UNIVERSITY OF KERALA

B. TECH. DEGREE COURSE

(2013 SCHEME)

SYLLABUS FOR

IV SEMESTER

MECHANICAL - STREAM - PRODUCTION ENGINEERING

SCHEME -2013

IV SEMESTER

MECHANICAL - STREAM - PRODUCTION ENGINEERING (P)

Course No	Name of subject	Credits	Weekly load, hours			C A Marks	Exam Duration Hrs	U E Max Marks	Total Marks
			L	T	D/ P				
13.401	Engineering Mathematics -III (BCHMNPSU)	4	3	1	-	50	3	100	150
13.402	Humanities (ACHPT)	3	3	-	-	50	3	100	150
13.403	Electrical Technology (MP)	4	3	1	-	50	3	100	150
13.404	Metallurgy & Material Science (MNPU)	4	3	1	-	50	3	100	150
13.405	Machine Tools - I (P)	4	3	1	-	50	3	100	150
13.406	Production Drawing (P)	4	-	-	4	50	3	100	150
13.407	Machine Tool Lab (P)	3	-	-	3	50	3	100	150
13.408	Mechanical Technology Lab (P)	3	-	-	3	50	3	100	150
	Total	**29**	**15**	**4**	**10**	**400**		**800**	**1200**

13.401 ENGINEERING MATHEMATICS - III (BCHMNPSU)

Teaching Scheme: 3(L) - 1(T) - 0(P) **Credits**: 4

Course Objective:

- *To introduce the basic notion in complex analysis such as Analytic Functions, Harmonic functions and their applications in fluid mechanics and differentiations and integration of complex functions, transformations and their applications in engineering fields.*
- *Numerical techniques for solving differential equations are also introduced as a part of this course.*

Module – I

Complex Differentiation: Limits, continuity and differentiation of complex functions. Analytic functions – Cauchy Riemann equations in Cartesian form (proof of necessary part only).Properties of analytic functions – harmonic functions. Milne Thomson method.

Conformal mapping: Conformality and properties of the transformations $w = \frac{1}{z}$, $w = z^2$, $w = z + \frac{1}{z}$, $w = \sin z$, $w = e^z$ - Bilinear transformations.

Module – II

Complex Integration: Line integral – Cauchy's integral theorem – Cauchy's integral formula – Taylor's and Laurent's series – zeros and singularities – residues and residue theorem.

Evaluation of real definite integrals – $\int_0^{2\pi} f(sinx, cosx)dx$, $\int_{-\infty}^{\infty} f(x)dx$ (with no poles on the real axis). (Proof of theorems not required).

Module – III

Numerical techniques-Solutions of algebraic and transcendental equations-Bisection method – Regula-falsi method – Newton - Raphson method. Solution of system of equations - Gauss elimination, Gauss- Siedel iteration. Interpolation – Newton's Forward and backward formulae - Lagrange's interpolation formula.

Module – IV

Numerical integration-Trapezoidal Rule- Simpson's one third rule.

Numerical solution of ODE –Taylor's series method - Euler's method - Modified Euler's method – Runge-Kutta method of order Four.

Numerical Solution of two-dimensional partial differential equation (Laplace equation)-using finite difference method (five point formula)

References:

1. Bali N. P. and M. Goyal, *Engineering Mathematics*, 7/e, Laxmi Publications, India, 2012.
2. Kreyszig E., *Advanced Engineering Mathematics*, 9/e, Wiley India, 2013.
3. Grewal B. S., *Higher Engineering Mathematics*, 13/e, Khanna Publications, 2012.
4. Koneru S. R., *Engineering Mathematics*, 2/e, Universities Press (India) Pvt. Ltd., 2012.
5. Sastry S. S., *Introductory Methods of Numerical Analysis*, 5/e, PHI Learning, 2012.
6. Babu Ram, *Numerical Methods*, 1/e, Pearson Education, 2010.

Internal Continuous Assessment *(Maximum Marks-50)*

50% - Tests (minimum 2)

30% - Assignments (minimum 2) such as home work, problem solving, quiz, literature survey, seminar, term-project, software exercises, etc.

20% - Regularity in the class

University Examination Pattern:

Examination duration: 3 hours *Maximum Total Marks: 100*

The question paper shall consist of 2 parts.

Part A (20 marks) - Five Short answer questions of 4 marks each. All questions are compulsory. There should be at least one question from each module and not more than two questions from any module.

