



there shall be no SEE. For more details the regulation governing the Degree of Bachelor of Engineering /Technology (BE/B.Tech.) 2021-22 may be referred.

  
**H.O.D.**

**Dept. of Agricultural Engineering  
Alva's Institute of Engg. & Technology  
Mijar, Moodubidire - 574225**



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
<b>Course Objectives:</b> <ul style="list-style-type: none"><li>•To understand the basic concepts of agrochemicals and their applications in agriculture.</li><li>•To study naturally occurring and synthetic chemical agents used for protecting crops in field as well as in storage.</li><li>•To understand the role of naturally occurring crop protecting chemical agents in fostering organic farming.</li><li>•To understand the impact of agrochemicals on environmental, animal, and human health</li><li>•To understand the regulatory mechanism of agrochemicals at national and international levels</li><li>•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.</li></ul>			
<b>Pedagogy (General Instructions)</b> <p>These are sample Strategies, which teacher can use to accelerate the attainment of the various course outcomes.</p> <ol style="list-style-type: none"><li>1. Adopt different types of teaching methods to develop the outcomes through PowerPoint presentations and Video demonstrations or Simulations.</li><li>2. Chalk and Talk method for teaching basic concepts.</li><li>3. Arranging visits to farmers' fields to expose pupils to real time farming situations.</li><li>4. Adopt collaborative (Group Learning) Learning in the class.</li><li>5. By giving assignments and presentation tasks to students.</li><li>6. Exploring information from research publications and regulatory documents</li></ol>			
<b>Module-1</b>			
<b>Naturally Occurring Crop Protection Agents</b> <p>Economic loss of agricultural produce due to pest problems: insects, diseases, rodents and weeds; Sources and utility of naturally occurring insecticides, bactericides, fungicides, nematocides, 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.</p>			
<b>Pedagogy</b>	<ol style="list-style-type: none"><li>1. PowerPoint Presentation</li><li>2. Chalk and Talk are used for Problem Solving (In-general)</li><li>3. Video demonstration or Simulations</li></ol>		
<b>Module-2</b>			
<b>Synthetic Crop Protection Agents</b> <p>History, scope and principles of chemical insect control; Synthetic insecticides, bactericides, fungicides, nematocides, 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 nematocides; Chitin synthesis inhibitors, insecticide synergists, and fumigants; Plant growth regulators – auxins, gibberellins, cytokinins, ethylene, abscisic acid; Brassinolides;</p>			
<b>Pedagogy</b>	<ol style="list-style-type: none"><li>1. PowerPoint Presentation</li><li>2. Chalk and Talk are used for Problem Solving (In-general)</li><li>3. Video demonstration or Simulations</li></ol>		
<b>Module-3</b>			
<b>Chemicals used for storage and preservation</b> <p>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,</p>			



respectively.	
<b>Pedagogy</b>	1. PowerPoint Presentation 2. Chalk and Talk are used for Problem Solving (In-general) 3. Video demonstration or Simulations
<b>Module-4</b>	
<b>Agrochemical Formulations</b> 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	
<b>Pedagogy</b>	1. PowerPoint Presentation 2. Chalk and Talk are used for Problem Solving (In-general) 3. Video demonstration or Simulations
<b>Module-5</b>	
<b>Agrochemicals – Regulation and Quality Control</b> 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.	
<b>Pedagogy</b>	1. PowerPoint Presentation 2. Chalk and Talk are used for Problem Solving (In-general) 3. Video demonstration or Simulations
<b>Course outcome (Course Skill Set)</b> At the end of the course the student will be able to : <ul style="list-style-type: none"> <li>• Understand the basic concepts of agrochemicals and their applications in agriculture.</li> <li>• Understand naturally occurring and synthetic chemical agents used for protecting crops in field as well as in storage.</li> <li>• Understand the role of naturally occurring crop protecting chemical agents in fostering organic farming.</li> <li>• Understand the impact of agrochemicals on environmental, animal, and human health</li> <li>• Understand the regulatory mechanism of agrochemicals at national and international levels</li> <li>• Acquire necessary basic knowledge on agrochemicals so as to evolve engineering strategies for their optimal and judicious applications in field as well as storage conditions, based on learning outcomes from other courses</li> </ul>	
<b>Assessment Details (both CIE and SEE)</b> 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	
<b>Continuous Internal Evaluation:</b> Three Unit Tests each of <b>20 Marks (duration 01 hour)</b> <ol style="list-style-type: none"> <li>1. First test at the end of 5<sup>th</sup> week of the semester</li> <li>2. Second test at the end of the 10<sup>th</sup> week of the semester</li> <li>3. Third test at the end of the 15<sup>th</sup> week of the semester</li> </ol>	



