UNIVERSITY OF KERALA

B. TECH. DEGREE COURSE
(2013 SCHEME)

SYLLABUS FOR
III SEMESTER
ELECTRICAL AND ELECTRONICS ENGINEERING
### III SEMESTER
#### ELECTRICAL AND ELECTRONICS ENGINEERING (E)

<table>
<thead>
<tr>
<th>Course No</th>
<th>Name of subject</th>
<th>Credits</th>
<th>Weekly load, hours</th>
<th>C A Marks</th>
<th>Exam Duration Hrs</th>
<th>UE Max Marks</th>
<th>Total Marks</th>
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<tr>
<td>13.301</td>
<td>Engineering Mathematics-II (ABCEFHMNPRSTU)</td>
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<td>13.304</td>
<td>Analog Electronics (E)</td>
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<td>13.305</td>
<td>DC Machines and Transformers (E)</td>
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<td>13.306</td>
<td>Hydraulic Machines and Heat Engines (E)</td>
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<td>13.307</td>
<td>Electronic Circuits Lab (E)</td>
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13.301 ENGINEERING MATHEMATICS - II (ABCEFHMNPRSTU)

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

Course Objective:

This course provides students a basic understanding of vector calculus, Fourier series and Fourier transforms which are very useful in many engineering fields. Partial differential equations and its applications are also introduced as a part of this course.

Module – I


Module – II


Fourier Transforms: Fourier integral theorem (no proof) – Complex form of Fourier integrals - Fourier integral representation of a function- Fourier transforms – Fourier sine and cosine transforms, inverse Fourier transforms, properties.

Module – III


Module – IV

Applications of Partial differential equations: Solution by separation of variables. One dimensional Wave and Heat equations (Derivation and solutions by separation of variables). Steady state condition in one dimensional heat equation. Boundary Value problems in one dimensional Wave and Heat Equations.

References:


**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 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:**

At the end of the course, the students will have the basic concepts of vector analysis, Fourier series, Fourier transforms and Partial differential equations which they can use later to solve problems related to engineering fields.
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


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


PART-II- ACCOUNTANCY (1 Period per week)

Module – III

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

References

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) - Two short answer questions of 10 marks each, covering entire syllabus. All questions are compulsory. (10x2=20marks)

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
Course Objectives:

The objective of this course is to set a firm and solid foundation in Electrical Engineering with strong analytical skills and conceptual understanding of analysis and design methods in electrical and magnetic circuits, and properties of continuous and discrete time systems.

Module – I


Dynamic circuits with periodic input: Periodic waveforms in circuit analysis. The exponential Fourier series, trigonometric Fourier series, condition for existence of Fourier series. Waveform symmetry and Fourier coefficients. Circuit applications, Average Power and RMS Values, Discrete magnitude and phase spectrum, Rate of decay of harmonic amplitude, Normalised power in a periodic waveform and Parseval's theorem, Power and power factor in AC system with distorted waveforms.

Module – II


Module – III

Two Port Network and Passive Filters - Parameters of two-port network, Impedance parameters, Admittance parameters, Hybrid parameters, Transmission parameters, Relationships between parameters, Interconnection of networks conversion formulae-two port symmetry – Pi and T equivalent – Image parameter description of a reciprocal two port network. Characteristic impedance and propagation constant of symmetric T and Pi
networks under sinusoidal steady state. Introduction to filters - low pass, high pass, band pass and band elimination filters, design of constant k and m derived filters.

**Module – IV**


**References :**


**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.

**Note:** Question paper should be set to check the analytical, design, and application skills. Descriptive questions should not exceed 20% of the maximum marks.

**Course Outcome:**

Upon successful completion of this course, students will be able to analyse, design and realise various electrical networks and systems.
13.304 ANALOG ELECTRONICS (E)

Teaching Scheme: 2(L) - 2(T) - 0(P)  
Credits: 4

Course Objectives:

- To impart an in depth knowledge in electronic semiconductor devices and circuits giving importance to the various aspects of design and analysis.
- To provide a sound understanding of the fundamentals of operational amplifier circuits.