Part B (80 Marks) - Candidates have to answer one full question out of the two from each module. Each question carries 20 marks.

Course Outcome:

After successful completion of this course, the students will be able to use numerical methods to solve problems related to engineering fields. This course helps students to master the basic concepts of complex analysis which they can use later in their career.

13. 402 HUMANITIES (ACHPT)

Teaching Scheme: 3(L) - 0(T) - 0(P) **Credits**: 3

Course Objectives:

- *To explore the way in which economic forces operate in the Indian Economy.*
- *The subject will cover analysis of sectors, dimensions of growth, investment, inflation and the role of government will also be examined.*
- *The principle aim of this subject is to provide students with some basic techniques of economic analysis to understand the economic processes with particular reference to India.*
- *To give basic concepts of book keeping and accounting*

PART I ECONOMICS (2 periods per week)

Module – I

Definition of Economics –Central Economic Problems – Choice of techniques –Production possibility curve – Opportunity Cost-Micro & Macro Economics

Meaning of Demand – Utility-Marginal Utility and Law of Diminishing Marginal Utility-Law of demand - Determinants of Demand – Changes in Demand – Market Demand—Demand, forecasting-Meaning of supply-Law of Supply- Changes in Supply-- Market Price Determination – Implications of Government Price Fixation

Production function – Law of Variable proportion – Returns to scale – Iso-quants and Isocost line- Least cost combination of inputs – Cost concepts – Private cost and Social Cost -

Short run and Long run cost- cost curves – Revenue – Marginal, Average and Total Revenue-Break even Analysis

Module – II

National Income concepts - GNP – GDP – NNP– Per Capita Income – Measurement of National Income-Output method- Income method and Expenditure method -Sectoral Contribution to GDP– Money-Static and Dynamic Functions of Money-Inflation – causes of inflation – measures to control inflation – Demand Pull inflation – cost push inflation – Effects of Inflation – Deflation.

Global Economic Crisis India's Economic crisis in 1991 – New economic policy – Liberalization – Privatization and Globalization-Multinational Corporations and their impacts on the Indian Economy- Foreign Direct Investment (FDI) Performance of India-Issues and Concerns. Industrial sector in India – Role of Industrialization -Industrial Policy Resolutions-Industry wise analysis – Electronics – Chemical – Automobile – Information Technology.

Environment and Development – Basic Issues – Sustainable Development- Environmental Accounting – Growth versus Environment – The Global Environmental Issues- Poverty- Magnitude of Poverty in India- -Poverty and Environment

PART-II- ACCOUNTANCY (1 Period per week)

Module – III

Book-Keeping and Accountancy- Elements of Double Entry- Book –Keeping-rules for journalizing-Ledger accounts-Cash book- Banking transactions- Trial Balance- Method of Balancing accounts-the journal proper(simple problems).

Final accounts: Preparation of trading and profit and loss Account- Balance sheet (with simple problems) - Introduction to accounting packages (Description only).

References

1. Dewett K. K., *Modern Economic Theory,* S Chand and Co. Ltd., New Delhi, 2002.
2. Todaro M., *Economic Development*, Addison Wesley Longman Ltd., 1994.
3. Sharma M. K., *Business Environment in India,* Commonwealth Publishers, 2011.
4. Mithani D. M., *Money, Banking, International Trade and Public Finance*, Himalaya Publishing House, New Delhi, 2012.
5. Dutt R. and K. P. M. Sundaran*, Indian Economy,* S. Chand and Co. Ltd., New Delhi, 2002.
6. Varian H. R., *Intermediate Micro Economics,* W W Norton & Co. Inc., 2011.
7. Koutsoyiannis A., *Modern Micro-economics,* MacMillan, 2003.
8. Batliboi J. R., *Double Entry Book-Keeping,* Standard Accountancy Publ. Ltd., Bombay, 1989.
9. Chandrasekharan Nair K. G., *A Systematic approach to Accounting*, Chand Books, Trivandrum, 2010.

Internal Continuous Assessment *(Maximum Marks-50)*

50% - Tests (minimum 2)

30% - Assignments (minimum 2) such as home work, problem solving, literature survey, seminar, term-project, software exercises, etc.

20% - Regularity in the class

University Examination Pattern:

Examination duration: 3 hours *Maximum Total Marks: 100*

The question paper shall consist of 2 parts. Part I and Part II to be answered in separate answer books.