Two assignments each of **10 Marks**

4. First assignment at the end of 4<sup>th</sup> week of the semester
5. Second assignment at the end of 9<sup>th</sup> 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 13<sup>th</sup> 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 Chemicals" Edited 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. 2<sup>nd</sup> 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

  
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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
<i>* Additional one hour may be considered for Instructions if required</i>			
<b>Course objectives:</b> <ul style="list-style-type: none"> <li>To recognize the importance of tillage operation in agricultural production.</li> <li>To explain the role of earth moving machinery during land preparation process.</li> <li>To identify the various types of seeding, inter cultivation tools and plant protection equipment used in agricultural production.</li> <li>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.</li> </ul>			
<b>Teaching-Learning Process (General Instructions)</b> These are sample strategies; which teachers can use to accelerate the attainment of the various course outcomes. <ol style="list-style-type: none"> <li>Adopt different types of teaching methods to develop the outcomes through PowerPoint presentations and Video demonstrations or Simulations.</li> <li>Chalk and Talk method for Problem Solving.</li> <li>Arrange visits to show the live working models other than laboratory topics.</li> <li>Adopt collaborative (Group Learning) Learning in the class.</li> <li>Adopt Problem Based Learning (PBL), which fosters students Analytical skills and develops thinking skills such as evaluating, generalizing, and analyzing information.</li> <li>Conduct Laboratory Demonstrations and Practical Experiments to enhance experiential skills</li> </ol>			
<b>MODULE-1</b>			<b>8 HOURS</b>
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.			
<b>Teaching-Learning Process</b>	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		
<b>MODULE-2</b>			<b>8 HOURS</b>
<b>Tillage:</b> 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.			
<b>Teaching-Learning Process</b>	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		
<b>MODULE-3</b>			<b>8 HOURS</b>
<b>Seeding Methods</b> 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.			
<b>Teaching-Learning Process</b>	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		
<b>MODULE-4</b>			<b>8 HOURS</b>



<b>Plant Protection Equipment</b> Weed control and Plant protection equipment - sprayers and dusters, their calibration, selection, constructional features of different components and adjustments.	
<b>Teaching-Learning Process</b>	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
<b>MODULE 5</b> <span style="float: right;"><b>8 HOURS</b></span>	
<b>Harvesting Machinery</b> 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.	
<b>Teaching-Learning Process</b>	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.
<b>Course outcomes (Course Skill Set):</b> At the end of the course the student will be able to: <ul style="list-style-type: none"> <li>Classify the types of tillage and tillage tools.</li> <li>Determine the various forces acting on tillage tools</li> <li>Distinguish the various methods involved in sowing, inter cultivation and plant protection operation</li> <li>Categorize the various types of sowing, inter cultivation and plant protection equipment</li> <li>Apply basic knowledge of the crop harvesting machineries</li> <li>Understand about testing of farm machine</li> </ul>	
<b>Assessment Details (both CIE and SEE)</b> 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 5<sup>th</sup> week of the semester
- Second test at the end of the 10<sup>th</sup> week of the semester

Two assignments each of **10 Marks**

- First assignment at the end of 4<sup>th</sup> week of the semester
- Second assignment at the end of 9<sup>th</sup> 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 15<sup>th</sup> 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=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](https://en.wikipedia.org/wiki/List_of_agricultural_machinery)

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

- Quizzes
- Assignments
- Seminars
- Mini Projects

  
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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
<b>Course objectives:</b> <ul style="list-style-type: none"><li>• Understand the basic principle of refrigeration and air conditioning</li><li>• Study various refrigeration cycles and evaluate performance using Mollier charts or refrigerant property tables.</li><li>• Learn about the Vapour absorption system and Steam jet refrigeration</li><li>• Know the Psychrometric Properties and Processes</li><li>• Familiarize with Air Conditioning Systems and Distribution of Air</li></ul>			
<b>Teaching-Learning Process (General Instructions)</b> <p>These are sample strategies, which teachers can use to accelerate the attainment of the various course outcomes.</p> <ol style="list-style-type: none"><li>1. Adopt different types of teaching methods to develop the outcomes through PowerPoint presentations and Video demonstrations or Simulations.</li><li>2. Chalk and Talk method for Problem Solving.</li><li>3. Adopt flipped classroom teaching method.</li><li>4. Adopt collaborative (Group Learning) learning in the class.</li><li>5. Adopt Problem Based Learning (PBL), which fosters students' analytical skills and develops thinking skills such as evaluating, generalizing, and analysing information.</li></ol>			
<b>MODULE-1</b>			
<b>Gas Power Cycles:</b> 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. <b>Air Compressors:</b> 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.			
<b>Teaching-Learning Process</b>	1. Power-point Presentation, 2. Video demonstration or Simulations, 3. Chalk and Talk are used for Problem Solving./White board		
<b>MODULE-2</b>			
<b>Ideal gases:</b> 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. <b>Real gases</b> – 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.			
<b>Teaching-Learning Process</b>	. 1. Power-point Presentation, 2. Video demonstration or Simulations, 3. Chalk and Talk are used for Problem Solving./White board		
<b>MODULE-3</b>			
<b>Refrigeration:</b> 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. <b>Psychrometrics and Air-Conditioning Systems:</b> 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.			



