PREFACE

The wave of liberalization and globalization has created an environment for free flow of information and technology through fast and efficient means the world over. This has lead to shrinking of world, bringing people from different cultures and environment together, giving rise to a global village. A shift has been taking place in India from closed economy to knowledge based and open economy. In order to cope-up with the challenges of handling new technologies, materials and methods, we have to develop human resources having appropriate knowledge, professional skills and attitude. Technical education system is one of the significant components for human resource development. **Polytechnics** play an important role in meeting the requirements of trained technical manpower for industries and field organizations. The initiatives being taken by the State Board of Technical Education, Tamilnadu to revise the curriculum of existing diploma programmes as per the needs of the industry are laudable.

In order to meet the requirements of future technical manpower, constant efforts have to be made to identify new employment opportunities, carryout activity analysis and design need based curricula of diploma programmes. This curriculum document has been designed by identifying job potential and competency profile of diploma holders leading to identification of curriculum areas for the course.

It is needless to emphasize that the real success of the diploma programme depends upon its effective implementation. This will require harnessing and effective utilization of resources. In addition to acquisition of appropriate physical resources, the availability of competent and qualified faculty is essential.

It is time for the managers of technical education system to reorganize the system to accept the challenges of both quantitative and qualitative expansion of technical education. The creation of EDUSAT facilities in the country must be exploited to its fullest extent to reap the benefits of interactive electronic media for teaching-learning process.

It is hoped that polytechnics will carry out job market research on a continuous basis to identify the new skill requirements and develop innovative methods of course offering and thereby infuse dynamism in the system.

Principal

Seshasayee Institute of Technology

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Coordinator

CONTENTS

1. Department Vision, Mission, PEO and PO

Vision

To meet the challenges of new technological advances and to provide update knowledge in the state of the art technology, re-orientation and up gradation of the curriculum to the level of industry relevant learning and training and thus to be a premier technical department that strives continuously for excellence in education

Mission

- To produce Electrical Engineers of high Caliber to serve the Society and Nation.
- To bridge the gap between industry and academic by framing curriculum and syllabus based on industrial needs
- To create and sustain environment of learning in which students acquire knowledge and learn to apply it professionally with due consideration of social and economical issues.
- To provide opportunity to enhance the creative talents of students and faculty members
- To inculcate moral and ethical values among the faculty and students

PROGRAMME EDUCATIONAL OBJECTIVES (PEOs)

Electrical and Electronics Engineering programme of Seshasayee Institute of Technology will prepare its diploma students

PEO1: To have fundamental and broad knowledge in Electrical and Electronics Engineering
PEO2: To apply creatively their understanding of engineering principles to the solution of problems arising in whatever career they choose
PEO3: To communicate their ideas and positions clearly and concisely
PEO4: To practice their Professions conforming to Ethical Values and Environmental friendly policies
PEO5: To work as a team in multi-cultural and multi-disciplinary Environments
PEO6: To adapt evolving Technologies, innovations and stay current with their Professions

PROGRAMME OUTCOMES (POs)

Students of Diploma in Electrical and Electronics Engineering course at our institute will be

PO1: Able to identify, analyze and provide solutions to problems in the field of Electrical and Electronic Engineering
PO2: Able to adopt energy conservation and renewable energy in order to promote eco-friendly electrical energy production
PO3: Able to communicate effectively in order to compete globally
PO4: Able to handle any situation with ethical and social responsibility
PO5: Able to work as an individual and as a team member in multi-cultural and multi-disciplinary Environments
PO6: Able to apply modern techniques and IT tools in Engineering

2. R U L E S & R E G U L A T I O N S

DIPLOMA COURSES IN ENGINEERING
(TERM PATTERN)
(Implemented from 2016- 2017)
E – SCHEME
(Common to all Programmes)

1. Description of the Programme:

a. Full Time (3 years)

The Programme for the Full Time Diploma in Engineering shall extend over a period of three academic years, consisting of 6 terms* and the First Year is common to all Engineering Programmes.

The Curriculum for all the 6 Terms of Diploma Programmes have been revised and revised curriculum is applicable for the candidates admitted from 2016 - 2017 academic year onwards.

b. Sandwich (3½ years)

The Programme for the Diploma in Paper Technology (Sandwich) shall extend over a period of three and half academic years, consisting of 7 terms* and the First Year is common to all Engineering Programmes. The courses of diploma Programmes being regrouped for academic convenience.

During 4^{th} and 7^{th} terms, the students undergo industrial training for six months. Examination will be conducted after completion of every 6 months of industrial training

2. Condition for Admission:

The candidates shall be required to have passed in the S.S.L.C Examination of the Board of Secondary Education, Tamilnadu.

(Or)

the Anglo Indian High School Examination with eligibility for Higher Secondary Course in Tamilnadu

(Or)

the Matriculation Examination of Tamil Nadu.

(Or)

Any other Examinations recognized as equivalent to the above by the Board of Secondary Education, Tamilnadu.

Note: In addition, at the time of admission, the candidate will have to satisfy certain minimum requirements, which may be prescribed from time to time.

3. Admission to Second year (Lateral Entry):

A pass in HSC (Academic)# or (Vocational) courses mentioned in the Higher Secondary Schools in Tamilnadu affiliated to the Tamilnadu Higher Secondary Board with eligibility for University Courses of study or equivalent examination, & should have studied the following Courses

Sl. No	Programmes	# H.Sc Academic Courses Studied	H.Sc Vocational Courses Studied	
			Related courses	Vocational courses
1	All the Regular and Sandwich Diploma Programmes	Maths, Physics & Chemistry	Maths, Physics & Chemistry (any one)	Related Vocational Courses - Theory & Practical

. # Subject to the approval of the AICTE

- For the Diploma Programmes related with Engineering/Technology, the related / equivalent courses prescribed along with Practicals may also be taken for arriving the eligibility.
- Programmes will be allotted according to merit through counseling by the Principal as per communal reservation.
- Candidates who have studied Commerce Courses are not eligible for Engineering Diploma Programmes.

4. Age Limit:

No Age limit.

5. Medium of Instruction:

English

6. Eligibility for the Award of Diploma:

No candidate shall be eligible for the Diploma unless he/she has undergone the prescribed course of study for a period of not less than 3 / 3½ academic years (Full Time/Sandwich), affiliated to the State Board of Technical Education and Training, Tamilnadu, when joined in First Year and 2 / 2½ years (Full Time/Sandwich), if joined under Lateral Entry scheme in the second year and passed the prescribed examination.

The minimum and maximum period for completion of Diploma Programmes are given below:

Diploma Programmes	Minimum Period	Maximum Period
Full Time	3 Years	6 Years
Full Time (Lateral Entry)	2 Years	5 Years
Sandwich	3½ Years	6½ Years
Sandwich (Lateral Entry)	2½ Years	5½ Years

7. Programmes of Study and Curriculum outline

The Programmes of study shall be in accordance with the syllabus prescribed from time to time, both in theory and practical courses.

8. Examinations:

Autonomous Examinations in all Programmes of all the terms under the scheme of examinations will be conducted at the end of each term for 75 marks.

The internal assessment marks for all the courses will be awarded on the basis of continuous assessment earned during the term concerned. For each course, 25 marks are allotted for internal assessment and 75 marks are allotted for Autonomous end Examination.

9. Continuous Internal Assessment:

A. For Theory Courses:

The Internal Assessment marks for a total of 25 marks, which are to be distributed as follows:

i) Course Attendance- 5 Marks

Award of marks for attendance to each Theory/Practical course will be as per the range given below

% of Attendance	**Marks**
80% - 83%	1 Mark
84% - 87%	2 Marks
88% - 91%	3 Marks
92% - 95%	4 Marks
96% - 100%	5 Marks

ii) Tests # - 10 Marks

2 Tests each of 2 hours duration for a total of 50 marks are to be conducted and the marks so obtained will be reduced to 5 marks. A Model exam covering all the five units is to be conducted and the marks will be reduced to 5 marks

TEST	**UNITS**	**WHEN TO CONDUCT**	**MARKS**	**DURATION**
Test I	In 2 Units	End of 5th week	50	2 hours
Test II	In 2 Units	End of 10th week	50	2 hours
Test III	**Model Examination - Compulsory** Covering all the 5 Units. (Autonomous Examinations- question paper pattern).	End of the term	75	3 hours

Question Paper Pattern for the Periodical Test :(Test - I & Test- II)

PART-A: 4 Questions X 2 marks - 8 marks

PART-B: 4 Questions X 3 marks - 12 marks

PART-C: 3 Questions X 10 marks - 30 marks

Total 50 marks

iii) Assignment / Online test - 10 Marks

- From the Academic year 2016-2017 onwards.

For each Course, Three Assignments/ On line tests are to be given/ conducted each for 20 marks and the average marks scored should be reduced for 10 marks.

All Test Papers and Assignment note books after getting the signature with date from the students must be kept in the safe custody in the Department for verification and audit. It should be preserved for 2 Terms and produced to the inspection team at the time of inspection/verification.

Total : 25 marks

B. For Practical Courses:

The Internal Assessment marks for a total of 25 marks are to be distributed as follows:-

a) Attendance	5 Marks (Procedure for the Award of marks is the same as theory courses)
b) Procedure / Observation and tabulation/ Other Practical related Work	10 Marks
c) Record writing	10 Marks
TOTAL	**25 Marks**

- All the Experiments/Exercises indicated in the syllabus should be completed and the same to be given for final Autonomous examinations.
- The Record for every completed exercise should be submitted in the subsequent Practical classes and marks should be awarded for 20 for each exercise as per the above allocation.
- At the end of the Term, the average marks of all the exercises should be calculated for 20 marks and the marks awarded for attendance is to be added to arrive the internal assessment marks for Practical.

- The students have to submit the duly signed bonafide record note book/file during the Practical Autonomous Examinations.
- All the marks awarded for assignments, tests and attendance should be entered in the Personal Log Book of the staff, who is handling the subject. This is applicable to both Theory and Practical courses.

10. Life and Employability Skills Practical:

Life and Employability Skills Practical with more emphasis is being introduced in IV Term for Circuit Branches and in V Term for other branches of Engineering.

Much Stress is given to increase the employability of the student

Internal Assessment Mark : 25 Marks

11. Project Work:

The students of all the Diploma Programmes have to do a Project Work as part of the Curriculum and in partial fulfilment for the award of Diploma by the State Board of Technical Education and Training, Tamilnadu. **The Project work must be reviewed twice in the same semester.**

a) Internal assessment mark for Project Work:

Project Review I	**10 marks**
Project Review II	**10 marks**
Attendance	**05 marks** (Procedure for the Award of marks is the same as theory courses)
Total	**25 marks**

Proper records are to be maintained for the two Project Reviews, and they should be preserved for 2 Semesters and produced to the inspection team at the time of inspection/verification.

b) Allocation of Mark for Project Work & Viva Voce in Board Examination:

Viva Voce	**30 marks**
Marks for Report Preparation, Demonstration	**35 marks**
Written Test Mark $ (from 2 topics for 30 minutes duration)	**10 Marks**
Total	**75 marks**

Written Test Mark $:

i) Environment Management: 2 questions X 2 ½ marks = **5 marks**

ii) Disaster Management: 2 questions X 2 ½ marks = **5 marks**

Total = 10marks

Selection of Questions should be from Question Bank, by the External Examiner.

No choice to be given to the candidates.

12. Scheme of Examinations:

The Scheme of examinations for courses is given in Curriculam outline

13. Criteria for Pass:

1. No candidate shall be eligible for the award of Diploma unless he/she has undergone the prescribed course of study successfully in an institution approved by AICTE and affiliated to the State Board of Technical Education & Training, Tamil Nadu and pass all the courses prescribed in the curriculum.

2. A candidate shall be declared to have passed the examination in a course if he/she secures not less than 40% in theory courses and 50% in practical courses out of the total prescribed maximum marks including both the Internal Assessment and the Autonomous Examinations marks put together, subject to the condition that he/she secures at least a minimum of 30 marks out of 75 marks in the Autonomous Theory Examinations and a minimum of 35 marks out of 75 marks in the Autonomous Practical Examinations.

14. Classification of successful candidates:

Classification of candidates who will pass out the final examinations from April 2019 onwards (Joined in first year in 2016-2017 / Joined in second year in 2017-2018) will be done as specified below.

First Class with Superlative Distinction:

A candidate will be declared to have passed in **First Class with Superlative Distinction** if he/she secures not less than 75% of the marks in all the courses and passes all the terms in the first appearance itself and passes all courses within the stipulated period of study 3/ 3½ years (Full Time/Sandwich) without any break in study.

First Class with Distinction:

A candidate will be declared to have passed in **First Class with Distinction** if he/she secures not less than 75% of the aggregate of marks in all the terms put together and passes all the terms except the I and II terms in the first appearance itself and passes all the courses within the stipulated period of study 3/3½ years (Full Time/Sandwich) without any break in study.

First Class:

A candidate will be declared to have passed in **First Class** if he/she secures not less than 60% of the aggregate marks in all terms put together and passes all the courses within the stipulated period of study 3/3½ years (Full Time/Sandwich) without any break in study.

Second Class:

All other successful candidates will be declared to have passed in **Second Class.**

15. Duration of a period in the Class Time Table:

The duration of each period of instruction is 1 hour and the total period of instruction hours excluding interval and Lunch break in a day should be uniformly maintained as 7 hours corresponding to 7 periods of instruction (Theory & Practical).

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3. SALIENT FEATURES

Name of the Programme	:	Diploma Programme in Electrical and Electronics Engineering
Duration of the Programme	:	Three years (Six Semesters)
Entry Qualification	:	Matriculation or equivalent as prescribed by State Board of Technical Education,Tamilnadu
Intake :	:	60
Pattern Of the Programme	:	Term (Semester) Pattern
Ratio Between Theory & Practical Classes	:	50 : 50

4. EMPLOYMENT OPPORTUNITIES FOR DIPLOMA HOLDERS IN ELECTRICAL AND ELECTRONICS ENGINEERING

It is observed that employment in government/public sector undertakings are dwindling day by day. Keeping present scenario in view, following employment opportunities are visualized in different sectors of employment for diploma holders in electrical and electronics engineering**.**

4.1 Manufacturing Industry (Mechanical)

The Electrical diploma holder will be involved in following activities in mechanical manufacturing industry:

- Planning and execution for Electrical installation
- Distribution of Electrical Power
- Maintenance of Industrial Electrical System
- Repair and Maintenance of Electrical Machines and Equipment
- Repair and Maintenance of Electronic Control Circuitry
- Testing and Standardization for Quality Control
- Energy Conservation

4.2 Manufacturing Industry (Electrical and Electronics)

The Electrical diploma holder will be involved in following activities in Electrical and Electronics manufacturing industry:

- Assistance in Research and Development
- Assistance in Planning, Designing and Detailing
- Shop-floor Management including Quality Control
- Power Generation and Distribution
- Installation of Electrical Power Supply Systems
- Maintenance of Electrical and Electronic System(s)
- Repair and Maintenance of Electrical Machines/Equipment (including testing)
- Production
- Inventory Management
- Marketing and Sales

4.3 Government Departments such as Electricity Board, MES, PWD, Railways, Air bases, Airports, Defence, Thermal, Hydro and Nuclear Power Stations and other Boards and Corporations

The Electrical diploma holder will be involved in following type of activities in above mentioned Government Departments:

- Assistance in Planning and Design of Electrical generation, transmission, distribution and protection system including testing, quality control

- Estimating for electrical installation Construction, erection and commissioning of lines and Sub-stations
- Electrical Safety measures
- Operation and Maintenance of Lines and Sub-stations/underground cables
- Tariffs and Calculations of bills for consumption of electricity
- Inventory Management
- Repair and Maintenance of Electrical Machines/ Equipment
- Operation and maintenance of Thermal, Hydro and Nuclear Power Stations

4.4 Hospitals, Commercial Complexes, Service Sector Organizations like Hotels, Tourist-Resorts, high-rise buildings, Cinema/Theater Halls etc.

Diploma holder in electrical engineering will be involved in following type of activities in above mentioned Service Sector Organizations:

- Layout of wiring circuit, planning and execution for Electrical Installation
- Standby or captive Power Generation and its Distribution
- Maintenance of Electrical and Electronic Equipment
- Preventive Maintenance of Communication System, Lifts, Air-Conditioning
- Plants and Water Supply System
- Inventory Management
- Estimation for electrical repair and maintenance work

4.5 Self Employment

Following type of self employment opportunities are available to the diploma holder in electrical engineering:

- Trading of Electrical Goods
- Establishing Repair and Maintenance Unit/ Centre
- Free Lancer for Repair and Maintenance of House-hold Electrical and Electronic Gadgets such as: Washing Machines, Geysers, Air Conditioners, Coolers and electrical installations etc.
- Electrical contractor
- Motor Winding Unit
- Auto-electrical Work
- Service sector

Can work as:

- Service and marketing engineer in the field of automation.
- Trainer of PLC & SCADA system.
- TSE (Technical Support Executive)

4.6 JOB PROFILE/ ACTIVITY PROFILE

(01) Reading and interpreting drawings related to electrical machines, equipment, wiring installations

(02) Selecting right kind and quality of materials

(03) Using measuring instruments, tools and testing devices for varied field applications

(04) Understanding of constructional details, principle of working, characteristics and application of electrical machines, equipment, appliances and instruments

(05) Understanding of salient features and working principles of generation, transmission, distribution, protection and utilization of electrical power in different sectors

(06) Understanding of practices involved in erection, testing/installation and commissioning of electrical machines, equipment, control panels and systems

(07) Troubleshooting of electrical machines, wiring installations, equipment and control systems

(08) Knowledge and awareness of: Power Tariff (Power Trade and Control), Indian Electricity rules, codes and Standards, Electrical Safety and Shock prevention Measures ,Labour Management,

(09) Understanding of safety practices such as earthing, fire and shock prevention measures adopted in industry and service sector

(10) Understanding the principles of basic and digital electronics, microprocessors and micro-controller based systems and their applications in electrical control circuits

(11) Uses Information Technology and computers for various applications in the field of electrical engineering

(12) Knowledge and awareness of upcoming technologies of their field like PLC,SCADA & DCS System

(13) Good knowledge of Electrical AutoCAD.

(14) Competencies in supervising shop floor/ work site operations

(15) Awareness about the environment, use of non-conventional energy sources, external financial and technical support system, and energy conservation techniques

(16) Knowledge of latest trends in the field of electronic controls, communication and and instrumentation

5. COMPETENCY PROFILE OF DIPLOMA HOLDER IN ELECTRICAL AND ELECTRONICS ENGINEERING

Keeping in view the employment scenario and requirement of four domains of learning viz. Professional Development Domain, Continued Learning Domain, Human Relations Domain and Personal Development Domain, a diploma holder in Electrical and Electronics Engineering should have the:

1. Understanding of constructional details, principle of working, characteristics and application of electrical machines, equipment, appliances and instruments
2. Understanding of salient features and working principles of generation, transmission, distribution, protection and utilization of electrical power in different sectors
3. Ability to read and interpret drawings related to sub stations, electrical machines, equipment, wiring installations for light and power.
4. Competency in selection of right kind and quality of materials and preparation of estimates for installation of control panels used in industry
5. Ability to prepare tender document as per given drawings
6. Ability to use measuring instruments, tools and testing devices for varied field applications
7. Competency in the design of control circuits for electrical machine control, control panels, wiring circuits etc.
8. Ability to draw Ladder diagram and write Program for Control of Machines using PLC
9. Understanding of practices involved in erection, testing/installation and commissioning of electrical machines, equipment, control panels and systems
10. Ability for fault diagnosis and repair of electrical machines, wiring installations, equipment and control systems
11. Knowledge and awareness of:
    - Power Tariff (Power Trade and Control)
    - Indian Electricity rules, codes and Standards
    - Safety and Shock prevention Measures
    - Labour Management
    - Technical Report-writing Skills
    - Team Working, Interpersonal Relations and Human Values
    - Entrepreneurship Development (Self Employment)
    - Concern for wastage
11. Understanding of safety practices such as earthing, fire and shock prevention measures adopted in industry and service sector
12. Understanding the principles of basic and digital electronics, microprocessors and micro- controller based systems and their applications in electrical control circuits.
13. Ability to use Information Technology and computers for various applications in the field of electrical engineering.
14. Knowledge of applied and engineering sciences for better comprehension of technologies used in electrical industry and service sector and to develop scientific temper, analytical skills and to facilitate continuing education.

15. Competencies in general, manual and machining skills for supervising shop floor/ work site operations
16. Proficiency in oral and written communication, technical report writing, managing relationship with juniors, pears and seniors for effective functioning in the world of work
17. Competency in solving simple problems related to various functional areas of electrical and electronics engineering may it be prototype development, diagnostic and fault finding or repair and maintenance of plant and equipment
18. Understanding of basic principles of managing men, material and equipment and techniques of achieving economy and quality
19. Awareness about the environment, use of non-conventional energy sources, external financial and technical support system, adopting energy conservation techniques
20. Knowledge of latest trends in the field of electronic controls, communication and instrumentation.

6. DERIVING CURRICULUM AREAS/SUBJECTS DERIVED FROM COMPETENCY PROFILE

Sl.No.	Competency Profile	Curriculum Areas
1.	Ability to read and interpret drawings related to sub stations, electrical machines, equipment, wiring installations for light and power,	✓ Basic Graphic and Drawing Skills ✓ Wiring circuits ✓ CAD drawing
2.	Ability to use measuring instruments, tools and testing devices for varied field applications	✓ Measurements and Instrumentation ✓ Electrical and Electronics Practicals
3.	Competency in the design of control circuits for electrical machine control, control panels, wiring circuits etc.	✓ Control and Maintenance of Electrical Machines ✓ Electrical Workshop Practice
4.	Understanding of constructional details, principle of working, characteristics and application of electrical machines, equipment, appliances and instruments	✓ Electrical Machines ✓ Utilization of Electrical Energy (Power System)
5.	Understanding of salient features and working principles of generation, transmission, distribution, protection and utilization of electrical power in different sectors	✓ Transmission and Distribution of ✓ Electrical Power ✓ Generation and Protection of ✓ Electrical Power
6.	Understanding of practices involved in erection/installation and commissioning of electrical machines, equipment, control panels and systems	✓ Erection Commissioning and operation of Electrical Machines and Installations
7.	Ability for fault diagnosis and repair of electrical machines, wiring installations, equipment and control systems	✓ Testing, repair and maintenance of Electrical Machines and Installations
8.	Competencies in general, manual and machining skills for supervising shop floor / work site operations Understanding of safety practices such as earthing, fire and shock prevention measures adopted in industry and service sector	✓ Electrical Workshop Practice

Sl.No.	Competency Profile	Curriculum Areas
9.	Competency in selection of right kind and quality of materials and preparation of estimates for installation of control panels used in industry	✓ Electrical Engineering Drawing ✓ Estimation and Costing
10.	Ability to prepare tender document as per given drawings	✓ Electrical Estimation and Costing
11.	Understanding the principles of basic and digital electronics, microprocessors and micro-controller based systems and their applications in electrical control circuits	✓ Digital Electronics ✓ Programmable Logic Controllers (PLCs) ✓ Microcontrollers
12.	Ability to use Information Technology and computers for various applications in the field of electrical engineering and Programming skill	✓ C++ Programming ✓ CAD & Simulation ✓ Computer Networks
13.	Knowledge of applied and engineering sciences for better comprehension of technologies used in electrical industry and service sector and to develop scientific temper, analytical skills and to facilitate continuing education	✓ Engineering Physics ✓ Engineering Chemistry ✓ Applied Mathematics ✓ Workshop Practice
14.	Proficiency in oral and written communication, technical report writing, managing relationship with juniors, pears and seniors for effective functioning in the world of work	✓ Communication Skills ✓ Project Work ✓ Exposure to World of Work ✓ Industrial Training
15	Competency in solving simple problems related to various functional areas of electrical engineering may it be prototype development, diagnostic and fault finding or repair and maintenance of plant and equipment	✓ Control and Maintenance of Electrical equipments ✓ Estimation and
.16	Awareness about the environment, use of non-conventional energy sources, external financial and technical support system, adopting energy conservation techniques	✓ Environmental Education ✓ Renewable (Non-Conventional) Sources of Energy

6.1 ABSTRACT OF CURRICULUM AREAS / SUBJECTS

a) Basic Sciences and Humanities	✓ Communication Skills – I & II ✓ Life & Employability Skills
b) Applied Sciences	✓ Engineering Mathematics – I & II ✓ Applied Mathematics ✓ Engineering Physics I & II ✓ Engineering Chemistry I & II
c) Basic Courses in Engineering	✓ Engineering Drawing I&II ✓ Workshop Practice
d) Core Courses in Electrical & Electronics Engineering	✓ Electrical Circuit Theory ✓ Electrical Machines – I ✓ Electronic Devices and Circuits ✓ Measurements and Instrumentation.
e) Applied Courses in Electrical & Electronics Engineering	✓ Electrical Machines – II ✓ Analog and Digital Electronics ✓ Electrical Workshop Practice ✓ Power System – I ✓ Power System – II ✓ Control and Maintenance of Electrical Machines ✓ Electrical Machine Design ✓ Power Electronics ✓ Renewable Energy Sources & Energy Auditing ✓ Wiring, Winding and Estimation
e) Specialized (Diversified) Courses in Electrical & Electronics Engineering	✓ C++ Programming ✓ Micro Controller ✓ VLSI Design ✓ CAD & Simulation ✓ Programmable Logic Controller ✓ Bio-Medical Instrumentation ✓ Computer Hardware and Networking ✓ Project work

7. CURRICULUM OUTLINE

TERM - III

Sl No	Course Code	Course Title	Teaching Scheme				Scheme Of Examination				
			L	T	P	C	Internal	End Exam	Total	Min. Mark For Pass	Duration
1	2E3201	Electrical Circuit Theory	5	---	---	5	25	75	100	40	3
2	2E3202	Electrical Machines – I	5	---	---	5	25	75	100	40	3
3	2E3203	Electronic Devices & Circuits	5	---	---	5	25	75	100	40	3
4	2E3401	C++ Programming	4	---	---	4	25	75	100	40	3
5	2E3204	Electrical Machines-I Lab	---	---	6	3	25	75	100	50	3
6	2E3205	Electronic Devices & Circuits Lab	---	---	4	2	25	75	100	50	3
7	2E3402	C++ Programming Lab	---	2	4	4	25	75	100	50	3
	TOTAL		19	2	14	28	175	525	700		

TERM - IV

Sl No	Course Code	Course Title	Teaching Scheme				Scheme Of Examination				
			L	T	P	C	Internal	End Exam	Total	Min. Mark For Pass	Duration
1	2E4301	Electrical Machines – II	5	---	---	5	25	75	100	40	3
2	2E4302	Analog & Digital Electronics	5	---	---	5	25	75	100	40	3
3	2E4206	Measurements & Instrumentation	5	---	---	5	25	75	100	40	3
4	2E4303	Electrical Machines-II Lab	---	---	6	3	25	75	100	50	3
5	2E4304	Analog & Digital Electronics Lab	---	---	4	2	25	75	100	50	3
6	2E4305	Electrical Workshop	2	---	4	4	25	75	100	50	3
7	2E4207	Life &Employability skill Practical	2	---	2	3	25	75	100	50	3
	TOTAL		19	0	16	27	175	525	700		

TERM -V

Sl No	Course Code	Course Title	Teaching Scheme				Scheme Of Examination				
			L	T	P	C	Internal	End Exam	Total	Min. Mark For Pass	Duration
1	2E5306	Power System – I	5	---	---	5	25	75	100	40	3
2	2E5307	Control & Maintenance of Electrical Machines	5	---	---	5	25	75	100	40	3
3	**Elective Theory - I (Any One)**		5	---	---	5	25	75	100	40	3
	2E5403.1	Micro Controller									
	2E5403.2	VLSI Design									
	2E5403.3	Electrical Machine Design									
4	2E5308	Control & Maintenance of Electrical Machines Lab	---	---	6	3	25	75	100	50	3
5	2E5309	Wiring, Winding & Estimation Lab	2	---	4	4	25	75	100	50	3
6	**Elective Practical – I (Any One)**		---	---	4	2	25	75	100	50	3
	2E5404.1	Micro Controller Lab									
	2E5404.2	VLSI Design Lab									
	2E5404.3	Electrical Machine Design Lab									
7	2E5405	CAD & Simulation Lab	2	---	2	3	25	75	100	50	3
	TOTAL		19	0	16	27	175	525	700		

TERM - VI

Sl No	Course Code	Course Title	Teaching Scheme				Scheme Of Examination				
			L	T	P	C	Internal	End Exam	Total	Min. Mark For Pass	Duration
1	2E6310	Power System - II	5	---	---	5	25	75	100	40	3
2	2E6311	Power Electronics	5	---	---	5	25	75	100	40	3
3	2E6312	Renewable Energy Sources & Energy Auditing	5	---	---	5	25	75	100	40	3
4	**Elective Theory - II (Any One)**		4	---	---	4	25	75	100	40	3
	2E6406.1	Programmable Logic Controller									
	2E6406.2	Bio-Medical Instrumentation									
	2E6406.3	Computer Hardware & Networking									
5	2E6313	Power Electronics Lab	---	---	6	3	25	75	100	50	3
6	**Elective Practical – II (Any One)**		---	---	4	2	25	75	100	50	3
	2E6407.1	Programmable Logic Controller Lab									
	2E6407.2	Bio-Medical Instrumentation Lab									
	2E6407.3	Computer Hardware & Networking Lab									
7	2E6408	Project Work	2	---	4	4	25	75	100	50	3
	TOTAL		21	0	14	28	175	525	700		

8. HORIZONTAL AND VERTICAL ORGANISATION OF THE COURSES

Sl.No.	Subject	Distribution of credits			
		Basic	Core	Applied	Diversified
1.	Communication English – I	4	-	-	-
2.	Engineering Mathematics – I	7	-	-	-
3.	Engineering Physics – I	5	-	-	-
4.	Engineering Chemistry – I	5	-	-	-
5.	Engineering Physics Practical – I	1	-	-	-
6.	Engineering Chemistry Practical – I	1	-	-	-
7.	Engineering Graphics - I	4	-	-	-
8	Workshop Practice	2	-	-	-
9	Communication English – II	5		-	-
10	Engineering Mathematics – II	5		-	-
11	Applied Mathematics	5		-	-
12	Engineering Physics – II	5		-	-
13	Engineering Chemistry – II	5		-	-
14	Engineering Physics Practical – II	1		-	-
15	Engineering Chemistry Practical – II	1		-	-
16	Engineering Graphics - II	4		-	-
17.	Electrical Circuit Theory	-	5	-	-
18	Electrical Machines-I	-	5	-	-
19	Electronic Devices & Circuits	-	5	-	-
20	C++ Pr ogramming	-	-	-	4
21	Electrical Machines-I Lab	-	3	-	-
22	Electronic Devices & Circuits Lab	-	2	-	-
23	C++ Programming Lab	-	-	-	4
24	Electrical Machines – II	-	-	5	-
25	Analog & Digital Electronics	-	-	5	-
26	Measurements & Instrumentation	-	5	-	-
27	Electrical Machines-II Lab	-	-	3	-

Sl.No.	Subject	Distribution of credits			
		Basic	Core	Applied	Diversified
28	Analog & Digital Electronics Lab	-	-	2	-
29	Electrical Workshop	-	-	4	-
30	Life &Employability skill Practical	-	3	-	-
31	Power System – I	-	-	5	-
32	Control & Maintenance of Electrical Machines	-	-	5	-
33	Elective – I Theory	-	-	-	5
34	Control & Maintenance of Electrical Machines Lab	-	-	3	-
35	Wiring, Winding & Estimation Lab	-	-	4	-
36	Elective – I Practical	-	-	-	2
37	CAD & Simulation Lab	-	-	-	3
38	Power System - II	-	-	5	-
39	Power Electronics	-	-	5	-
40	Renewable Energy Sources & Energy Auditing	-	-	5	-
41	Elective – II Theory	-	-	-	4
42	Power Electronics Lab	-	-	3	-
43	Elective –II Practical	-	-	-	2
44	Project work	-	-	-	4
Total		**60**	**28**	**54**	**28**

Detailed Content of Various Courses

TERM - III

2E3201 - ELECTRICAL CIRCUIT THEORY

RATIONALE

Study of Electric Circuits is an essential in study of Electrical and Electronics Engineering. The subject forms the foundation of Electrical and Electronics Engineering. It prepares the students to familiarize with basic concepts and principles of electrical circuits. Study of Circuits and Network constitutes the basic and fundamental aspect of deriving insight into the functioning and analysis of Electrical network, instruments and machineries.