Part I Economics *(70 marks) – Part I shall consist of 2 parts.*

Part A (20 Marks) - Ten short answer questions of 2 marks each, covering entire syllabus of Part I (five questions each from Module I and Module II). All questions are compulsory.

Part B (50 marks) - Candidates have to answer one full question out of the two from Part I (Module I and Module II). Each question carries 25 marks.

Part II Accountancy *(30 marks)*

Candidates have to answer two full questions out of the three from Part II (Module III). Each question carries 15 marks.

Course outcome:

- *The students will be acquainted with its basic concepts, terminology, principles and assumptions of Economics.*
- *It will help students for optimum or best use of resources of the country.*
- *It helps students to use the understanding of Economics of daily life.*
- *The students will get acquainted with the basics of book keeping and accounting.*

13.403 ELECTRICAL TECHNOLOGY (MP)

Teaching Scheme: 3(L) - 1(T) - 0(P) **Credits**: 4

Course Objectives:

The objective of this course is to give a strong foundation on all electrical machines including dc machines, transformers, induction motors and synchronous motors. It also gives a basic idea about traction and welding.

Module – I

DC Machines-principle of operation-emf equation-types of excitations. Separately excited, shunt and series excited DC generators, compound generators. General idea of armature reaction, OCC and load characteristics - simple numerical problems.

Principles of dc motors-torque and speed equations-torque speed characteristics- variations of speed, torque and power with motor current. Applications of dc shunt series and compound motors. Principles of starting, losses and efficiency – load test- simple numerical problems.

Module – II

Transformers – principles of operations – emf equation- vector diagrams- losses and efficiency – OC and SC tests. Equivalent circuits- efficiency calculations- maximum efficiency – all day efficiency – simple numerical problems. Auto transformers constant voltage transformer- instrument transformers.

Three phase induction motors- slip ring and squirrel cage types- principles of operation – rotating magnetic field- torque slip characteristics- no load and blocked rotor tests. Circle diagrams- methods of starting – direct online – auto transformer starting.

Module – III

Single phase motors- principle of operation of single phase induction motor – split phase motor – capacitor start motor- stepper motor- universal motor Synchronous machines- types – emf equation of alternator – regulation of alternator by emf method. Principles of operation of synchronous motors- methods of starting- V curves- synchronous condenser.

Module – IV

Electric traction – systems of power supply – functional schematic of ac electric locomotives- types of motors used in traction systems. Methods of speed control – methods of braking. Electric welding. Different types.

References:

1. Theraja B. L. and A. K. Theraja, *A Text Book of Electrical Technology*, S. Chand & Company Ltd., 2008.
2. Kothari D. P. and I. J. Nagrath, *Electrical Machines*, Tata McGraw Hill, 2004.
3. Partab H., *Art and Science of Utilization of Electric Energy*, Dhanpat Rai & Sons, 1980.
4. Mehta V. K. and R. Mehta, *Principles of Electrical and Electronics***,** S. Chand & Company Ltd., 1996.
5. Gupta B. R. and V. Singhal, *Fundamentals of Electric Machines*, New Age International Publishers Ltd, New Delhi, 2005.
6. Sivanagaraju S., M. B. Reddy and D. Srilatha, Generation and Utilization Electrical Energy, Pearson Education, 2010.

Internal Continuous Assessment *(Maximum Marks-50)*

50% - Tests (minimum 2)

30% - Assignments (minimum 2) such as home work, problem solving, quiz, literature survey, seminar, term-project, software exercises, etc.

20% - Regularity in the class

University Examination Pattern:

Examination duration: 3 hours *Maximum Total Marks: 100*

The question paper shall consist of 2 parts.

Part A (20 marks) - Ten Short answer questions of 2 marks each. All questions are compulsory. There should be at least two questions from each module and not more than three questions from any module.

Part B (80 Marks) - Candidates have to answer one full question out of the two from each module. Each question carries 20 marks.

Course Outcome:

The student will get a good grasp on working of electrical machines and transformers, and their applications.

13.404 METALLURGY AND MATERIAL SCIENCE (MNPU)

Teaching Scheme: 3(L) - 1(T) - 0(P) **Credits**: 4

Course Objective:

To impart knowledge on engineering materials, deformation of materials, equilibrium diagrams of selected alloy systems, heat treatment of steels, properties of steels, cast iron and other alloys and their applications.

Module – I

Introduction to material science and engineering, Classification of engineering materials, Crystal structure of metallic materials. Imperfections in crystals: point defects, line defects, surface defects.

