



UNIVERSITY OF CALICUT

Abstract

VOCATIONAL COURSE in Physics-ADVANCED DIPLOMA COURSE IN ELECTRICAL, ELECTRONICS AND INSTRUMENTATION-Scheme and Syllabus- Approved -Implemented-w.e.f 2014 Admissions-Orders issued

G & A - IV - J

U.O.No. 7081/2014/Admn

Dated, Calicut University.P.O, 21.07.2014

- Read:-*1. Item no. 4 of the minutes of the meeting of the Board of Studies in Physics UG held on 20.06.2014.
2. Item no.34 of the minutes of the meeting of the Faculty of Science held on 27.06.2014.
- 3.Orders of the VC on 14.07.2014, in the file no, 18602/GA IV /J1/2013/CU.

ORDER

The Board of Studies in Physics UG approved the syllabus for **Vocational Course in Physics**, vide paper read as (1).

The Faculty of Science has also approved the minutes of the Board vide paper read as (2).

The Hon'ble Vice Chancellor, considering the exigency, exercising the powers of the Academic Council has approved the items regarding syllabus implementation in the minutes of the concerned Boards of Studies mentioned in the minutes of the Faculty of Science, subject to ratification by the Academic Council, vide paper read as (5).

Sanction has, therefore, been accorded for implementing the Scheme and Syllabus of **Vocational Course in Physics**, in the University, w.e.f 2014 Admissions.

Orders are issued accordingly.

(The syllabus is available in the website: universityofcalicut.info)

Muhammed S
Deputy Registrar

To

1. All Affiliated Colleges/SDE/Dept.s/Institutions under University of Calicut.
2. The Controller of Examinations, University of Calicut.
3. The Director SDE, University of Calicut.

Forwarded / By Order

Section Officer

BSc PHYSICS

VOCATIONAL COURSE

ADVANCED DIPLOMA COURSE IN ELECTRICAL, ELECTRONICS AND INSTRUMENTATION

I year Certificate Course in Electrical, Electronics and Instrumentation (300 hours and 20 Credits)

Medium of instruction: English

Syllabus

MODULE. 1 (60 hours and 4 credits)

I. Basic ideas of electricity and magnetism

Static electricity, permittivity/dielectric constant, electric field and electric potential, capacitor and capacitance: capacitors in parallel and series. Energy stored in a capacitor. Magnetism, magnetic flux, flux density, electromagnetism. Force on a current carrying conductor placed in a magnetic field. Electromagnetic induction: Faraday's laws, self and mutual inductance.

II. Electric circuits & networks

Electric current, voltage and resistance. Laws of resistance, specific resistance, conductivity, effect of temperature on resistance. DC circuits, Ohms law, branch currents and Voltages. Network theorems: Kirchoffs Laws, Thevenins, Nortons and superposition theorems. Electric power and energy.

III. AC fundamentals

Generation of alternating current, Simple and complex wave forms. Definition of frequency, time period, amplitude, average value, RMS value, peak value, form factor, phase and phase difference. AC through R, L C, LR, LC and LCR circuits (parallel and series), Q factor

Polyphase circuits: Generation of polyphase voltages, advantages phase sequence, Interconnection of three phases and delta connection relation between phase and line voltages, current in star and delta connections. Three phase power measurements, single wattmeter, three wattmeter and two wattmeter methods.

IV. Faults in power system Fuses and circuit Breakers

Faults in power system, fuses fusing element rated current of fuse element, different types of fuses and working, circuit breaker's functions, fault clearing process, trip circuit. Protective relays and their importance, lightning arrestor, Earthing: Types of grounding-Types of lamps.

V. Domestic wiring

Essential elements, calculation of conductor size, current rating of aluminum and copper cables. Wiring accessories- general rules for internal wiring: preparation of layout, wiring diagram for houses office building etc. Illumination fundamentals & illumination levels.

MODULE. 2 (60 hours and 4 credits)

I. Diodes and transistors

PN junction, depletion layer, potential barrier, forward bias and reverse bias, Zener diode, Bipolar transistors, PNP and NPN and various connections, input-output characteristics, amplification factor. Basic concepts of UJT, FET, MOSFET & SCR.

II. Rectifiers and amplifiers

Half wave and full wave - center taped & bridge type, wave forms, PIV, ripple factor, efficiency of rectifiers. Various types of filters, Amplifiers, RC coupled and transformer coupled frequency response. Power amplifiers: Class A, B and C types and feedback amplifier. Oscillators Conditions for oscillations. Tuned oscillator Hartley, Colpitts, Phase shift oscillators and Multivibrators.

III. Measuring Instruments

Working principle of dynamometer, voltmeter and ammeter; Multi-range instruments, errors and their remedy. Classification of resistance: low, medium and high-potentiometer method-, Multimeters. CRO-CRT block diagram-applications of CRO

IV. Domestic appliances and maintenance.

Electrical Iron, fan, mixer-grinder, motor and water heater. Main switch, fuse and distribution boards with MCB and ELCB.

MODULE. 3 (60 hours and 4 credits)

V. Linear Integrated Circuits

Diff. Amplifier-CMRR, Gain, Operational Amplifier-Internal-gain, band width, features & applications-Inv and Non-inv Amplifier.IC741-pin diagram-applications-Integrator, Differentiator. Instrumentation Amp-configuration-features. IC555 Timer-internal-applications as Timer.