OBJECTIVES

- Understand the fundamentals of Electrostatics
- Apply Kirchhoff's current and voltage laws and Ohm's law to circuit problems
- Simplify circuits using series and parallel equivalents
- Perform Network analysis and other solving techniques for DC circuits
- Solve circuit problems using Theorems
- Perform Network analysis and other solving techniques for DC circuits.
- Understand the basic knowledge on single phase and three phase A.C circuits
- Develop knowledge on RLC series and parallel resonance.

SCHEME OF INSTRUCTION & EXAMINATION

Course Code	Instruction		Credit	Scheme Of Examination			
	Hours / week	Hours / Term		Marks			Duration
				Internal	End Exam	Total	
2E3201	5	75	5	25	75	100	3

TOPICS AND ALLOCATION OF HOURS & MARKS

Unit No	Name of the Topic	Hours	Marks
I	Electrostatics and D.C. Circuits	12	15
II	Network Theorems	13	15
III	Single phase A.C Circuits	13	15
IV	Parallel Circuits & Resonance	12	15
V	Three phase A.C. Circuits	13	15
	Revision	05	
	Cycle Tests and Model Examination	07	
	Total	75	75

2E3201 - ELECTRICAL CIRCUIT THEORY

CONTENT DETAILS

UNIT I : ELECTROSTATICS AND D.C. CIRCUITS

1.1 Fundamentals of Electric Circuits : Basic Concept of current, e.m.f, potential difference, Resistance - Resistivity, temperature coefficient of resistance - Resistances in series - Resistances in parallel. - Power and energy – Relationship between electrical, mechanical and Thermal units. Simple problems.

1.2 Electrostatics and Capacitance: Electric flux - Electric flux density - Electric field intensity - Electric potential - Coulomb's laws of electrostatics. Concept of capacitance - relationship between Voltage, Charge and Capacitance - Energy stored in a capacitor - capacitance of parallel plate capacitor - capacitors in series and in parallel - Problems.

1.3 D.C. Circuits : Ohm's law-applications of Ohm's law-series and parallel circuits - Kirchoff's laws - Kirchoff's Current Law - Kirchoff's Voltage Law - Problems in the above topics.

UNIT II : NETWORK THEOREMS

2.1 Network analysis : Definition of Network - Branches - Nodes. Mesh current and Node voltage analysis.

2.2 Transformations : Voltage source to Current source and Current source to Voltage source transformation - Star to Delta and Delta to Star transformations.

2.3 Theorems : Thevenin's Theorem - Norton's Theorem, Superposition Theorem and Maximum power transfer theorem. (Problems on all the above topics in D.C circuits only)

UNIT III : SINGLE PHASE A.C CIRCUITS

3.1 Fundamentals : J operator - rectangular and polar coordinates - Concept of Vector diagram - Sinusoidal voltage and current - instantaneous, peak, average and effective values - form factor and peak factor (derivations for sine wave only)

3.2 Series Circuits : Pure resistive, inductive and capacitive circuits - RL, RC and RLC series circuits - impedance - phase angle - phasor diagram - power and power factor -power triangle - apparent power, active and reactive power (Problems on all the above topics)

UNIT IV : PARALLEL CIRCUITS & RESONANCE

4.1 Parallel Circuits : Parallel circuits (two branches only) - conductance, susceptance and admittance – problems.

4.2 Series resonance: Concept of Resonance - Effects of varying inductance and capacitance in series RLC circuit - Resonant Frequency - Q factor – Half power frequencies - Bandwidth – problems.

4.3 Parallel resonance : Two branch Parallel circuits, - Resonant Frequency - Q-Factor – Dynamic impedance - Band width - problems. Comparison of series and parallel resonance. Applications of Resonant circuits.

UNIT - V THREE PHASE A.C. CIRCUITS

5.1 Three phase AC circuits: 3 Phase Generation - wave form - Equations - Phasor diagram - Phase sequence -Advantages of three phase system over single phase system. Star, Delta connections – Concept of Balanced and unbalanced load - Relation between line and phase values of voltages, currents in star and delta connection.

5.2 Three phase Power: Three phase power - Power delivered by Star connected and Delta connected loads - Problems in balanced loads of star and delta connections. Measurement of 3 phase power and power factor using two wattmeter method (Derivation and Problems) .

TEXT BOOK

Sl.No.	Title	Author	Publisher
1	Electric circuit theory 5th Edition-2008	Dr.M.Arumugam Dr.N. Premkumaran	Khanna Publishers, New Delhi.,

REFERENCE BOOKS

Sl.No.	Title	Author	Publisher
1	A Text book of Electrical Technology volume-I MCE-23-2015	B.L.Theraja	S.Chand & Co New Delhi
2	Fundamentals OF Electrical circuit theory 7th Edition-2006	B. Chattopadhyay P.C.Rakshit	S.Chand & Co New Delhi
3	Circuit and networks 4th Edition-2010	A. Sudhakar & Shyam Mohan S Palli	Tata -Mc Graw Hill.

ONLINE RESOURCES

www.allaboutcircuits.com/textbook/direct.../electric-circuits/
www.electrical4u.com/electrical-engineering-objective-questions-mcq/

COURSE OUTCOME

CO1	Able to understand the fundamentals of Electrostatics and DC circuits
CO2	Able to solve circuits using network theorems
CO3	Able to understand the concept of single phase AC supply
CO4	Knowledge in series and parallel resonance
CO5	Able to understand the concept of three phase AC supply

2E3202 - ELECTRICAL MACHINES – I

RATIONALE

This subject is classified under core technology group which intends to teach facts, concepts, principles & procedure for operation & testing of electrical machines, such as DC generators, DC motors and single & three phase transformers. Student will be able to analyze the characteristics of DC motors, Transformers & Qualitative Parameters of these machines. Knowledge gained by the students will be helpful in the study of technological subjects such as Power systems, utilization of electrical energy, manufacturing processes & testing and maintenance of electrical machines.

OBJECTIVES

- Understand the concept of magnetic circuit principle and associated laws
- Know the DC generator principle, construction, types, characteristics, efficiency and applications.
- Know the DC motor principle, construction, types, characteristics, testing and starters.
- Know the principle, construction & characteristics of single phase transformer, auto transformer
- Know the principle, construction and characteristics of three phase transformer
- Know the different connection and paralleling of transformers
- Know the Maintenance of DC machines
- Get an overview of Batteries

SCHEME OF INSTRUCTION & EXAMINATION

Course Code	Instruction		Credit	Scheme Of Examination			
	Hours / week	Hours / Term		Marks			Duration
				Internal	End Exam	Total	
2E3202	5	75	5	25	75	100	3

TOPICS AND ALLOCATION OF HOURS & MARKS :

Unit No	Name of the Topic	Hours	Marks
I	D.C Generators	12	15
II	D.C Motors	13	15
III	Single phase Transformers	13	15
IV	Three phase Transformers	13	15
V	Storage Batteries	12	15
	Revision	05	
	Cycle Tests and Model Examination	07	
	Total	75	75

2E3202 - ELECTRICAL MACHINES - I

CONTENT DETAILS

UNIT I : D C GENERATORS

1.1 Principle : Review of electromagnetic induction – Properties of Magnetic flux - Faraday's laws – Fleming's right hand rule – Principle of operation of D.C. generators –Construction of D.C. generators – Field system– Types of armature windings – Principles of lap and wave windings – EMF equation – simple problems. .

1.2 Characteristics of D.C. generators – Building up of voltage of D.C. Shunt generators — No load characteristics of Shunt generator –Determination of critical field resistance – Causes of failure to build-up voltage and remedy – Load characteristics of series and shunt generators – load characteristics of cumulatively and differentially compounded generators .

1.3 Applications of DC Generators - armature reaction – methods of compensating armature reaction – process of commutation

UNIT II : D C MOTORS

2.1 Principle of D.C. Motors – Fleming's left hand rule – Construction and working of DC motor – Back emf – Torque equation.

2.2 Characteristics of DC motors: Torque-current, Speed-current, Speed-Torque characteristics of different motors – Speed control of DC motors – Field control and armature control **–** necessity of Starters – 3 point and 4 point starter - losses in D.C. Machines.

2.3 Testing of D.C. machines – Predetermination of efficiency of motor and generator by Swinburne's test – Problems in above topics – Applications of D.C. Motors.

UNIT III : SINGLE PHASE TRANSFORMERS

3.1Principle & Construction – Working principle of Transformer - constructional details of core, shell type transformers – coil assembly.

3.2 EMF Equation – Voltage ratio – Transformer on No load – Transformer on load – Current ratio – Phasor diagram on no load and on load at different power factors – O.C. test, S.C. test – Determination of equivalent circuit constants– Determination of voltage regulation and efficiency – Condition for maximum efficiency– Problems on the above topics

3.3 All day efficiency - polarity test– Parallel operation of single phase transformers– Auto transformer – principle – saving of copper – applications.

UNIT IV : THREE PHASE TRANSFORMERS

4.1 Three phase Transformer construction – Construction of Three phase Transformer - Types of connections – Star-star, Star-Delta, Delta-Star, Delta-delta connections – Scott connection - V connection of transformer – Parallel operation of three phase transformers.

4.2 Grouping of transformers - Conditions – Phasing out test – Pairing of transformer - Load sharing of transformers with equal and unequal ratings

4.3 Accessories & Testing of transformers – Various cooling arrangements – Transformer accessories – conservator – breather – explosion vent – Bucholz relay–ON load and OFF load tap changer – Transformer oil tester – Acidity test -– Earthing – Measurement of earth resistance.

UNIT V : STORAGE BATTERIES

Classification of cells – construction – chemical action and physical changes during charging and discharging - internal resistance and specific gravity of lead acid, nickel iron and nickel cadmium cells – indication of fully charged and discharged battery. Defects and their remedies – capacity – methods of charging – maintenance – applications.

TEXT BOOK

Sl.No.	Title	Author	Publisher
1	A course in Electrical Technology (Vol - II) MCE-2005	B.L.Theraja	S.Chand & Co New Delhi

REFERENCE BOOKS

Sl.No.	Title	Author	Publisher
1	Electrical machines A course of Electrical Engg 4th Edition-2014.	K.Bhattacharya, Principal,TTTI, Chandigar	Tata -Mc Graw Hill , New Delhi
2	Operation & Maintenance of Electrical Machines	B.V.S. Rao	Khanna Publishers, New Delhi
3	Electrical Technology 10th Edition -2010	Edward Hughes	Addision – Wesley International Student Ed.

ONLINE RESOURCES

www.nptel.ac.in/courses/108105017/
www.nptel.ac.in/courses/108106071/
www.electrical4u.com/battery-history-and-working-principle-of-batteries/

COURSE OUTCOME

CO1	Able to Understand the concept of magnetic circuits. Able to Know the DC generator principle, construction, types, characteristics, efficiency and applications.
CO2	Able to Know the DC motor principle, construction, types, characteristics, efficiency and applications.
CO3	Able to Know the single phase Transformer principle, construction, types, characteristics, efficiency and applications.
CO4	Able to Know the three phase Transformer principle, construction, types, characteristics, efficiency and applications.
CO5	Able to understand the concept of Batteries.

2E3203 - ELECTRONIC DEVICES AND CIRCUITS

RATIONALE

The aim of introducing this course is to impart knowledge of basic Electronics devices to the students of Electronics Engineering. Through the study of this course, the students will get knowledge of construction, working & characteristics of various types of diodes and transistors. The study of the devices will be helpful to understand the various basic and applied technology courses.

OBJECTIVES

- Familiarize various passive and active components
- Study the working principle of PN junction diode and transistor
- Understand the working principle of different types of rectifiers
- Differentiate various types of amplifiers
- Study the performance of special devices like UJT, FET
- Study the performance of different transistor oscillators
- Study the performance of SCR, DIAC, TRIAC and IGBT
- Know the construction and working principle of optoelectronic devices
- Study the performance of solar cell
- Explain the concept of wave shaping circuits such as clippers and clampers

SCHEME OF INSTRUCTION & EXAMINATION

Course Code	Instruction		Credit	Scheme Of Examination			
	Hours / week	Hours / Term		Marks			Duration
				Internal	End Exam	Total	
2E3203	5	75	5	25	75	100	3

TOPICS AND ALLOCATION OF HOURS & MARKS :

Unit No	Name of the Topic	Hours	Marks
I	Components and Diodes	12	15
II	Bipolar Junction Transistor	13	15
III	Transistor oscillators and FET and UJT	13	15
IV	SCR, DIAC, TRIAC, MOSFET and IGBT	13	15
V	Opto Electronics Devices and Wave shaping Circuits	12	15
	Revision	05	
	Cycle Tests and Model Examination	07	
	Total	75	75

2E3203 - ELECTRONIC DEVICES AND CIRCUITS

CONTENT DETAILS

UNIT I : COMPONENTS AND DIODES

1.1 Components : Components - Electronic components - Passive components -Resistors - Fixed and variable -Colour coding -Uses -Capacitors -Fixed and Variable -Uses. Inductors - Fixed and Variable - Factors affecting the inductance -Applications.
1.2 Semiconductor Diodes : Diodes -Semiconductors -PN Junction diode -Forward and Reverse bias characteristics - Specifications - Zener diode -Construction & working principle - Characteristics -Zener break down -Avalanche break down -Zener diode as a voltage regulator - Applications -Specifications.
1.3 Applications Of Components : Rectifier –Introduction - Classification of Rectifiers - Half Wave Rectifier, Full Wave Rectifier & Bridge Rectifier - Comparisons(no derivations) - Efficiency -Ripple factor -Applications -Filters -C, LC and PI Filters.

UNIT II : BIPOLAR JUNCTION TRANSISTOR

2.1 Basic concepts : Transistor -Transistor as an amplifier -Transistor Biasing -Fixed bias, Collector base bias, Self bias
2.2 Configurations : CB, CE, CC Configurations -Characteristics - Comparison between three configurations in terms of input impedance, output impedance, current gain, voltage gain
2.3 Transistor Applications: RC coupled amplifier - Emitter follower and its applications - Negative feedback - Concept, effect of negative feedback – types of negative feedback connections- Transistor as a switch.

UNIT III : TRANSISTOR OSCILLATORS AND FET AND UJT

3.1 Transistor Oscillator : Transistor Oscillator-Classifications-Condition for Oscillation (Barkhausen criterion) - General form of LC Oscillator - Hartley Oscillator - Colpitts Oscillator - RC Phase shift Oscillator, Crystal oscillator.
3.2 Field effect Transistor : Field effect Transistor– Construction - Working principle of FET - Difference between FET and BJT - classification of FET - Characteristics of FET - Specifications -FET amplifier (Common source Amplifier), FET as CHOPPER.
3.3 Unijunction Transistor : UJT - Construction - Equivalent circuit - Operation – characteristics -UJT as a Relaxation Oscillator.

UNIT IV : SCR, DIAC, TRIAC, MOSFET AND IGBT

4.1 Silicon Controlled Rectifier: SCR -Introduction -Working -Two transistor analogy of SCR - VI characteristics - SCR as a Switch -Specifications.
4.2 DIAC & TRIAC: DIAC -Construction -Working -Characteristics -Diac as bi-directional switch - TRIAC -Basic working principle -Characteristics
4.3 MOSFET & IGBT: MOSFET -Construction -Characteristics -MOSFET as a Switch - CMOS - basic concept - IGBT -Basic principle -IGBT as a Switch.

UNIT V : OPTO ELECTRONICS DEVICES AND WAVE SHAPING CIRCUITS

5.1 Opto Electronics Devices:
LDR, LED, LCD, Opto coupler, Opto interrupter -Infrared transmitter and Receiver -Laser diode (simple treatment) -Solar cell -Avalanche Photodiode - Photo transistor.
5.2 Wave shaping Circuits:
Diode clipper -Types - clamper circuits using diode - Voltage doubler,

TEXT BOOK

Sl.No.	Title	Author	Publisher
1	Principles of electronics Re-Ed, 2010	V.K. Mehta	S.Chand & Co

REFERENCE BOOKS

Sl.No.	Title	Author	Publisher
1	Electronic devices applications and integrated circuits 5th Edition, 2010	Mathur Kulshreshtha Chadha	Umesh publications, New Delhi – 6
2	Integrated circuits 1st Edition, 2008	K.R. Botkar	Khanna Publishers, New Delhi
3	Electronic devices and circuits 23rd Edition, 2008	G.K. Mithal	Khanna Publishers, New Delhi
4	Electronic devices and circuits 2nd Edition 2008	Salivahanan, N.Suresh Kumar A.Vallavaraj	Tata -Mc Graw Hill , New Delhi

ONLINE RESOURCES

www.electronics.wisc-online.com/category.aspx
www.electrical4u.com/theory-of-semiconductor/

COURSE OUTCOME

CO1	Able to identify electronic components and Understand the working principle of different types of rectifiers
CO2	Able to know different configurations of transistor and their applications.
CO3	Able to understand different devices like FET, UJT and their applications.
CO4	Able to understand power electronic devices like SCR, DIAC, TRIAC, MOSFET AND IGBT and their applications.
CO5	Knowing the concept of wave shaping circuits such as clippers and clampers

2E3401 C++ PROGRAMMING

RATIONALE

Computers are now-a-days necessary in human routine life. At each and every stage, we find its importance. In technical side, engineers are using computers extensively to solve their design problems. Here, an attempt is made to generate different skills in C++ programming like the concept of function over loading, classes and objects, constructers, operator over loading, virtual function and writing and reading the data from a file.

OBJECTIVES

After the completion of this laboratory, the student should be able to

- Understand the concepts of OOPs, their advantages and applications
- Comprehend the features of C++
- Know to create classes, objects, constructors and destructors
- Know the concepts and advantages of overloading operator and type conversions
- Appreciate the concepts of inheritance and the various types of inheritance.
- Understand virtual functions & their need and usage
- Appreciate the need for manipulators and the design of the same
- Use the various operations of files to perform file operations.

SCHEME OF INSTRUCTION & EXAMINATION

Course Code	Instruction		Credit	Scheme Of Examination			
	Hours / week	Hours / Term		Marks			Duration
				Internal	End Exam	Total	
2E3401	4	60	4	25	75	100	3

TOPICS AND ALLOCATION OF HOURS & MARKS :

Unit No	Name of the Topic	Hours	Marks
I	Introduction to OOPS & C++ programming	10	15
II	Functions, Classes and Objects	10	15
III	Constructors, Destructors & Operator Overloading	10	15
IV	Inheritance, Virtual Base Classes & Virtual Functions	10	15
V	Files & Streams	10	15
	Revision	03	
	Cycle Tests and Model Examination	07	
	Total	60	75

2E3401 C++ PROGRAMMING

CONTENT DETAILS

UNIT I : INTRODUCTION TO OOPS & C++ PROGRAMMING

1.1 Introduction to OOPS: Paradigms of Programming Languages – Basic concept of Object Oriented Programming – Differences between Procedure Oriented Programming & Object Oriented Programming, characteristics of Object Oriented Languages – Objects, Classes, Inheritance, Polymorphism, Dynamic binding, message communication – Benefits of OOP - Application of OOPs.

1.2 C++ : Introduction to C++: Features of C++ - Benefits of C++ - Applications of C++ - Structure of C++ program- Tokens, Comments, Basic data types, User defined data types, Derived data types ,Symbolic constants, Type Compatibility, Declaration Of Variables, Dynamic Inilialization of variables, Reference variables.

1.3 Operators in C++: Scope resolution operator, Member dereferencing operators, Memory management operators ,Manipulators (setw & endl), Type cast operator , Operator precedence, control structures.

UNIT II :FUNCTIONS, CLASSES AND OBJECTS

2.1 Functions : Function prototyping,Call by reference, Return by reference, Inline functions, Default arguments & Function overloading

2.2 Classes and objects : Defining a class - Specifying a class, simple class example , Creating objects, Accessing class members, Defining member functions,Outside the class definition,Inside the class definition, C++ program with class

2.3 Memory allocation for objects , Static data members, Static member functions, Arrays within a class, Arrays of objects.

UNIT III :CONSTRUCTORS, DESTRUCTORS & OPERATOR OVERLOADING

3.1 Constructors & Destructors : Default constructors, Parameterized constructor , Overloaded constructor, Copy Constructor, Destructor, Objects as function arguments. Returning objects from functions, Friend functions, Friend Class (only definition)

3.2 Operator Overloading : Defining operator overloading, Overloading unary operator, Overloading binary operator, Overloading binary operator using friends, Manipulation of strings using operators, Rules for overloading operator.

3.3 Type conversions : Basic to class type, Class to basic type, One class to another class type.

UNIT IV :INHERITANCE, VIRTUAL BASE CLASSES & VIRTUAL FUNCTIONS

4.1 Inheritance : Introduction, Defining Derived classes, Single Inheritance, Making a private member inheritable, Multilevel inheritance, Multiple inheritance, Hierarchical inheritance, Hybrid inheritance.

4.2 Virtual base classes : Abstract classes, Constructors in Derived classes, nesting of classes

4.3 Virtual Functions : Pointers to objects, ***this*** pointer, Pointers to derived classes, Virtual function, Rules for virtual functions, Pure virtual function

UNIT V :FILES & STREAMS

5.1 Managing Console I/O Operations : C++ streams, C++ stream classes for console I/O operations , Unformatted I/O operations, Formatted console I/O operations, Managing output with Manipulators, Designing our own manipulator

5.2 Files : Classes for file stream operations, Opening and closing a file, Detecting end of file, File modes, File pointers and their manipulation, Sequential I/O operations

5.3 Updating a file : Updating a file with Random Access, Error handling functions, Command line arguments

TEXT BOOK

Sl.No.	Title	Author	Publisher
1	Object Oriented Programming With C++ (Sixth Edition) 2013	E Balaguruswamy	Tata Mc Graw Hill

REFERENCE BOOKS

Sl.No.	Title	Author	Publisher
1	Oops With C++ 1st Edition, 2012	Niranjan A.	Sapna Publications
2	Object Oriented Programming In C++, 1st Edition, 2008	Rajesh K Shukla	Wiely Precise Text Book.2008.
3	C++ Complete Reference 4th Edition, 2003	Herbert Schilt	Tata Mc Graw Hill

ONLINE RESOURCES

http://nptel.ac.in/courses/106105151/
www.learncpp.com
www.cplusplus.com/doc/tutorial/

COURSE OUTCOME

CO1	Able to Understand the concepts of OOPs, their advantages and applications. Able to write,compile and debug programs involving decision structures, loops.
CO2	Able to design programs using functions and Know to create classes, objects, constructors and destructors
CO3	Able to understand the concepts and advantages of overloading operator and type conversions
CO4	Knowing the concepts of inheritance and the various types of inheritance and able to understand virtual functions & their need and usage.
CO5	Developing applications using OOP concepts and files.

2E3204 ELECTRICAL MACHINES – I LAB

RATIONALE

The background of theoretical knowledge about Electrical Circuits, machines and measurements has been imparted in the theoretical papers. However, the electrical Diploma Holders will require handling various Electrical Instruments and machines in the field whenever they are given chance. So, it is necessary to acquaint the students with the practical aspects handling the Instruments & machines to increase their confidence and develop skill of measurements, data entry, graph reading, analysis of the experimental results, etc.

The coverage of syllabus is made in such a way that the students will get through knowledge of Handling the machines & Instruments. By performing such experiments they will gain confidence to face the problems and rectify them boldly. The students will develop skills of measuring data, their tabulations, plotting graphs, interpreting the data and the graphs to develop analytical skill.

OBJECTIVES

After the completion of this laboratory, the student should be able to

- Verify Ohm's Law and Kirchoff's Law
- Verify Superposition, Thevinin's and Maximum power transfer theorems
- Obtain resonance of the given RLC Series circuit
- Measure Single phase and Three phase ac power
- Calibrate the given Ammeter and Voltmeter and to obtain error
- Obtain Open Circuit Characteristics of self excited DC shunt generator
- Obtain Load characteristics of DC generators(Series, shunt & compound generator)
- Conduct Load test on Dc Series motor and DC Shunt motor
- Control the speed of DC shunt motor
- Predetermine the efficiency of DC machine by Swinburne's tests
- Predetermine the efficiency and regulation of the single phase transformer.
- Understand the construction and working of DC starters

SCHEME OF INSTRUCTION & EXAMINATION

Course Code	Instruction		Credit	Scheme Of Examination			
	Hours / week	Hours / Term		Marks			Duration
				Internal	End Exam	Total	
2E3204	6	90	3	25	75	100	3

Scheme Of Evaluation:

SLNO	Description	Maximum Marks
1	Circuit diagram	20
2	Connections and proceeding the Experiment	25
3	Reading/calculation/graph/result	25
4	Viva Voce	05
5	TOTAL	75

2E3204 ELECTRICAL MACHINES – I LAB

CONTENT DETAILS

SNO	List of Experiments
1	Verification of Ohms Law
2	Verification of Kirchoff's Law
3	Vector diagram of RLC Series Circuit
4	Open Circuit Characteristics of self excited DC shunt generator
5	Load test on a DC series generator
6	Load test on a DC shunt generator
7	Load test on a DC compound generator
8	Load test on a DC series motor
9	Load test on a DC shunt motor
10	Speed control of DC shunt motor using armature control & field control.
11	Predetermination of efficiency of DC machine by Swinburne‘s tests
12	Load test on the single phase transformer
13	Predetermination of efficiency and regulation of the single phase transformer by OC & SC tests
14	Equivalent circuit constants of the single phase transformer by OC & SC tests
15	Parallel operation of single phase transformers
16	Load test on the three phase transformer
Note: Only one question will have to be answered by the students in the examination BY LOT out of the total 16 Questions	

RESOURCE REQUIREMENTS

Sl.no	LIST OF EQUIPMENTS	Quantity Required
1	DC Shunt Motor 3 / 5 KW (or more) with loading arrangement	2
2	DC Series Motor 3 / 5 KW (or more) with loading arrangement	1
3	DC Compound Motor 3 / 5 KW (or more) with loading Arrangement	1
4	DC Shunt Generator 3 / 5 KW (or more) coupled with Prime Mover	1
5	DC Series Generator 3 / 5 KW (or more) coupled with Prime mover	1
6	DC Compound Generator 3 / 5 KW (or more) coupled with Prime mover	1
7	1 phase Transformer 1KVA (or more) 220V/110V	3

8	3 phase Transformer 1 KVA (or more) 440V/220V	1
9	1 phase Variac 15 Amps	3
10	3 phase Variac 15 Amps	1
11	Loading Rheostat 220V, 30A, Single phase loading Rheostat	2
12	Tachometer Analog / Digital type	2
13	3 point starter / 4 point starter	3
14	Rheostat – various ranges 50Ω-100Ω,1300Ω-600Ω	10
15	DC Ammeter- various ranger 0-1,0-2,0-15,0-30 Amps	10
16	DC Voltmeter- various ranges 0-75V,0-150V, 0-300V,0-600V	10
17	Wattmeter-various ranges LPF 75/150/300/600 Volts	1
18	Wattmeter-various ranges UPF 75/150/300/600 Volts	3

COURSE OUTCOME

CO1	Able to Obtain resonance of the given RLC Series circuit. Able to Measure Single phase and Three phase ac power. Able to Calibrate the given Ammeter and Voltmeter .
CO2	Able to Obtain Open Circuit Characteristics of self excited DC shunt generator Able to Obtain Load characteristics of DC series generator, shunt generator and compound generator
CO3	Able to Conduct Load test on Dc Series motor and DC Shunt motor. Able to Control the speed of DC shunt motor.
CO4	Able to Predetermine the efficiency of DC machine by Swinburne‘s tests Able to Conduct Load test on single phase transformer
CO5	Able to Predetermine the efficiency and regulation of the single phase transformer by OC & SC tests Able to understand the construction and working of Dc starters

2E3205 ELECTRONIC DEVICES & CIRCUITS LAB

RATIONALE

To expose the students to the basic operation of the electronic equipments and helps them to develop experimental skills for developing the electronic circuits for the required applications.