Mechanical behaviour of materials: Elastic, visco elastic, anelastic behaviour.

Mechanisms of plastic deformation: role of dislocation, slip and twinning; Schmid's law. Strengthening mechanisms: Grain size reduction, solid solution strengthening, work hardening, Precipitation hardening. Recovery, recrystallisation and grain growth.

Specimen preparation for microstructural examination: Etching. Grain size determination by comparison with standard chart, Hall-Petch equation.

Module – II

Fracture: ductile fracture, brittle fracture, Griffith's theory of brittle fracture, ductile to brittle transition , fracture toughness.

Fatigue: mechanism of fatigue, S-N curve. Creep: creep curve, mechanism of creep.

Diffusion: Fick's laws of diffusion, Mechanisms of diffusion, applications. Solidification of metals and alloys. Solid solution, Hume Rothery's rules.

Phase diagrams: Phase rule, Lever Rule, Relationship between micro structure and properties, Isomorphous systems: Cu-Ni phase diagram, Eutectic systems: Pb-Sn phase diagram. Eutectoid and peritectic reactions.

Module – III

Iron- Carbon equilibrium diagram Development of microstructure in Iron Carbon alloys, Phase transformations in steel. Detailed discussion on Iron-Iron Carbide phase diagram with reference to micro constituents like austenite, ferrite, cementite, pearlite and ledeburite.

TTT diagram for eutectoid steel, CCT diagram, critical cooling rate. Transformation of austenite to pearlite, bainite, martensite spheroidite etc.

Heat treatment of steel: Annealing, normalizing, hardening, tempering, austempering, martempering, Hardenability, Jominy end quench test. Surface treatments: Case Hardening, Carburising, Nitriding, Cyaniding, CVD, PVD, Thermal spraying.

Module – IV

Applications of ferrous and non ferrous alloys: Steel- low, medium, high carbon steels, Alloy steels: effect of various alloying elements in steel.

Stainless steels -ferritic, austenitic, martensitic, duplex steels. Tool steels. Cast iron- gray, white, ductile cast irons. Copper and its alloys. Aluminium and its alloys, Magnesium and alloys, Titanium and its alloys.

Composite materials for mechanical engg applications: classification, fabrication methods: stir casting, powder metallurgy and filament winding. Introduction to Smart materials, Nano materials, Bio materials, Bioplastics. Selection of materials based on properties, service, economic and environmental considerations.

References:

1. Callister W. D. and D. G. Rethwisch, *Material Science and Engineering*, 8/e, John & Wiley Sons, 2010.
2. Raghavan V., *Material Science and Engineering*, PHI Learning Pvt. Ltd., 2004.
3. Jose S. and Mathew E. V., *Metallurgy and Materials Science,* Pentagon Educational Services, 2011.
4. Shackelford J., *Introduction to Materials Science for Engineers*, 7/e, Pearson, 2009.
5. Van Vlack L. H., *Elements of Materials Science and Engineering*, Addison-Wesley, 1989.
6. Lakhtin Y., *Engineering Physical Metallurgy*, Gordon and Breach Science Publishers, 1965.
7. Dieter G. E., *Mechanical Metallurgy*, McGraw-Hill, 1976.
8. Reed-Hill R. E., *Physical Metallurgy*, PWS-Kent Publishing Company, 1992.
9. Avner S. H*., Introduction to Physical Metallurgy*, McGraw-Hill, 1974.

Internal Continuous Assessment *(Maximum Marks-50)*

50% - Tests (minimum 2)

30% - Assignments (minimum 2) such as home work, problem solving, quiz, literature survey, seminar, term-project etc.

20% - Regularity in the class

University Examination Pattern:

Examination duration: 3 hours *Maximum Total Marks: 100*

The question paper shall consist of 2 parts.

Part A (20 marks) - Ten Short answer questions of 2 marks each. All questions are compulsory. There should be at least two questions from each module and not more than three questions from any module.

Part B (80 Marks) - Candidates have to answer one full question out of the two from each module. Each question carries 20 marks.

Course Outcome:

After successful completion of the course, the students will possess knowledge on:

- *The property classifications of materials that determine their applicability.*
- *The mechanisms of elastic and plastic deformations and thereby be able to modify the mechanical properties of materials.*
- *Heat treatment processes and how to select suitable heat treatments for specific applications.*
- *Different failure mechanisms and thereby how to decide steps to avoid failures.*
- *Different alloy systems and their applications, so that proper selection of material can be made.*
- *Newer engineering materials like Composites, smart materials, nanomaterials.*

13.405 MACHINE TOOLS – I (P)

Teaching Scheme: 3(L) - 1(T) - 0(P) **Credits:** 4

Course Objectives:

To impart basic concepts of machining and machining tools such as lathe, drilling, shaping, slotting, milling and grinding machines.