Module – I

Transistor biasing and bias stability – Biasing circuits – Fixed bias, collector feedback bias and potential divider bias circuits. DC and AC load lines, Factors causing bias instability. Stability factors - design of potential divider bias (derivation for \( S, S_v, S_\beta \)) circuits. Bias compensation circuits - diode compensation, thermistor compensation.

Transistor modeling - h parameter equivalent circuit - graphical determination of h parameters. BJT Small signal analysis of CE amplifier at low frequencies - current gain, input impedance, voltage gain, output impedance and power gain using exact equivalent circuit. Transistor high frequency model.

Module – II

Field effect transistor - construction and characteristics of JFETs, JFET parameters, ratings and specifications. JFET bias circuits - voltage divider bias-. JFET small signal analysis of common source and common drain amplifiers.

MOSFET - Construction and characteristics of MOSFET- depletion and enhancement type, specifications. Depletion MOSFET small signal models. CMOS devices – advantages and applications.

Multistage amplifiers - RC coupled, transformer coupled and direct coupled transistor amplifiers, Darlington amplifier. General frequency considerations of single stage amplifier - Low frequency considerations, High frequency considerations - Overview of frequency response of cascaded FET amplifiers, UJT- working principle & characteristics.

Module – III

Large signal amplifiers - Classifications of amplifiers - Maximum power and efficiency of class A (series fed and transformer coupled) amplifier Class B and Class C amplifiers , Class AB, Crossover distortion. Push pull and complementary symmetry power amplifiers.
Distortion in amplifiers - causes and effect (analysis not required), series voltage regulator (with design).


**Module – IV**


**Op amp circuits** - inverting and non-inverting amplifiers, summer, integrator differentiator and comparator circuits - comparator IC 311 - voltage level detectors - zero crossing detectors - Schmitt trigger, logarithmic amplifier. Wave form generation - triangular and sinusoidal wave generators.

**References :**

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 have the basic knowledge of electronic devices and circuits and will be able to design, analyse and implement analog electronic circuits.*
13.305 DC MACHINES AND TRANSFORMERS (E)

Teaching Scheme: 2(L) - 2(T) - 0(P)  
Credits: 4

Course Objective:

The course offers to explore the fundamental concepts underlying the working of DC machines and transformers.

Module – I


Module – II


Module – III


Module – IV

Auto transformers - dry type transformers. 3-phase transformers - 3-phase transformer connections - choice of transformer connections - Transformer harmonics - oscillating neutral. 3-phase bank of single-phase transformers - Parallel operation of 3-phase transformers– Scott Connection - Vector groups – Three winding transformers - stabilization by tertiary winding – equivalent circuit - Tap changing transformers - no load tap changing - on load tap changing.

References:


**Internal Continuous Assessment (Maximum Marks-50)**

- 50% - Tests (minimum 2)
- 30% - Assignments (minimum 2) such as homework, 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 the successful completion of the course, the students will get a thorough knowledge in the principle of operation, construction, working, characteristics and applications of DC generators, DC motors and transformers. Also this course helps the students to study the synchronous machines and Induction machines.
13. 306 HYDRAULIC MACHINES AND HEAT ENGINES (E)

Teaching Scheme: 2(L) - 2(T) - 0(P)  
Credits: 4

Course Objective:  
To impart knowledge of fluid flow problems and mechanical power generating devices which have applications in electrical engineering.

Module – I

Review of properties of fluids, Newton’s law of viscosity – Intensity of pressure, pressure head–Gauge pressure, absolute pressure, measurement of pressure – Piezometer tube, manometers (simple U tube, differential and single column manometers) and mechanical gauges. Continuity equation- Bernoulli’s equation (First Principle) – Application of Bernoulli’s equation–Venturimeter (Horizontal, Vertical and Inclined position), Orifice meter Flow through orifices -Hydraulic coefficients of orifice. Notches (Rectangular and Triangular). Flow through pipes: Laminar and Turbulent flow, Reynolds number, Losses in pipes-Minor and Major losses. Equivalent pipes, Darcy’s and Chezy’s formula - Transmission of power through pipes.