OBJECTIVES

After the completion of this laboratory, the student should be able to

- Draw the circuit diagrams of biasing circuit and obtain characteristics of PN junction diode, Zener diode, JFET, UJT, SCR, DIAC, TRAIC, LDR, Photo diode and Photo transistor, clipper clamper and voltage doubler.
- Draw the circuit diagrams of Rectifiers, filters, transistors, amplifier and oscillators
- Assemble / construct all the above circuits.
- Test the above circuits for their performance
- Analyses the above circuits

SCHEME OF INSTRUCTION & EXAMINATION

Course Code	Instruction		Credit	Scheme Of Examinations			
	Hours / week	Hours / Term		Marks			Duration
				Internal	End Exam	Total	
2E3205	4	60	2	25	75	100	3

Scheme Of Evaluation:

SLNO	Description	Maximum Marks
1	Circuit diagram	20
2	Connection	25
3	Execution	15
4	Output / Result	10
5	Viva Voce	05
6	TOTAL	75

2E3205 - ELECTRONIC DEVICES & CIRCUITS LAB

CONTENT DETAILS

SLNO	List of Experiments
1	VI Characteristics of PN Junction Diode
2	VI Characteristics of Zener diode
3	Half wave with and without filter
4	Full wave rectifier with and without filter
5	Bridge Rectifier with and without filter
6	VI characteristics of Regulator using zener diode.
7	Input/output characteristics of CE Transistor
8	Frequency response of RC coupled amplifier
9	Emitter follower
10	RC phase shift oscillator.
11	Hartley and Colpitts oscillator
12	JFET characteristics
13	UJT characteristics.
14	SCR characteristics
15	DIAC and TRIAC characteristics
16	Clipper, clamper and voltage doubler.
17	LDR, Photo diode and Photo transistor characteristics.
18	Solar cell and opto coupler.
Note: Only one question will have to be answered by the students in the examination BY LOT out of the total 18 Questions.	

RESOURCE REQUIREMENTS

Sl.no	LIST OF EQUIPMENTS	Quantity Required
01	Regulated Power Supply	3
02	Dual RPS	2
03	Variac	3
04	Function Generator	4
05	CRO	4
06	Ammeters	12
07	Voltmeters	6
08	Digital Multimeter	6
09	Digital IC trainer kit	6
10	Half wave & Full wave rectifier kit	1
11	Bridge rectifier kit	1

12	Pi filter kit	1
13	Clipper (+ve & -ve) kit	1
14	Clamper (+ve & -ve) kit	1
15	Voltage doubler kit	1
16	CE transistor kit	1
17	RC coupled amplifier kit	1
18	RC phase shift oscillator kit	1
19	Common source amplifier kit	1
20	Emitter follower kit	1
21	Negative feedback amplifier kit	1
22	Relaxation oscillator kit	1
23	Hartley & colpitts oscillator kit	1
24	DIAC kit	1
25	TRIAC kit	1
26	LDR, Photo diode &	1
27	Solar cell & opto coupler kit	1
28	Bread board	6
29	Soldering Iron & Tools set	2

COURSE OUTCOME

CO1	Able to Draw the circuit diagrams of biasing circuit and obtain characteristics of PN junction diode, Zener diode, JFET, UJT, SCR, DIAC, TRAIC, LDR, Photo diode and Photo transistor, clipper clamper and voltage doubler.
CO2	Able to Draw the circuit diagrams of Rectifiers, filters, transistors, amplifier and oscillators
CO3	Able to Assemble / construct all the above circuits.
CO4	Able to Test the above circuits for their performance.
CO5	Able to Analyses the above circuits

2E3402 C++ PROGRAMMING LAB

RATIONALE

Computers are now-a-days necessary in human routine life. At each and every stage, we find its importance. In technical side, engineers are using computers extensively to solve their design problems. Here, an attempt is made to generate different skills in C++ programming like the concept of function over loading, classes and objects, constructers, operator over loading, virtual function and writing and reading the data from a file.

OBJECTIVES

After the completion of this laboratory, the student should be able to

- Write a program in function over loading.
- Write a program in classes and objects.
- Write a program in constructers and operator over loading.
- Write a program in virtual function and writing and reading the data from a file.

SCHEME OF INSTRUCTION & EXAMINATION

Course Code	Instruction		Credit	Scheme Of Examinations			
	Hours / week	Hours / Term		Marks			Duration
				Internal	End Exam	Total	
2E3205	6	90	4	25	75	100	3

Scheme Of Evaluation:

SNO	Description	Maximum Marks
1	Aim & Procedure	10
2	Program	25
3	Execution	25
4	Result [Input & Output]	10
5	Viva Voce	05
6	TOTAL	75

2E3402 - C++ PROGRAMMING LAB

CONTENT DETAILS

SLNO	List of Experiments
1	Program to read n numbers and display the largest value
2	Program to generate Fibonacci series
3	Program for addition /subtraction of two matrices.
4	Program to multiply two matrices.
5	Program to find the sum of numbers in a list
6	Program for sorting the name in alphabetical order.
7	Program to arrange the given set of numbers in ascending order.
8	Program to find the roots of quadratic equation
9	Program to perform arithmetic operation depending upon user‘s choice
10	Program to convert lower case to upper case and vice versa
11	Program to illustrate the concept of function over loading
12	Program to illustrate the concepts of classes and objects
13	Program to add two complex numbers using constructers.
14	Program to illustrate the concept of operator over loading.
15	Program to convert one data type to another data type.
16	Program to illustrate the concept of virtual function.
17	Program to count number of characters, words & lines in a text.
18	Program to define a class string, use overload operator to compare two strings.
19	Write a function to swap the values of to variables to illustrate the concept of
20	Program to use a single file for writing and reading the data
Note: Only one question will have to be answered by the students in the examination BY LOT	

LIST OF EQUIPMENTS AND THE QUANTITY REQUIRED
(FOR A BATCH OF 30 STUDENTS)

OPERATING SYSTEM :	WINDOWS XP OR WINDOWS VISTA OR WINDOWS 7 / LINUX
OFFICE PACKAGE :	MICROSOFT OFFICE 2000 OR OFFICE 2003 OR OFFICE 2007/OPEN OFFICE

HARDWARE REQUIREMENTS :	
DESKTOP COMPUTER SYSTEM WITH LATEST CONFIGURATION	30 NOS
POWER BACKUP (UPS)	10 KVA
LASER PRINTER	3 NOS

SOFTWARE REQUIREMENTS : C++ COMPILER

SAFETY PRECAUTIONS TO BE FOLLOWED BY STUDENTS

- Do not touch, connect or disconnect any plug or cable without teacher's permission
- Don't attempt to touch any live wires
- Systems should be shutdown properly after completion of work

COURSE OUTCOME

CO1	Able to write, compile and debug programs involving decision structures, loops.
CO2	Able to design programs using functions and Know to create classes, objects, constructors and destructors
CO3	Able to understand the concepts and advantages of overloading operator and type conversions
CO4	Knowing the concepts of inheritance and the various types of inheritance and able to understand virtual functions & their need and usage.
CO5	Developing applications using OOP concepts and files.

TERM - IV

2E4301 - ELECTRICAL MACHINES –II

RATIONALE

This course is classified under core technology group intended to teach students of facts, concepts, principles & procedure for operations and testing of electrical machines such as induction motor, alternator and synchronous motor. Student will be able to analyze the characteristics and qualitative parameters of these machines. The knowledge gained by the student is useful in the study of technological subjects such as control of electrical machines Utilization of electrical energy.

OBJECTIVES

On completion of the following units of syllabus contents, the students must be able to

- To know alternator principle, construction, types, emf induced and cooling.
- To know the performance characteristic and paralleling of alternator, test and predetermination of performance characteristic of alternator.
- 3 phase induction motor construction, principle, types, characteristics, applications and starting
- Synchronous motor starting, running and applications, comparison with induction motor.
- Single phase motors types, construction, characteristic and applications.
- Induction motor types, ratings and maintenance.
- Starter maintenance.

SCHEME OF INSTRUCTION & EXAMINATION

Course Code	Instruction		Credit	Scheme Of Examination			
	Hours / week	Hours / Term		Marks			Duration
				Internal	End Exam	Total	
2E4301	5	75	5	25	75	100	3

TOPICS AND ALLOCATION OF HOURS & MARKS :

Unit No	Name of the Topic	Hours	Marks
I	Alternator Principle & Construction	12	15
II	Alternator Performance	13	15
III	Three Phase Induction Motor	13	15
IV	Synchronous Motor & Single Phase Motors	13	15
V	Special AC and DC Machines	12	15
	Revision	05	
	Cycle Tests and Model Examination	07	
	Total	75	75

2E4301 - ELECTRICAL MACHINES – II

CONTENT DETAILS

UNIT I : ALTERNATOR PRINCIPLE & CONSTRUCTION

1.1 Alternator Principle & Construction: Basic Principle & Requirements of alternator – Rotating Field System & Rotating Armature System -Advantages of Rotating Field (Stationary Armature) System -Types of Rotor - Salient Pole rotor - Non Salient pole rotor - Construction -Salient Pole -Non Salient Pole -Turbo Alternator

1.2 Windings & EMF equation: Types of armature windings (No winding diagram) - Single layer- Double layer -Lap & Concentric winding -Integral slot winding - Fractional Slot winding - Phase spread -Pitch Factor -Distribution factor-EMF equation of alternators-Simple problems-Effect of Pitch factor on EMF-Advantages of chorded pitch winding - Effect of pitch factor on harmonics-Methods of obtaining Sine wave in salientpole & non salientpole alternators

1.3 Cooling of alternators: Different methods -Horizontal, vertical -Natural & forced cooling - Hydrogen Cooling & its Merits.

UNIT II : ALTERNATOR PERFORMANCE

2.1Alternator Performance: Alternator on No load -Effective Armature resistance –Leakage reactance -Reactance due to armature reaction– Synchronous reactance - Synchronous impedance –Causes for Voltage drop in alternators (Simple problems)– Vector diagram of alternators on load (for lag, lead and unity power factors)

2.2 Testing : Open circuit & Short circuit test –Determination of regulation by direct load test - Pre-determination of Regulation by EMF method, MMF method, ZPF method

2.3 Parallel operation of alternators : Necessity of Synchronization -Advantages -Methods – Dark lamp method -Bright Lamp method -Synchroscope method - Synchronizing current, Synchronizing power, Synchronizing torque -Effect of change in excitation of alternators in parallel -Load sharing of two alternators (Simple problems)

UNIT III : SYNCHRONOUS MOTOR & SINGLE PHASE MOTORS

3.1 Synchronous Motor: Basic theory - Reasons for not self starting - Different methods of starting Synchronous motor - Vector diagram on No load (Simple problems) - V Curve and inverted V curve for different excitation at constant input power -Effect of change in excitation

3.2 Power Factor Improvement: Power factor improvement using Synchronous motor (Simple problems) Hunting -Applications of Synchronous Motors –Comparison between Synchronous motor & Three phase induction motor.

3.3 Single Phase Induction Motor: Double Field Revolving theory for Single phase Induction Motor -Construction, Principle of working & applications of Split Phase motors, Capacitor type motors, Shaded pole motor, Universal motor, Repulsion motor.

UNIT IV : THREE PHASE INDUCTION MOTOR

4.1 principle & construction: rotating magnetic field produced by 2 phase and 3 phase system - principle of operation of 3 phase induction motor - construction - slip and slip frequency - comparison between cage and slip ring induction motors

4.2 Characteristics of motor : starting torque derivation -condition for maximum starting torque - torque under running condition -torque in synchronous watts -slip-torque characteristics - relationship between starting torque and full load torque (no problems) - development of phasor diagram of three phase induction motor no load test and blocked rotor test - development of approximate equivalent circuit -development of circle diagram -determination of maximum torque, slip etc., (no problems) - speed control by injected e.m.f. method, rotor resistance method

4.3 starters & other induction motors: starters for induction motor -direct on line starter, rotor resistance starter -auto transformer starter - star delta starter- soft starters , crawling, cogging in induction motor. -construction, working principle and applications of double cage motor, linear induction motor and induction generator

UNIT V : SPECIAL AC AND DC MACHINES

5.1 SPECIAL AC MACHINES : Permanent magnet Synchronous motors – Construction and performance – Advantages – Applications –Synchros – Constructional features – Control Transmitter – Control receiver - Applications of synchros – A.C. Servo motors – Two phase A.C. Servo motor – Linear induction motor

5.2 SPECIAL DC MACHINES : Permanent Magnet D.C. Motor – Construction–Working principle – Speed control – Advantages – Applications – Servo motors – D.C. Servomotors – Stepper motors – Variable reluctance stepper motor – Permanent magnet stepper motor.

TEXT BOOK

Sl.No.	Title	Author	Publisher
1	A text book of Electrical Technology 23rd Re-edition, 2006	B.L.Theraja A.L. Theraja	S.Chand & Co New Delhi

REFERENCE BOOKS

Sl.No.	Title	Author	Publisher
1	Electrical machines 4th Edition, 2014	S.K.Bhattacharya	Tata -Mc Graw Hill , New Delhi
2	Operation and Maintenance of Electrical Machines	B.V.S. Rao	Khanna Publishers, New Delhi
3	Electrical Technology 10th Edition, 2010	Edward Hughes	Addision -Wesley International Student Ed.
4	Performance and design of AC machines, 3rd Edition 2002	M.G.Say	CBS Publication, New Delhi

ONLINE RESOURCES

www.nptel.ac.in/courses/108106072/
www.electrical4u.com/alternator-or-synchronous-generator/
www.electrical4u.com/electrical-motor-types-classification-and-history-of-motor/
www.electrical4u.com/electrical-power-transformer-definition-and-types-of-transformer/

COURSE OUTCOME

CO1	Able to know alternator principle, construction, types, emf induced and cooling. Able to know the performance characteristic and paralleling of alternator, test and predetermination of performance characteristic of alternator.
CO2	Able to understand 3 phase induction motor construction, principle, types, characteristics, applications and starting
CO3	Able to understand Synchronous motor starting, running and applications, comparison with induction motor.
CO4	Knowing the concepts of Single phase motors types, construction, characteristic and applications.
CO5	Knowing the concepts of Induction motor types, ratings and maintenance and Starter maintenance.

2E4302 - ANALOG & DIGITAL ELECTRONICS

RATIONALE

The main aim of this subject is to enable to students to know the basic concepts of analog and digital electronics and gain familiarity with the available IC chips. This will form a broad base for studying computer troubleshooting, microcontrollers and further studies.

OBJECTIVES

On completion of the following units of syllabus contents, the students must be able to

- Explain the characteristics of op. amp.
- Explain the various applications of op.amp.
- Explain the functional block diagram of 555 Timer.
- Explain Astable and Monostable Multivibrator using 555.
- State and explain Demorgan‘s Theorems
- Write the Truth Table and symbol of Logic gates OR, AND, NOT, NAND NOR, Ex-OR.
- Simplify Logic functions using Karnaugh‘s map.
- Explain the operation of Half-Adder, Full Adder, Half Subtractor, Full Subtractor.
- Explain parity Generator & Checkers,Decoder ,Encoder, Demultiplexer and Multiplexer
- Explain various Digital Logic families
- Explain various FF, D, T, SR, and MSJK.
- Explain Asynchronous Binary counter, Decode Counter, synchronous counter
- Explain weighted register and R-2R Ladder Type D/A convertor
- Explain simultaneous, Ramp, successive approximation, Dual slope A/D Converter

SCHEME OF INSTRUCTION & EXAMINATION

Course Code	Instruction		Credit	Scheme Of Examination			
	Hours / week	Hours / Term		Marks			Duration
				Internal	End Exam	Total	
2E4302	5	75	5	25	75	100	3

TOPICS AND ALLOCATION OF HOURS & MARKS :

Unit No	Name of the Topic	Hours	Marks
I	Linear ICs: Op-amps, Timers and their applications	12	15
II	Boolean Algebra	12	15
III	Combinational Circuits	13	15
IV	Sequential Circuits	13	15
V	D/A, A/D and Memory	13	15
	Revision	05	
	Cycle Tests and Model Examination	07	
	Total	75	75

2E4302 - ANALOG & DIGITAL ELECTRONICS

CONTENT DETAILS

UNIT I : . LINEAR ICS: OP-AMPS, TIMERS AND THEIR APPLICATIONS

1.1 Op-amps : Operational amplifier -Ideal Op.Amp -Block diagram and characteristics - (Minus input follows Plus input and No current through Minus and Plus input) -op-amp parameters -CMRR -Slew rate -Virtual ground

1.2 Applications of opamp : Inverting amplifier - Summing amplifier -Non inverting amplifier -Voltage follower -Comparator -Zero crossing detector - Integrator– Differentiator– Op.Amp Specifications.

1.3 Timer : 555 Timer - Functional Block diagram -Astable, Monostable and Schmitt Trigger . IC voltage regulator -3 pin IC regulators -78 xx, 79xx, LM317

UNIT II : BOOLEAN ALGEBRA

2.1 Number systems & Boolean Algebra : Decimal -Binary -Octal -Hexadecimal -BCD - Conversion from one number system to other –Boolean Algebra -Basic laws and Demorgan‘s Theorems

2.2 Logic gates : OR -AND -NOT -NOR -NAND -EXOR : Symbols, Truth table and Boolean expression -Realization of gates using universal gates NAND and NOR

2.3 Simplification Of Boolean Expressions : Problems using 2, 3, and 4 variables -Boolean expression for outputs -Simplification of Boolean expression using karnaugh map (upto 4 variable)- Constructing logic circuits for the Boolean expressions.

UNIT III : COMBINATIONAL LOGIC

3.1 Arithmetic circuits : Binary addition -Binary Subtraction -1‘s complement and 2‘s complement -Signed binary numbers -Half adder -Full adder -Half subtractor -Full subtractor

3.2 Functional Logic circuits : Parity Generator and checker– Digital comparator - Arithmetic Logic Unit -Decoder -3 to 8 decoder -BCD to seven segment decoder - Encoder - Multiplexer –Demultiplexer -Digital Logic families

3.3 Digital Logic families : TTL NAND – CMOS NOR -LS series - Fan in - Fan out - Propagation delay - Noise immunity for the above families.- Tristate Logic.

UNIT IV : SEQUENTIAL LOGIC

4.1 Flip-flops : RS -D -T -JK -Master Slave Flip Flops -Edge triggered FF

4.2 Counters : Asynchronous Binary Counter -Decade counter -Mod n counter -Up/ Down Counter - Presettable counter -Ring counter -Johnson counter -Synchronous counter

4.3 Shift register : 4 bit shift register -Serial in Serial out -Serial in Parallel out -Parallel in serial out - Parallel in Parallel out.

UNIT V : D/A, A/D AND MEMORY

5.1 D/A Converter : Basic concepts -Weighted Resistor D/A converter -R-2R Ladder D/A converter -Specification of DAC IC.

5.2 A/D Converter : Analog to digital conversion using Ramp method –Successive approximation method - voltage to frequency converter - Frequency to voltage converter specification of A/D converter.

5.3 Memory : Static Memory - Dynamic Memory - Static Memory organization in terms of address lines, control lines and data lines - Expanding memory (say 8k to 16k) SDRAM - DDR RAM.

TEXT BOOK

Sl.No.	Title	Author	Publisher
1	Digital Principles and applications, 1st Edition,2006	Albert Paul Malvino Donold P. Leach	TMH New Delhi
2	Integrated Circuits 1st Edition,2008	K.R.Botkar	Khanna Publishers, New Delhi

REFERENCE BOOKS

Sl.No.	Title	Author	Publisher
1	Modern Digital Electronics 4th Edition,2009	R.P.Jain	TMH New Delhi
2	Electronics Devices Application and Integrated Circuits 5th Edition	Mathur Kulshreshtha Chadha	Umesh publications, New Delhi - 6
3	Digital Electronics 6th Edition 2004	Roger L. Tokheim Macmillan	McGraw -Hill -

ONLINE RESOURCES

www.electrical4u.com/digital-electronics/
www.electronics.wisc-online.com/category.aspx

COURSE OUTCOME

CO1	Having the Knowledge about Linear ICs: Op-amps, Timers and their applications
CO2	Able to understand Boolean Algebra Able to simplify Boolean expressions using K Map.
CO3	Able to understand the concepts and usage of Combinational Circuits.
CO4	Able to understand the concepts and usage of Sequential Circuits
CO5	Able to understand the concepts and applications of D/A, A/D and Memory

2E4206 - MEASUREMENTS AND INSTRUMENTATION

RATIONALE

The course "Electrical Measurement And Measuring Instruments" is important in the field of electrical engineering. This course deals with the methods of measuring voltage, current, power, energy, frequency, power factor & parameters like resistance, inductance and capacitance and constructional detail and principle of operation of the instruments used for such measurements. Also it provides the methods to extend the range of low range instruments to measure higher values. The detailed classification of all instruments used for the above measurement is dealt.

OBJECTIVES

On completion of the following units of syllabus contents, the students must be able to

- Understand the basic concepts on measuring system and definition of important terms,
- Know the various analog instruments used to measure voltage, current and resistance and their principle of working, construction and applications.
- Know the construction, working and applications of Cathode Ray Oscilloscope
- Know the construction, working and applications of Wattmeters and Energy Meters
- Understand the concept of Digital meters.
- Know the special instruments like MD indicator, trivector meter, synchroscope, etc.
- Understand Basic transducers and their working.

SCHEME OF INSTRUCTION & EXAMINATION

Course Code	Instruction		Credit	Scheme Of Examination			
	Hours / week	Hours / Term		Marks			Duration
				Internal	End Exam	Total	
2E4206	5	75	5	25	75	100	3

TOPICS AND ALLOC ATION OF HOURS & MARKS

Unit No	Name of the Topic	Hours	Marks
I	Basics of Measurement System and CRO	12	15
II	Measurement Of Current, Voltage And Resistance	13	15
III	Measurement Of Power And Energy	13	15
IV	Special Instruments	13	15
V	Principle Of Instrumentation	12	15
	Revision	03	
	Cycle Tests and Model Examination	07	
	Total	75	75

2E4206 - MEASUREMENTS AND INSTRUMENTATION

CONTENT DETAILS

UNIT I : BASICS OF MEASUREMENT SYSTEM AND CRO

1.1 Definition & Classification: Definition of True value -accuracy -precision -errors - correction - sensitivity -resolution -instrument efficiency. Classification of instruments - Absolute and secondary instruments -indicating, integrating and recording instruments - Effects utilized in instruments

1.2 Operating forces: Deflecting, controlling and damping forces– control system - comparison of spring and gravity control -different types of damping systems - constructional details of supports - balancing -torque weight ratio.

1.3 CRO: Block diagram of a general purpose CRO - Functions of each block – Dual trace and dual beam CRO - Digital Storage oscilloscope - Applications of CRO

UNIT II : MEASUREMENT OF CURRENT, VOLTAGE AND RESISTANCE

2.1 MC and MI Instruments: Constructional details and working of permanent magnet moving coil meters - constructional details and working of moving iron (Attraction and repulsion) meters as ammeters and voltmeters. Extension of instrument range by shunts and multipliers -problems.

2.2 Instrument transformers: Principle of working -connection in a circuit -rating -ratio and phase angle error (definition and formula only) -Effect of sudden opening of secondary of CT.- Introduction to optical instrument transformers

2.3 Measurement of resistance: Classification of Resistances (low, medium and high) - construction and working principle of shunt and series ohmmeters, Construction, working and applications of Megger and multi meter.

UNIT III : MEASUREMENT OF POWER AND ENERGY

3.1 Watt meters: Classification of watt meters - dynamometer type wattmeter- construction - theory of operation - low p.f. Wattmeter -two element, three-phase wattmeter. Maximum demand (M.D). indicator.

3.2 Energy Meter: Construction principle and working of static type energy meters - smart meters - integrated measuring digital instruments for measuring electrical power in KW, KVA, KVAR & KWh. use of CT and PT for energy measurement.

3.3 Power factor Meter: Construction - principle of working of dynamometer type power factor meter - single phase and three phase.

UNIT IV : SPECIAL INSTRUMENTS

4.1 Frequency meters: principle and working of Weston frequency meter - - Block diagram of digital frequency meter - advantages and applications.- Block diagram of digital voltmeter - advantages and applications.

4.2 Synchroscope: Construction -working of Weston synchroscope. Phase sequence meter: Construction - principle of working of rotating type Indicator.

4.3 Bridges: Anderson bridge for measurement of inductance, Schering bridge for measurement of capacitance (No derivation, formula under balanced condition only). Cable fault location - Murray and Varley loop tests.

4.4 Recorders: Construction, working and applications of X Y recorder and Strip chart recorder

UNIT V : PRINCIPLE OF INSTRUMENTATION (Qualitative treatment only)

5.1 Transducers: Primary and secondary transducers -active and passive transducers - electrical transducers - types - advantages of electrical transducers over mechanical transducers - Analog and Digital transducers - Comparison between Analog & Digital transducers -Block diagram of instrumentation system - Use of computers in process control

5.2 Resistive, Inductive & Capacitive Transducers: Resistive transducer – potentiometers - Measurement of Temperature - Resistance Temperature Detector - Thermocouple - Thermistor - Strain gauge for the measurement of pressure. Inductive transducer - types -applications - measurement of displacement using inductive transducer (LVDT). Capacitive transducers - types - applications – measurement of liquid level using capacitive transducer.

TEXT BOOK

Sl.No.	Title	Author	Publisher
1	A course in electrical and electronic measurements and instrumentation Reprint -2015	A.K.Sawhney Puneet Sawhney	Dhanpat Rai & Co., (P) Ltd., New Delhi

REFERENCE BOOKS

Sl.No.	Title	Author	Publisher
1	Electronic instrumentation 3rd Edition -2010	HS Kalsi	Tata McGraw Hill,New Delhi
2	Modern Electronic Instrumentation and measurement Techniques	Albert D.Heifrick William David Cooper	Learning Materials Centre, ISTE,New Delhi
3	A course in electrical and electronic measurements and instrumentation	Umesh Sinha	Satya Prakashan,New Delhi

ONLINE RESOURCES

www.electrical-engineering-portal.com/download-center/books-and-guides/
www.vssut.ac.in/lecture_notes/lecture1423813026.pdf

COURSE OUTCOME

CO1	Able to Understand the basic concepts and definition of important terms.
CO2	Able to Know the various analog instruments used to measure voltage, current and resistance and their principle of working, construction and applications.
CO3	Able to Know the construction, working and applications of CRO
CO4	Able to Know the construction, working and applications of Wattmeters and Energy Meters, Digital meters, Bridges and Recorders
CO5	Able to understand Basic transducers and their working

2E4303 - ELECTRICAL MACHINES - II LAB

RATIONALE

In Electrical Machine-II, the students have been imparted with the theoretical knowledge of different electrical machines. Keeping in view of practical knowledge the syllabus of Electrical Machines Lab has been preferred. So that it may bring boldness and confidence in the students regarding the actual working of Electrical machines.

OBJECTIVES

After the completion of this laboratory, the student should be able to

- Run the alternator and to determine the regulation by synchronous impedance method.
- Determine the load characteristic of Single Phase and three Phase alternator.
- Run and synchronize two alternators by lamp & synchroscope method.
- Determine 'V' and 'Inverted-V' curve of 3 phase synchronous motor.
- Run and conduct load test on Single Phase I.M., 3 Phase Cage I.M. and Slipring I.M.
- Draw equivalent circuit of an IM, by conducting No load & Blocked rotor test.
- Develop Circle diagram of three phase Induction motor
- Determine the unknown inductance by using Anderson bridge
- Determine the unknown capacitance by using Schering bridge
- Calibrate the given Wattmeter, Single Phase energy meter and 3 Phase energy meter.
- Measure the earth resistance using earth tester kit.
- Measure the displacement using LVDT.
- Calibrate the load cell.