<b>Teaching-Learning Process</b>	1. Power-point Presentation, 2. Video demonstration or Simulations, 3. Chalk and Talk are used for Problem Solving./White board
<b>MODULE-4</b>	
<b>Introduction to Turbo machines:</b> 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, <b>Introduction to positive displacement machines:</b> Classification, comparison with turbomachines. Construction and working of reciprocating pump, gear and vane pumps,	
<b>Teaching-Learning Process</b>	1. Power-point Presentation, 2. Video demonstration or Simulations, 3. Chalk and Talk are used for Problem Solving./White board
<b>MODULE 5</b>	
<b>Centrifugal Pumps:</b> 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. <b>Centrifugal Blowers &amp; Compressors:</b> Centrifugal blower; types; size & speed; vane shape & efficiency; vane shape & characteristics; actual performances characteristics; Concept of slip and slip coefficient	
<b>Teaching-Learning Process</b>	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 5<sup>th</sup> week of the semester
2. Second test at the end of the 10<sup>th</sup> week of the semester
3. Third test at the end of the 15<sup>th</sup> week of the semester

Two assignments each of **10 Marks**

4. First assignment at the end of 4<sup>th</sup> week of the semester
5. Second assignment at the end of 9<sup>th</sup> 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 13<sup>th</sup> 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, 5th edition, 2001.

**Web links and Video Lectures (e-Resources):**

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

  
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Mijar, Moodubidire - 574225**



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
<b>Course Objectives:</b> <ul style="list-style-type: none"><li>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.</li><li>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.</li></ul>			
<b>Teaching-Learning Process (General Instructions)</b> These are sample Strategies; which teachers can use to accelerate the attainment of the various course outcomes. <ol style="list-style-type: none"><li>Adopt different types of teaching methods to develop the outcomes through PowerPoint presentations and Video demonstrations or Simulations.</li><li>Chalk and Talk method for Problem Solving.</li><li>Arrange visits to show the live working models other than laboratory topics.</li><li>Adopt collaborative (Group Learning) Learning in the class.</li><li>Adopt Problem Based Learning (PBL), which fosters students Analytical skills and develops thinking skills such as evaluating, generalizing, and analyzing information.</li><li>Conduct Laboratory Demonstrations and Practical Experiments to enhance experiential skills.</li></ol>			
<b>Module-1</b>			
<b>Introduction:</b> 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.			
<b>Teaching-Learning Process</b>	<ol style="list-style-type: none"><li>PowerPoint Presentation</li><li>Chalk and Talk are used for Problem Solving (In-general)</li><li>Video demonstration or Simulations</li><li>Laboratory Demonstrations and Practical Experiments</li></ol>		
<b>Module-2</b>			
<b>Erosion Control Measures:</b> 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.			
<b>Teaching-Learning Process</b>	<ol style="list-style-type: none"><li>PowerPoint Presentation</li><li>Chalk and Talk are used for Problem Solving (In-general)</li><li>Video demonstration or Simulations</li><li>Laboratory Demonstrations and Practical Experiments</li></ol>		
<b>Module-3</b>			
<b>Wind Erosion:</b> 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.			
<b>Teaching-Learning Process</b>	<ol style="list-style-type: none"><li>PowerPoint Presentation</li><li>Chalk and Talk are used for Problem Solving (In-general)</li><li>Video demonstration or Simulations</li><li>Laboratory Demonstrations and Practical Experiments</li></ol>		
<b>Module-4</b>			
<b>Soil Loss Estimation:</b> 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.			
<b>Teaching-Learning Process</b>	<ol style="list-style-type: none"><li>PowerPoint Presentation</li><li>Chalk and Talk are used for Problem Solving (In-general)</li></ol>		

<b>Process</b>	3. Video demonstration or Simulations
	4. Laboratory Demonstrations and Practical Experiments
<b>Module-5</b>	
<b>Design Principle of Channel:</b> Most Economical trapezoidal, introduction to water harvesting techniques; introduction to stream water quality and pollution.	
<b>Teaching-Learning Process</b>	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 5<sup>th</sup> week of the semester
2. Second test at the end of the 10<sup>th</sup> week of the semester
3. Third test at the end of the 15<sup>th</sup> week of the semester

Two assignments each of **10 Marks**

4. First assignment at the end of 4<sup>th</sup> week of the semester
5. Second assignment at the end of 9<sup>th</sup> 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 13<sup>th</sup> 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):**

