

TRACTOR & AUTOMOTIVE ENGINES		Semester	IV
Course Code	BAG402	CIE Marks	50
Teaching Hours/Week (L:T:P: S)	(3:0:2:0)	SEE Marks	50
Total Hours of Pedagogy	40 hours Theory + 8-10 Lab slots	Total Marks	100
Credits	04	Exam Hours	03
Examination nature (SEE)	Theory		
<b>Course Objectives:</b>			
<ul style="list-style-type: none"><li>The objective of this subject is to impart the knowledge of tractor engine components, working principles of IC engines, auxiliary systems, the combustion aspects of SI and CI engines in addition to the methods of improving performance.</li><li>The students shall become aware on the latest developments in the field of IC engines like MPFI, CRDI etc. The student also shall apply the thermodynamic concepts in IC engines.</li><li>Basic understanding of fuel properties and its measurements using various types of measuring devices</li><li>Energy conversion principles, analysis and understanding of I C Engines will be discussed.</li><li>Application of these concepts for these machines will be demonstrated. Performance analysis will be carried out using characteristic curves.</li><li>Exhaust emissions of I C Engines will be measured and compared with the standards.</li></ul>			
<b>Teaching-Learning Process (General Instructions)</b>			
These are sample Strategies, which teacher 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></ol>			
<b>Module-1</b>		<b>8 HOURS</b>	
<b>Introduction about design and development of Agril. Tractors</b>			
Introduction, different types of tractors available in india/abroad and its importance in agriculture. Selection of engines available in the market and their performance.			
<b>Farm power</b> – Introduction, sources of farm power, merits and demerits of different forms of power, status of farm power in India. Conventional and non conventional energy sources, classification of tractor and I.C engines,			
<b>Module-2</b>		<b>8 HOURS</b>	
<b>Study of I.C engine</b> – Introduction, Thermodynamic cycle, Principle and working of IC engine. Comparison of 2-stroke and 4-stroke engine cycles and CI and SI engines. Engine components.			
<b>Study of Engine Valve systems</b> , valve mechanism and Valve timing diagram. Study of importance of air cleaning system. Study of types of air cleaners and performance characteristics of various air cleaners.			
<b>Module-3</b>		<b>8 HOURS</b>	
<b>Study of fuel supply system.</b> Study of fuels, properties of fuels, calculation of air-fuel ratio. Study of tests on fuel for SI and CI engines. Study of detonation and knocking in IC engines. Study of carburetion system, carburetors and their main functional components.			
<b>Study of fuel injection system</b> – Injection pump, their types, working principles. Fuel injector nozzles – their types and working principle. Fuel filter. (Simple problems)			
<b>Module-4</b>		<b>8 HOURS</b>	
<b>Study of governor</b> – Introduction, principle of governors, classification of governing system. Governor regulation and governor hunting			
<b>Study of lubrication system</b> – Introduction, lubricating oil tests, types and functional components of governors. Study of lubricants – physical properties, additives and their application.			
<b>Study of cooling system</b> – need, cooling methods and main functional components. Study of need and type of thermostat valves. Additives in the coolant.			



Module-5	8 HOURS
<b>Study of ignition system of SI engines</b> – Introduction, types of ignition system and their components. Measurement of engine power – Terminology connected with engine power (simple problems)	

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

Sl.NO	Experiments
1	Study of I.C. Engine parts and functions
2	Study of Working principle of Four stroke and Two stroke cycle I.C. Engine
3	Study of valve system and valve timing diagram
4	Determination of engine power
5	Study of Oil & Fuel system - determination of physical properties
6	Study of Air cleaning system
7	Study of Diesel injection system & timing
8	Study of Cooling system
9	Demonstration of working of governing system
10	Demonstration of working of Lubricating system
11	Demonstration of working of electrical and ignition system
12	Visit to engine manufacturer/ assembler/ spare parts agency. (Optional)