SCHEME OF INSTRUCTION & EXAMINATION

Course Code	Instruction		Credit	Scheme Of Examination			
	Hours / week	Hours / Term		Marks			Duration
				Internal	End Exam	Total	
2E4303	6	90	3	25	75	100	3

Scheme Of Evaluation:

SLNO	Description	Maximum Marks
1	Circuit diagram	20
2	Connections and proceeding the Experiment	25
3	Reading/calculation/graph/result	25
4	Viva Voce	05
5	TOTAL	75

2E4303 - ELECTRICAL MACHINES - II LAB

CONTENT DETAILS

Sl.No	List of Experiments
1	Predetermination of regulation of alternator by synchronous impedance method
2	Load Test on three Phase Alternator
3	Synchronising of two alternators by lamp & synchroscope method.
4	Determination of V‘ Curve and inverted V‘ curves of a 3Ø synchronous motor.
5	Load test on a single phase induction motor and plot the performance curves
6	Load test on three phase induction motor and plot the performance curves
7	Equivalent circuit of a 3 phase Induction motor by conducting No load & Blocked rotor test
8	Circle diagram for 3 phases Induction Motor by conducting suitable Tests
9	Demonstration of power factor improvement by conducting suitable Tests
10	Calibration of Wattmeter.
11	Calibration of single phase energy meter by direct loading
12	Calibration of single phase energy meter by phantom loading
13	Calibration of 3 phase energy meter
14	Measurement of the earth resistance by using Megger / Earth tester kit.
15	Measurement of Displacement by LVDT
16	Measurement of weight by Load Cell
17	Measurement of Resistance, Inductance and Capacitance by Bridges
Note: Only one question will have to be answered by the students in the examination BY LOT out of the total 17 Questions.	

RESOURCE REQUIREMENT :

Sl.No	LIST OF EQUIPMENTS	Quantity Required
1	Synchronous Motor 3 / 5 HP (or more)	1
2	3 Phase Squirrel cage Induction motor 5 HP 440V/20A with loading arrangement	1
3	1 phase Induction motor 1 HP 230V/0.5A	1
4	3 phase Slip ring Induction motor 5HP 440V/20A	1
5	3 phase Alternator with prime mover	2
6	3 phase capacitor bank rating of 1KVAR, 400/440 V.	2
7	Synchronizing panel	2
8	AC Ammeter - Different ranges	10
9	DC Ammeter- Different ranges	6

10	AC Voltmeter - Different ranges	10
11	DC Voltmeter - Different ranges	6
12	Wattmeter - Different ranges	6
13	Wheatstone bridge	1
14	Anderson Bridge	1
15	Schering Bridge	1
16	1 Phase Energy meter Calibration Induction Type	1
17	3 Phase Energy meter Calibration Induction Type	1
18	Earth Resistance Kit (Megger)	2
19	LVDT Kit to measure Displacement	1
20	Load Cell kit with Load arrangement	1
21	Tachometer Analog / Digital	2
22	Synchroscope	1
23	Frequency meter	2
24	Power Factor meter	2
25	Single phase R.S.S meter	1
26	3 phase R.S.S meter	1

COURSE OUTCOME

CO1	Able to determine the load characteristic of Single Phase and three Phase alternator. Able to run and synchronize two alternators by lamp & synchroscope method.
CO2	Able to determine 'V' and 'Inverted-V' curve of 3 Ø synchronous motor. Able to run and conduct load test on 1 Ø I.M.,3 Ø Phase Cage I.M. and Slipring I.M. Able to draw equivalent circuit of an IM, by conducting No load & Blocked rotor test.
CO3	Able to develop Circle diagram of three phase Induction motor Able to determine the unknown inductance by using Anderson bridge Able to determine the unknown capacitance by using Schering bridge .
CO4	Able to calibrate the given Wattmeter, 1 Ø energy meter and 3 Ø energy meter. Able to measure the earth resistance using earth tester kit.
CO5	Able to measure the displacement using LVDT. Able to calibrate the load cell.

2E4304 - ANALOG & DIGITAL ELECTRONICS LAB

RATIONALE

In this practical work, the student‘s knowledge about the Analog and Digital systems. They will become capable of developing and implementing Digital Circuits. They will also be able to acquire skills of operating A/D and D/A converters, counters and display system.

OBJECTIVES

After the completion of this laboratory, the student should be able to

- Build and test various applications of operational amplifiers.
- Familiarized with use of Digital ICs.
- Assemble and study the various multivibrator circuit and voltage regulator circuits.
- Construct and study different counter circuits using IC‘s.
- Know A/D & D/A conversions.

SCHEME OF INSTRUCTION & EXAMINATION

Course Code	Instruction		Credit	Scheme Of Examination			
	Hours / week	Hours / Term		Marks			Duration
				Internal	End Exam	Total	
2E4304	4	60	2	25	75	100	3

Scheme Of Evaluation:

SLNO	Description	Maximum Marks
1	Circuit diagram	25
2	Connection	15
3	Execution	25
4	Result	05
5	Viva Voce	05
6	TOTAL	75

2E4304 - ANALOG & DIGITAL ELECTRONICS LAB

CONTENT DETAILS

SLNO	List of Experiments
1	Construct and test a) Inverting Amplifier and b)Non inverting amplifier using Op-A
2	Construct and test a) Scale changer circuit b) Summer circuit using Op.Amp.
3	Construct and test a) Differentiator circuit b) Integrator circuit using Op. Amp.
4	Construct and test a Astable Multivibrator using IC 555 and test its performance.
5	Construct and test a Monostable Multivibrator using IC 555 and test its performance.
6	Verify the truth table for the following gates AND, OR, NOT, NAND, NOR, EX-OR USING 74XX ICs.
7	Construct other gates using NAND gates.
8	Construct a Half Adder/Half Subtractor using 74XX ICs and verify its truth table
9	Construct Full Adder and verify the truth table using 74XX ICs.
10	Construct Full Subtractor and verify its truth table using 74XX ICs
11	Construct parity generator & parity checker circuit and verify its truth table using 74XX ICs.
12	Construct and verify the truth table of RS, D ,JK & T FFS
13	Construct a 4 bit BCD counter using 7473/7476 ICs and observe the output waveform
14	Construct a Decade counter using 7473/7476 ICs and observe the output waveform
15	Construct and verify the performance of a single digit counter with seven segment LEDs
16	Construct a 4 bit weighted Resistor D/A converter and test its performance.
17	Construct a 4 bit R-2R Ladder D/A converter and test its performance
18	Study and verification of the operation of ADC
Note: Only one question will have to be answered by the students in the examination BY LOT out of the total 18 Questions.	

EQUIPMENTS REQUIRED :

Sl.No	Name of the Equipment	Qty
01	DC Regulated Power Supply (0-30 v),1A	5
02	DC Regulated Power Supply 5V,1A	3
03	Dual RPS	2
04	Variac	3
05	Function Generator	4
06	CRO	4
07	Powerscope	1

08	Ammeters	12
09	Voltmeters	8
10	Digital Multimeter	5
11	Digital IC trainer kit	6
12	Differentiator & Integrator kit	1
13	DAC kit	1
14	Half adder & Full adder trainer kit	1
15	ADC kit	1
16	IC 555	10
17	IC 741	10
18	IC 7404,7408.7432,7400,7402,7408,7486	Each 8
19	IC 7474	10
20	IC 7490	2

COURSE OUTCOME

CO1	Able to Build and test various applications of operational amplifiers.
CO2	Familiarized with use of Digital ICs.
CO3	Able to Assemble and study the various multivibrator circuit and voltage regulator circuits.
CO4	Knowing how to Construct and study different counter circuits using IC‘s.
CO5	Able to Know A/D & D/A conversions.

2E4305 – ELECTRICAL WORKSHOP

RATIONALE:

Workshop SKILL is also a kind of ESSENTAL PRACTICAL KNOWEDGE required for the Engineering students in general and Diploma Students in particular. A Diploma holder must know how to behave and work on shop floor. This helps to develop psychomotor skill and attitude. Workshop practice is the backbones of the real industrial work situation, which helps in development and enhancement of relevant skill required by the technical working in engineering industries and workshops. They will be using different types of tools/equipment in different shops for fabrication and servicing.

. This Electrical Workshop will impart practical knowledge to the Diploma students servicing of domestic appliances, .and the skill on assembling and test of household electrical appliances.

OBJECTIVE

- To Identify and use the tools used in servicing of electrical appliances.
- To Assemble the various parts of domestic appliances.
- To Make the electrical connections and test its performance.
- To Demonstrate observance of the safety consciousness and good housekeeping in a workshop.

SCHEME OF INSTRUCTION & EXAMINATION

Course Code	Instruction		Credit	Scheme Of Examination			
	Hours / week	Hours / Term		Marks			Duration
				Internal	End Exam	Total	
2E4305	6	90	4	25	75	100	3

Scheme Of Evaluation:

SLNO	Description	Maximum Marks
1	Connection Diagram	10
2	Tools Required	10
3	Dismantling and Assembling Procedure	30
4	Testing	20
5	Viva Voce	5
6	TOTAL	75

2E4305 – ELECTRICAL WORKSHOP

CONTENT DETAILS

SLNO	List of Exercises
1	Familiarization of tools used for electrical repair works and personal protection equipments.
2	Dismantling of Electrical iron box, identifying the parts, checking the conditions, assembling and testing.
3	Dismantling of Mixer Grinder, identifying the parts, checking the conditions, assembling and testing.
4	Dismantling of Wet Grinder, identifying the parts, checking the conditions, assembling and testing.
5	Assembling the accessories of ceiling fan, test the connections of winding & capacitor and run the fan with speed regulator.
6	Connect the battery and inverter to supply partial load in a domestic wiring during mains failure.
7.	Assembling and testing of 15 watts LED light.
8.	Battery charging through solar panel. Connect solar panel to charge battery through charge controller.
9.	Dismantling of induction heater, identifying the parts, checking the conditions, assembling and testing
10.	Dismantling of Washing Machine, identifying the parts, checking the conditions, assembling and testing.

EQUIPMENT / MATERIALS REQUIRED:

SLNO	DESCRIPTION	QUANTITY
1	Tools: Screw driver, Cutting pliers, Wire Spanner set, Line Tester, Nose pliers Stripper, Hammer,	2 sets
2.	Personal Protective Equipments: Safety helmet, Safety gloves, Nose mask, Ear plug, Safety Belt	2 sets
3.	Multi Meter	4
4	Electric Iron Box	2
5.	Mixer Grinder	2
6.	Wet Grinder	2
7.	Ceiling Fan	2
8.	Inverter	2
9.	LED lamp with fitting	5
10	Solar Photo Voltaic Module	2

11	Lead Acid Battery	1
12	Battery Charger and Charge controller	1
13	Induction heater	1
14	Washing Machine	1

COURSE OUTCOME

CO1	Able to identify and use the tools used in servicing of electrical appliances.
CO2	Able to assemble the various parts of domestic appliances.
CO3	Able to make the electrical connections and test its performance.
CO4	Demonstrate observance of the safety consciousness and good housekeeping in a workshop.

2E4207– LIFE AND EMPLOYABILITY SKILLS PRACTICAL

Course Code	Instruction		Credit	Scheme Of Examination			
	Hours / week	Hours / Term		Marks			Duration
				Internal	End Exam	Total	
2E4307	4	60	3	25	75	100	3

RATIONALE

Against the backdrop of the needs of the Industries, as wells as based on fulfilling the expectations of the Industries, the Diploma Level students have to be trained directly and indirectly in toning up their competency levels. Proficiency in Communication only, equips them with confidence and capacity to cope with the employment. Hence, there is a necessity to focus on these in the curriculum. At the end of the Course, the student is better equipped to express himself in oral and written communication effectively.

SPECIFIC INSTRUCTIONAL OBJECTIVES

1. Emphasize and Enhance Speaking Skills
2. Increase Ability to Express Views & Opinions
3. Develop and Enhance Employability Skills
4. Induce Entrepreneurship and Plan for the Future
5. Expose & Induce Life Skills for Effective Managerial Ability

Topics and Allocation of Hours:

Sl. No.	Section	No. of Hours
1	Part - A LISTENING ACTIVITY TOPICS: Global Warming, Pollution, Environment and Communal harmony	12
2	Part - B SPEAKING ACTIVITY TOPICS: Communication; Behavioural Skills; Productivity , Descriptive skills, femiliarizing FAQ in personal interview, situational dialogues and telephonic conversation, Occupational Safety, Health Hazard; Accident & Safety, First aid	28
3	Part - C WRITING AND READING ACTIVITY TOPICS: 1.Pre interview skills 2.while interview skills (Facing Interviews) 3.Post interview skills ; Entrepreneurship and Project Preparation	08
4	Part – D GOOGLE SEARCH AND PRESENTATION in Record note (for Continuous Assessment as Assignments on any five topics) (16 Topics enclosed separately)	12
	TOTAL	60

2E4207– LIFE AND EMPLOYABILITY SKILLS PRACTICAL

CONTENT DETAILS

Sl. No	SECTION	SKILLS TO BE ACQUIRED	ACTIVITY	No,OF HOURS
1.	PART-A LISTENING ACTIVITY TOPICS: 1. Global Warming, 2. Pollution, 3.Environment,Communal Harmony	Deductive/reasoning skills Cognitive Skills Retention Skills	Talking down notes/hints Answering question Fill in the blanks the exact words heard Brief the read out passage	04 04 02 02
2.	PART-B SPEAKING ACTIVITY TOPICS: COMMUNICATION: Behavioural skills; Productivity, Occupational safety, Health Hazards,Accident &safety,First-aid,descriptive skillsFAQ in personal interview Various situational dialogues and telephonic conversation	Personality/psychological skills Pleasing &Amiable Skills Assertive skills Expressive skills Fluency/compatibility skills Leadership/team Spirit skills Interview skills(FAQ)	Instant sentence making Say expression/phrases Self introduction/ another higher official in company Describe/explain products Dialogues on technical ground discuss &interact Group Discussion	02 02 04 06 06 08
3.	PART-C READING AND WRITING ACTIVITY TOPICS: Facing interviews; entrepreneurship and Project Preparation	Creative & Reasoning Skills Creative &Composing Skills Attitude& Aim Skills Entrepreneurship Skills	Frame New words with the given words/Phrases Prepare an outline of a project to obtain loan from bank in becoming an entrepreneurship	02 02 02 02
4	PART-D Google search and presentation in record note(for continuous Assessment on any five topics) (16 Topics enclosed separately)	Cognitive Skills Presentation Skills & Interactive Skills	Search in the website Prepare a presentation Discuss & Interact Records as assignment	12

ASSIGNMENT TOPICS

1.Productivity in Industries
2.Quality Tools, Quality Circles and Quality Consciousness
3. Effective Management
4. House Keeping in Industries
5. Occupational Safety and Hazard
6. Occupational Accident and First Aid
7. Labour Welfare Legislations
8. Labour Welfare Acts and Rights
9. Entrepreneurship
10.Marketing Analysis, Support and Procurement
11.Constitutional And Legal Provisions For Women In India
12.The Harassment of Women at Workplace (Prevention and Prohibition and Redressal) Act, 2013
13. Guidelines and Norms laid down by the Hon'ble Supreme Court in Vishaka and Others
14. The National Commission for Protection of Child Rights (NCPCR)
15..Protection of Children from Sexual Offences (POCSO) Act and Rule 6 of POCSO Rules, 2012
16. Importance of Communication in English

LABORATORY REQUIREMENTS:

1. An echo-free room
2. Necessary furniture and comfortable chairs
3. A Computer with internet access
4. English newspapers with equivalent Tamil news papers
5. A minimum of Three Mikes with or without cords
6. Colour Television with DTH
7. DVD/VCD Player with Home Theatre speakers
8. Projector

Suggested Reading:

1. Production and Operations Management by S.N. Chary, TMH
2. Essentials of Management by Koontz & Weihrich, TMH
3. Modern Production / Operations Management by E.S. Buffa and R.K. Sarin, John Wiley & Sons
4. Production Systems: Planning, Analysis and Control by J.L. Riggs, 3rd ed., Wiley.
5. Productions and Operations Management by A.Muhlemann, J. Oakland and K. Lockyer, Macmillan
6. Operations Research - An Introduction by H.A. Taha, Prentice Hall of India
7. Operations Research by J.K. Sharma, Macmillan
8. Business Correspondence & Report Writing by R.C. Sharma and K. Mohan, TMH
9. How to prepare for Group Discussion & Interview (With Audio Cassette) by Prasad, TMH 10. Spoken English – A self-learning guide to conversation practice (with Cassette)
11. Introduction to Environmental Engineering by Mackenzie, L. Davis and A. David, Cornwell, McgrawHill, 3rd Ed.
12. Environmental Engineering by Peary, Rowe and Tachobanoglous, McgrawHill
13. Total Quality Management – An Introductory Text by Paul James, Prentice Hall
14. Quality Control and Applications by Housen & Ghose
15. Industrial Engineering Management by O.P. Khanna

Course Outcome:
After learning the course the students should be able to:

CO 1	Emphasize and Enhance Speaking Skills
CO 2	Increase Ability to Express Views & Opinions
CO 3	Develop and Enhance Employability Skills
CO 4	Induce Entrepreneurship and Plan for the Future
CO 5	Expose & Induce Life Skills for Effective Managerial Ability

LEARNING STRUCTURE **100 Marks**

- **Focus more on Speaking & Listening Skills**
- **Attention less on Reading & Writing Skills**
- **Apply the skills in fulfilling the Objectives on Focused Topics**

a) Listening **25 Marks**

1. Deductive Reasoning Skills (Note taking, summarizing**,** **10**
2. Cognitive Skills (answering questions) **10**
3. Retention Skills (filling in blanks with exact words heard) **05**

b) Speaking Extempore/ Prepared **30 Marks**

1. Coherence Skills (story telling) **05**
2. Interview Skills (FAQ in interviews) **05**
3. Assertive Skills (introducing oneself/others) **05**
4. Expressive Skills (describe/explain things) **05**
5. Fluency/Compatibility Skills (dialogue) **05**
6. Leadership/Team Spirit Skills (group discussion) **05**

c) Writing & Reading **20 Marks**

1. Creative & Reasoning Skills (frame questions on patterns) **05**
2. Creative & Composing Skills (make sentences on patterns) **05**
3. Attitude & Aim Skills (prepare resume) **05**
4. Entrepreneurship Skills (prepare outline of a project) **05**

d) Continuous Assessment (Internal Marks) **25 Marks**

(search, read, write down, speak, listen, interact & discuss)

1. Cognitive Skills (Google search on focused topics)
2. Presentation Skills& Interactive Skills (after listening, discuss)

Total Marks: **100 Marks**

Continuous Assessment (Internal Marks)

I	LISTENING (3 exercises), SPEAKING (6 exercises) and READING & WRITING (4 exercises). All activities shall be recorded in the Record note. 13 exercises x 10 marks = 130 marks. Reduced to 10 marks	10 Marks
II	Present in the Record Note on any 5 topics prescribed in syllabus as Assignments Topics 5 Assignments x 10 Marks = 50 marks. Average of 5 Assignments is 10 marks	10 Marks
III	Attendance	5 Marks
	Total	25 Marks

TERM - V

2E5306 - POWER SYSTEM –I

RATIONALE

Power system comprises generation, transmission and distribution. In this course generation, transmission and distribution, types of generation schemes , transmission with transmission loss and efficiencies , different type of sub-stations , different type of distribution schemes, EHV AC and HVDC transmission, underground cable and economics aspects involved are dealt with. Further types of tariff are briefly included to give brief and overall idea to the technicians.

In power stations and sub stations applications of switchgear and various protective schemes applied to various electrical equipment/ machines/ bus bars, feeders, transmission lines/ distribution lines etc. are essential to minimize normal and abnormal faults and for safety of human being. Safety is the major criteria of every power station and substation for machines/ equipment and human beings. Operating skill of switchgear and protective systems is much essential for the technician working in the particular work area.

Essential efforts are being made in this course to ensure that students develop skills in operating various controls and switchgear in power system. He/she needs to make remedial measures for faults/abnormalities in machines/equipment in power system using appropriate diagnostic instrument/devices.

OBJECTIVES

To understand

- Conventional Power Plants - layout, site.
- Non conventional power generation - methods.
- Grid system.
- Energy Conservation, Audit and Management
- AC transmission -supports, conductors, lines, effects.
- High Voltage DC transmission.
- Line insulators, UG cables.
- Fuse-types and their characteristics.
- Principle, types and location of current limiting reactors.
- Causes of over voltages & Methods of reducing over voltages.
- Operating principles, construction & applications of lightening arrestor.
- Insulation co-ordination & volt- time characteristic.
- Importance of Neutral Earthing, Methods, advantages & applications.
- Necessity & types of interruption devices like ACB, OCB, ABCB, SF6 and vacuum circuit breakers.
- Working principle and various types of circuit breakers
- Concept of protective relay and its selection.
- Classification of relays.
- Principle of working and operation of relays and their construction.
- Basic terms related to relay like pick up value, reset value- and operating current etc.

- Use the static relays in modern power system.
- Settings of various types of relays.
- Maintenance and testing of relays.

SCHEME OF INSTRUCTION & EXAMINATION

Course Code	Instruction		Credit	Scheme Of Examination			
	Hours / week	Hours / Term		Marks			Duration
				Internal	End Exam	Total	
2E5306	5	75	5	25	75	100	3

TOPICS AND ALLOCATION OF HOURS & MARKS :

Unit No	Name of the Topic	Hours	Marks
I	Generation Of Electrical Power	13	15
II	A.C Transmission And HVDC Transmission	13	15
III	Line Insulators And Underground Cables	13	15
IV	Circuit Breakers And Over Voltage Protection	12	15
V	Protective Relays And Grounding	12	15
	Revision	05	
	Cycle Tests and Model Examination	07	
	Total	75	75

2E5306 - POWER SYSTEM –I

CONTENT DETAILS

UNIT I : GENERATION OF ELECTRICAL POWER

1.1 **Conventional methods of Generation :** Introduction-Conventional methods of power generation -schematic arrangement and choice of site for Hydel, thermal, Nuclear power plants-Advantages and Disadvantages - Comparison of these power plants - Principle and types of co generation

1.2 Economics of power Generation : Grid or Inter connected system - Advantages of Inter connected systems- Load Transfer through Inter connector - Load curves and Load duration curves - connected load - Average load -Maximum Demand -Demand factor - Load factor - Plant Use Factor - Diversity factor - Plant capacity factor -Significance of high load & diversity factors - Load sharing between base load and peak load plants - Load Despatching centre -Functions - stand alone system

1.3 Tariff : Factors influencing tariff – Types of tariff – Flat rate tariff – Two part tariff – Maximum demand tariff – Three part tariff – Block rate tariff – Power factor tariff – Simple problems

UNIT II : A.C TRANSMISSION AND HVDC TRANSMISSION

2.1 A.C. Transmission,conductors & Line supports : Introduction-Typical Layout of A.C. Power supply scheme various system of power Transmission-Advantages and Disadvantages of A.C Transmission- High Transmission Voltage-Advantages-Economic choice of Transmission voltage-Elements of a Transmission Line - Economic choice of conductor size-Kelvin's Law- Its limitation-over Head Line-Conductor materials and their properties-Line supports-Its properties - Types of supports and their applications-spacing between conductors-length of span

2.2 Calculations in overhead lines : Sag in over head lines-Calculation of Sag- When the supports are at equal and unequal levels – Problems - constants of a Transmission line-Transposition of Transmission lines-Skin Effect- Ferranti Effect-Corona- formation and corona loss-Factors affecting corona- Advantages and Disadvantages-Classification of O.H. Transmission lines- performance of single phase short Transmission line - voltage regulation and Transmission Efficiency- Problems.

2.3 H.V.D.C Transmission: Advantages and Disadvantages of D.C Transmission- Layout Scheme and principle of High Voltage D.C Transmission - D.C link configurations (monopolar, Bipolar and Homopolar)-HVDC convertor Station(Schematic diagram only)-Comparision between constant current and constant voltage HVDC systems.

UNIT III : LINE INSULATORS AND UNDERGROUND CABLES

3.1 Line Insulators: Introduction-Line Insulator materials-Properties of Insulators-Types- causes of failure of Insulators-Testing of Insulators-Potential Distribution over suspension Insulator string-String Efficiency - methods of improving string Efficiency-problems.

3.2 Underground cables: Introduction-Advantages and requirement of cables- construction-of a three core cable-Insulating materials for cables- properties of Insulating materials used in cables- classification of cables-cables for three phase service- construction of Belted cable, screened cable, Pressure cables

3.3 Laying, Grading & Fault finding in cables : Laying of underground cables-Direct laying, Draw- in- system, solid system- Advantages and Disadvantages- Grading of cables-capacitance grading, Inter sheath grading (No derivation and Problems)

UNIT IV : CIRCUIT BREAKERS AND OVER VOLTAGE PROTECTION

4.1 Circuit Breakers: Switch gear-Essential features of Switch gear-faults in a Power system (definition only). Basic principle of circuit Breaker -Arc Phenomenon- methods of Arc extinction-Arc voltage -Restriking voltage and recovery voltage-Rate of rise of restriking voltage- current chopping Interruption of capacitive current -resistance switching-C.B ratings - Breaking capacity, making capacity, short time rating - Auto reclosing in circuit Breakers - Classification of C.B.S - construction, working principle , merits and Demerits of Air Blast C.B, SF6 and vacuum C.B-Maintenance schedule for circuit breakers. D.C breaking - Problems of D.C breaking-Schematic for HVDC C.B- producing current zero.

4.2 Fuses: Desirable characteristics-Fuse Element materials-current rating of fuse elements-fusing current-Cut off current-L.V fuses-Rewirable fuse, HRC cartridge fuse,HRC fuse with tripping device -H.V. fuses-cartridge type, liquid type and metal clad-fuses-Comparision of fuse and circuit breaker.

4.3 Over voltage protection: Voltage surge- causes of over voltage-Lightning-Types of lightning strokes -Direct stroke, Indirect stroke-Harmful Effects of lightning - Protection against lightning-Earthing screen, Overhead ground wires, Lightning arresters- Expulsion type, Gapless arrester.

UNIT V : PROTECTIVE RELAYS AND GROUNDING

5.1 Protective relays: Basic principled -Fundamental requirements of protective relaying-Primary and back up Protection-relay characteristics-relay timing -Instantaneous relay –Inverse time relay and Definite time lag relay-Inverse definite minimum time relay-classification of relays-Construction, Principle of operation and applications of Induction type over current relay Directional and Non-directional), Distance relay, Differential relay

5.2 Modern relays : Negative sequence relay, Induction type reverse power relay, Earth leakage relay. Static relays- Basic elements of static relay -Schematic diagram and operating principle of smart protective relays - current, Impedance, directional, reactance and Mho relays.

5.3 Grounding: Introduction - Equipment grounding - system grounding - ungrounded Neutral system - Necessity of Neutral grounding -methods - solid grounding, Resistance grounding - Reactance grounding, Resonant grounding - Earthing Transformer.

TEXT BOOK

Sl.No.	Title	Author	Publisher
1	Principles of Power Systems 3rd re-edition, 2005	VK. Mehta	S.Chand & Co New Delhi .

REFERENCE BOOKS

Sl.No.	Title	Author	Publisher
1	A Course in Electrical Power 2013 Edition, 2013	Soni , Gupta & Bhatnagar	Dhanpath Rai & Co (P) Ltd., New Delhi
2	Electrical Power System Re print-2009	S.L. Uppal	Khanna Publishers, New Delhi
3	A Course in Electrical Power 2013 Edition, 2013	J.P. Gupta	Katson Publishing House, New Delhi

ONLINE RESOURCES

www.nptel.ac.in/courses/108102047/
www.electrical4u.com/protection-system-in-power-system/
www.electrical4u.com/electrical-switchgear-protection/
www.electrical4u.com/electrical-power-transmission-system-and-network/

COURSE OUTCOME

CO1	Able to understand Conventional Power Plants - layout, site. Able to understand Non conventional power generation - methods. Able to understand Grid system, Energy Conservation, Audit and Management
CO2	Able to understand AC transmission -supports, conductors, lines, effects. Able to understand High Voltage DC transmission, Line insulators, UG cables.
CO3	Able to know Fuse-types and their characteristics. Able to know Principle, types and location of current limiting reactors. Able to know Causes of over voltages & Methods of reducing over voltages.
CO4	Able to know Insulation co-ordination & volt- time characteristic. Able to know the Importance of Neutral Earthing, Methods, advantages & applications. Able to know the Necessity & types of interruption devices like ACB, OCB, ABCB, SF6 and vacuum circuit breakers.
CO5	Able to understand Working principle and various types of circuit breakers Able to know the Concept of protective relay and its selection. Having the knowledge about Classification of relays, Principle of working and operation of relays and their construction. Knowledge about Basic terms related to relay like pick up value, reset value- and operating current etc. ,Use the static relays in modern power system, Settings of various types of relays, Maintenance and testing of relays.

2E5307 - CONTROL AND MAINTENANCE OF ELECTRICAL MACHINES

RATIONALE

In the present era, the students, after passing Diploma in Electrical Engineering, will be employed in different industries, board and railways etc., where they will have to deal with the different types of machines and control circuits. It is, therefore, very essential to impart the knowledge of control and maintenance of electrical machines in details, to the students for successfully discharging their duties.

OBJECTIVES

To understand

- Electrical control circuit elements including various types of industrial switches, industrial relays, industrial timers, solenoids, contactors and interlocking arrangements.
- DC motor control circuits for direction control, speed control, acceleration control, braking control and jogging using contactors.
- Speed control of dc motor using Electronic components.
- AC motor control circuits for direction control, speed control, acceleration, control, braking control and jogging using contactors.
- Transformer installation, protection, oil checking and maintenance.