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

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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
<b>Course objectives:</b> <ol style="list-style-type: none"> <li>1. To provide an insight to different machine tools, accessories and attachments.</li> <li>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.</li> <li>3. To expose the students to CNC Machine Tools, CNC part programming, and industrial robots.</li> <li>4. To provide an insight into different sand preparation and foundry equipment.</li> <li>5. To provide training to students to enhance their practical skills in milling, shaping and hand moulding operations.</li> </ol>			
Sl.NO	Experiments		
1.	<b>Machine shop:</b> <ol style="list-style-type: none"> <li>I. Introduction, Lathe machine, types of lathe machine, working principle of lathe, parts, Cutting tools, accessories &amp; attachment</li> <li>II. Jobs involving in thread cutting, groove cutting &amp; plane turning</li> <li>III. Jobs involving in taper turn, knurling, chamfering &amp; centre drilling</li> </ol>		
2.	<b>Shaper</b> <ol style="list-style-type: none"> <li>I. Introduction, classification of shaper, working principle &amp; parts of shaper</li> <li>II. Jobs involving in cutting of V Groove/ dovetail / Rectangular groove using a shaper</li> </ol>		
3.	<b>Milling machine</b> <ol style="list-style-type: none"> <li>I. Introduction, types, working principle, tools &amp; equipment's used</li> <li>II. Jobs involving in Cutting of Gear Teeth using Milling Machine</li> <li>III. Jobs involved to use indexing for preparation of hexagon</li> </ol>		
4.	<b>Computer Numerical Control (CNC):</b> <ol style="list-style-type: none"> <li>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.</li> </ol>		
5.	<b>Foundry shop</b> <ol style="list-style-type: none"> <li>I. Introduction to foundry materials, moulds, uses of cores, melting furnaces, tools &amp; equipment used in Foundry shop</li> <li>II. Mould making using single piece pattern (step block-round)</li> <li>III. Mould making using split piece pattern</li> </ol>		
<b>Course outcomes (Course Skill Set):</b> At the end of the course the student will be able to: <ol style="list-style-type: none"> <li>1. Understand integral parts of lathe, shaping and milling machines and various accessories and attachments used.</li> <li>2. Select cutting parameters like cutting speed, feed, depth of cut, and tooling for various machining operations.</li> <li>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.</li> <li>4. Perform machining operations such as plain shaping, inclined shaping, keyway cutting and Indexing etc.</li> <li>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.</li> </ol>			



### 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 down to 30 marks (60% of maximum marks).
- Weightage to be given for neatness and submission of record/write-up on time.
- Department shall conduct 02 tests for 100 marks, the first test shall be conducted after the 8<sup>th</sup> week of the semester and the second test shall be conducted after the 14<sup>th</sup> 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. 4<sup>th</sup> 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.

