module-4	
Mine spoils- impact, land degradation and reclamation and rehabilitation, slope stabilization and mine environment management. Micro-irrigation in wastelands development.	
Teaching-Learning Process	1. PowerPoint Presentation 2. Chalk and Talk are used for Problem Solving (In-general) 3. Video demonstration or Simulations 4. Laboratory Demonstrations and Practical Experiments
Module-5	
Sustainable wasteland development - drought situations, socio-economic perspectives. Government policies. Participatory approach. Preparation of proposal for wasteland development and benefit-cost analysis.	
Teaching-Learning Process	1. PowerPoint Presentation 2. Chalk and Talk are used for Problem Solving (In-general) 3. Video demonstration or Simulations 4. Laboratory Demonstrations and Practical Experiments

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). A student shall be deemed to have satisfied the academic requirements and earned the credits allotted to each subject/ course if the student secures not less than 35% (18 Marks out of 50)in the semester-end examination(SEE), and 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:

Three Unit Tests each of **20 Marks (duration 01 hour**)

1. First test at the end of 5th week of the semester
2. Second test at the end of the 10th week of the semester
3. Third test at the end of the 15th week of the semester

Two assignments each of **10 Marks**

4. First assignment at the end of 4th week of the semester
5. Second assignment at the end of 9th week of the semester

Group discussion/Seminar/quiz any one of three suitably planned to attain the COs and POs for **20 Marks** (**duration 01 hours**)

6. At the end of the 13th week of the semester

The sum of three tests, two assignments, and quiz/seminar/group discussion will be out of 100 marks and will be **scaled down to 50 marks**

(to have less stressed CIE, the portion of the syllabus should not be common /repeated for any of the methods of the CIE. Each method of CIE should have a different syllabus portion of the course).

CIE methods /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 subject (**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.

The students have to answer 5 full questions, selecting one full question from each module

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. Michael A. M. 2012. Irrigation: Theory and Practice. Vikas Publishing Vikas Publ. House New Delhi.
6. Chaudhuri., A.B., 1992, Mine environment and management: An Indian Scenario. Ahsih publishing house. Newdelhi.
7. Jaume Bech., Claudio Bini and Mariya A Pashkevich.,2017. Assessment, Restoration and Reclamation of Mining Influenced Soils. Candice Janco – Elseveir publisher., UK.
8. Shankaranarayan.K.A.,1962.Wasteland Development and Their Utilisation, Scientific Publishers, Jodhpur
9. 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):

STORAGE & PACKAGING TECHNOLOGY (OEC-I)			
Course Code	**21AG651**	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	03

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 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 skills such as evaluating, generalizing, and analyzing information.
6. Conduct Laboratory Demonstrations and Practical Experiments to enhance experiential skills.

Module-1

Spoilage and storage: Direct damages, Indirect damages of perishable and durable commodities – control measures - factors affecting storage – types of storage – Losses in storage and estimation of losses.

Teaching-Learning Process	1. PowerPoint Presentation 2. Chalk and Talk are used for Problem Solving (In-general) 3. Video demonstration or Simulations 4. Laboratory Demonstrations and Practical Experiments

Module-2

Storage methods : Improved storage methods for grain-modern storage structures-infestation-temperature and moisture changes in storage structures-CAP storage-CA storage of grains and perishables- construction operation and maintenance of CA storage facilities

Teaching-Learning Process	1. PowerPoint Presentation 2. Chalk and Talk are used for Problem Solving (In-general) 3. Video demonstration or Simulations 4. Laboratory Demonstrations and Practical Experiments

Module-3

Functions of packaging materials: Introduction – packaging strategies for various environment – functions of package – packaging materials – bio degradable packaging materials – shrink and stretch packaging materials.

Teaching-Learning Process	1. PowerPoint Presentation 2. Chalk and Talk are used for Problem Solving (In-general) 3. Video demonstration or Simulations 4. Laboratory Demonstrations and Practical Experiments

Module-4

Food Packaging Materials and Testing: Introduction – paper and paper boards - flexible - plastics - glass containers – cans – aluminium foils - package material testing-tensile, bursting and tear strength.