SCHEME OF INSTRUCTION & EXAMINATION

Course Code	Instruction		Credit	Scheme Of Examination			
	Hours / week	Hours / Term		Marks			Duration
				Internal	End Exam	Total	
2E5307	5	75	5	25	75	100	3

TOPICS AND ALLOCATION OF HOURS & MARKS :

Unit No	Name of the Topic	Hours	Marks
I	Control Circuit Components	12	15
II	DC & AC Motor Control Circuits	13	15
III	Industrial Control Circuits	12	15
IV	Operation & maintenance of ac motors and starters	13	15
V	Operation & maintenance of transformer	13	15
	Revision	05	
	Cycle Tests and Model Examination	07	
	Total	75	75

2E5307 - CONTROL AND MAINTENANCE OF ELECTRICAL MACHINES

CONTENT DETAILS

UNIT I : CONTROL CIRCUIT COMPONENTS

Switches : - Push button, selector, drum, limit, pressure, temperature (Thermostat), float, zero speed and Proximity switches.

Relays -Voltage relay, dc series current relay, frequency response relay, latching relay and phase failure relay (single phasing preventer). Over current relay -Bimetallic thermal over load relay and Magnetic dash pot oil filled relay.

Timer -Thermal, Pneumatic and Electronic Timer. Solenoid Valve, Solenoid type contactor (Air Break Contactor), Solid State Relay, Simple ON-OFF motor control circuit, Remote control operation and interlocking of drives.

UNIT II : DC & AC MOTOR CONTROL CIRCUITS

DC Motor Control Circuits : Current limit acceleration starters -Series relay and counter EMF starters - Definite Time acceleration starters.

AC Motor Control Circuits : Motor current at start and during acceleration – No load speed and final speed of motor -DOL starter – Automatic auto transformer starter (open circuit and closed circuit transition) - Star/Delta starter (semi automatic and automatic)– Starter for two speed, two winding motor –Reversing the direction of rotation of induction motor –Plug stopping of the motor -Dynamic braking -Three step rotor resistance starter for wound induction motor - Secondary frequency acceleration starter

UNIT III : INDUSTRIAL CONTROL CIRCUITS

Planner machine — Contactor control circuit — Logic control circuit-- Skip hoist control Automatic control of a water pump — Control of electric oven — Control of air compressor - Control of over head crane — Control of conveyor system — Control of elevator — Trouble spots in control circuits — General procedure for trouble shooting.

UNIT IV : OPERATION & MAINTENANCE OF AC MOTORS AND STARTERS

Change the direction of Rotation, Role of Single phase preventer, Types of enclosures, Permissible overload, effect of ambient temperature, Insulation classification, Indicating & Protecting devices for Large Size Motors, If overload mechanism trips frequently what action to be taken, Control devices for motors, role of relays in motor, Points to be attended during periodical maintenance, Air gap measurement, Ball & Roller bearing usage, precautions in fitting bearings, bearing problems, Alignment of directly coupled motors, Static and Dynamic balancing of rotor, Causes of low insulation resistance, rectification of low insulation resistance problem, drying out of motors, Step to be taken if a motor is unduly hot, Vacuum impregnation, Selection of starters for High/Low starting torque applications.

UNIT V : OPERATION & MAINTENANCE OF TRANSFORMER

Forces generated in transformer during short circuit - Noise in operation – Reason for temperature rise- -insulation resistance-Drying out- precaution for paralleling transformer-inrush current and remedy- insulation co-ordination-effect on insulation during star point earthing – transformer maintenance schedule – action to be taken while transformer oil, temperature rises unduly – points to be checked by oil level tends to fall down – attention required for bushing and insulator

TEXT BOOK

Sl.No.	Title	Author	Publisher
1	Control of Electrical Machines 1st Edition 2006	S.K. Bhattacharya	New Age International Publishers ,New Delhi.

REFERENCE BOOKS

Sl.No.	Title	Author	Publisher
1	Automation, Production System And Computer-Integrated Manufacturing 1st Edition 2016	Mikell P. Groover	Prentice Hall of India (P) Ltd., New Delhi
2	Control of Electrical Machines 1st Edition 1973	Irving L Kosow	Prentice Hall of India (P) Ltd., New Delhi
3	Electronic motor control 10th Edition 2014	Walter Alrich	Tarapoewala publications,MUMBAI

ONLINE RESOURCES

electrical-engineering-portal.com/download-center/books-and-guides/
www.electronics.wisc-online.com/category.aspx

COURSE OUTCOME

CO1	Able to understand Electrical control circuit elements including various types of industrial switches, industrial relays, industrial timers, solenoids, contactors and interlocking arrangements.
CO2	Able to understand DC motor control circuits for direction control, speed control, acceleration control, braking control and jogging using contactors.
CO3	Able to understand Speed control of dc motor using Electronic components.
CO4	Able to understand AC motor control circuits for direction control, speed control, acceleration, control, braking control and jogging using contactors.
CO5	Able to understand Transformer installation, protection, oil checking and maintenance.

2E5403.1 - MICRO CONTROLLER

RATIONALE

Microcontrollers have also assumed great significance in the field of electronics and common goods industry, and thus considered to be an important field of engineering. This course aims to expose the students to both of these and give them adequate knowledge of these topics.

OBJECTIVES

On completion of the following units of syllabus contents, the students must be able to

- Understand the history and need of Microprocessor.
- Understand the internal architecture details of 8085 Microprocessor.
- Explain Architecture of 8051 Microcontroller & the functions of various registers.
- Understand interrupt structure of 8051.
- Understand serial data communication concepts.
- Understand the programming techniques.
- Explain various addressing modes & Write simple programs using 8051.
- Understand the block diagram and control word formats for peripheral devices.
- Understand how to interface with RS232C.
- Understand how to interface with 8255.
- Understand various application of 8051 Microcontroller

SCHEME OF INSTRUCTION & EXAMINATION

Course Code	Instruction		Credit	Scheme Of Examination			
	Hours / week	Hours / Term		Marks			Duration
				Internal	End Exam	Total	
2E5403.1	5	75	5	25	75	100	3

TOPICS AND ALLOCATION OF HOURS & MARKS :

Unit No	Name of the Topic	Hours	Marks
I	Architecture of 8051 & their Pin details	13	15
II	Overview of 8051 Instruction Sets	13	15
III	Interrupts and Programming Examples	13	15
IV	Timer/Counter and Serial Communication:	12	15
V	Interfacing Techniques	12	15
	Revision	05	
	Cycle Tests and Model Examination	07	
	Total	75	75

2E5403.1 - MICRO CONTROLLER

CONTENT DETAILS

UNIT I : ARCHITECTURE OF 8051 & THEIR PIN DETAILS

1.1 Introduction to microprocessor & microcontroller : Architecture of 8085 -Functions of each block. Comparison of Microprocessor and Microcontroller -Features of microcontroller - Advantages of microcontroller -Applications Of microcontroller -Manufactures of microcontroller.

1.2 Architecture of 8051 : Block diagram of Microcontroller –Functions of each block. Pin details of 8051 -Oscillator and Clock -Clock Cycle -State - Machine Cycle -Instruction cycle – Reset - Power on Reset - Special function registers **:** Program Counter -PSW register -Stack - I/O Ports .

1.3 Memory Organisation: ROM - RAM - Memory Organization of 8051,Interfacing external memory to 8051

UNIT II : OVERVIEW OF 8051 INSTRUCTION SETS:

2.1 Assembler and Addressing Modes : Instruction Format, Different addressing modes of 8051, Assembling and running an 8051 program –Structure of Assembly Language -Assembler directives.

2.2 Instruction Sets : Classification of 8051 Instructions(based on Length) -Classification of 8051 Instructions(based on Function) .Data Handling instructions - Data transfer instructions - Arithmetic Instructions - Format of these instructions and examples

2.3 Logical Instructions & control instructions: Logical instructions(byte Operands) , Branching instructions – unconditional & conditional jump instructions - Format of these instructions and examples

UNIT III : I/O , INTERRUPTS AND PROGRAMMING EXAMPLES:

3.1 I/O : Bit addresses for I/O and RAM - I/O programming - I/O bit manipulation programming - Bit Manipulation Instructions

3.2 Interrupts & Interrupt handling - Interrupts available in 8051,their vector addresses, Interrupt priority in 8051- **Interrupt related SFRs:** interrupt enable register (IE) Interrupt priority register (IP), **Interrupt handling** - Programming Timer Interrupts –Programming external hardware interrupts -Programming the serial communication interrupt (Basic Level)

3.3 Programs : Multibyte Addition - 8 Bit Multiplication and Division - Biggest Number / Smallest Number -Ascending order / Descending order –Conversion Programs -HEX to BCD, BCD to HEX , HEX to ASCII & ASCII to Binary -Time delay routines

UNIT IV : TIMER/COUNTER AND SERIAL COMMUNICATION:

4.1 Special function registers : SFRs used for Timer/Counter -Timer 0 and Timer 1 registers - TCON register – TMOD register - SFRs used for Serial Communication - SCON register - SBUF register - PCON register .

4.2 Programming 8051 Timers/ Counter programming : Different modes of Timer - Programming Modes - Mode 0,Mode 1, Mode 2 & Mode 3. Different modes of Counter - Programming Modes - Mode 0, Mode 1, Mode2 & Mode 3. Simple Programs (using mode 1 or mode 2)

4.3 Basics of Serial programming : RS 232 Standards -8051 -connection to RS 232 - 8051 Serial Communication Programming -Programming the 8051 to transfer data serially - Programming the 8051 to Receive data serially

UNIT V : INTERFACING TECHNIQUES

5.1 Programmable interface IC: IC 8255 -Block Diagram -Modes of 8255 -CWR format - 8051 interfacing with the 8255.

5.2 Interfacing circuits : Relays and opto isolators –Sensor interfacing -ADC interfacing - DAC interfacing -Keyboard interfacing - Seven segment LED Display Interfacing - LCD display interfacing .

5.3 Microcontroller based Application : Stepper Motor interfacing -DC motor interfacing PWM.

TEXT BOOK

Sl.No.	Title	Author	Publisher
1	The 8051 microcontroller And Embedded Systems, 2nd Edition	Muhammad Ali Mazidi Janice Gillispie Mazidi	Prentice Hall of India (P) Ltd., New Delhi

REFERENCE BOOKS

Sl.No.	Title	Author	Publisher
1	8051 microcontroller Architecture, Programming & Applications 2nd Edition 1996	Kenneth J. Ayala	Penram International .
2	Using Assembly Language 3rd Edition 1992	Allen L.Wyatt Sr	Prentice Hall of India (P) Ltd., New Delhi

ONLINE RESOURCES

www.vssut.ac.in/lecture_notes/lecture1423813120.pdf

www.circuitstoday.com/8051-microcontroller

COURSE OUTCOME

CO1	Able to Understand the internal architecture details of 8085 Microprocessor. Knowledge about Architecture of 8051 Microcontroller
CO2	Able to Understand the programming techniques. Able to understand various Addressing modes , write,compile and debug programs involving decision structures, loops.
CO3	Able to understand interrupt structure of 8051.
CO4	Knowing the concepts of serial communication. Able to understand how to interface with RS232C.
CO5	Able to understand the block diagram and control word formats for peripheral devices and understand how to interface with 8255. Able to understand various application of 8051 Microcontroller

2E5403.2 - VLSI DESIGN

RATIONALE:

VLSI stands for "Very Large Scale Integration". This is the field which involves packing more and more logic devices into smaller and smaller areas. Field programmable gate arrays (FPGAs) can now contain over a million equivalent logic gates and tens of thousands of flip-flops. The reality is that today digital systems are designed by writing software in the form of hardware description languages (HDLs). The most common HDLs used today are VHDL and Verilog. This subject gives the students the complete idea of VLSI design

OBJECTIVES:

After learning this subject, the students will be able to

- Explain the Idea about State Machine Mealy and Moore Machines
- Explain the basic idea about Memory Organization
- Explain the Architecture of PAL
- Explain the Macro cell concept, VHDL design flow
- Explain About Various Design Types like Structural , Behavioral and RTL
- Explain About Data Flow Description, VHDL packages and Functions
- Give schematic diagram introduction to CPLD (Complex Programmable Logic Device) architecture & FPGA architecture.
- Explain the CLB's, LUT's, DCM units in FPGA.
- Explain the XILINX FPGA & CPLD families.
- Explain the Hierarchal Design flow, Basic concepts of Verilog HDL

SCHEME OF INSTRUCTION & EXAMINATION

Course Code	Instruction		Credit	Scheme Of Examination			
	Hours / week	Hours / Term		Marks			Duration
				Internal	End Exam	Total	
2E5403.2	5	75	5	25	75	100	3

TOPICS AND ALLOCATION OF HOURS & MARKS :

Unit No	Name of the Topic	Hours	Marks
I	Combinational Logic Circuits	13	15
II	VHDL for combinational logic circuit	13	15
III	Sequential Logic circuits	13	15
IV	VHDL for sequential Logic circuits	12	15
V	PLDS and FPGA circuits	12	15
	Revision	05	
	Cycle Tests and Model Examination	07	
	Total	75	75

2E5403.2 - VLSI DESIGN

CONTENT DETAILS

UNIT I : COMBINATIONAL LOGIC CIRCUITS

1.1 COMBINATIONAL CIRCUIT DESIGN: NMOS and CMOS logic implementation of Switch, NOT, AND, OR, NAND, and NOR Gates CMOS Transmission Gate. Digital logic variable, functions, inversion, gate/circuits, Boolean algebra and circuit synthesis using gates (Up to 4 variables).

1.2 COMBINATIONAL CIRCUIT BUILDING BLOCKS:
Circuit synthesis using Multiplexer, Demultiplexer, Encoders, Decoders, Arithmetic adder, Subtractor and Comparator circuits. Hazards and races

UNIT II : VHDL FOR COMBINATIONAL LOGIC CIRCUIT

2.1 VHDL FOR COMBINATIONAL CIRCUIT: Introduction to VLSI and its design process. Introduction to CAD tool and VHDL: Design Entry, Synthesis, and Simulation. Introduction to HDL and different level of abstractions. Behavioural modeling, dataflow modeling, structural modeling . HDL Statements and Assignments

2.2 VHDL CODE: AND, OR, NAND, NOR gates, Implementation of Mux, Demux, Encoder, decoder. Four bit Arithmetic adder, sub tractor and comparator in VHDL

UNIT III : SEQUENTIAL LOGIC CIRCUITS

3.1 SEQUENTIAL CIRCUIT DESIGN: Introduction/Refreshing to Flipflops and its excitation table, counters and Shift registers

3.2 DESIGN STEPS: State diagram, State table, state assignment. Example for Moore and Mealy machines. Design of modulo counter (upto 3 bit) with only D flip-flops through state diagram

UNIT IV : VHDL FOR SEQUENTIAL LOGIC CIRCUITS

4.1 VHDL FOR SEQUENTIAL CIRCUIT: VHDL constructs for storage elements. VHDL code for D Latch / D, JK and T Flip-flops with or without reset input.

4.2 VHDL EXAMPLES: Counters :Synchronous counters-2 bit &3 bit up counter. 3 bit up/down counter Decade counter, Johnson Counter

UNIT V : PLDS AND FPGA CIRCUITS

PLDS & FPGA: Introduction to PROM,PLA and PAL. Implementation of combinational circuits with PROM, PAL and PLA (up to 4 variables).Comparison between PROM, PAL and PLA. Introduction to Complex Programmable Logic device, Field Programmable Gate Array. Introduction to ASIC. Types Of ASIC

TEXT BOOK

Sl.No.	Title	Author	Publisher
1	Fundamentals of Digital Logic with VHDL design 2nd Edition -2008	Stephen brown Varnesic	McGrawHill

REFERENCE BOOKS

Sl.No.	Title	Author	Publisher
1	Digital Design 5th Edition 2013	M.Morris Mono Michael D.Ciletti	Pearson Education.
2	A VHDL Primer 3rd Edition 1999	Bhasker.J	Prentice Hall India

ONLINE RESOURCES

www.electrical4u.com/digital-electronics/
www.electronics.wisc-online.com/category.aspx

COURSE OUTCOME

CO1	Able to Understand the fundamentals of different types of MOSFET Able to the Idea about State Machine Mealy, Moore Machines and Memory Organization
CO2	Able to explain the Architecture of PAL,explain the Macro cell concept. Able to describe about the VHDL design flow
CO3	Able to explain about Concurrent Signals,about various design Types like Structural , Behavioral and RTL Able to explain about Data Flow Description
CO4	Knowing the concepts Explain About VHDL packages and Functions Able to understand schematic diagram of CPLD (Complex Programmable Logic Device) architecture & FPGA architecture. Able to explain the CLB's, LUT's, DCM units in FPGA.
CO5	Able to know the concepts of XILINX FPGA & CPLD families. Able to understand Hierarchal Design flow. Able to understand Basic concepts of Verilog HDL

2E5403.3 ELECTRICAL MACHINE DESIGN

RATIONALE

Throughout the country there are many electrical industries and manufacturing different kinds of electrical machines like transformers, DC generators, DC motors, AC motors, and alternators. Their rating starts from hundreds of WATTS / VA to few KW / KVA or even in MW / MVA. These Industries have R&D center, Diploma or Graduate engineers as R&D engineers for product development. Hence it is necessary to include electrical machine design as one of the subject at diploma level courses.

OBJECTIVES

To understand

- Static and Rotating Electrical Machine specifications, materials, losses and effects of temperature rise.
- Magnetic force, magnetic force gap, teeth and leakage flux in static and rotating electrical machines.
- Designing of single phase, three phase transformer, core and coil.
- Designing of dc machines.
- Designing of 3phase induction motor and 3phase synchronous machines.

SCHEME OF INSTRUCTION & EXAMINATION

Course Code	Instruction		Credit	Scheme Of Examination			
	Hours / week	Hours / Term		Marks			Duration
				Internal	End Exam	Total	
2E5403.3	5	75	5	25	75	100	3

TOPICS AND ALLOCATION OF HOURS & MARKS :

Unit No	Name of the Topic	Hours	Marks
I	Electrical Machine Design – Basic Consideration	12	15
II	Magnetic Circuit Calculations	12	15
III	Design of Transformer	13	15
IV	Design of dc machines	13	15
V	Design of ac machines	13	15
	Revision	05	
	Cycle Tests and Model Examination	07	
	Total	75	75

2E5403.3 ELECTRICAL MACHINE DESIGN

CONTENT DETAILS

UNIT I : ELECTRICAL MACHINE DESIGN – BASIC CONSIDERATION

1.1 Design Introduction: Design definition – Design consideration – limitation.
1.2 Constructional materials: Constructional elements of Transformers and rotating machines – constructional materials of electrical machines – conducting magnetic and insulating materials standard specification.
1.3 General Design & Class of Duty: General design process – main dimensions of rotating machines – electrical and magnetic losses – temperature – rise – class of duty – limits of temperature rise.

UNIT II : MAGNETIC CIRCUIT CALCULATIONS

2.1 Magnetic Circuits of Machines: Magnetic circuits of DC machines, round rotation AC machines, salient poles AC machines and Transformer.
2.2 Magnetic circuit parameters: Specific magnetic and electrical loading – Factor influencing the specific and magnetic loading –magnetizing curves – calculation of magnetizing force for the air gap of rotating machines and for teeth.
2.3 Magnetic leakages: Magnetic leakages – leakage flux – leakage reactance – armature slot leakage reactance

UNIT III : DESIGN OF TRANSFORMER

3.1 Design considerations: Important considerations – core and shell types – distribution transformers and power transformers – core section – clearance – yoke section – main dimension.
3.2 Design of Single phase and Three Phase Transformers: Single phase core type transformers – three phase core type transformer – output coefficient – voltage per turn – specific magnetic and electric loading of transformer
3.3 Winding design: Winding design – cross over, helix, disc helix.

UNIT IV : DESIGN OF DC MACHINES

4.1 Design considerations: Important design consideration – number of poles – advantages of large number of poles - air gap.
4.2 Armature and Field System Parameters: Armature slot – current density – field system – commutator.
4.3 Design of large dc motor: Design of large dc motor – Specific magnetic and electric loading of dc machines.

UNIT V : DESIGN OF AC MACHINES

5.1 Design Consideration: AC machine design consideration – power equation – separation of diameter and length – problems.
5.2 Design of Three phase Induction Motor : Three phase induction motor – important design consideration – standard frames and stampings – gap length – flux density – current density – power factor – efficiency – slot combination – winding - design of 3 phase induction motors.
5.3 Design of Three phase Synchronous Machines: Three phase synchronous machines – important design consideration – radial gap length – stator slot – stator coil – rotor construction – design of 3 phase synchronous machines.

TEXT BOOK

Sl.No.	Title	Author	Publisher
1	Principles Of Electrical Machine Design, 4th Edition 2010	R.K.Agarwal	S.K.Kataria & Sons

REFERENCE BOOKS

Sl.No.	Title	Author	Publisher
1	Principles Of Electrical Machine Design with Computer 2nd Edition 2006	S.K.Sen	Oxford & IBH
2	Design of Electrical Machine 5th Edition 2002	Mittle V.N.	Standard Book – House
3	Electrical Machine Design 2nd Edition 2000	A. Nagoor kani	RBA Publications
4	Performance and Design of AC Machine 3rd Edition 2005	M.G.Say	CBS Publisher & Distributor

ONLINE RESOURCES

www.vtu.allsyllabus.com/EEE/sem_6/Electrical_Machine_Design/index.php

COURSE OUTCOME

CO1	Able to understand Static and Rotating Electrical Machine specifications, materials, losses and effects of temperature rise.
CO2	Able to understand Magnetic force, magnetic force gap, teeth and leakage flux in static and rotating electrical machines.
CO3	Able to understand Designing of single phase, three phase transformer, core and coil.
CO4	Knowing the concepts of Designing of dc machines.
CO5	Able to understand Designing of 3phase induction motor and 3phase synchronous machines..

2E5308 - CONTROL AND MAINTENANCE OF ELECTRICAL MACHINES LAB

RATIONALE

The purpose of this course is to provide the student with basic skills required to work in the industry. This course will provides the student a hands-on approach to various types of starters used for a motor and know the power and control circuit of various starters and braking methods will be used for AC and DC Motors.

OBJECTIVES

After the completion of this laboratory, the student should be able to

- Wire and test the control circuit for various types of starters.
- Perform breakdown test and acidity test on the given transformer oil.
- Wire and test the control circuit for various operations like jogging, reversing control and braking of Motors.
- Conduct test on speed control of DC motor using SCR.

SCHEME OF INSTRUCTION & EXAMINATION

Course Code	Instruction		Credit	Scheme Of Examination			
	Hours / week	Hours / Term		Marks			Duration
				Internal	End Exam	Total	
2E5308	6	90	3	25	75	100	3

Scheme Of Evaluation:

SLNO	Description	Maximum Marks
1	Circuit diagram	20
2	Connection	20
3	Execution	25
4	Result	05
5	Viva Voce	05
6	TOTAL	75

2E5308 - CONTROL AND MAINTENANCE OF ELECTRICAL MACHINES LAB

CONTENT DETAILS

SLNO	List of Experiments
1	Perform breakdown test and determine the dielectric strength of transformer oil
2	Conduct acidity test on transformer oil.
3	Test the timing characteristic of thermal over load relay
4	Remote and interlocking operation using push button and contactor.
5	Wire and test the control circuit for jogging in 3Φ Cage IM
6	Wire and test the control circuit for semi-automatic star-delta starter
7	Wire and test the control circuit for automatic star-delta starter using thermal timer.
8	Wire and test the control circuit for dynamic braking of 3Φ Cage IM.
9	Wire and test the control circuit for two speed pole changing motor.
10	Wire and test the control circuit for automatic Rotor resistance starter
11	Wire and test the control circuit for dynamic braking of DC Shunt Motor
12	Test the working of single phase preventer.
13	Wire and test the control circuit for Reversing control of 3Φ Cage IM
14	Wire and test the control circuit for automatic star-delta starter using pneumatic timer..
15	Conduct test on speed control of DC motor using SCR
Note: Only one question will have to be answered by the students in the examination BY LOT	

EQUIPMENTS REQUIRED

Sl.No	LIST OF EQUIPMENTS	Quantity
1	Transformer oil Test Kit	1
2	Acidity test kit	1
3	Thermal Overload Relay Tester	1
4	Control circuit for Jogging of 3 phase IM	1
5	Control Circuit for Semi-automatic Star –delta Starter	1
6	Control circuit for Automatic star-delta starter	1
7	Control circuit for dynamic braking of cage motor	1
8	Control circuit for two speed pole changing motor	1
9	Control circuit for automatic Rotor resistance starter	1
10	Speed control of DC motor using SCR	1
11	Control circuit for single phase preventer	1
12	Control circuit for DOL starter	1

13	Control circuit for Star-Delta starter	1
14	Control circuit for jogging, forward and reverse operations	1
15	Control circuit for single phase preventer	1
16	Control circuit for rotor resistance starter	1

COURSE OUTCOME

CO1	Wire and test the control circuit for various types of starters
CO2	Perform breakdown test and acidity test on the given transformer oil
CO3	Wire and test the control circuit for various operations like jogging, reversing control and braking of Motors
CO4	Conduct test on speed control of DC motor using SCR

2E5309 - WIRING, WINDING & ESTIMATION LAB

RATIONALE

The purpose of this course is to provide the student with basic skills required to work in the commercial wiring and winding industry and also the students are prepare estimate for commercial and industrial electrification schemes. This course will provides the student a hands-on approach

a) to learn various methods of wiring construction including running conduit, wire pulling, and termination.

b) to learn the size of wire for a particular winding application, methods of laying of wires, types of insulation used etc.

c) to learn the Knowledge of electrical engineering drawing, IE rules, different types of electrical Installation and their design considerations.

d) to design and prepare working drawing of different Installation projects.

e) understanding of the methods

f) procedure of estimating the material required

g) skill of preparing schedule of material

OBJECTIVES

After the completion of this laboratory, the student should be able to

- To execute a staircase wiring for G+3 floors.
- To control one emergency bell from three different places.
- To connect a 1 phase motor load with main switch, starter, MCB and run.
- To connect a 3 phase motor load with main switch, starter, ELCB and run.
- To connect a 3 phase Main Switch, DB with suitable load.
- To make 1 phase service main with necessary items.
- To develop the wiring circuit to control (on/off) lamps (Incandescent lamp, Fluorescent Lamp, Sodium vapour lamp, Mercury Lamp) with a provision of fuse/ MCB/ electronic choke /switches.
- To prepare a test board with series/ parallel connection testing provisions.
- To wind a small transformer and testing it.
- To design and wind the No-volt coil used in starters.
- To wind and Insert the coils for a given 3 phase induction motor and ceiling fan motor
- To give end connection for a 3 phase Winding study motor connection.
- To prepare a price list for various Electrical wiring items and other accessories.
- To prepare a note on various insulation materials used in motor winding.
- Define different types of Electrical Installation
- Interpret the Electrical Engineering Drawing
- State IE rules
- State and describe the basic terms, general rules, circuit design procedure, wiring design

and design considerations of Residential/Industrial Installations.

- Explain the sequence to be followed in carrying out the estimate of Residential/Industrial Installations.
- Prepare detail estimate and costing of Residential/Industrial Electrical Installations.

SCHEME OF INSTRUCTION & EXAMINATION

Course Code	Instruction		Credit	Scheme Of Examination			
	Hours / week	Hours / Term		Marks			Duration
				Internal	End Exam	Total	
2E5309	6	90	4	25	75	100	3

Scheme Of Evaluation:

SL No.	Description	Time Duration	Marks
1	Only one question will have to be answered by the students in the examination BY LOT out of the total 14 Questions in PART-A,	2 Hrs	40
2	Writing two IE Rules (no choice) Each 5 mark (Among 12 rules) 2x 5 = 10 marks		10
3	Writing complete Estimation with either or pattern.[Plan / Layout and assumptions made -10 marks Single line diagram, Calculations- 10 marks Material schedule with specification -10 marks	1 Hrs	20
4	Viva Voce		05
5	TOTAL	3 Hrs	75

2E5309 - WIRING, WINDING & ESTIMATION LAB

CONTENT DETAILS

SLNO	List of Experiments
WIRING :	
1	To execute Stair case wiring for G + 3 floors
2	To prepare a wiring circuit to check the availability of R/Y/B phases using one lamp only by operating individual switches for each phase and test it
3	Execute the Emergency alarm circuit with a provision of 3 bells in series to ring together when any one of the 3 push button is pressed
4	Execute the wiring using single phase main switch, Single phase D.O.L starter and miniature C.B to install single phase Induction motor.
5	Execute the wiring using Three phase main switch, Star/delta starter and Earth Leakage C.B to install 3phase Induction motor with a provision for arrangement to trip ELCB when fault occurs.
6	Execute the wiring for service connection with single phase Energy meter cutout main switch, 4way D.B and connect a load on any two sub circuit.
7	Execute the wiring for connecting sodium vapour and mercury vapour Lamp with single phase supply.
8	Execute the Fluorescent Tube light connection with Electronic choke and test it. Also measure the voltage across the tube light fitting.
9	Prepare a test board with necessary supply provision, Indicator lamp, fuse unit to test electrical appliances.
10	In a 3 phase, 4 wire system, connect two lamps in different ratings between R-Phase to Neutral and y-phase to Neutral respectively. Disconnect the Neutral using SPST switch. Note the changes occur in two lamps
WINDING:	
1	Design and wind 230/12-0-12 volt, 500mA Transformer and test it.
2	Design and wind a No volt coil used in starter.
3	Wind and insert the coils for ceiling fan motor (minimum 2 coils)
4	Give end connection for a 3 phase Induction motor winding for a 2 pole or 4 pole operations and run it. Measure the No load current and speed.