  
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## V Semester

RESEARCH METHODOLOGY & INTELLECTUAL PROPERTY RIGHTS			
Course Code:	21RMI56	CIE Marks	50
Teaching Hours/Week (L:T:P: S)	1:2:0:0	SEE Marks	50
Total Hours of Pedagogy	25	Total Marks	100
Credits	02	Exam Hours	03
<b>Course Objectives:</b> CO1. To Understand the knowledge on basics of research and its types. CO2. To Learn the concept of Literature Review, Technical Reading, Attributions and Citations. CO3. To learn Ethics in Engineering Research. CO4. To Discuss the concepts of Intellectual Property Rights in engineering.			
<b>Teaching-Learning Process (General Instructions)</b> These are sample Strategies; which teachers can use to accelerate the attainment of the various course outcomes.  <div><div>1.</div><div>Lecturer methods (L) need not be only the traditional lecture methods, but alternative effective teaching methods could be adopted to attain the outcomes.</div></div> <div><div>2.</div><div>Use of Video to explain various concepts on IPR.</div></div> <div><div>3.</div><div>Encourage collaborative (Group Learning) Learning in the class.</div></div> <div><div>4.</div><div>Ask at least three HOT (Higher Order Thinking) questions in the class, which promotes critical thinking.</div></div> <div><div>5.</div><div>Introduce Topics in manifold representations.</div></div> <div><div>6.</div><div>Show the different ways to analyze the research problem and encourage the students to come up withtheir own creative ways to solve them.</div></div> <div><div>7.</div><div>Discuss how every concept can be applied to the real world - and when that's possible, it helps Improve the students' understanding.</div></div>			
<b>Module-1 (5 Hours)</b>			
<b>Introduction:</b> Meaning of Research, Objectives of Engineering Research, and Motivation in Engineering Research, Types of Engineering Research, Finding and Solving a Worthwhile Problem.  Ethics in Engineering Research, Ethics in Engineering Research Practice, Types of Research Misconduct, Ethical Issues Related to Authorship.			
<b>Teaching- Learning Process</b>	Chalk and talk method / PowerPoint Presentation.		
<b>Module-2(5 Hours)</b>			
<b>Literature Review and Technical Reading,</b> New and Existing Knowledge, Analysis and Synthesis of Prior Art Bibliographic Databases, Web of Science, Google and Google Scholar, Effective Search: The Way Forward Introduction to Technical Reading Conceptualizing Research, Critical and Creative Reading, Taking Notes While Reading, Reading Mathematics and Algorithms, Reading a Datasheet. <b>Attributions and Citations:</b> Giving Credit Wherever Due, Citations: Functions and Attributes, Impact of Title and Keywords on Citations, Knowledge Flow through Citation, Citing Datasets, Styles for Citations, Acknowledgments and Attributions, What Should Be Acknowledged, Acknowledgments in, Books Dissertations, Dedication or Acknowledgments.			
<b>Teaching-Learning Process</b>	Chalk and talk method / PowerPoint Presentation		
<b>Module-3(5 Hours)</b>			
<b>Introduction To Intellectual Property:</b> Role of IP in the Economic and Cultural Development of the Society, IP Governance, IP as a Global Indicator of Innovation, Origin of IP History of IP in India. Major Amendments in IP Laws and Acts in India.  <b>Patents:</b> Conditions for Obtaining a Patent Protection, To Patent or Not to Patent an Invention. Rights Associated with Patents. Enforcement of Patent Rights. Inventions Eligible for Patenting. Non-Patentable Matters. Patent Infringements. Avoid Public Disclosure of an Invention before Patenting. Process of Patenting. Prior Art Search. Choice of Application to be Filed. Patent Application Forms. Jurisdiction of Filing Patent Application. Publication. Pre-grant Opposition. Examination. Grant of a Patent. Validity of Patent Protection. Post-grant Opposition. Commercialization of a Patent. Need for a Patent Attorney/Agent. Can a Worldwide Patent be Obtained. Do I Need First to File a Patent in India. Patent Related Forms. Fee Structure. Types of Patent Applications. Commonly Used Terms in Patenting. National Bodies Dealing with Patent Affairs. Utility Models.  <b>Process of Patenting.</b> Prior Art Search. Choice of Application to be Filed. Patent Application Forms. Jurisdiction of Filing Patent Application. Publication. Pre-grant Opposition. Examination. Grant of a Patent. Validity of Patent Protection. Post-grant Opposition. Commercialization of a Patent. Need for a Patent Attorney/Agent. Can a Worldwide Patent be Obtained. Do I Need First to File a Patent in India. Patent Related Forms. Fee Structure. Types of Patent Applications. Commonly Used Terms in Patenting. National Bodies Dealing with Patent Affairs. Utility Models.			
<b>Teaching- Learning Process</b>	Chalk and talk method / PowerPoint Presentation.		