**Course outcomes (Course Skill Set):**

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

- Understand, discuss and describe the fundamentals and working of IC engine
- Apply their knowledge and identify the working mechanism of different components of IC engine.
- Analyse the problems in using right amount of fuel and lubricants for better efficiency and economy
- Evaluate and understand the heat engine balance of engine for maintaining at right temperature for different type of work
- Apply and understand ignition system and problems faced during starting of ignition system
- Apply and understand governing system and problems faced during running of governing system
- Perform experiments to determine the properties of fuels and oils.
- Conduct experiments on engines and draw characteristics.
- Test basic performance parameters of I.C. Engine and implement the knowledge in industry
- Identify exhaust emission, factors affecting them and exhibit his competency towards preventive maintenance of IC Engine

**Assessment Details (both CIE and SEE)**

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

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

- IPCC means practical portion integrated with the theory of the course.
- CIE marks for the theory component are **25 marks** and that for the practical component is **25 marks**.
- 25 marks for the theory component are split into **15 marks** for two Internal Assessment Tests (Two Tests, each of 15 Marks with 01-hour duration, are to be conducted) and **10 marks** for other assessment methods mentioned in 220B4.2. The first test at the end of 40-50% coverage of the syllabus and the second test after covering 85-90% of the syllabus.
- Scaled-down marks of the sum of two tests and other assessment methods will be CIE marks for the theory component of IPCC (that is for **25 marks**).
- The student has to secure 40% of 25 marks to qualify in the CIE of the theory component of IPCC.



### CIE for the practical component of the IPCC

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

### SEE for IPCC

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

1. The question paper will have ten questions. Each question is set for 20 marks.
2. There will be 2 questions from each module. Each of the two questions under a module (with a maximum of 3 sub-questions), **should have a mix of topics** under that module.
3. The students have to answer 5 full questions, selecting one full question from each module.
4. Marks scored by the student shall be proportionally scaled down to 50 Marks
  - **The theory portion of the IPCC shall be for both CIE and SEE, whereas the practical portion will have a CIE component only. Questions mentioned in the SEE paper may include questions from the practical component.**
  - 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. Jagdishwar Sahay. 2015. Elements of Agricultural Engineering. Standard Publishers, New Delhi
2. Jain SC and CR Rai., 2008. Farm Tractor Maintenance and Repair. Standard Publishers, New Delhi
3. Jain, S.C., and Rai, C.R. (1984). Farm Tractor - Maintenance and Repair. Tata Mc Graw- Hill Publishing Company Ltd, New Delhi.
4. Liljedahl John, B., Casleton Walter, M., Turnquist Paul, K., and Smith David, W. (1951). Tractors and Their Power Units, . John Wiley & Sons, New-York.
5. Donnel Hunt. Farm Power Machinery and management. Iowa State University Press, Ames, USA.
6. Gill Paul, W., Smith James, H., and Ziurys Eugene, J. (1967). Fundamentals of Internal Combustion Engines. Oxford & IBE Publishing Company, New Delhi.
7. Gupta, R.B., and Gupta, B.K. (1987). Tractor Mechanic, Theory, Maintenance and Repair. Sathya Prakashan and Tech India Publications, New Delhi.
8. Mathur, M.L., and Sharma, R.P. (1994). A Course in Internal Combustion Engines. Danpat Rai & Sons, Delhi.
9. Gill Paul, W., Smith James, H., and Ziurys Eugene, J. (1967). Fundamentals of Internal Combustion Engines.

Oxford & IBE Publishing Company, New Delhi.

10. Gupta, R.B., and Gupta, B.K. (1987). Tractor Mechanic, Theory, Maintenance and Repair. Sathya Prakashan and Tech India Publications, New Delhi.
11. Jain, S.C., and Rai, C.R. (1984). Farm Tractor - Maintenance and Repair. Tata Mc Graw- Hill Publishing Company Ltd, New Delhi.
12. Nakra C.P., 2009. Farm Machines and Equipments. Dhanpat Rai Publishers, New Delhi
13. Neil Southorn, Tractors, 1995. Operation, Performance and Maintenance, Inkata Press Australia.

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

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

- Quizzes
- Assignments
- Seminars

  
H.O.D.

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