PART –B	
ESTIMATION:	
1	Wiring systems - Types of wiring - points to be considered for selection of wiring comparison - Considerations for selecting wire size - size of conductors / cable used for various installations
2	**Indian Electricity Rules (1956)**

	Rule 28 Voltage - Rule 30 Service Lines and apparatus on consumer premises. - Rule 31 Cut-out on consumer‘s premises. - I.E. Rules on safety -Rule 33 : Earthed terminal consumer premises -Rule 43: Provision applicable to protective equipment - Rule 44: Instruction of restoration of person suffering from electric stock -Rule 46 Periodical inspections and testing of consumer‘s installation. Rule 47 Testing of consumer‘s installation. - Rule 48: precautions - Rule 54 Declared voltage of supply to consumer.-Rule 56 Sealing of meters and cut-outs. -Rule 57 Meters, maximum demand indicators and other apparatus on consumer Premises.- -Rule 77 Clearance above ground of the lowest conductor. - Rule 79 Clearance from buildings of low and medium voltage lines and service lines. - Rule 87 Line crossing or approaching each other. Rule 88 Guarding.
3	Estimation for Residential Building
4	Estimation for small Industrial Load
5	Estimation for Irrigation pump load
6	Estimation for Street Lighting
7	Estimation for single phase service connection

Equipment / Materials required

SLNO	DESCRIPTION	SPECIFICATION	QUANTITY
1	SPST Flush type switch	250 V, 5A	15 Nos.
2.	Batten Lamp holder		10 Nos.
3.	Round block		20 Nos.
4.	Switch board	20 cm x 15 cm	1 No.
		10 cm x 10 cm	15 Nos.
5.	M.C.B.	250 V, 10 A, 2 pole	2 Nos.
6.	Push button switch	250 V, 5A	5 Nos.
7.	2 plate ceiling rose	250 V, 5A	10 Nos.
8.	Electric bell	250 V, 5A	3 Nos.
9.	Single phase D.P.I.C. Main switch	250 V, 16A	3 Nos.
10.	Single phase D.O.L. Starter	250 V, 10A	1 No.
11	Three phase T.P.I.C. Main switch	500 V, 30A	2 Nos.
12	Star / delta starter	440 V, 5 H.P.	1 No.
13	E.L.C.B.	500 V, 30A	1 No.
14	Single phase, 2 wire watt-hour meter	250 V, 15A, 50 Hz	1 No.
15	Cut out	16 A	1 No.
16	Single phase, 4 way distribution Box	250 V, 15 A	1 No.
17	Mercury vapour lamp with accessories		1 set
18	Sodium vapour lamp with accessories		1 set
19	Fluorescent tube light with electronic choke and holder	40 W	1 set
20	Neon tube lamp (any sign)		3 blocks

21	Two way flush type switch	250 V, 5A	10 Nos.
22	Wooden box	30 cm x 15 cm	1 No.
23	PVC pipe	1”	Required qty
24	Saddle clips	1”	Required qty
25	Coppor wire	2.5 sq.mm., 1.5 sq.mm	Required qty
26	Bare copper wire	2.5 Sq.mm	Required qty
27	Lamps (C.F.L. or Incandescent)	Different ratings	Required qty
28	Transformer core: EI60 type stampings	0.35mm Thickness	55 Nos
29	Readymade bobbins (EI60/21)		Required qty
30	Winding coil (copper)	25 SWG, 36 SWG 37 SWG 38 SWG	Required qty
31	Varnish		Required qty
32	Winding machine		1 No.
33	Ceiling Fan (motor)		1 No.
34	Single phase induction motor	0.5 H.P. 50 Hz, 240 V	1 No.

COURSE OUTCOME

CO1	Able to Wire and test different circuits
CO2	Able to assemble and test different lamp circuits
CO3	Able to understand and perform different motor Windings
CO4	Able to wind and test Transformer coils
CO5	Able to Estimate Electrical material and cost for different loads
CO6	Able to understand and implement IE rules

2E5404.1 - MICRO CONTROLLER LAB

RATIONALE

The importance of the microcontroller based systems is well established. With the advent of microcontroller only the world of Digital Computer found its place in every sphere of our life. There are numerous application of this technology in the industries for control and efficient running of machineries. It is therefore essential that the students who read about this technology should also perform experiments to acquaint themselves with the actual working. The Assembly Language is to be introduced in this course for practice.

OBJECTIVES

After the completion of this laboratory, the student should be able to

- Write a Assembly language program to perform bit level arithmetic operations.
- Write a Assembly language program to perform multi bit level arithmetic operations
- Write a Assembly language program to perform code conversions.
- Write a Assembly language program to solving Boolean equation.
- Write a Assembly language program to interfacing relay, seven segment display, LCD display, 4x4 matrix key board ,ADC 0808 with 89C51.
- Write a Assembly language program to interfacing Stepper motor and DC motor with 89C51.

SCHEME OF INSTRUCTION & EXAMINATION

Course Code	Instruction		Credit	Scheme Of Examination			
	Hours / week	Hours / Term		Marks			Duration
				Internal	End Exam	Total	
2E5404.1	4	60	2	25	75	100	3

Scheme Of Evaluation:

SLNO	Description	Maximum Marks
1	Program	20
2	Hexa code conversion	20
3	Execution	20
4	Result with input and output tabulation	10
5	Viva Voce	05
6	TOTAL	75

2E5404.1 - MICRO CONTROLLER LAB

CONTENT DETAILS

SLNO	List of Experiments
PROGRAMMING	
1	Addition, Subtraction
2	Multi-byte addition
3	Multiplication and Division of two numbers
4	Finding the maximum number in an array
5	Arranging the given data in Ascending order
6	BCD to Hex conversion
7	Hex to BCD conversion
8	Hex to ASCII
9	ASCII to Binary
10	Square Root of an given number
11	Least Common Multiple
12	Greatest Common Divisor
13	Parity bit generation .
14	Program using I/Os in port 1
15	Program using timer / Counter..
16	Program using interrupt
INTERFACING WITH APPLICATION BOARDS:	
1	Digital I/O
2	Matrix keyboard
3	Seven segment LED displays
4	LCD Displays
5	Traffic light
6	8 bit ADC and 8 bit DAC
7	Stepper motor control
8	DC motor control
Note: Only one question will have to be answered by the students in the examination BY LOT out of the total 24(16+8) Questions.	

EQUIPMENTS REQUIRED

Sl.No	LIST OF EQUIPMENTS	Quantity
1	8051 Microcontroller Kit	12
2	Digital I/O Interface Board	1
3	Matrix keyboard Interface Board	1
4	Seven segment LED display Interface Board	1
5	LCD Display Interface Board	1
6	Traffic light Interface Board	1
7	8 bit ADC and 8 bit DAC Interface Board	1
8	STEPPER MOTOR CONTROL Interface Board	1
9	DC motor control Interface Board	1
10	Lift control Interface Board	1
11	Sending data through serial port between controller kits	1
12	Printer Interface Interface Board.	1

COURSE OUTCOME

CO1	Able to Write a Assembly language program to perform multi bit level arithmetic operations.
CO2	Able to write a Assembly language program to perform bit level arithmetic operations.
CO3	Able to Write a Assembly language program to perform code conversions & to solving Boolean equation.
CO4	Able to Write a Assembly language program to interfacing relay, seven segment display, LCD display, 4x4 matrix key board ,ADC 0808 with 89C51.
CO5	Able to Write a Assembly language program to interfacing Stepper motor and DC motor with 89C51.

2E5404.2- VLSI LAB

RATIONALE:

Today digital systems are designed by writing software in the form of hardware description languages (HDLs). The most common HDLs used today are VHDL and Verilog. This lab helps the students to improve their programming skills in the hardware description language VHDL. The designer typically describes the *behavior* of the logic circuit rather than writing traditional Boolean logic equations. In this lab Computer-aided design tools are used to simulate the VHDL design and to *synthesize the* design to actual hardware.

OBJECTIVES:

After completion of this lab, the students will be able to

- Write the VHDL programs for any logic design
- Simulate the design
- Synthesize the design

SCHEME OF INSTRUCTION & EXAMINATION

Course Code	Instruction		Credit	Scheme Of Examination			
	Hours / week	Hours / Term		Marks			Duration
				Internal	End Exam	Total	
2E5404.2	4	60	2	25	75	100	3

Scheme Of Evaluation:

SLNO	Description	Maximum Marks
1	Program	25
2	Execution	25
3	Result with input and output tabulation	20
4	Viva Voce	05
5	TOTAL	75

2E5404.2- VLSI LAB

CONTENT DETAILS

Sl. No.	LIST OF EXPERIMENTS
1	**SIMULATION OF VHDL CODE FOR COMBINATIONAL CIRCUIT** Optimize a 4 variable combinational function (SOP or POS), describe it in VHDL code and simulate it. Example: F= (0,5,8,9,12) in sop or pos
2	**SIMULATION OF VHDL CODE FOR ARITHMETIC CIRCUITS** Design and Develop the circuit for the following arithmetic function in VHDL Codes and Simulate it. Addition, Subtraction Multiplication (4 x 4 bits)
3	**SIMULATION OF VHDL CODE FOR MULTIPLEXER** Design and develop a 2 bit multiplexer and port map the same for developing up to 8 bit multiplexer.
4	**SIMULATION OF VHDL CODE FOR DEMULTIPLEXER** Design and develop an 8 output demultiplexer. Simulate the same code in the software.
5	**SIMULATION OF VHDL CODE FOR JK,T AND D FLIP FLOP**
6	**VHDL IMPLEMENTATION OF MULTIPLEXER** Describe the code for a multiplexer and implement it in FPGA kit in which switches are connected for select input and for data input a LED is connected to the output.
7	**VHDL IMPLEMENTATION OF DEMULTIPLEXER** Switches are connected for select input and data input, Eight LEDs are connected to the output of the circuit
8	**VHDL IMPLEMENTATION OF 7 SEGMENT DECODER** Develop Boolean expression for 4 input variables and 7 output variables. Design and develop a seven segment decoder in VHDL for 7 equations. A seven segment display is connected to the output of the circuit. Four switches are connected to the input. The 4 bit input is decoded to 7 segment equivalent.
9	**VHDL IMPLEMENTATION OF 7 SEGMENT DECODER BY LUT** Develop a 7 segment decoder using Look up table. Describe the seven segment decoder in VHDL using developed LUT. A seven segment display is connected to the output of the circuit. Four switches are connected to the input. The 4 bit input is decoded to 7 segment equivalent.
10	**VHDL IMPLEMENTATION OF ENCODE** Design and develop HDL code for decimal (Octal) to BCD encoder. There will 10 input switches (or 8 switches) and 4 LEDs in the FPGA kit. The input given from switches and it is noted that any one of the switch is active. The binary equivalent for the corresponding input switch will be glowing in the LED as output.
11	**VHDL IMPLEMENTATION OF TEST BENCH FOR A BOOLEAN FUNCTION.**

12	**VHDL IMPLEMENTATION FOR BLINKING A LED** Develop a VHDL Code for delay and verify by simulating it. This delay output is connected to LED. Delay is adjusted such away LED blinks for every 1 or 2 or 3 seconds
13	**VHDL IMPLEMENTATION FOR BLINKING A ARRAY OF LEDS** Design and develop a VHDL Code for 4 bit binary up/down counter. Four LEDs are connected at the output of the counter and a switch is connected in the input for selecting up or down. The count up or down should happen in accordance to the switch input for every one seconds.
14	**VHDL IMPLEMENTATION OF A SPELLER WITH AN ARRAY OF LEDS** Design and develop VHDL Code for a 5 bit Johnson ring counter 4 bit The LEDs are connected at the output of the counter. The speller should work for every one seconds.
15	**VHDL IMPLEMENTATION OF 7 SEGMENT DISPLAY** Design and develop a seven segment decoder in VHDL. Design and develop a 4 bit BCD counter, the output of the counter is given to seven segment decoder. A seven segment display is connected to the output of the decoder. The display shows 0,1,2 .. 9 for every one second
16	**VHDL simulation and IMPLEMENTATION OF A SIPO SHIFT REGISTER**
17	**VHDL IMPLEMENTATION OF STEPPER MOTOR INTERFACE**

COURSE OUTCOME

CO1	Able to Design and Develop the circuit for the following arithmetic function in VHDL Codes and Simulate it. Addition, Subtraction Multiplication (4 x 4 bits)
CO2	Able to write Write the VHDL programs for any logic design.
CO3	Able to Simulate the design.
CO4	Able to Synthesis the design.
CO5	Able to understand how to interface stepper motor using VHDL

2E5404.3 ELECTRICAL MACHINE DESIGN LAB

RATIONALE:

Apart from theoretical knowledge of designing electrical machineries, there is a need for students to understand the practical design considerations and their implementations. The main aim of this course is to provide advanced knowledge and understanding about the construction and design of the electrical machines. The course provides to the students the basis and the methodologies to a correct design of the electrical machines (transformers, rotating AC machines and DC machines). Innovative tools and techniques used for the design optimization of the electrical machine for industrial, automotive and aerospace applications. The applying knowledge and understanding capabilities will allow the students to approach the problem linked to the design of the electrical machines.

OBJECTIVES

To provide sound knowledge about constructional details and design of various electrical machines, in order

- to study magnetic circuit parameters and thermal rating of various types of electrical machines.
- to design and assemble armature and field systems for D.C. machines.
- to design and assemble core, yoke and windings of transformers.
- to design stator and rotor of induction machines and synchronous machines.

SCHEME OF INSTRUCTION & EXAMINATION

Course Code	Instruction		Credit	Scheme Of Examination			
	Hours / week	Hours / Term		Marks			Duration
				Internal	End Exam	Total	
2E5404.3	4	60	2	25	75	100	3

Scheme of Evaluation:

SLNO	Description	Maximum Marks
	For exercises requiring circuit diagram and connection	
1	Circuit Diagram	25
2	Connection , Readings Taken & Tabulation (25+10)	35
3	Calculation & Result and Graph if any	10
4	Viva Voce	5
	TOTAL	75
	For other exercises	
1	Design Particulars / Theory behind exercises	35
2	Workmanship & finishing / carrying of the test &	35
3	Viva Voce	5
	TOTAL	75

2E5404.3 ELECTRICAL MACHINE DESIGN LAB

CONTENT DETAILS

SNO	List of Experiments
1	By simple experiment, verify the magnetic laws using Coil, permanent magnet and Galvanometer
2	Verify the rotating magnetic field with stator and ball.
3	Measure magnetic flux using flux meter.
4	Using Crawler test the windings.
5	Design a 1 phase 1 KVA , 230/15V core type transformer and assemble the core.
6	Design a 1 phase 1KVA, 230/15V shell type transformer and assemble the core.
7	Design 3 phase 1 KVA transformer and assemble winding, core, etc.,
8	Design 3 phase 1 KVA transformer (delta/star connected) and wind one coil set.
9	Design armature for 5 KW dc machine and insert one coil set.
10	Design field pole for 5 KW dc machine and assemble one pole and insert in the body.
11	Assemble the given dc machine (pole, inter pole, armature, commutator, brush etc).
12	Design and assemble ceiling fan.
13	Design and assemble a 3 HP induction motor.
14	Design and assembled 3phase 3HP synchronous motor.
15	Dismantle and assemble a 3 phase wound rotor induction motor.
16	Design and assembled 1phasesalient pole 5KVA alternator.
Note: Only one question will have to be answered by the students in the examination BY LOT out of the total 16 Questions	

COURSE OUTCOME

CO1	Able to to understand study magnetic circuit parameters and thermal rating of various types of electrical machines.
CO2	Able to design and assemble armature and field systems for D.C. machines.
CO3	Able to design and assemble core, yoke and windings of transformers..
CO4	Able to design stator and rotor of induction machines and synchronous machines.

2E5405 - CAD & SIMULATION LAB

RATIONALE

All the Engineering applications are simulated through computers. They are tested and then built using real components for commercial implementation. Simulation software‘s are available for all Engineering fields. Hers is an attempt to impart the knowledge of using simulation software for realizing some of the Electrical and Electronics circuits for the Diploma students. Also the students were trained to draw 2E diagrams using Auto CAD.

OBJECTIVES

On completion of the following experiments, the students must be able to

- Know the various aspects of a simulation software
- Simulate and test the simple electrical and electronics circuits
- Simulate and test the wave generating circuits
- Simulate and prove the simple theorems
- Simulate and test the performance characteristics of converters
- To design and verify the results of various electric circuits using simulation software
- At the end of the semester the student must be able to draw
- 2E diagrams using Auto CAD
- The line diagrams of substations, The simple basic diagrams for laboratory circuits.

SCHEME OF INSTRUCTION & EXAMINATION

Course Code	Instruction		Credit	Scheme Of Examination			
	Hours / week	Hours / Term		Marks			Duration
				Internal	End Exam	Total	
2E5405	4	60	3	25	75	100	3

Scheme of Evaluation:

PART -A	Circuit Diagram (Manual Drawing)	10 Marks
	Development	10 Marks
	Simulation & Print out	20 Marks
PART -B	Circuit Diagram (Manual Drawing) (ACAD)	10 Marks
	Development & Print out	20 Marks
	Viva	05 Marks
TOTAL		75 Marks

2E5405 - CAD & SIMULATION LAB

CONTENT DETAILS

SLNO	List of Experiments
	PART –A
ELECTRICAL WIRING DIAGRAMS	
1	Draw the symbols of Electrical and Electronic components.
2	Draw the panel wiring diagram of two single phase alternators in parallel
3	Draw the winding diagram of lap connected DC armature with commutator connection and brush positions.
4	Draw the winding diagram of wave connected DC armature with commutator connection and brush positions.
5	Draw the mush winding diagram of a three phase induction motor.
6	Draw the concentric winding diagram of a single phase induction motor
7	Draw the control circuit of jogging.
8	Draw the control circuit of automatic rotor starters.
9	Draw the connection diagram of ON load tap changer
10	Draw the circuit of three phase transformers in parallel
11	Draw the connections of three point starter.
12	Draw the connections of automatic star - delta starter
13	Draw the connections of direct on line starter
14	Draw the Single Line diagram of Single phase MCB Distribution board.
15	Draw the Single Line diagram of three phase MCB Distribution board.
16	Draw the Single Line diagram of Lighting Distribution Board (LDB).
17	Draw the Single Line diagram of fire alarm riser arrangement in multi-storey
18	Draw the single line diagram of 110 KV / 11 KV receiving substation
	PART –B
ELECTRICAL CIRCUITS SIMULATION	
1	Step response of RL & RC series circuits
2	Verification of superposition theorem
3	Verification of Norton‘s theorem
4	Verification of Thevenin‘s theorem
5	Simulation of half wave and full wave rectifier
6	Simulation of RLC series and parallel circuits
7	Simulation of single phase, half wave converter using SCR with R-load
8	Simulation of single phase, semi converter with RL load
9	Simulation of single phase full converter with RL load
10	Simulation of 6 step Voltage Source Inverter supplying R-load

LIST OF EQUIPMENTS AND THE QUANTITY REQUIRED (FOR A BATCH OF 30 STUDENTS)

OPERATING SYSTEM :	WINDOWS XP OR WINDOWS VISTA OR WINDOWS 7 / LINUX
OFFICE PACKAGE :	MICROSOFT OFFICE 2000 OR OFFICE 2003 OR OFFICE 2007/OPEN OFFICE

HARDWARE REQUIREMENTS :	
DESKTOP COMPUTER SYSTEM WITH LATEST CONFIGURATION	30 NOS
POWER BACKUP (UPS)	10 KVA
LASER PRINTER	3 NOS

SOFTWARE REQUIREMENTS : ACAD, SIMULATION S/W (PSIM)

SAFETY PRECAUTIONS TO BE FOLLOWED BY STUDENTS

- Do not touch, connect or disconnect any plug or cable without teacher's permission
- Don't attempt to touch any live wires
- Systems should be shutdown properly after completion of work

COURSE OUTCOME

CO1	Able to Know the various aspects of a simulation software .
CO2	Able to Simulate and test the simple electrical and electronics circuits
CO3	Able to Simulate and test the wave generating circuits , the performance characteristics of converters and prove the simple theorems.
CO4	Able to design and verify the results of various electric circuits using simulation software
CO5	Able to At the end of the semester the student must be able to draw 2D diagrams, the line diagrams of substations & the simple basic diagrams for laboratory circuits using Auto CAD.

TERM - VI

2E6310 - POWER SYSTEM –II

RATIONALE

Importance of Electrical Engineering is well known. This subject deals with Distribution and utilization Electrical Energy at various levels. Industrial application of electrical engineering such as electrolysis and illumination, electrical heating, electrical welding, electrical traction and for electrical drives have been dealt vigorously in this paper. Students reading this paper will be well versed in primary application of electrical power in industries.

OBJECTIVES

On completion of the following units of syllabus contents, the students must be able to

- Network of Electrical distribution system and its components.
- Distinguish between various types of substations and bus bar arrangement
- Understand the characteristics of all types of motors together with various ratings, braking arrangements and their application
- select the proper drive for industrial application
- Gain knowledge about Electronic Traction system
- Draw speed time curves and solve problem on max speed
- Understand the concept of traction control methods of equipments
- Gain knowledge on illumination‘ solve problem using laws
- Understand the concept various methods of electrical heating of furnace operations temperature control
- Gain knowledge on welding methods &control equipments

SCHEME OF INSTRUCTION & EXAMINATION

Course Code	Instruction		Credit	Scheme Of Examination			
	Hours / week	Hours / Term		Marks			Duration
				Internal	End Exam	Total	
2E6310	5	75	5	25	75	100	3

TOPICS AND ALLOCATION OF HOURS & MARKS :

Unit No	Name of the Topic	Hours	Marks
I	Distribution	13	15
II	Industrial Drives	13	15
III	Electric Traction	13	15
IV	Illumination	13	15
V	Electric Heating And Welding	12	15
	Revision	05	
	Cycle Tests and Model Examination	07	
	Total	75	75

2E6310 - POWER SYSTEM –II

CONTENT DETAILS

UNIT I : DISTRIBUTION

1.1 SUBSTATION: Introduction-Sub stations-classification of sub stations-Indoor and outdoor S.S - Gas insulated S.S-comparisions-Layout110/11KV Substation and 11KV/400V Distribution Substation- substation equipments-Bus bar- Types of bus bar arrangement - Advantages and Disadvantages.

1.2 DISTRIBUTION: Distribution system-Requirements of a Distribution system-parts of Distribution system-Classification of Distribution systems-comparison of different distribution systems (A.C and D.C) -A.C Distribution - Types- connection - schemes of AC Distribution system

1.3 A.C DISTRIBUTION CALCULATIONS-Calculation of voltage at load points on single phase distribution systems (With concentrated load only)- Distributor fed at one end, both ends and ring mains-problems- Three phase, four wire, Star connected unbalanced load circuit- Problems- consequence of Disconnection of Neutral in three phase four wire system (illustration with an example)

UNIT II : INDUSTRIAL DRIVES

2.1 TYPES OF DRIVES: Introduction - Electric drive - Advantages - parts of Electric drives - Transmission of power - Types of Electric drives-Individual, group and multi motor drives - Advantages and disadvantages of Individual and group drive – Variable frequency Drive.

2.2 SELECTION OF DRIVES: Factors governing the selection of motors-Nature and classification of load Torque-Matching of speed Torque characteristics of load and motor-Standard ratings of motor- classes of load duty cycles-Selection of motors for different duty cycles-Selection of motors for specific application

2.3 TRACTION MOTORS AND CONTROL: Desirable characteristics of Traction motors-Motors used for Traction purpose-Methods of starting and speed control of D.C Traction motors-Rheostatic Control-energy saving with plain rheostatic control- series-parallel control- Energy saving with series parallel starting - Shunt Transition -Bridge-Transition- Drum control-contactor type bridge Transition controller - Metadyne control-multiple unit control - Regenerative braking. Recent trends in Electric Traction-Magnetic Levitation (MEGLEV)-Suspension systems

UNIT III : ELECTRIC TRACTION

3.1 SYSTEM OF TRACK ELECTRIFICATION : Introduction-Traction systems-Advantages and Disadvantages of Electric Traction. Methods of supplying power-Rail connected system and over head system-O.H. equipments-contact wire, catenary and droppers- current collection gear for OHE-Bow and pantograph collector-Different systems of Track Electrification-Advantages of single phase low frequency A.C. system-Booster Transformer-Necessity- Methods of connecting B.T-Neutral sectioning.

3.2 TRACTION MECHANICS: Units and notations used in Traction mechanics- Speed time curve for different services - simplified speed time curve-Derivation of maximum speed-crest speed, Average speed, Schedule speed (definitions only)-Tractive effort and power requirement- Specific energy output- specific energy consumption

UNIT IV : ILLUMINATION

4.1 DEFINITIONS: Introduction - Definition and units of different terms used in illumination - plane Angle, Solid angle, Light,. Luminous flux, Luminous Intensity, Luminous Efficacy candle power, Lumen, Illumination, M.S.C.P, M.H.C.P, M.H.S.C.P- Reduction factor, Luminance, glare Lamp efficiency. Space-height ratio, Depreciation factor Utilization factor, waste light factor, Absorption factor, Beam factor, Reflection factor

4.2 REQUIREMENTS OF GOOD LIGHTING SYSTEM Laws of Illumination-problems. Types of lighting scheme- Factors to be considered while designing lighting scheme- Design of lighting Scheme (Indoor and outdoor)- Problems- Lighting systems- Factory lighting, Flood lighting, Street lighting.

4.3 SOURCES OF LIGHT: Fluorescent Lamp , Sodium vapour lamp, High pressure mercury vapour lamp, induction lamps - Energy saving lamps (C.F.L and L.E.D lamps) - Stroboscopic Effect – Troubleshooting of Fluorescent Lamps -Energy saving consideration for fluorescent lamp. .

UNIT V : ELECTRIC HEATING AND WELDING

5.1 ELECTRIC HEATING: Introduction -Advantages of Electric heating-modes of heat transfer- classification of Electric Heating - Power frequency electric heating- Direct and Indirect resistance heating-Infrared heating-Arc heating -High frequency Electric heating-Induction heating –Eddy current heating and Dielectric heating.

5.2 ELECTRIC FURNACES: Resistance furnace-Requirements of Heating elements-commonly used heating element materials - Resistance furnace for special purposes-Temperature control of resistance furnace-Arc furnace -Direct and Indirect Arc furnace-Temperature control of Arc furnace-Reasons for employing low voltage and high current supply –Induction furnace-Direct and Indirect core type Induction furnace - coreless Induction furnace-Power supply for coreless Induction furnace.

5.3 ELECTRIC WELDING: Introduction-Types of Electric welding-Requirements of good weld- Preparation of work -Resistance welding- Butt welding, Spot welding, Seam welding, Projection welding and Flash welding-Arc welding-Carbon Arc welding, metal Arc welding, Atomic hydrogen Arc welding, Inert gas metal arc welding-Comparison between Resistance and Arc welding. Radiation welding -Ultrasonic welding, Electron beam welding, LASER beam welding-Electric welding equipments (A.C. and D.C).

TEXT BOOK :

Sl.no.	Name Of The Book	Author	Publisher
1	A Course in Electrical Power 4th Edition 1971	J.B. Gupta	Katson Publishing House , New Delhi

REFERENCE BOOKS:

Sl.no.	Name Of The Book	Author	Publisher
1	Electric Power 5th Edition 1976	S.L. Uppal	Khanna Publishers, New Delhi
2	A course in Electric Power 9th Edition 1987	M.L.Soni, P.V.Gupta & U.S.Bhatnagar	Dhanpat Rai & Sons, New Delhi
3	Modern Electric Traction 3rd Edition Reprint 2013	H. Partab	Dhanpat Rai & Sons, New Delhi..
4	Electrical Power Distribution 6th Ed. 2011	A.S. Pabla	Tata Mc.Graw Hill , New Delhi.
7	Electric Drives:concepts and Applications , 2nd Ed. 2011	Vedam Subrahmanyam	Tata Mc.Graw Hill , New Delhi.

ONLINE RESOURCES

www.electrical4u.com/electrical-drives/
www.electrical-engineering-portal.com/download-center/books-and-guides/

COURSE OUTCOME

CO1	Able to Understand the concepts of Network of Electrical distribution system and its components. Able to Distinguish between various types of substations and bus bar arrangement
CO2	Able to Understand the characteristics of all types of motors together with various ratings, braking arrangements and their application. Able to select the proper drive for industrial application
CO3	Able to Gain knowledge about Electronic Traction system
CO4	Able to Understand the concept of traction control methods of equipments and also concept various methods of electrical heating of furnace operations temperature control
CO5	Gain knowledge on illumination‘ solve problem using laws . Gain knowledge on welding methods &control equipments

2E6311 - POWER ELECTRONICS

RATIONALE

Power Electronics plays a very vital role in the field of control engineering specifically in the modern industries as they mostly use electronic controls, which are more efficient, effective and precise as compare to the conventional methods. The concept of power electronics is to give broad base Knowledge of power Electronics and its industrial application. It encompasses the topics like power Semiconductor devices, SCR control Mechanism, Controlled rectifier, chopper, Inverter & Cycloconvertor. The industrial application will enable the students to gather knowledge of Industries & automation.