<b>Module-4(5 Hours)</b>	
<p><b>Copyrights and Related Rights:</b> Classes of Copyrights, Criteria for Copyright, Ownership of Copyright, Copyrights of the Author, Copyright Infringements, Copyright Infringement is a Criminal Offence, Copyright Infringement is a Cognizable Offence, Fair Use Doctrine, Copyrights and Internet, Non-Copyright Work, Copyright Registration, Judicial Powers of the Registrar of Copyrights, Fee Structure, Copyright Symbol, Validity of Copyright, Copyright Profile of India, Copyright and the word 'Publish', Transfer of Copyrights to a Publisher, Copyrights and the Word 'Adaptation', Copyrights and the Word 'Indian Work', Joint Authorship, Copyright Society, Copyright Board, Copyright Enforcement Advisory Council (CEAC), International Copyright Agreements, Conventions and Treaties, Interesting Copyrights Cases.</p> <p><b>Trademarks:</b> Eligibility Criteria, Who Can Apply for a Trademark, Acts and Laws, Designation of Trademark Symbols, Classification of Trademarks, Registration of a Trademark is Not Compulsory, Validity of Trademark, Types of Trademark Registered in India, Trademark Registry, Process for Trademarks Registration, Prior Art Search, Famous Case Law: Coca-Cola Company vs. Bisleri International Pvt. Ltd.</p>	
<b>Module-5(5 Hours)</b>	
<p><b>Industrial Designs:</b> Eligibility Criteria, Acts and Laws to Govern Industrial Designs, Design Rights, Enforcement of Design Rights, Non-Protectable Industrial Designs India, Protection Term, Procedure for Registration of Industrial Designs, Prior Art Search, Application for Registration, Duration of the Registration of a Design, Importance of Design Registration, Cancellation of the Registered Design, Application Forms, Classification of Industrial Designs, Designs Registration Trend in India, International Treaties, Famous Case Law: Apple Inc. vs. Samsung Electronics Co.</p> <p><b>Geographical Indications:</b> Acts, Laws and Rules Pertaining to GI, Ownership of GI, Rights Granted to the Holders, Registered GI in India, Identification of Registered GI, Classes of GI, Non-Registerable GI, Protection of GI, Collective or Certification Marks, Enforcement of GI Rights, Procedure for GI Registration Documents Required for GI Registration, GI Ecosystem in India.</p> <p><b>Case Studies on Patents.</b> Case study of Curcuma (Turmeric) Patent, Case study of Neem Patent, Case study of Basmati patent. <b>IP Organizations In India, Schemes and Programmes</b></p>	
<b>Teaching- Learning Process</b>	Chalk and talk method / PowerPoint Presentation
<p><b>Assessment Details (both CIE and SEE)</b></p> <p>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.</p> <p><b>Continuous Internal Evaluation:</b></p> <p><b>Three Unit Tests each of 20 Marks (duration 01 hour)</b></p> <ol style="list-style-type: none"> <li>1. First test at the end of 5 th week of the semester</li> <li>2. Second test at the end of the 10 th week of the semester</li> <li>3. Third test at the end of the 15 th week of the semester</li> </ol> <p><b>Two assignments each of 10 Marks</b></p> <ol style="list-style-type: none"> <li>4. First assignment at the end of 4 th week of the semester</li> <li>5. Second assignment at the end of 9 th week of the semester</li> </ol> <p>Group discussion/Seminar/quiz any one of three suitably planned to attain the COs and POs for 20 Marks (duration 01 hours)</p> <ol style="list-style-type: none"> <li>6. At the end of the 13th week of the semester</li> </ol> <p>The sum of three tests, two assignments, and quiz/seminar/group discussion will be out of 100 marks and will <b>be scaled down to 50 marks</b> (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).</p> <p>CIE methods /question paper is designed to attain the different levels of Bloom's taxonomy as per the Outcome defined for the course.</p> <p><b>Semester End Examination:</b></p> <p>Theory SEE will be conducted by University as per the scheduled timetable, with common question papers for the subject (duration 03 hours)</p> <ol style="list-style-type: none"> <li>1. The question paper will be set for 100 marks. Marks scored shall be proportionally reduced to 50 marks</li> <li>2. The question paper will have ten questions. Each question is set for 20 marks.</li> <li>3. There will be 2 questions from each module. Each of the two questions is under a module (with a maximum of 2 sub-questions).</li> <li>4. The students have to answer 5 full questions, selecting one full question from each module.</li> </ol> <p><b>Marks scored by the students will be proportionally scaled down to 50 marks</b></p>	



**Course Outcomes (Course Skill Set)**

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

- CO 1. To know the meaning of engineering research.
- CO 2. To know the procedure of Literature Review and Technical Reading.
- CO 3. To know the fundamentals of patent laws and drafting procedure.
- CO 4. Understanding the copyright laws and subject matters of copyrights and designs
- CO 5. Understanding the basic principles of design rights.

**Suggested Learning Resources:****Textbook**

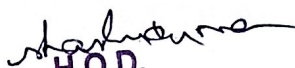
1. Dipankar Deb • Rajeeb Dey, Valentina E. Balas "Engineering Research Methodology", ISSN 1868-4394 ISSN 1868-4408 (electronic), Intelligent Systems Reference Library, ISBN 978-981-13-2946-3 ISBN 978-981-13-2947-0 (eBook), <https://doi.org/10.1007/978-981-13-2947-0>
2. Intellectual Property A Primer for Academia by Prof. Rupinder Tewari Ms. Mamta Bhardwa

**Reference Book:**

1. David V. Thiel "Research Methods for Engineers" Cambridge University Press, 978-1-107-03488-4
2. Intellectual Property Rights by N.K.Acharya Asia Law House 6<sup>th</sup> Edition. ISBN: 978-93-81849-30-9