Teaching-Learning Process	1. PowerPoint Presentation 2. Chalk and Talk are used for Problem Solving (In-general) 3. Video demonstration or Simulations 4. Laboratory Demonstrations and Practical Experiments

Module-5	
Special Packaging Techniques: Vacuum and gas packaging - aseptic packaging - retort pouching – edible film packaging – tetra packaging – shrink and stretch packaging.	
Teaching-Learning Process	1. PowerPoint Presentation 2. Chalk and Talk are used for Problem Solving (In-general) 3. Video demonstration or Simulations 4. Laboratory Demonstrations and Practical Experiments

Course outcome (Course Skill Set)

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

1. Understand the various packaging methods
2. Understand the importance of packaging of food
3. Understand the interaction of food, packaging and environment
4. Understand the different methods of package development and packaging 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). A student shall be deemed to have satisfied the academic requirements and earned the credits allotted to each subject/ course if the student secures not less than 35% (18 Marks out of 50)in the semester-end examination(SEE), and 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:

Three Unit Tests each of **20 Marks (duration 01 hour**)

1. First test at the end of 5th week of the semester
2. Second test at the end of the 10th week of the semester
3. Third test at the end of the 15th week of the semester

Two assignments each of **10 Marks**

4. First assignment at the end of 4th week of the semester
5. Second assignment at the end of 9th week of the semester

Group discussion/Seminar/quiz any one of three suitably planned to attain the COs and POs for **20 Marks** (**duration 01 hours**)

6. At the end of the 13th week of the semester

The sum of three tests, two assignments, and quiz/seminar/group discussion will be out of 100 marks and will be **scaled down to 50 marks**

(to have less stressed CIE, the portion of the syllabus should not be common /repeated for any of the methods of the CIE. Each method of CIE should have a different syllabus portion of the course).

CIE methods /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 subject (**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.

The students have to answer 5 full questions, selecting one full question from each module

Suggested Learning Resources:

Books

1. Sahay, K.M. and K.K.Singh. 1996. unit operations of agricultural processing. Vikas publishing house Pvt.ltd., New Delhi.
2. Food Packaging Technology, Hand book, 2004. NIIR Board, New Delhi.
3. Pandey, P.H.2002. post harvest engineering of horticultural crops through objectives. Saroj Prakasam. Allahabad.
4. Himangshu Barman. 2008, Post Harvest Food grain storage. Agrobios (India), Jodhpur.
5. Chakaraverty, A. 2000. third edition. Post harvest technology of cereals, pulses and oil seeds. Oxford & IBH publishing & Co.Pvt.Ltd. New Delhi.

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

LANDSCAPE IRRIGATION DESIGN AND MANAGEMENT (OEC-I)			
Course Code	**21AG652**	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	02

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 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 skills such as evaluating, generalizing, and analyzing information.
6. Conduct Laboratory Demonstrations and Practical Experiments to enhance experiential skills.

Module-1

INTRODUCTION –Historical importance of Indian gardens and history of gardening in different areas. Famous gardens of India and study of their methods of irrigation systems. Definition of landscape - conventional methods of landscape irrigation - study of hose irrigation system – components. Study of components of portable sprinkler with hose pipes. Merits and demerits of conventional landscape irrigation systems

Teaching-Learning Process	1. PowerPoint Presentation 2. Chalk and Talk are used for Problem Solving (In-general) 3. Video demonstration or Simulations 4. Laboratory Demonstrations and Practical Experiments

Module-2

Types of modern landscape irrigation methods - merits and demerits, Pop-up sprinklers – spray pop-up sprinklers - components - selection criteria. Design criteria for pop-up sprinkler systems in landscaping, Shrub adopter system – features - accessories

Teaching-Learning Process	1. PowerPoint Presentation 2. Chalk and Talk are used for Problem Solving (In-general) 3. Video demonstration or Simulations 4. Laboratory Demonstrations and Practical Experiments

Module-3

Types of drip irrigation methods adopted in landscaping and their components. Design and layout of drip irrigation system in landscaping. Design of bubbler irrigation system - selection and design criteria

Teaching-Learning Process	1. PowerPoint Presentation 2. Chalk and Talk are used for Problem Solving (In-general) 3. Video demonstration or Simulations 4. Laboratory Demonstrations and Practical Experiments

Module-4

Types of landscapes -natural landscapes and human made landscapes, Basic theme of gardens viz. circular, rectangular and diagonal themes. Factors affecting landscape design viz., initial approach, view, human choice, simplicity and topography etc. Suitability of different types of irrigation systems forlandscapes, Study of water requirements for different landscapes - numerical problems on water requirements of landscapes, Study of segments of landscape irrigation systems.