VI. Digital Electronics.

Number systems- Binary, Hexadecimal, Octal. Conversions-Simple Binary addition, subtraction. Logic gates-Basic gates-truth table. Universal Gates-truth tables. Half adder & full adder. Simple flip-flop-SR, clocked SR,JK. Simple application as a counter. Concept of Microprocessors-Block Diagram. Specifications(8085,8086). Machine language, assembly language and HLL. Basics of Microcontrollers-block diagram.

VII. Instrumentation.

Importance of Instrumentation-measurement of physical quantities in industry-Transducers-types-resistive, capacitive & Inductive Transducers. Strain gauges, LVDTs, Capacitive transducers-characteristics and applications. Need of signal conditioning-D/A and A/D conversion-block diagram & concept of data Acquisition systems. Application of MPs in data acquisition

VIII. Introduction to Industrial Control.

Need of Control systems in Industries-Concept of conventional controls systems-Introduction to DCS and SCADA-Block schematics-features. Programmable Logic Controller-intro-block schematic-Typical Applications.

MODULE. 4 (120 hours and 8 credits)

Laboratory training I

1. Familiarization of basic measuring instruments screw gauge, vernier calipers, voltmeter, ammeter.

2. Measurement of low and medium resistance by volt-ampere method.
3. Measurement of single phase power.
4. Verification of Kirchhoff's laws, Superposition theorem and Thevenin's theorem in DC circuit.
5. Measurement of single phase power using Wattmeter.
6. Draw the forward and reverse characteristics of germanium and Silicon diodes.
7. Reverse and forward characteristics of a Zener diode.
8. Measurement of DC and AC voltages using CRO.
9. Measurement of time period using CRO.
10. Wiring Practice:
 - a. One lamp controlled by one switch.
 - b. Two or more lamps connected in series and controlled by means of one switch.
 - c. Two lamps controlled by two switches independently from two different points.
 - d. Series & parallel - control of two lamps using two-way switches.
 - e. Control of bell from different places.
 - f. Single Phase circuits with cut-outs, energy meter, main switch, fuses and distribution boards with MCB and ELCB.
 - g. Measurement of earth resistance and resistivity.
11. Troubleshoot of AC & DC motors.
12. Repair and maintenance of Domestic appliances: electric iron, mixer-grinder, fan, water heater.

Laboratory training II

(i) Linear ICs

1. Familiarization of IC 741.
2. Op-amp as inv amp & non -inv ampr-measurement of gain & o/p.
3. Integrator using op-amp.
4. Differentiator with op-amp.
5. IC 555 as Multivibrator.

(ii) Digital

6. Exercises on basic Gates.
7. Exercises on Universal gates.
8. Half adder & full Adder.
9. Flip-flop SR.
10. Clocked SR.
11. JK flip-flop.
12. Simple counter.
13. Familiarization of Microprocessor kit (8085/8086).

(iii) Instrumentation.

14. Strain gauges in bridge configuration-o/p measurement on strain.
15. LVDT verification of o/p.
16. Exercises on ADC.
17. Exercises on DAC.
18. Instrumentation amp-measurements.

Books for Study (Relevant sessions from)

- 1) Electrical Technology Vol. I & Vol II by B.L Theraja A k Theraja.
- 2) Electrical circuit analysis – Hayt & Kimmerly.
- 3) Digital Electronics by Malvinolich.
- 4) Electrical Estimating & Costing by J B Guptha.
- 5) 8051 Micro controller by Ayla.
- 6) 8085 Micro Processor by B Ram.
- 7) Basic electrical Engineering by J. B. Guptha.
- 8) A course in Electrical Power, J.B.Gupta.
- 9) Switchgear and Protection, by J.B.Gupta.
- 10) Electronic Devices and Circuits by J.B.Gupta.
- 11) Electronic Measurements & Instrumentation, J.B.Gupta.
- 12) Industrial Instrumentation by Khalsi.
- 13) A text book of Laboratory course in Electrical Engineering, By: S.G.Tarnekar.
- 14) Electronic Lab manual Vol I & Vol II by Kuryachan T D & Shyam Mohan S.

Reference Books

- 1) A course in Electrical Technology Vol. I & II by J.B.Gupta.
- 2) Electronics Devices and Circuits by Boylsted.
- 3) S.Chand's Electronic Components and Applications, By Dilip TulshiRamji G., Ujwal Prakash Alavandi, Isha Rajesh Nair.
- 4) S.Chand's Principles of Digital Techniques 12069Polytec.3Sem, By: Dilip TulshiRamji G., Kanchan Sanjay Ingole, Geeta Mahendra.
- 5) Fundamentals of Electrical Engineering and Electronics, by J.B.Gupta.
- 6) Principle of Electronics by V K Metha.
- 7) [Basic Electrical Engineering](#), V Mittle,Arvind Mittle.
- 8) Basic Electrical Engineering – V K Metha.
- 9) Digital Electronics by Floyed.
- 10) Electronic Lab manual Vol I & Vol II by K A Navas.