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

- Quizzes
- Assignments
- Seminars

  
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## V Semester

V Semester			
Environmental Studies			
Course Code	21CIV57	CIE Marks	50
Teaching Hours/Week (L:T:P: S)	1+2+0+0	SEE Marks	50
Total Hours of Pedagogy	15	Total Marks	100
Credits	01	Exam Hours	01
<b>Course objectives:</b> <ul style="list-style-type: none"><li>To create environmental awareness among the students.</li><li>To gain knowledge on different types of pollution in the environment.</li></ul>			
<b>Teaching-Learning Process (General Instructions)</b> <p>These are sample Strategies; which teacher can use to accelerate the attainment of the various course outcomes.</p> <ol style="list-style-type: none"><li>Apart from conventional lecture methods various types of innovative teaching techniques through videos, and animation films may be adopted so that the delivered lesson can progress the students in theoretical, applied and practical skills.</li><li>Environmental awareness program for the in house campus</li><li>Encourage collaborative (Group Learning) Learning in the class.</li><li>Seminars, surprise tests and Quizzes may be arranged for students in respective subjects to develop skills.</li></ol>			
<b>Module-1</b>			
Ecosystems (Structure and Function): Forest, Desert, Wetlands, River, Oceanic and Lake. Biodiversity: Types, Value; Hot-spots; Threats and Conservation of biodiversity, Forest Wealth, and Deforestation.			
Teaching-Learning Process	Chalk and talk, PowerPoint presentation and animation tools		
<b>Module-2</b>			
Advances in Energy Systems (Merits, Demerits, Global Status and Applications): Hydrogen, Solar, OTEC, Tidal and Wind. Natural Resource Management (Concept and case-studies): Disaster Management, Sustainable Mining, case studies, and Carbon Trading.			
Teaching-Learning Process	Chalk and talk, powerpoint presentation and animation tools		
<b>Module-3</b>			
<b>Environmental Pollution</b> (Sources, Impacts, Corrective and Preventive measures, Relevant Environmental Acts, Case-studies): Surface and Ground Water Pollution; Noise pollution; Soil Pollution and Air Pollution. <b>Waste Management &amp; Public Health Aspects:</b> Bio-medical Wastes; Solid waste; Hazardous wastes; E-wastes; Industrial and Municipal Sludge.			
Teaching-Learning Process	Chalk and talk, powerpoint presentation and animation tools		
<b>Module-4</b>			
<b>Global Environmental Concerns</b> (Concept, policies and case-studies): Ground water depletion/recharging, Climate Change; Acid Rain; Ozone Depletion; Radon and Fluoride problem in drinking water; Resettlement and rehabilitation of people, Environmental Toxicology.			
Teaching-Learning Process	Chalk and talk, powerpoint presentation and animation tools		



Module-5	
<b>Latest Developments in Environmental Pollution Mitigation Tools (Concept and Applications):</b> G.I.S. & Remote Sensing, Environment Impact Assessment, Environmental Management Systems, ISO14001; Environmental Stewardship- NGOs. Field work: Visit to an Environmental Engineering Laboratory or Green Building or Water Treatment Plant or Waste water treatment Plant; ought to be Followed by understanding of process and its brief documentation.	
<b>Teaching-Learning Process</b>	Chalk and talk, power point presentation and animation tools
<b>Course outcome (Course Skill Set)</b> At the end of the course the student will be able to : <ul style="list-style-type: none"> <li>• CO1: Understand the principles of ecology and environmental issues that apply to air, land, and water issues on a global scale,</li> <li>• CO2: Develop critical thinking and/or observation skills, and apply them to the analysis of a problem or question related to the environment.</li> <li>• CO3: Demonstrate ecology knowledge of a complex relationship between biotic and a biotic components.</li> <li>• • CO4: Apply their ecological knowledge to illustrate and graph a problem and describe the realities that managers face when dealing with complex issues.</li> </ul>	
<b>Assessment Details (both CIE and SEE)</b> 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 <b>Continuous Internal Evaluation:</b> Three Unit Tests each of <b>20 Marks (duration 01 hour)</b> <ol style="list-style-type: none"> <li>1. First test at the end of 5<sup>th</sup> week of the semester</li> <li>2. Second test at the end of the 10<sup>th</sup> week of the semester</li> <li>3. Third test at the end of the 15<sup>th</sup> week of the semester</li> </ol> Two assignments each of <b>10 Marks</b> <ol style="list-style-type: none"> <li>4. First assignment at the end of 4<sup>th</sup> week of the semester</li> <li>5. Second assignment at the end of 9<sup>th</sup> week of the semester</li> </ol> Group discussion/Seminar/quiz any one of three suitably planned to attain the COs and POs for <b>20 Marks (duration 01 hours)</b> <ol style="list-style-type: none"> <li>6. At the end of the 13<sup>th</sup> week of the semester</li> </ol> The sum of three tests, two assignments, and quiz/seminar/group discussion will be out of 100 marks and will be <b>scaled down to 50 marks</b> (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). <b>CIE methods /question paper is designed to attain the different levels of Bloom's taxonomy as per the outcome defined for the course.</b>	
<b>Semester End Examination:</b> Theory SEE will be conducted by University as per the scheduled timetable, with common question papers for the subject ( <b>duration 01 hours</b> ) <b>Question paper pattern:</b> <ol style="list-style-type: none"> <li>1. The Question paper will have 50 objective questions.</li> </ol>	

2. Each question will be for 01 marks
3. Students will have to answer all the questions on an OMR Sheet.
4. The Duration of the Exam will be 01 hour

**Suggested Learning Resources:**

**Books**

- Environmental studies, Benny Joseph, Tata McGraw-Hill 2<sup>nd</sup> edition 2012
- Environmental studies, S M Prakash, pristine publishing house, Mangalore 3<sup>rd</sup> edition-2018