Teaching-Learning Process	1. PowerPoint Presentation 2. Chalk and Talk are used for Problem Solving (In-general) 3. Video demonstration or Simulations 4. Laboratory Demonstrations and Practical Experiments

Module-5

Main components of modern landscape irrigation systems and their selection criteria.Types of pipes and pressure ratings in landscape irrigation, Study of economics of pipe selection, pipe sizing and selection criteria. Numerical problems on economics of pipe selection. Study of different automation system for landscape irrigation. Study of main components, types of controllers and their application in automation system. Design and layout of modern landscape irrigation systems

Teaching-Learning Process	1. PowerPoint Presentation 2. Chalk and Talk are used for Problem Solving (In-general) 3. Video demonstration or Simulations 4. Laboratory Demonstrations and Practical Experiments

Course outcome (Course Skill Set)

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

1. Acquire knowledge on historical importance of Indian gardens and conventional methods of landscape irrigation
2. Be proficient in types of modern landscape irrigation methods and their design
3. Understand the types of drip irrigation methods adopted in landscaping and their design
4. Some of the basic concepts related to landscape and its suitability
5. To acquaint the students with 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). A student shall be deemed to have satisfied the academic requirements and earned the credits allotted to each subject/ course if the student secures not less than 35% (18 Marks out of 50)in the semester-end examination(SEE), and 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:

Three Unit Tests each of **20 Marks (duration 01 hour**)

1. First test at the end of 5th week of the semester
2. Second test at the end of the 10th week of the semester
3. Third test at the end of the 15th week of the semester

Two assignments each of **10 Marks**

4. First assignment at the end of 4th week of the semester
5. Second assignment at the end of 9th week of the semester

Group discussion/Seminar/quiz any one of three suitably planned to attain the COs and POs for **20 Marks** (**duration 01 hours**)

6. At the end of the 13th week of the semester

The sum of three tests, two assignments, and quiz/seminar/group discussion will be out of 100 marks and will be **scaled down to 50 marks**

(to have less stressed CIE, the portion of the syllabus should not be common /repeated for any of the methods of the CIE. Each method of CIE should have a different syllabus portion of the course).

CIE methods /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 subject (**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.

The students have to answer 5 full questions, selecting one full question from each module

Suggested Learning Resources:

Books

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

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 (OEC-I)			
Course Code	**21AG653**	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	03

Course Objectives:

- To study the importance of sustainable agriculture for the growing population, various resources required and their sustainability Importance of science, food security and ecological balance

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 skills such as evaluating, generalizing, and analyzing information.
6. Conduct Laboratory Demonstrations and Practical Experiments to enhance experiential skills.

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.

Teaching-Learning Process	1. PowerPoint Presentation 2. Chalk and Talk are used for Problem Solving (In-general) 3. Video demonstration or Simulations 4. Laboratory Demonstrations and Practical Experiments

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)	
Teaching-Learning Process	1. PowerPoint Presentation 2. Chalk and Talk are used for Problem Solving (In-general) 3. Video demonstration or Simulations 4. Laboratory Demonstrations and Practical Experiments
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.	
Teaching-Learning Process	1. PowerPoint Presentation 2. Chalk and Talk are used for Problem Solving (In-general) 3. Video demonstration or Simulations 4. Laboratory Demonstrations and Practical Experiments
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.	
Teaching-Learning Process	1. PowerPoint Presentation 2. Chalk and Talk are used for Problem Solving (In-general) 3. Video demonstration or Simulations 4. Laboratory Demonstrations and Practical Experiments
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.	
Teaching-Learning Process	1. PowerPoint Presentation 2. Chalk and Talk are used for Problem Solving (In-general) 3. Video demonstration or Simulations 4. Laboratory Demonstrations and Practical Experiments