Module – I

Introduction to metal removal process- fundamentals of cutting, tool life, cutting tool material and cutting fluid. Machine and Machine Tool -Types of machine tools, Lathes: Engine Lathes – block diagram – functions of each part –Lathe specifications - work holding devices in lathes and their function- different mechanisms, lathe operations, Speed and feed for turning, turning time calculations. Types of lathes- Capstan, Turret, and Copying. Automatic and semi-automatic lathes - their working principles, Applications and essential difference from engine lathe.

Module – II

Drilling machines- types and block diagrams - specifications, main parts and functions, operations- gang milling, multiple drill head, upright drilling, relative operations – reaming, boring, tapping, counter boring, courses sinking, trepanning and spot facing work and tool holding devices, torque calculation – speed, feed and depth of cut - drilling tool nomenclature.

Module – III

Shaping, planning, and slotting machines - specifications, main parts, mechanism, functions, operations -work and tool holding devices, drives adopted and tools used. Types and applications.

Simple problems to calculate the velocity – speed, feed and depth of cut. Reaming and Boring machines- main parts and operations.

Module – IV

Milling machines- types and specifications, main parts and functions, milling operations, Types of milling cutters- indexing-simple, compound and differential. -Milling of spur and helical gears. Gear cutting using milling machine – procedure with neat sketch.

Grinding machines- main parts and functions- plain, cylindrical, centre less and surface grinding operations. Grinding wheels- Cutting speed and feeds- coolants used-Factors governing wheel selection. Wheel dressing. Thread grinding, profile grinding, Tool and cutter grinders.

References:

1. Choudhury S. K. H.,A. K. H. Choudhury and N. Roy, *Elements of Workshop Technology - Machine Tools Vol.* II, 11/e, Media Promoters & Publishers Pvt. Ltd., 2001.
2. HMT, *Production Technology*, Hindustan Machine Tools Ltd., 2001.
3. Jain R.K., *Production Technology,* Khanna Publishers, 2008.
4. Lindberg R. A., *Processes and Material of Manufacture,* 4/e, Pearson Education, 2006.
5. Chapman W. A. J., *Workshop Technology* -III, Intl Ideas, 1981.
6. R. R. Kibbe, R. O. Meyer, J. E. Neely and W. T. White, *Machine Tool Practices*, Pearson Education, 2009.
7. Kalpakjian S., *Manufacturing Engineering and Technology*, 6/e, Pearson Education, 2009.

Internal Continuous Assessment *(Maximum Marks-50)*

50% - Tests (minimum 2)

30% - Assignments (minimum 2) such as home work, problem solving, quiz, literature survey, seminar, term-project, software exercises, etc.

20% - Regularity in the class

University Examination Pattern:

Examination duration: 3 hours *Maximum Total Marks: 100*

The question paper shall consist of 2 parts.

Part A (20 marks) - Ten Short answer questions of 2 marks each. All questions are compulsory. There should be at least two questions from each module and not more than three questions from any module.

Part B (80 Marks) - Candidates have to answer one full question out of the two from each module. Each question carries 20 marks.

Course Outcome:

After successful completion of the course, the student acquires knowledge of production machines commonly used in manufacturing industry.

13.406 PRODUCTION DRAWING (P)

Teaching Scheme: 0(L) - 0(T) - 4(P) **Credits**: 4

Course Objective:

- *To impart the basic concepts of production drawing*
- *To develop understanding about how to draw a machine assembly*
- *To help the students how to translate design concepts to drawing.*

Module – I

Information to be furnished in drawings - Fits and Tolerances, form tolerance and position tolerance, Geometric tolerance and its indications on drawing, Surface texture- indication of surface roughness, indication of production method, surface treatment, IS specifications.

Module – II

Assembly drawing - Shaft bearing and supports – Pedestal bearings, Plummer block and foot step bearing, I.C. Engine parts – Piston (Two strokes) and Connecting Rod.

Module – III

Machine parts and **Valves (Part drawing)** - Stop valve for boilers, Rams bottom safety valve and lever safety valve. Lathe tail stock, spindle, tool post, Tool head for shaping machine, screw jack, Bench vice and Machine vice. Jigs for milling and drilling, drill holder.