OBJECTIVES

On completion of this unit the student should be able to:

- Explain the characteristics of Thyristor family.
- Draw and explain the working of trigger circuits.
- Draw and explain the operation of commutation circuits.
- State the applications of trigger and commutation circuits.
- Familiarize the phase controlled rectifier
- Know the applications of the phase controlled rectifier
- Draw and describe the working of half wave controlled rectifier circuit with R and RL load
- Draw and explain the working of single phase semiconverter bridge and single phase full converter Bridge for RL load.
- Draw and explain the operation of single phase and three phase full converter with RL load
- Study the complete protection of converter circuits
- Understand the working choppers and inverters
- Describe the various methods of inverters with circuit diagram
- Understand the control of DC Drives
- Know the various methods of speed control of DC drives
- Learn the different types of power factor improvement in phase controlled converter
- Familiarize the control of DC and AC drives
- Know the torque - speed characteristics of three phase induction motor
- Study the speed control of three phase induction motor
- Understand the closed loop control of AC drive
- Know the operation of single phase and three phase cyclo converter

SCHEME OF INSTRUCTION & EXAMINATION

Course Code	Instruction		Credit	Scheme Of Examination			
	Hours / week	Hours / Term		Marks			Duration
				Internal	End Exam	Total	
2E6311	5	75	5	25	75	100	3

TOPICS AND ALLOCATION OF HOURS & MARKS :

Unit No	Name of the Topic	Hours	Marks
I	Overview Of Power Electronics	12	15
II	Line Commutated Power Control Circuits	13	15
III	Forced Commutated Power Control Circuits	13	15
IV	Applications Of Power Electronics	13	15
V	Motor Drive Applications	12	15
	Revision	05	
	Cycle Tests and Model Examination	07	
	Total	75	75

2E6311 - POWER ELECTRONICS

CONTENT DETAILS

UNIT I : OVERVIEW OF POWER ELECTRONICS :

Power electronics-Definition -Scope Applications - Power Electronic Switch Specifications - Types of Power Electronic Circuits – Design of Electronics Equipment)- Power module - Intelligent module Silicon Controlled Rectifier - Forward Blocking Region - Forward Conducting Region -Reverse Blocking Region-Effect of dv/dt and Snubber -Effect of Rate of Rise in Current(di/dt)-Thyristor Ratings - Thyristor Gate Requirements - Triggering Circuits for Thyristor - Resistance Triggering Circuits- RC Trigger Circuits - UJT based Trigger Circuits-Driver and Buffer Circuits for Thyristor . Thyristor Commutation Techniques-Class A, B, Class C, Class D, Class E Types- Devices – MOSFET - IGBT – GTO

UNIT II : LINE COMMUTATED POWER CONTROL CIRCUITS :

Line Commutated Converters(Controlled Rectifiers)- Principle of Phase Controlled Converter Operation - Single Phase Full Converters - Single Phase Dual Converters - Three Phase Full Converters - Three Phase Dual Converters - Pulse converters**.** AC Voltage Controllers-Principle of Phase Control - Single phase Bidirectional controllers with Resistive Load - Single Phase Controller with Inductive Load - Three Phase Full Wave Controllers - Cyclo Converters-Single Phase Cyclo Converters -Three Phase Cyclo Converters

UNIT III :FORCED COMMUTATED POWER CONTROL CIRCUITS

DC-DC Switch-Mode Converters(Choppers)-Control of DC – DC Converter - Step-Down (BUCK) Converter - Continuous-Conduction Mode - Step-Up(BOOST) Converters - Continuous Conduction Mode – BUCKBOOST Converters – Continuous Conduction Mode - Cuk DC-DC Converters. DC-AC Switch-Mode Inverters-Pulse Width Modulated Inverters- Introduction - Principle of Operation - Single Phase Bridge Inverters - Three Phase Inverters - 180^0 Conduction Mode - 120^0 Conduction Mode - Voltage Control of Single Phase Inverters - Single Pulse Width Modulation - Multiple Pulse Width Modulation - Sinusoidal Pulse Width Modulation - Voltage Control of Three Phase Inverters - Sinusoidal PWM

UNIT IV : APPLICATIONS OF POWER ELECTRONICS

Switch Mode Power Supplies - Full Bridge Converter type-Uninterrupted Power Supply - ON line(No Break) and OFF line(Short-Break) types - Static AC Circuit Breaker - AC Solid State Relays High Frequency Flourescent Lighting - Induction Heating - Electric Welding - High Voltage DC Transmission - Wind and Small Hydro Interconnection - Static VAR Compensators - Thyristor Controlled Inductors -Thyristor Switched Capacitors

UNIT V : MOTOR DRIVE APPLICATIONS

DC Drives-DC Motor with a Separately Excited Field Winding - Line Frequency Converters - Effect of Discontinuous Armature Current – Control of Adjustable Speed Drives - Switch-Mode DC-DC Converters Induction Motor Drives-Introduction - Basic Principle of Induction Motor Operation - Induction Motor Characteristics at rated(line) frequency and rated voltage - Speed Control by Varying Stator frequency and voltage- Torque-Speed Characteristics - Start-Up Considerations - Voltage Boost required at low frequencies - Induction Motor Capability below and above the rated speed - Variable frequency Converter Classifications - Variable frequency PWM-VSI Drives - Line frequency Variable-Voltage Drives - Reduced Voltage Starting("Soft Start") of Induction Motors -Speed Control by Static Slip-Power Recovery.

TEXT BOOK

Sl.No.	Title	Author	Publisher
1	Power Electronics 2nd Edition Reprint 2008	M.D. Singh K.B.Khanchandani	Tata McGraw Hill Publishing Company, New Delhi

REFERENCE BOOKS

Sl.No.	Title	Author	Publisher
1	Power Electronics 3rd Edition,2004	Mohammed H.Rashid	New Age Publication.
2	Power Electronics 3rd Edition,2009	Mohan, Undeland, Riobbins.	Wiley India Edition. Media Enhanced
3	Power Electronics 4th Edition, 2011.	Dr.P.S.Bimbhra	Khanna Publishers.
4	Power Electronics 8th Reprint 2011	M.S.Jamil Asghar	PHI Learning Private Limited Eastern Economy Edition

ONLINE RESOURCES

www.nptel.ac.in/courses/108105066/
www.electrical4u.com/thyristor-silicon-controlled-rectifier/
www.electronics.wisc-online.com/category.aspx

COURSE OUTCOME

CO1	Able to understand the Overview Of Power Electronics
CO2	Able to know Line Commutated Power Control Circuits
CO3	Able to understand Forced Commutated Power Control Circuits
CO4	Able to know Applications Of Power Electronics
CO5	Able to know Motor Drive Applications

2E6312 – RENEWABLE ENERGY SOURCES AND ENERGY AUDITING

RATIONALE

Energy is a crucial input in the process of economic, social and industrial development. High-energy consumption has traditionally been associated with higher quality of life, which in turn is related to Gross National Product (GNP). Since the conventional energy resources are under strain of depletion, it is high time to tap the non-conventional energy sources. The electrical diploma holder will have to face this challenge in future life. Therefore this course is introduced as an elective course in diploma programme to familiarize the diploma students with non-conventional engineering sources, so that they may exploit them in near future.

OBJECTIVES

- Understand conventional sources of energy.
- Identify non-conventional (renewable) sources of energy.
- Understand the concept of solar radiation.
- Use and operate different appliances based on solar radiation.
- Understand the concept of wind energy and its applications like wind mill wind farm etc.
- Understand feasibility of as a source of energy
- Identify different types of biomass energy plants.
- Apply principles of conservation of energy
- Understand the concept of energy auditing, energy saving etc.
- Identify newer and newer renewable sources of energy.

SCHEME OF INSTRUCTION & EXAMINATION

Course Code	Instruction		Credit	Scheme Of Examination			
	Hours / week	Hours / Term		Marks			Duration
				Internal	End Exam	Total	
2E6312	5	75	5	25	75	100	3

TOPICS AND ALLOCATION OF HOURS & MARKS :

Unit No	Name of the Topic	Hours	Marks
I	Introduction to Energy Sources	12	15
II	Solar Radiation, Collection & Applications	12	15
III	Wind & Bio Energy	13	15
IV	Tidal Energy, OTEC & Geothermal Energy	13	15
V	Energy Audit & Energy Conservation	13	15
	Revision	05	
	Cycle Tests and Model Examination	07	
	Total	75	75

2E6312 – RENEWABLE ENERGY SOURCES AND ENERGY AUDITING

CONTENT DETAILS

UNIT I : INTRODUCTION TO ENERGY SOURCES & SOLAR RADIATION

1.1 INTRODUCTION TO ENERGY SOURCES: Primary energy Sources -Secondary fuels - Supplement sources- Energy consumption as a measure of prosperity - World energy futures - Conclusions of the study on alternate energy strategies

1.2 CONVENTIONAL SOURCES: Energy sources and their availability -Commercial or conventional energy sources - Coal, Oil, Agriculture and Organic base

1.3 NON-CONVENTIONAL SOURCES: Solar energy, Wind energy. Energy from Biomass, Energy from Biogas, Energy from ocean, Tidal energy , Geothermal energy , Hydrogen energy , Fuel cells - Thermionic Convertor- Thermo electric power -Renewable energy sources - Advantages - Obstacles to the implementation - Prospects of renewable energy sources - World renewable energy resources.

UNIT II : SOLAR RADIATION, COLLECTION & APPLICATIONS

2.1 SOLAR RADIATION: Solar constant - solar radiation at earth‘ s surface -Beam and diffuse solar radiation - Solar radiation measurements - Angstrom Compensation pyrheliometer - Abbot silver disk pyrheliometer -Eppley pyrheliometer Yellot solarimeter -Suryamapi

2.2 SOLAR ENERGY COLLECTION: Introduction - Flat plate collectors - Typical liquid collector - Heat transport system - Advantages of flat -Plate collectors - Concentrating collector (focusing type) - Parabolic trough collector - Fresnel lens collector - Point focusing collector (paraboloidal type) - Concentrating collectors (Non focusing type) -Compound parabolic concentrator - Advantages & Disadvantages of concentrating collectors over flat plate collectors - Selective absorber coatings -Characteristics of absorber coatings.

2.3 SOLAR ENERGY APPLICATIONS: Introduction - solar water heating, passive heating system & active heating system - space cooling - absorption air conditioning - intermittent absorption cooling - solar thermal electric conversion - Solar electric power generation - ON Grid and OFF Grid connection of Solar Power Plan - Principles of solar cells - Photovoltaic system for power generation - Solar photovoltaic arrays - Storage batteries - Inverters - Applications of solar PV system - Advantages and Disadvantages of PV solar energy conversion - Solar distillation - Solar pumping - Solar furnace - Solar green houses - Advantages -Solar production of hydrogen

UNIT III : WIND & BIO ENERGY

3.1 INTRODUCTION: Introduction to wind energy - basic principles of wind energy conversion - nature of wind - power in the wind -maximum power - forces on the blade - wind energy conversion

3.2 WIND ENERGY GENERATION: Small producers and large producers -wind data & (qualitative treatment only) energy estimation -site selection consideration - Basic components of wind energy conversion systems - classifications of WECS - advantages and disadvantages of WECS generating system - scheme of electric generation - generator control - load control -energy storage - applications of wind energy - wind energy in India -prospects

3.3 BIO ENERGY : Introduction to biomass - Biomass conversion Technologies - wet process and dry process - Biogas generation - classification of biogas plants - continuous & batch types - The dome and the drum types -Types of Biogas plants - Floating gas holder - Fixed dome digestor -Comm y biogas plants - Materials used for biogas generation - Utilistion of biogas - methods of obtaining energy from Biomass Combustion - Anerobic digestion Pyrolsis - Hydrolyses and Ethanol Fermentation - Gasifier - Classifications - Applications of Gasifiers

UNIT IV : TIDAL, OCEAN THERMAL & GEOTHERMAL ENERGY

4.1 TIDAL ENERGY: Introduction to tidal power - Basic principles of tidal power - components of tidal power plants - power house -Darn sluice ways from the basin to sea and vice versa - operation - methods of utilisation of Tidal energy -single basin & Double basin arrangements - site requirement - storage - Advantages - limitation of Tidal power generation - prospects of tidal energy in India.

4.2 OCEAN THERMAL ENERGY & WAVE ENERGY: Open (Steam/ Claude) cycle - Limitations - Closed (Vapour / Anderson) cycle -Wave machines (Wave machine converters) - Buoy type -Oscillating air / water column principle -Recent advances in Wave energy technology

4.3 GEOTHERMAL ENERGY: Introduction to Geothermal energy - fields - Hydro thermal & semi thermal fields classifications - Advantages of Geothermal energy over other energy forms - Applications of Geothermal energy at different temperatures -material selection for geothermal power plant - Geothermal exploration - seismic monitoring - Geothermal well drilling - operational & Environmental problems - Geothermal energy in India -prospects

UNIT V : ENERGY AUDIT & ENERGY CONSERVATION

5.1 ENERGY MANAGEMENT : Principles of energy accounting -Energy economics -Annual cost method -Present worth method -Capitalised cost method -Principle of energy management - Functions of energy manager- Energy efficient operations .

5.2 ENERGY AUDIT : General Aspects of Energy Auditing -Introduction - Types of Energy Auditing - Benefits of Energy Audit - Requirements to conduct Energy Audit - Methodology for Energy Audit - Energy Audit Report

5.3 ENERGY CONSERVATION : Need for energy conservation -Strategies for loss reduction -Energy conservation measures in transmission & distribution-Energy conservation in industries - Energy conservation in agricultural sectors - Energy conservation in homes - Energy Conservation Building Code

TEXT BOOK

Sl.No.	Title	Author	Publisher
1	Non conventional energy sources 3rd Edition, 1995	G.D.RAI.	Khanna Publishers, New Delhi,

REFERENCE BOOKS

Sl.No.	Title	Author	Publisher
1	Energy Technology (non conventional, renewable & conventional) 3rd Ed.1999	S. RAO & Dr.B.B. PARULEKAR	Khanna Publishers, New Delhi
2	Solar energy utilization 4th Edition, 1995	G.D.RAI	Khanna Publishers, New Delhi,

ONLINE RESOURCES

www.vssut.ac.in/lecture_notes/lecture1428910296.pdf

www. eia.gov/energyexplained/?page=renewable_home

www.renewableenergyworld.com/index/tech.html

COURSE OUTCOME

CO1	Able to know various Energy Sources
CO2	Able to understand Solar Radiation, Collection & Applications
CO3	Able to understand the concept of Wind & Bio Energy
CO4	Able to understand the concept of Tidal Energy, OTEC & Geothermal Energy
CO5	Able to understand the concept of Energy Audit & Energy Conservation

2E6406.1 - PROGRAMMABLE LOGIC CONTROLLER

RATIONALE

A diploma holder when employed in automated industrial process controls or in automated power station will be required to know the basics of Programmable Logic Controllers, their working and their programming. Hence this course aims to expose the students to Programmable Logic Controllers and give them adequate knowledge about PLC & SCADA.

OBJECTIVES

To understand

- Evolution, internal structure, interface modules, advantages & market available PLCs.
- Various types of input and output modules.
- Input sensors.
- Various PLC programming methods, basic instructions like
- ON, OFF, timer, counter, latched and unlatched outputs.
- Simple PLC ladder programs for starters, filling plants.
- PLC networking, industrial standard communication networks.
- SCADA system hardware and software.

SCHEME OF INSTRUCTION & EXAMINATION

Course Code	Instruction		Credit	Scheme Of Examination			
	Hours / week	Hours / Term		Marks			Duration
				Internal	End Exam	Total	
2E6406.1	4	60	4	25	75	100	3

TOPICS AND ALLOCATION OF HOURS & MARKS :

Unit No	Name of the Topic	Hours	Marks
I	Architecture & Operation of Programmable Logic	10	15
II	Programming of PLC	10	15
III	PLC Programming -1 (applicable for Allen Bradley PLC)	10	15
IV	PLC Programming -2 (applicable for Allen Bradley PLC)	10	15
V	I/O module communication & Networking	10	15
	Revision	03	
	Cycle Tests and Model Examination	07	
	Total	60	75

2E6406.1 - PROGRAMMABLE LOGIC CONTROLLER

CONTENT DETAILS

UNIT I : INTRODUCTION TO PROGRAMMABLE LOGIC CONTROLLER

1.1 INTRODUCTION TO PLC : Evolution of Automation – Development of PLC - Requirements of PLC - Features of PLC - Advantages over relay logic - components of PLC – Types of PLC - Specifications and criteria for selection of suitable PLC.- PLC manufacturers

1.2 **ARCHITECTURE OF PLC :** Block diagram of PLC – principle of operation - CPU - memory organization -I/O modules – PLC scan – power supplies to PLC

1.3 PLC PROGRAMMING LANGUAGES -Standard languages-Ladder diagram (LD) - Function block diagram (FBD), Sequential function chart(SFC)- Statement List(STL), (each one example program) -Symbols of a PLC Input and output contact graphical languages(IES) and Ladder methods – program format.

UNIT II : PROGRAMMING OF PLC (Applicable for allen bradley PLC)

2.1 ADDRESSING SCHEMES & I/O COMMANDS: Input Addressing scheme in important commercial PLCs. Output Addressing scheme in important commercial PLCs. Typical Numbering mode. Simple instructions -Programming NC and NO contacts EXAMINE ON and EXAMINE OFF instructions - online, offline methods–Latch and Unlatch outputs -pulse edge evaluation

2.2 LADDER DIAGRAM: Ladder diagram of AND, OR, NOT, XOR, NAND AND NOR gate - Equivalent ladder diagram to demonstrates De Morgan's theorem, Ladder diagram practice for simple Logical expressions, Multiplexer and Demultiplexer.

UNIT III : TIMERS & COUNTERS (Applicable for allen bradley PLC)

3.1 Timer : Definition& Classification of a timer. Characteristics of PLC timer – Functions in a timer – resetting – retentive and non retentive functions and function block format .

3.2 Counter : Operation of PLC counter- Counter parameters – Format of counter instructions & Data file.

3.3 Instructions Used In Timer & Counter - on-delay and off-delay timer. Counter instructions- UP/DOWN counters-Timer and Counter applications. Simple problems using Timer.

UNIT IV : PLC ADVANCED INSTRUCTIONS (Applicable for allen bradley PLC)

4.1 Advanced instructions : Types of Instructions - Addressing data formats - Comparison Instructions - EQU,NEQ, LES, GRT, GRQ, & LIM. - Program control instructions

4.2 Data manipulating instructions -Math instructions -Logic instructions -Data handling instructions - Format and simple examples

4.3 Ladder logic diagram for DOL starter, Automatic Star-Delta Starter, Jogging operation of 3Φ IM, Forward and reversing operation of 3Φ IM, Fluid filling operation and 3 - floor Lift control system.

UNIT V : I/O MODULES,COMMUNICATION & NETWORKING

5.1 INPUT/OUTPUT MODULES : Discrete input module -AC input module -DC input module – sinking and sourcing -sensor input -special input modules– Sensors -limit switch, reed switch, photo electric sensor, inductive proximity sensor.. Discrete output module - TTL output module -Relay output –Isolated output module - surge suppression in output – Analog outputs -open collector output.

5.2 Communication Interfaces : Types of communication interface – parallel – serial interface. IEEE 488 bus, RS232 interface .

5.3 Networking : Types of networking –network communications -principles - transmission media-- communication mode- simplex – Half duplex – full duplex Network Topology- Bus Ring, Star and Tree. Supervisory Digital Control (SCADA) - introduction and brief history of SCADA -SCADA Hardware and software- Application of SCADA systems (basic only)

TEXT BOOK

Sl.No.	Title	Author	Publisher
1	Programmable Logic Controllers and Industrial Automation an Introduction, 4th reprint 2012	Madhuchandra Mitra Samarjit Sen Gupta	Penram International Publishing Pvt. Ltd

REFERENCE BOOKS

Sl.No.	Title	Author	Publisher
1	Introduction to Programmable Logic Controllers, 3rd Edition 2005	Gary Dunning	Thomson Delmar Learning
2	Programmable Logic Controller With Applications, 1st Edition 2004	Pradeep Kumar & Srivashtava	BPB
3	Technician's Guide to Programmable Controllers, 6th Edition 2012	Richard A. Cox	Vikas Publishing Houses

ONLINE RESOURCES

www.electronics.wisc-online.com/category.aspx
www.electrical-engineering-portal.com/

COURSE OUTCOME

CO1	Able to understand Architecture & Operation of Programmable Logic Controller
CO2	Able to know the Programming of PLC
CO3	Able to understand PLC Programming -1 (applicable for Allen Bradley PLC)
CO4	Able to understand the concept of Advanced PLC Programming (applicable for Allen Bradley PLC)
CO5	Able to Know the concepts of I/O module communication & Networking

2E6406.2 BIO MEDICAL INSTRUMENTATION

RATIONALE

Bio medical engineering education is in the growing stage. But every year, there is a tremendous increase in the use of modern medical equipment in the hospital and health care industry therefore it is necessary for every student to understand the functioning of various medical equipments. This subject to enable the students to learn the basic principles of different biomedical instruments viz Clinical measurement, Bio - medical recorders, Therapeutic instruments, Biotelemetry and Modern imaging techniques instruments.

OBJECTIVES

After learning this subject the student will be able to understand the about

- The generation of Bio-potential and its measurement using various electrodes.
- The measurement of blood pressure, lung volume, respiration rate, body temperature and skin temperature.
- The principles of operations of ECG recorder, EEG recorder, ENG recorder. Pacemaker, various imaging techniques
- The working principles of audio meter. telemetry.
- The basic principle of dialysis, short wave diathermy, ventilators, telemedicine, various types of lasers. CT and MRI scanner.
- To learn about patient safety.
- The various methods of accident prevention.

SCHEME OF INSTRUCTION & EXAMINATION

Course Code	Instruction		Credit	Scheme Of Examination			
	Hours / week	Hours / Term		Marks			Duration
				Internal	End Exam	Total	
2E6406.2	4	60	4	25	75	100	3

TOPICS AND ALLOCATION OF HOURS & MARKS :

Unit No	Name of the Topic	Hours	Marks
I	Bio - electric signals, electrodes and clinical measurement	10	15
II	Bio - medical recorders	10	15
III	Therapeutic instruments	10	15
IV	Biotelemetry and patient safety	10	15
V	Modern imaging techniques	10	15
	Revision	03	
	Cycle Tests and Model Examination	07	
	Total	60	75

2E6406.2 BIO MEDICAL INSTRUMENTATION

CONTENT DETAILS

UNIT I : BIO-ELECTRIC SIGNALS AND ELECTRODES

1.1 INTRODUCTION: Elementary ideas of cell structure, Bio – potential and their generation – resting and action potential – propagation of action potential.

1.2 ELECTRODES: Electrodes – Micro – Skin surface – needle electrodes.

1.3 CLINICAL MEASUREMENT: Measurement of Blood pressure (direct, indirect) – blood flow meter (Electromagnetic & ultrasonic blood flow meter) – blood pH measurement - Measurement of Respiration rate – measurement of lung volume – heart rate measurement – Measurement of body and skin temperature - Chromatography, Photometry, Flurometry.

UNIT II : BIO - MEDICAL RECORDERS

2.1 ELECTRO CARDIOGRAPH (ECG): Electro cardiograph (ECG) – Lead system – ECG electrodes – ECG amplifiers – ECG recording units – analysis of ECG curves.

2.2 EEG recorder: Nervous system – EEG recorder – 10-20 lead system – recording techniques – EEG wave types – Clinical use of EEG – brain tumour

2.3 Electro myograph (EMG) & Electro retinograph (ERG):

Electro – myograph (EMG) – EMG waves – measurement of conduction velocity – EMG recording techniques – Electro – retinograph (ERG) Audiometer – principle – types – Basics audiometer working.

UNIT III : THERAPEUTIC INSTRUMENTS

3.1 PACEMAKER: Cardiac pacemaker – classification – External pace makers – implantable pacemaker – pacing techniques – programmable pacemaker

3.2 DEFIBRILLATORS & DIALYSIS: Cardiac defibrillators – types – AC and DC defibrillators - Heart lung machine with Block diagram. Dialysis – Hemo dialysis – peritoneal dialysis.

3.3 ENDOSCOPES & VENTILATORS: Endoscopes – Endoscopic laser coagulator and applications – physiotherapy equipment – short wave diathermy – micro wave diathermy – ultrasonic therapy unit (block / circuit) – Ventilators – types – modern ventilator block diagram.

UNIT IV : BIOTELEMETRY AND PATIENT SAFETY

4.1 BIOTELEMETRY: Introduction to biotelemetry – physiological – adaptable to biotelemetry – components of a biotelemetry system – application of telemetry – elements of biotelemetry; AM, FM transmitter and receiver –requirements for biotelemetry system – radio telemetry with sub carrier– single channel and multi channel telemetry

4.2 TELEMEDICINE & PATIENT SAFETY: Telemedicine – introduction, working, applications. Patient safety: Physiological effects of electric current – Micro and macro shock – leakage current – shock hazards from electrical equipment.

4.3 SAFETY ASPECTS: Methods of Accident Prevention – Grounding – Double Insulation – Protection by low voltage – Ground fault circuit interrupter – Isolation of patient connected parts – Isolated power distribution system. Safety aspects in electro surgical units – burns, high frequency current hazards, Explosion hazards.

UNIT V : MODERN IMAGING TECHNIQUES:

5.1 LASER: LASER beam properties – block diagram – operation of CO2 and NDYag LASER – applications of LASER in medicine.

5.2 X RAY & TOMOGRAM: X ray apparatus – block diagram – operation – special techniques in X-ray imaging – Tomogram – computerized Axial tomography

5.3 ULTRASONIC IMAGING TECHNIQUES: Ultrasonic imaging techniques – Echo cardiography – Angiography – CT scanner - Magnetic resonance imaging techniques.

TEXT BOOK

Sl.No.	Title	Author	Publisher
1	Bio- Medical Instrumentation 2nd Edition 1994	Dr.M.Arumugam	Anuradha Publishers

REFERENCE BOOKS

Sl.No.	Title	Author	Publisher
1	Handbook of Bio- Medical Instrumentation , 3rd Ed.2015	R.S.Khandpur	Tata McGraw Hill
2	Medical Electronics	Kumardoss	Tata McGraw Hill
3	Bio-Medical Instrumentation and Measurement 2nd Edition 1980	Cromwell, Weibell, Pfeiffer	PrenticeHall international

ONLINE RESOURCES

www.eeeuniversity.com/2013/08/ei2311-biomedical-instrumentation.html

www.biomedikal.in/2009/12/lecture-notes-on-biomedical-instrumentation/

COURSE OUTCOME

CO1	Able to know Bio - electric signals, electrodes and clinical measurement
CO2	Able to know the concept of Bio - medical recorders
CO3	Able to know the concept of Therapeutic instruments
CO4	Able to know the concept of Biotelemetry and patient safety
CO5	Able to know the concept of Modern imaging techniques

2E6406.3 - COMPUTER HARDWARE AND NETWORKING

RATIONALE

A computer engineer should be able to install and maintain keyboard, printer, mouse, monitor etc along with the computer system. This course provides the necessary knowledge and skills regarding working, construction and interfacing aspects of peripherals. The students will get to know how various peripherals communicate with central processing unit of the computer system and pattern their respective operations.

OBJECTIVES

On completion of the following units of syllabus contents, the students must be able to

- Familiarize themselves the evolution of PCs.
- Familiarize with the motherboards, memory chips,various Bus standards, chip sets and processors. Understand the operation of Keyboard, Mouse and Displays.
- Understand the concept of HDD, FDD and special devices.
- Understand the operation of CD and DVD.
- Familiarize with the working of video capture board, sound blaster cards.
- Understand the different I/O ports and SMPS used in the PCs.
- Understand the working of Modem, Digital camera, Printer and Scanners.
- Acquire knowledge about assembling of PC,.
- Understand the concept of CMOS set up program & post diagnostics software and uses. Familiarize with the different computer networks, network media and hardware.
- Understand the concept of installation & configuring network, network administration.

SCHEME OF INSTRUCTION & EXAMINATION

Course Code	Instruction		Credit	Scheme Of Examination			
	Hours / week	Hours / Term		Marks			Duration
				Internal	End Exam	Total	
2E6406.3	4	60	4	25	75	100	3

TOPICS AND ALLOCATION OF HOURS & MARKS :

Unit No	Name of the Topic	Hours	Marks
I	Motherboards and processors	10	15
II	Peripherals	10	15
III	I/O ports and External peripherals	10	15
IV	PC Assembling and Testing	10	15
V	Computer Network and Installation	10	15
	Revision	03	
	Cycle Tests and Model Examination	07	
	Total	60	75

2E6406.3 - COMPUTER HARDWARE AND NETWORKING

CONTENT DETAILS

UNIT I : MOTHERBOARDS AND PROCESSORS

1.1 Motherboards : Evolution - PC through Pentium core2 Duo –comparison chart - PC system units -Front Panel / Rear side connectors, switches and indicators - Specification parameters - Lap top PCs -Palm top PCs. Mother Board: Evolution -Mother Board components - BIOS - CMOS RAM -Form Factor -Riser Architecture -Main Memory -memory chips (SIMM, DIMM, RIMM) -extended -expanded -cache -virtual Memories.

1.2 Bus Standards & Chipsets : PC BUS -ISA and Knowledge of other Buses - PCI - AGP - USB Architectures, important signals -comparison chart. Chip sets: Introduction - Intel chipset 945 series and knowledge of other chip sets -AMD chipset series.

1.3 Processors: Introduction -CISC Basic structure –RISC basic structure -evolution -Intel CPUs(P IV, Dual core, Core DUO, Core2 DUO) - AMD CPUs(K6, ATHLON, DURON) - VIA Cyrix CPUs(6X86MX, VIA/CYRIX III, VIA SAMUEL II).