**Reference Books: -**

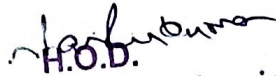
- Benny Joseph, Environmental studies, Tata McGraw-Hill 2<sup>nd</sup> edition 2009
- M.Ayi Reddy Textbook of environmental science and Technology, BS publications 2007
- Dr. B.S Chauhan, Environmental studies, university of science press 1<sup>st</sup> edition

**Web links and Video Lectures (e-Resources):**

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

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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
<b>Course objectives:</b> <ul style="list-style-type: none"><li>• Describe how AR systems work and list the applications of AR.</li><li>• Understand and analyse the hardware requirement of AR.</li><li>• Use computer vision concepts for AR and describe AR techniques</li><li>• Analyse and understand the working of various state of the art AR devices</li><li>• Acquire knowledge of mixed reality</li></ul>			
<b>Teaching-Learning Process (General Instructions)</b> <p>These are sample Strategies, which teachers can use to accelerate the attainment of the various course outcomes.</p> <ol style="list-style-type: none"><li>1. Adopt different types of teaching methods to develop the outcomes through PowerPoint presentations and Video demonstrations or Simulations.</li><li>2. Chalk and Talk method for Problem Solving.</li><li>3. Adopt flipped classroom teaching method.</li><li>4. Adopt collaborative (Group Learning) learning in the class.</li><li>5. Adopt Problem Based Learning (PBL), which fosters students' analytical skills and develops thinking skills such as evaluating, generalizing, and analysing information.</li></ol>			
<b>Module-1</b>			
<b>Introduction to Augmented Reality (A.R):</b> 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			
<b>Augmented Reality Concepts-</b> Concepts Related to Augmented Reality, Ingredients of an Augmented Reality Experience.			
<b>Teaching-Learning Process</b>	<ol style="list-style-type: none"><li>1. Power-point Presentation,</li><li>2. Video demonstration or Simulations,</li><li>3. Chalk and Talk are used for Problem Solving./White board</li></ol>		
<b>Module-2</b>			

<b>Augmented Reality Hardware:</b> <b>Augmented Reality Hardware – Displays</b> – Audio Displays, Haptic Displays, Visual Displays, Other sensory displays, Visual Perception , Requirements and Characteristics, Spatial Display Model. <b>Processors</b> – Role of Processors, Processor System Architecture, Processor Specifications. <b>Tracking &amp; Sensors</b> - Tracking, Calibration, and Registration, Characteristics of Tracking Technology, Stationary Tracking Systems, Mobile Sensors, Optical Tracking, Sensor Fusion.	
<b>Teaching-Learning Process</b>	1. Power-point Presentation, 2. Video demonstration or Simulations, 3. Chalk and Talk are used for Problem Solving./White board
<b>Module-3</b>	
<b>Computer Vision for Augmented Reality &amp; A.R. Software: Computer Vision for Augmented Reality</b> - Marker Tracking, Multiple-Camera Infrared Tracking, Natural Feature Tracking by Detection, Simultaneous Localization and Mapping, Outdoor Tracking <b>Augmented Reality Software</b> - Introduction, Major Software Components for Augmented Reality Systems, Software used to Create Content for the Augmented Reality Application.	
<b>Teaching-Learning Process</b>	1. Power-point Presentation, 2. Video demonstration or Simulations, 3. Chalk and Talk are used for Problem Solving./White board
<b>Module-4</b>	
<b>AR Techniques- Marker based &amp; Markerless tracking: Marker-based approach-</b> Introduction to marker-based tracking, types of markers, marker camera pose and identification, visual tracking, mathematical representation of matrix multiplication <b>Marker types-</b> Template markers, 2D barcode markers, imperceptible markers. <b>Marker-less approach-</b> Localization based augmentation, real world examples <b>Tracking methods-</b> Visual tracking, feature based tracking, hybrid tracking, and initialization and recovery.	
<b>Teaching-Learning Process</b>	1. Power-point Presentation, 2. Video demonstration or Simulations, 3. Chalk and Talk are used for Problem Solving./White board
<b>Module-5</b>	
<b>AR Devices &amp; Components : AR Components</b> – Scene Generator, Tracking system, monitoring system, display, Game scene <b>AR Devices</b> – Optical See- through HMD, Virtual retinal systems, Monitor bases systems, Projection displays, and Video see-through systems	
<b>Teaching-Learning Process</b>	1. Power-point Presentation, 2. Video demonstration or Simulations, 3. Chalk and Talk are used for Problem Solving./White board
<b>Course outcome (Course Skill Set)</b> 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 5<sup>th</sup> week of the semester
2. Second test at the end of the 10<sup>th</sup> week of the semester
3. Third test at the end of the 15<sup>th</sup> week of the semester

Two assignments each of **10 Marks**

1. First assignment at the end of 4<sup>th</sup> week of the semester
2. Second assignment at the end of 9<sup>th</sup> 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

  
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