References:-

1. Bhatt N. D. and V. M. Panchal, *Machine Drawing*, Charotar Publisher, 2002.
2. Varghese P. I., *Machine Drawing*, VIP Publishers, Thrissur, 2012.
3. Gill P. S., *Machine Drawing*, S.K. Kataria & Sons, New Delhi, 2010.
4. Parkinson A. C., *Engineering Drawing*, Pitman & Sons, 1966.
5. Junnarkar N. D., *Machine Drawing*, Pearson Education, 2009.

Internal Continuous Assessment *(Maximum Marks-50)*

40% - Tests (minimum 2)
40% - Class work.
20% - Regularity in the class

University Examination Pattern:

Examination duration: 4 hours *Maximum Total Marks: 100*

The question paper shall consist of 2 parts. Part A and Part B

Part A (20 marks)

The question paper contains three questions from Module I. Each full question carries 10 marks. The candidates have to answer any two full questions out of the three.

Part B (80 marks)

The question paper contains one compulsory question on dimensioned drawing from Module II and Module III combined. Full question carries 80 marks.

***Note:** Weightage shall be awarded for neatness, dimensioning and preparation of list of materials in part drawing.*

Course Outcome:

The student acquires knowledge of production drawing considering fits and tolerances.

13.407 MACHINE TOOLS LAB (P)

Teaching Scheme: 0(L) - 0(T) - 3(P) **Credits**: 3

Course Objective :

- *To develop the machining skills*
- *To have clear understanding of working of machine tools*
- *To have an idea about the difficulty and work content in machining operations*

List of Exercises:

1. **Lathe:** Study of tools and accessories, exercise on plane and taper turning, groove (ball and cup) and thread cutting.
2. **Shaping Machines:** Study of tools and accessories, exercise on shaping flat surfaces and V-groove.
3. **Drilling machines:** - Study of tools and accessories, exercise on drilling machines.

Internal Continuous Assessment *(Maximum Marks-50)*

40% - Test
40% - Class work and Record
20% - Regularity in the class

University Examination Pattern:

Examination duration: 3 hours *Maximum Total Marks: 100*

Questions based on the list of exercises prescribed.

Scheme of valuation and weightage of marks will be prepared by the examiners based on the instructions given by the Chairman of University examination for IV Semester Production Engineering.

Candidate shall submit the certified fair record for endorsement by the external examiner.

Course Outcome:

This lab enables the students to familiarize the various aspects of machining using machine tools.

13.408 MECHANICAL TECHNOLOGY LAB (P)

Teaching Scheme: 0(L) - 0(T) - 3(P) **Credits**: 3

Course Objective :

- *To impart practical experiences on IC Engines and their performances.*
- *To impart practical experiences on heat transfer equipment and compressors.*

Part I : Study of I.C engines:

a) SI engines – Parts, working and systems.
b) CI engines - Parts, working and systems.

Part II: List of Experiments:

1. Experiments on I C Engines
   a) Load test to obtain performance characteristics based on B.P. (One SI & One CI Engine)
   b) Heat Balance test - Heat exchanger method
   c) Retardation test on diesel engine
   d) Volumetric efficiency and Air-fuel ratio test
   e) Morse test on petrol engine
2. Experiments on Heat Transfer
   a) Determination of Thermal Conductivity of solids.(metal and non metal)
   b) Determination of Heat transfer coefficient in convection heat transfer (Free and Forced)
   c) Effectiveness of Heat exchangers
3. Performance test on Centrifugal Blower.
4. Performance test on Reciprocating Air compressor
5. Performance test on air-conditioning equipment

Internal Continuous Assessment *(Maximum Marks-50)*

40% - Test
40% - Class work and Record
20% - Regularity in the class

University Examination Pattern:

Examination duration: 3 hours *Maximum Total Marks: 100*

Questions based on the list of experiments prescribed in Part II.

75% - Theory, Procedure and tabular column (30%);

Conducting experiment, Observation, Tabulation with Sample calculation (30%)

Graphs, Results and inference (15%)

25% - Viva voce (Based on Part I and Part II)

Candidate shall submit the certified fair record for endorsement by the external examiner.

Course Outcome:

At the end of this session, the student will experiences what he had heard from theory on engines, compressors, heat transfer equipments etc. This also enables him to search for related topics of interest in these areas.