Module – II


Module – III


Module – IV

I C Engines – Classification - two-stroke and four stroke engines(Working) – SI and CI engines – mean effective pressure– characteristic curves - Brake power , Indicated power –


References:


**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 the successful completion of the course students acquire knowledge of fluid flow problems and principle and working of pumps and IC engines.*
13.307 ELECTRONIC CIRCUITS LAB (E)

Teaching Scheme: 0(L) – 0(T) – 3(P) 

Credits: 3

Course Objective:

Developing skill for design and implementation of various analogue electronic circuits.

Introduction: Characteristics of silicon and germanium diode.

List of Experiments:

2. R-C differentiating, integrating, clipping and clamping circuits (using diodes or transistors).
5. Output and transfer Characteristics of JFET and determination of JFET parameters.
7. Design and testing of a common source JFET amplifier – obtain its frequency response.
8. Design and testing of R-C phase shift and Wein bridge oscillators using transistor.
11. UJT characteristics and relaxation oscillator using UJT.
12. Study of OPAMP 741 and determination of its parameters.
13. Determination of slew rate of an OP-AMP and inverting and non-inverting amplifiers using OPAMP.
14. Simulation of wave shaping circuits, voltage regulator and CE amplifier using simulation software.

Internal Continuous Assessment (Maximum Marks-50)

40% - Test
40% - Class work and Fair Record
20% - Regularity in the class
University Examination Pattern:

Examination duration: 3 hours  Maximum Total Marks: 100

Questions based on the experiments No.1 to 13 in the above list. (Question based on experiment No.14 may be included as a part of the question.)

30% -- Circuit and design

30% -- Performance (Wiring, usage of equipment and trouble shooting)

20% -- Result

20%-- Viva voce

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

Course Outcome:

After successful completion of this course, the students will be capable of designing, analysing and implementing analogue electronic circuits.
13.308 HYDRAULIC MACHINES AND HEAT ENGINES LAB (E)

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

Course Objective:

To give students practical experiences in flow problems and performances of mechanical devices

Part A Hydraulic Machines Lab:

Introduction: i) Study of gauges, meters and valves.

ii) Study of pumps and turbines.

List of Experiments:

1. Experimental determination of coefficient of discharge (C_d) and Calibrations of Orifice meter, Venturimeter and Notches- To find actual discharge for given head.

2. Determination of Darcy’s coefficient of friction (f) and Chezys constant(C)-To find head loss for given length and discharge.

3. Performance tests on centrifugal pump (Single end/Double end) - To calculate specific speed at best operating condition and economic cost of running.

4. Performance tests on Plunger pump-To find slip and volumetric efficiency

5. Performance tests on Impulse and Reaction turbines- To find specific speed at best operating condition

Part B Heat Engines Lab:

Introduction: General Study on I C engines

List of Experiments:

1. Performance test on SI Engines (Hydraulic/Brake drum dynamometer), Morse Test

2. Performance test on CI Engines (Hydraulic/Brake drum dynamometer)

3. Performance test on SI/CI engine (Electrical loading)

4. Heat Balance Test on C I Engine

5. Retardation Test on C I Engine

Internal Continuous Assessment: (Maximum Marks: 50)

40% - Tests (final lab test)

40% - Lab work, record works, homework, assignments etc.

20% - Regularity in the class
University Examination Pattern: (See Note given at the end)

Examination duration: 3 hours  Maximum Total Marks: 100

Questions based on the list of experiments prescribed.

- 30% - Theory, Procedure and tabular columns
- 30% - Conducting experiment, Observation, Tabulation with Sample calculation
- 15% - Graphs, Results and Inference
- 25% - Viva voce (based on both Part A and Part B)

Common Lab record will be used for both Hydraulic Machines Lab and Heat Engines Lab. Candidate shall submit the certified fair record for endorsement by the external examiner.

Note: Conduction of University Lab Examination:

The student will be evaluated in any one of the labs (either Hydraulic Machines lab or Heat Engines lab) for the university examination based on draw of lots. The examinations for both labs should be conducted in parallel on same days under the Chairman of Exam for third semester Mechanical Engineering.

Course Outcome:

After the successful completion of the course students will be able to understand the working of hydraulic machines such as pumps and turbines and heat engines.