Course outcome (Course Skill Set)

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

1. Gain knowledge on the need for sustainable agriculture
2. Comprehend the need for food security on global level and the Nutritional Security.
3. 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). A student shall be deemed to have satisfied the academic requirements and earned the credits allotted to each subject/ course if the student secures not less than 35% (18 Marks out of 50)in the semester-end examination(SEE), and 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:

Three Unit Tests each of **20 Marks (duration 01 hour**)

1. First test at the end of 5th week of the semester
2. Second test at the end of the 10th week of the semester
3. Third test at the end of the 15th week of the semester

Two assignments each of **10 Marks**

4. First assignment at the end of 4th week of the semester
5. Second assignment at the end of 9th week of the semester

Group discussion/Seminar/quiz any one of three suitably planned to attain the COs and POs for **20 Marks** (**duration 01 hours**)

6. At the end of the 13th week of the semester

The sum of three tests, two assignments, and quiz/seminar/group discussion will be out of 100 marks and will be **scaled down to 50 marks**

(to have less stressed CIE, the portion of the syllabus should not be common /repeated for any of the methods of the CIE. Each method of CIE should have a different syllabus portion of the course).

CIE methods /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 subject (**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.

The students have to answer 5 full questions, selecting one full question from each module

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

AI & IMAGE PROCESSING LAB			
Course Code	**21AGL66**	CIE Marks	50
Teaching Hours/Week (L:T:P: S)	(0:0:2:0)	SEE Marks	50
Credits	01	Exam Hours	03

Course objectives:

- Implement and evaluate AI algorithms in Python programming language.
- Demonstrate the basic skills of image process
- Demonstrate the application development skills
- Design and develop the applications of images

Sl.NO	Experiments

1. (a) Write a python program to print the multiplication table for the given number

   (b) Write a python program to check whether the given number is prime or not?

   (c) Write a python program to find factorial of the given number?

2. (a) Write a python program to implement List operations (Nested List, Length, Concatenation, Membership, Iteration, Indexing and Slicing)

   (b) Write a python program to implement List methods (Add, Append, Extend & Delete).

3. Write a python program to implement simple Chatbot with minimum 10 conversations
4. Write a python program to Illustrate Different Set Operations
5. (a)Write a python program to implement a function that counts the number of times a string(s1) occurs in another string(s2)

   (b)Write a program to illustrate dictionary operations([],in, traversal)and methods: keys(),values(),items()
6. Implementation of the problem solving strategies: either using Forward Chaining or Backward Chaining (AI Problems to be implemented in Python)
7. Implement any Game and demonstrate the Game playing strategies
8. Write a Program to read a digital image. Split and display image into 4 quadrants, up, down, right and left
9. Write a program to show rotation, scaling, and translation of an image.
10. Read an image, first apply erosion to the image and then subtract the result from the original.
11. Demonstrate the difference in the edge image if you use dilation instead of erosion.
12. Read an image and extract and display low-level features such as edges, textures using filtering techniques
13. Demonstrate enhancing and segmenting low contrast 2D images.

Course outcomes (Course Skill Set):

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

1. Implement and demonstrate AI algorithms.
2. Evaluate different algorithms.
3. Image Segmentation algorithm development
4. Image filtering in spatial and frequency domain.
5. Morphological operations in analysing image 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). A student shall be deemed to have satisfied the academic requirements and earned the credits allotted to each course. The student has to secure not less than 35% (18 Marks out of 50) in the semester-end examination (SEE).

Continuous Internal Evaluation (CIE):

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 Evaluation (SEE):

SEE marks for the practical course is 50 Marks.

SEE shall be conducted jointly by the two examiners, ***one internal and another one is the external examiner from other institute***, examiners are appointed by the University

1. All laboratory experiments are to be included for practical examination.
2. (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.
3. Students can pick one question (experiment) from the questions lot prepared by the internal /external examiners jointly.
4. Evaluation of test write-up/ conduction procedure and result/viva will be conducted jointly by examiners.
5. 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)
6. 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

7. Rubrics suggested in Annexure-II of Regulation book.

Suggested Learning Resources:

-