UNIT II : PERIPHERALS

2.1 Keyboard,Mouse & Display : Introduction -keyboard operation -key board signals - keyboard interface logic -wireless keyboard function - Mouse construction - principle operation of Mouse -optical mouse -wireless mouse -mouse signals -Mouse Installation -track pads.- Displays: Video basics -anatomy of CRT, LCD and TFT displays - resolution –interlacing - refresh rate -dot pitch – data projectors -touch screens.

2.2 HDD: introduction - HDD construction - parameters – operation- HDC block diagram - working principle -IDE, EIDE, SCSI, ultra ATA, and SATA series -installation – partitioning– partition table - formatting - FAT –data reading -data writing (FM, MFM) - Boot record – Directory structure.

2.3 FDD & Special Devices: Introduction -disk construction – types - FDD construction -drive operation -types –FDC operation -pen drives -flash drives -I pods. CD & DVD: Introduction - construction - operation – formats– Technology–DVD writer–combo drive construction - read/write operation - DVD drive installation.

UNIT III : I/O PORTS AND EXTERNAL PERIPHERALS

3.1 Video Capture Board: Introduction -block diagram of an integrated video capture/ VGA card -connectors -capture process - audio and video capture and play back sequence - compression and de-compression techniques. Sound Blaster Card: Basics of digital sound - audio compression and decompression -sound blaster card -installation -MIDI -3D audio -EAX - MP3 -SDMI.

3.2 I/O Ports & SMPS: serial - parallel port - game port – controllers (Block Diagram) - operation -signals –SMPS – working - block diagram - AT & ATX connectors . Modem: Introduction - functional block of modem – working principle -types –installation. Digital Camera: introduction - Construction -operation -SLR camera– features.

3.3 Printer & Scanner: Printer : introduction -types -dot matrix -inkjet -laser – operation - onstruction - features - installation – troubleshooting.- Scanner: Introduction -operation -scan resolution -color scanners -scan modes -file formats.

UNIT IV : PC ASSEMBLING AND TESTING

4.1 PC Assembly: Power supplies - Configuring mother board/jumper setting - connectors - cables - Adding memory modules -assembling a computer -upgrading a PC.

4.2 CMOS setup program & POST: CMOS setup program - various setup options -POST definition -IPL hardware -POST test sequence -beep codes -error messages.

4.3 Diagnostic Software & Viruses: PC latest diagnostic software -bench mark programs - computer viruses -Precautions -Anti-virus software -signature of viruses -Fire wall.

UNIT V : COMPUTER NETWORK AND INSTALLATION

5.1 Computer Network Basics: Introduction -OSI layer model - network types -LAN- WAN - CAN -MAN -HAN -internet - intranet - extranet - uses - Blue tooth Technology. Local Area Network: LAN topologies -star -ring -mesh –bus -Client/Server -peer to peer.

5.2 Network Media & Hardware: Twisted wire - Coaxial cable - fiber optic cable -flow control -Ethernet -Arc net – Router -active hub - passive hub -wireless network – blue tooth dongle.

5.3 Installing and configuring Network : (Windows NT 2003): Network Components and Connectors -Installing NIC –Installing Cables -Hub -Setting up NIC -Network Setup Wizard - Working with Network resources - Sharing resources on Network -New Connection Wizard. Network Administration(Windows NT 2003): Accounts and Groups -Working with User Accounts & security - passwords - Group Membership Profiles – Working with Groups - Granting Permissions –Managing Shares -Switching Between Users

TEXT BOOK

Sl.No.	Title	Author	Publisher
1	Computer Installation and Servicing 2nd Edition 2005	D. Balasubramanian	TMH Publishing Company,New Delhi

REFERENCE BOOKS

Sl.No.	Title	Author	Publisher
1	IBM PC and Clones 2nd Edition Reprint 2006	B.Govindarajulu	TMH Publishing Company,New Delhi
2	Local Area Networks -An introduction to the technology 2nd Edition 1996	McNamara John. E	Digital Press

ONLINE RESOURCES

www.techtutorials.net

www.nptel.ac.in/courses/106105081/1

COURSE OUTCOME

CO1	Able to Familiarize with the motherboards, memory chips,various Bus standards, chip sets and processors. Understand the operation of Keyboard, Mouse and Displays. Able to Familiarize with the working of video capture board, sound blaster cards.
CO2	Able to Understand the concept of HDD, FDD and special devices. Able to Understand the operation of CD and DVD.
CO3	Able to Understand the different I/O ports and SMPS used in the PCs. Able to Understand the working of Modem, Digital camera, Printer and Scanners.
CO4	Acquire knowledge about assembling of PC
CO5	Able to Understand the concept of CMOS set up program & post diagnostics software and uses. Familiarize with the different computer networks, network media and hardware. Able to Understand the concept of installation & configuring network, network administration.

2E6313 - POWER ELECTRONICS LAB

RATIONALE

On complication this Lab, the students will familiar with power electronics devices, different triggering circuit and application of SCR and other industrial application.

OBJECTIVES

On completion of the following experiments, the students must be able to

- get the knowledge about the trigger circuit
- draw the input/output waveform using HCB and FCB
- know the performance of lamp control using DIAC-TRIAC
- learn the various techniques used for turn-off of Thyristor
- draw the waveform of series/parallel inverter
- draw the output waveform of DC chopper
- measure the output voltage of chopper
- find the performance of speed control of universal motor
- understand the concept of Closed loop control of AC motor
- know the performance of speed control of DC motor by varying firing angle
- understand the concept of Closed loop control of DC motor
- draw the output waveform of DC chopper using MOSFET/IGBT
- measure the variable output voltage using PWM technique

SCHEME OF INSTRUCTION & EXAMINATION

Course Code	Instruction		Credit	Scheme Of Examination			
	Hours / week	Hours / Term		Marks			Duration
				Internal	End Exam	Total	
2E6313	6	90	3	25	75	100	3

Scheme Of Evaluation:

SL	Description	Maximum Marks
1	Circuit diagram	25
2	Connection	20
3	Reading/graph/result	25
4	Viva Voce	05
5	TOTAL	75

2E6313 - POWER ELECTRONICS LAB

CONTENT DETAILS

SLNO	List of Experiments
1	Line synchronized, Ramp and Pedestal UJT trigger circuit with AC load
2	Single phase Half and Full Controlled Bridge with R load
3	Lamp control circuit using DIAC –TRIAC
4	SCR commutation circuits
5	Basic Series Inverter.
6	Single phase Parallel Inverter using MOSFET / IGBT
7	DC chopper control circuit using thyristor (any one).
8	Universal motor control circuit using TRIAC
9	Closed loop speed control of Single phase AC motor
10	DC shunt motor control circuit
11	Closed loop speed control of DC motor with loading arrangement
12	PWM based step down DC chopper using MOSFET/IGBT
13	Single phase Single pulse / Sinusoidal PWM inverter using MOSFET/IGBT
14	SMPS using MOSFET/IGBT
15	Three phase Half bridge / Full bridge Converter
Note: Only one question will have to be answered by the students in the examination BY	

EQUIPMENTS REQUIREMENT:

Sl.No	Name of the Equipment	Qty
01	Regulated Power Supply	3
02	CRO	3
03	PowerScppe	1
	Digital Multimeter	3
04	Line synchronized, Ramp and Pedestal UJT trigger circuit with AC load kit	1
05	Single phase Half and Full Controlled Bridge with R load **kit**	1
06	Lamp control circuit using DIAC –TRIAC kit	1
07	SCR commutation circuits kit	1
08	Basic Series Inverter.	1
09	Single phase Parallel Inverter using MOSFET / IGBT	1
10	DC chopper control circuit using thyristor (any one).	1
11	Universal motor control circuit using TRIAC	1
12	Closed loop speed control of Single phase AC motor	1

13	DC shunt motor control circuit	1
14	Closed loop speed control of DC motor with loading arrangement	1
15	PWM based step down DC chopper using MOSFET/IGBT	1
16	Single phase Single pulse / Sinusoidal PWM inverter using MOSFET/IGBT kit	1
17	SMPS using MOSFET/IGBT kit	1
18	Three phase Half bridge / Full bridge Converter kit	1

COURSE OUTCOME

CO1	Able to get the knowledge about the trigger circuit Able to draw the input/output waveform using HCB and FCB
CO2	Able to know the performance of lamp control using DIAC-TRIAC Able to learn the various techniques used for turn-off of Thyristor
CO3	Able to draw the waveform of series/parallel inverter
CO4	Able to draw the output waveform of DC chopper Able to measure the output voltage of chopper Able to find the performance of speed control of universal motor Able to understand the concept of Closed loop control of AC motor
CO5	Able to know the performance of speed control of DC motor by varying firing angle Able to understand the concept of Closed loop control of DC motor Able to draw the output waveform of DC chopper using MOSFET/IGBT Able to measure the variable output voltage using PWM technique

2E6407.1 - PROGRAMMABLE LOGIC CONTROLLER LAB

RATIONALE

The purpose of this course is to provide the student with basic skills required to work with the various types of PLC‘s. This course will provides the student a hands-on approach to conversion of many conventional control circuits into PLC control circuit. Also the students will exposure into various methods of programming used for PLC.

OBJECTIVES

After the completion of this laboratory, the student should be able to

- implement a ladder logic program approach to various logic gates, verification of Demorgan‘s Theorem and demonstration of Multiplexer and De-Multiplexer .
- implement a ladder logic program approach to the control circuit for various operations like jogging, reversing control and braking of Motors.
- implement a ladder logic program approach to the control circuit for various types of starters.
- implement a ladder logic program approach for load shedding of transformer.

SCHEME OF INSTRUCTION & EXAMINATION

Course Code	Instruction		Credit	Scheme Of Examination			
	Hours / week	Hours / Term		Marks			Duration
				Internal	End Exam	Total	
2E6407.1	4	60	2	25	75	100	3

Scheme Of Evaluation:

SNO	Description	Maximum Marks
1	Ladder Logic diagram	25
2	I/O Addressing, Wiring Diagram and Connection	15
3	Execution	20
4	Result	10
5	Viva Voce	05
6	TOTAL	75

2E6407.1 - PROGRAMMABLE LOGIC CONTROLLER LAB

CONTENT DETAILS

SL NO	List of Experiments
1	Write and implement a ladder logic program to demonstrate a) NAND Gate b) NOR Gate c) EX-OR Gate and d) EX-NOR Gate with PLC.
2	Write and implement a ladder logic program to demonstrate Demorgan‘s Theorem using PLC
3	Write and implement a ladder logic program to demonstrate Multiplexer and De-Multiplexer using PLC
4	Write and implement a ladder logic program for DOL Starter using PLC
5	Write and implement a ladder logic program for Semi Star-Delta Starter using PLC.
6	Write and implement a ladder logic program for Automatic Star-Delta Starter using PLC
7	Write and implement a simple ladder logic program for interfacing a lift control with PLC.
8	Write and implement a simple ladder logic program for interfacing a conveyor control with PLC
9	Write and implement a ladder logic program for Jogging operation of three phase Induction Motor using PLC.
10	Write and implement a ladder logic program for reversing operation of three phase Induction Motor using PLC.
11	Write and implement a ladder logic program for level control system of a Water Tank using PLC
12	Write and implement a ladder logic program for a bi-directional movable arm using PLC.
13	Write and implement a ladder logic program for blinking indicator circuit in which two lights are flashed alternately every 5 seconds using PLC.
14	Write and implement a ladder logic program that will control a stepper motor so that it moves 10 steps forward, waits for 20 seconds, and then cause the motor to move 10 steps in the reverse direction using PLC
15	Write and implement a ladder logic program for load shedding of transformer.
Note: Only one question will have to be answered by the students in the examination BY LOT out of the total 15 Questions.	

EQUIPMENTS REQUIREMENT:

Sl.No	Name of the Equipment	Qty
01	PLC with suitable No of I/O (various brands, Computer interface cables software etc)	5
02	Push button switch limit switch, reed switch, photo electric sensor, inductive proximity sensor Capacitive proximity sensor Regulated Power	5 each
03	PLC Power supply (SMPS if necessary)	Required No
04	DOL Starter Kit	2 No
05	Semi Automatic Star-Delta Starter Kit	5 No
06	Fully Automatic Star-Delta Starter Kit	2 No
07	Kit for Jogging operation of three phase Induction Motor	5 No
08	Kit for reversing operation of three phase Induction Motor	1 No
09	Kit for Level control system of a Water Tank	1 No
10	Kit for Bi-directional movable arm using PLC.	1 No
11	Kit for blinking indicator circuit with two lights	1 No
12	Stepper motor controller kit	1 No
13	Lift control Kit	1 No
14	Conveyor belt kit	2 No

COURSE OUTCOME

CO1	Able to implement a ladder logic program approach to various logic gates, verification of Demorgan‘s Theorem and demonstration of Multiplexer and De-Multiplexer .
CO2	Able to implement a ladder logic program approach to the control circuit for various operations like jogging, reversing control and braking of Motors.
CO3	Able to implement a ladder logic program approach to the control circuit for various types of starters.
CO4	Able to implement a ladder logic program approach for load shedding of transformer.
CO5	Able to understand and implement control logic for process applications

2E6407.2 BIO-MEDICAL INSTRUMENTATION LAB

RATIONALE:

Recent advances in medical field have been fuelled by the instruments developed by the Electronics and Instrumentation Engineers. Pacemakers, Ultrasound Machine CAT, Medical diagnostic systems are few names which have been contributed by engineers. Now health care industry uses many instruments which are to be looked after by instrumentation engineers. This subject will enable the students to learn the basic principles of different instruments/equipment used in the health care industry. The practical work done in this area will impart skill in the use, servicing and maintenance of these instruments/equipment. Proficiency in this area will widen the knowledge and skill of diploma holders in the field of biomedical instrumentation.

OBJECTIVES:

On completion of the following experiments, the students must be able to

- Construct and test differential, high gain and instrumentation amplifiers
- Measure pH values, blood pressure, temperatures, etc,.
- Handle different types of biomedical equipments

SCHEME OF INSTRUCTION & EXAMINATION

Course Code	Instruction		Credit	Scheme Of Examination			
	Hours / week	Hours / Term		Marks			Duration
				Internal	End Exam	Total	
2E6407.2	4	60	2	25	75	100	3

Scheme of Evaluation:

SLNO	Description	Maximum Marks
	For exercises requiring circuit diagram and connection	
1	Circuit Diagram	20
2	Connection	20
3	Readings Taken & Tabulation	10
4	Calculation & Result and Graph if any	20
5	Viva	5
	TOTAL	75
	For other exercises	
1	Design Particulars / Theory behind exercises	30
2	Work menship & finishing / carrying of the test & finding the result	40
3	Viva	5
	TOTAL	75

2E6407.2 BIO-MEDICAL INSTRUMENTATION LAB

CONTENT DETAILS

SNO	List of Experiments
1	Construction and Testing of Differential amplifier.
2	Construction and Testing of Instrumentation amplifier.
3	Measurement of pH of given solution.
4	Measurement of Blood pressure.
5	Measurement of ECG waveform.
6	Construction and verification of pacemaker circuit.
7	Construction and testing of high gain amplifier.
8	Measurement of Body and Skin temperature
9	Study, handle and use of following instruments/Equipments:
	a) Cardiac monitor.
	b) Vascular probe with vasoline monitor.
	c) ECG stimulator.
	d) Muscle stimulator.
	e) Vectorodyne electrotherapy equipment.
	f) Vascular Doppler recorder.
	g) Pressure plethysmograph.
	h) Skin sympathetic response meter.
Note: Only one question will have to be answered by the students in the examination BY LOT out of the total 16 Questions	

COURSE OUTCOME

CO1	Able to Construct and test differential, high gain and instrumentation amplifiers
CO2	Able to Measure pH values, blood pressure, temperatures, etc,.
CO3	Able to Handle different types of biomedical equipments

2E6407.3 - COMPUTER HARDWARE AND NETWORKING LAB

RATIONALE

The course aims at making the students familiar with various parts of computers and how to assemble them, and different types of peripherals desired. In addition, the course will provide the students with necessary knowledge and skills in computer software installation and maintenance to make him diagnose software faults.

This subject also gives the knowledge and competency to diagnose the problems in computer hardware and peripherals and also gives the knowledge for trouble shooting for systematic repair and maintenance of computers and computer peripherals.

OBJECTIVES

On completion of the following exercises, the students must be able to

- Know the various indicators, switches and connectors used in Pentium.
- Familiarize the layout of SMPS, motherboard and various Disk Drives.
- Configure Bios set up options.
- Install various secondary storage Devices with memory partition and Formatting.
- Know the various types of printer installation and to handle the troubleshooting ability.
- Acquire the practical knowledge about the installation of various communication and entertainment devices.
- Handle the audio/video devices, interfacing with PC.
- Setup Video-conference System..
- Assemble PC system and checking the working condition.
- Identify the problems in Pentium systems, software installation and rectification also.

SCHEME OF INSTRUCTION & EXAMINATION

Course Code	Instruction		Credit	Scheme Of Examination			
	Hours / week	Hours / Term		Marks			Duration
				Internal	End Exam	Total	
2E6407.3	4	60	2	25	75	100	3

Scheme Of Evaluation:

SLNO	Description	Maximum Marks
1	Circuit diagram	25
2	Connection	15
3	Execution	25
4	Result	05
5	Viva Voce	05
6	TOTAL	75

2E6407.3 - COMPUTER HARDWARE AND NETWORKING LAB

CONTENT DETAILS

SLNO	List of Experiments
1	Switches, Indicators and connectors of PC: Identification of front panel indicators and switches in a computer system of table top/ tower case model and also identification of rear side connectors
2	PC system layout: Draw a Computer system layout and Mark the positions of SMPS, Mother Board, FDD, HDD, and CD-Drive/DVD-Drive add on cards in table top / tower model systems
3	Mother Board Layout: Draw the layout of Pentium IV or Pentium Dual core Pentium Core2 DUO mother board and mark Processor, Chip set ICs. RAM, Cache, Xtal, cooling fan, I/O slots and I/O ports and various jumper settings.
4	CMOS Setup Program: 1. Changing the Standard settings 2. Changing advanced settings (BIOS and Chipset features)
5	Installation of FDD: 1. Install and configure an FDD in a computer system. 2. Floppy drive diagnostics/servicing.
6	USB pen drives and I-pods. 1. Connect and enable a pen drive or I-pod in a PC. 2. Format the pen drive or I-pod. 3. Copy files and folders from pen drive I-pod to HDD. 4. Copy files and folders from HDD to pen drive or I-pod.
7	HDD Installation: 1. Install the given HDD. 2. Configure in CMOS-Setup program 3. Partition the HDD using FDISK. 4. Format the Partitions.
8	Printer Installation & Troubleshooting: 1. Installing and checking a Dot-Matrix Printer. 2. Installing and checking an Ink jet / Laser Printer. 3.Possible problems and troubleshooting
9	Modem Installation: 1. Install and configure a Modem in a windows PC. 2. Check the working condition of modem with PC
10	DVD Multi-recorder drive installation: 1. Install a DVD Multi-recorder drive in a PC. 2 Configure using device driver. 3. Check the read / write operation using a cd / dvd.
11	Installation of Scanner: 1. Connect the given scanner with a PC. 2. Configure the scanner with driver. 3. Check the scanner by scanning a page / a portion in a page
12	Familiarize: Scandisk, recent Anti-virus software and recent PC Diagnostic
13	Assembling a PC: Assemble a Pentium IV or Pentium Dual Core Duo system with necessary peripherals and check the working condition of the PC.
14	Install and Configure Windows NT2003 operating system in a PC.
15	Construct Network by connecting one or two computer with a Windows NT2003 Server

16	install and Configure LINUX operating system in a PC
17	Construct Network by connecting one or two computer with a LINUX Server.
18	Configure the network for an Internet server
19	Add / Remove devices using Hardware Wizard
20	Add and Manage User Profile, Set permission to the users both in Windows NT 2003/ LINUX
Note: Only one question will have to be answered by the students in the examination BY LOT out of the total 20 Questions.	

COURSE OUTCOME

CO1	Able to know the various indicators, switches and connectors used in Pentium.
CO2	Able to familiarize the layout of SMPS, motherboard and various Disk Drives.
CO3	Able to configure Bios set up options.
CO4	Able to install various secondary storage Devices with memory partition and Formatting.
CO5	Able to know the various types of printer installation and to handle the troubleshooting ability
CO6	Able to acquire the practical knowledge about the installation of various communication and entertainment devices.
CO7	Able to Handle the audio/video devices, interfacing with PC
CO8	Able to Setup Video-conference System
CO9	Able to assemble PC system and checking the working condition
CO10	Able to identify the problems in Pentium systems, software installation and rectification also

2E6408 - PROJECT WORK

Course Code	Instruction		Credit	Scheme Of Examination			
	Hours / week	Hours / Term		Marks			Duration
				Internal	End Exam	Total	
2E6408	6	90	4	25	75	100	3

RATIONALE

Project work aims at developing skills in the students whereby they apply in totality the knowledge and skills gained through the course in the solution of a practical problem undertaken as a project work. The students have different aptitudes and strengths. Project work, therefore, should match the strengths of students. For this purpose, students should be asked to identify the type of project work, they would like to execute. It is also essential that the faculty of the respective departments may have a brainstorming session to identify suitable project assignments. The project assignment can be individual assignment or a group assignment. There should not be more than 3 students if the project work is given to a group. The students should identify themselves or be given project assignment at least two to three months in advance. The project work identified in collaboration with industry/field organization should be preferred.

OBJECTIVES

After the completion of this laboratory, the student should be able to

- Implement the theoretical and practical knowledge gained through the curriculum into an application suitable for a real practical working environment preferably in an industrial environment
- Develop software packages or applications to implement the actual needs of the community. Get exposure on industrial environment and its work ethics.
- Learn and understand the gap between the technological knowledge acquired through curriculum and the actual industrial need and to compensate it by acquiring additional knowledge as required.
- Carry out cooperative learning through synchronous guided discussions within the class in key dates, asynchronous document sharing and discussions, as well as to prepare collaborative edition of the final project report.
- Expose students to the field of computing and to gain experience in software design. Understand the facts and importance of environmental management.
- Understand and gain knowledge about disaster management.

SCHEME OF INSTRUCTION & EXAMINATION

Course Code	Instruction		Credit	Scheme Of Examination			
	Hours / week	Hours / Term		Marks			Duration
				Internal	End Exam	Total	
2E6408	6	90	4	25	75	100	3

Scheme of Evaluation:

Marks for Report Preparation, Demo, Viva-voce	65 Marks
Marks for answers of 4 questions which is to be set by the external examiner from the given question bank consisting of questions in the following two topics Disaster Management and Environmental Management. Out of four questions two questions to appear from each of the above topics i.e. 2 questions x 2 topics = 4 questions 4 questions x 2 ½ marks = 10 Marks	10 Marks
TOTAL	75 Marks

2E6408 - PROJECT WORK

CONTENT DETAILS

PART-A

ENVIRONMENTAL MANAGEMENT

Introduction – Environmental Ethics – Assessment of Socio Economic Impact – Environmental Audit – Mitigation of adverse impact on Environment – Importance of Pollution Control – Types of Industries and Industrial Pollution.

Solid waste management – Characteristics of Industrial wastes – Methods of Collection, transfer and disposal of solid wastes – Converting waste to energy – Hazardous waste management Treatment technologies. Waste water management – Characteristics of Industrial effluents – Treatment and disposal methods – Pollution of water sources and effects on human health. Air pollution management – Sources and effects – Dispersion of air pollutants – Air pollution control methods – Air quality management. Noise pollution management – Effects of noise on people – Noise control methods.

PART-B

DISASTER MANAGEMENT

Introduction – Disasters due to natural calamities such as Earthquake, Rain, Flood, Hurricane, Cyclones etc – Man made Disasters – Crisis due to fires, accidents, strikes etc – Loss of property and life.. Disaster Mitigation measures – Causes for major disasters – Risk Identification – Hazard Zones – Selection of sites for Industries and residential buildings – Minimum distances from Sea – Orientation of Buildings – Stability of Structures – Fire escapes in buildings - Cyclone shelters – Warning systems. Disaster Management – Preparedness, Response, Recovery

– Arrangements to be made in the industries / factories and buildings – Mobilization of Emergency Services - Search and Rescue operations – First Aids – Transportation of affected people – Hospital facilities – Fire fighting arrangements – Communication systems – Restoration of Power supply – Getting assistance of neighbors / Other organizations in Recovery and Rebuilding works – Financial commitments – Compensations to be paid – Insurances – Rehabilitation.

LIST OF QUESTIONS

1. ENVIRONMENTRAL MANAGEMENT

1. What is the responsibility of an Engineer-in-charge of an Industry with respect to Public Health?
2. Define Environmental Ethic.
3. How Industries play their role in polluting the environment?
4. What is the necessity of pollution control? What are all the different organizations you know, which deal with pollution control?
5. List out the different types of pollutions caused by a Chemical / Textile / Leather / Automobile / Cement factory.
6. What is meant by Hazardous waste?
7. Define Industrial waste management.
8. Differentiate between garbage, rubbish, refuse and trash based on their composition and source.
9. Explain briefly how the quantity of solid waste generated in an industry could be reduced.
10. What are the objectives of treatments of solid wastes before disposal?
11. What are the different methods of disposal of solid wastes?
12. Explain how the principle of recycling could be applied in the process of waste minimization.
13. Define the term 'Environmental Waste Audit'.
14. List and discuss the factors pertinent to the selection of landfill site.
15. Explain the purpose of daily cover in a sanitary landfill and state the minimum desirable depth of daily cover.
16. Describe any two methods of converting waste into energy.
17. What actions, a local body such as a municipality could take when the agency appointed for collecting & disposing the solid wastes fails to do the work continuously for number of days?
18. Write a note on Characteristics of hazardous waste.
19. What is the difference between municipal and industrial effluent ?
20. List few of the undesirable parameters / pollutants anticipated in the effluents from oil refinery industry / thermal power plants / textile industries / woolen mills / dye industries / electroplating industries / cement plants / leather industries (any two may be asked)
21. Explain briefly the process of Equalization and Neutralization of waste water of varying characteristics discharged from an Industry.
22. Explain briefly the Physical treatments "Sedimentation" and "Floatation" processes in the waste water treatment.
23. Explain briefly when and how chemical / biological treatments are given to the waste water.
24. List the four common advanced waste water treatment processes and the pollutants they remove.
25. Describe refractory organics and the method used to remove them from the effluent.
26. Explain biological nitrification and de-nitrification.
27. Describe the basic approaches to land treatment of Industrial Effluent.
28. Describe the locations for the ultimate disposal of sludge and the treatment steps needed prior to ultimate disposal.
29. List any five Industries, which act as the major sources for Hazardous Air Pollutants.
30. List out the names of any three hazardous air pollutants and their effects on human health.
31. Explain the influence of moisture, temperature and sunlight on the severity of air pollution effects on materials.
32. Differentiate between acute and chronic health effects from Air pollution.
33. Define the term Acid rain and explain how it occurs.

34. Discuss briefly the causes for global warming and its consequences
35. Suggest suitable Air pollution control devices for a few pollutants and sources.
36. Explain how evaporative emissions and exhaust emissions are commonly controlled.
37. What are the harmful elements present in the automobile smokes? How their presence could be controlled?
38. What is the Advantage of Ozone layer in the atmosphere? State few reasons for its destruction.
39. Explain the mechanism by which hearing damage occurs.
40. List any five effects of noise other than hearing damage.
41. Explain why impulsive noise is more dangerous than steady state noise.
42. Explain briefly the Source – Path – Receiver concept of Noise control.
43. Where silencers or mufflers are used ? Explain how they reduce the noise.
44. Describe two techniques to protect the receiver from hearing loss when design / redress for noise control fail.
45. What are the problems faced by the people residing along the side of a railway track and near to an Airport? What provisions could be made in their houses to reduce the problem?

2. DISASTER MANAGEMENT

1. What is meant by Disaster Management? What are the different stages of Disaster management?
2. Differentiate Natural Disasters and Man made Disasters with examples.
3. Describe the necessity of Risk identification and Assessment Surveys while planning a project.
4. What is Disasters recovery and what does it mean to an Industry?
5. What are the factors to be considered while planning the rebuilding works after a major disaster due to flood / cyclone / earthquake? (Any one may be asked)
6. List out the public emergency services available in the state, which could be approached for help during a natural disaster.
7. Specify the role played by an Engineer in the process of Disaster management.
8. What is the cause for Earthquakes? How they are measured? Which parts of India are more vulnerable for frequent earthquakes?
9. What was the cause for the Tsunami 2004 which inflicted heavy loss to life and property along the coast of Tamilnadu ? Specify its epicenter and magnitude.
10. Specify the Earthquake Hazard Zones in which the following towns of Tamilnadu lie: (a) Chennai (b) Nagapattinam (c) Coimbatore (d) Madurai (e) Salem.
11. Which parts of India are experiencing frequent natural calamities such as (a) heavy rain fall (b) huge losses due to floods (c) severe cyclones
12. Define basic wind speed. What will be the peak wind speed in (a) Very high damage risk zone – A, (b) High damage risk zone, (c) Low damage risk zone.
13. Specify the minimum distance from the Sea shore and minimum height above the mean sea level, desirable for the location of buildings.
14. Explain how the topography of the site plays a role in the disasters caused by floods and cyclones.
15. Explain how the shape and orientation of buildings could reduce the damages due to cyclones.
16. What is a cyclone shelter ? When and where it is provided? What are its requirements?
17. What Precautionary measures have to be taken by the authorities before opening a dam for discharging the excess water into a canal/river ?
18. What are the causes for fire accidents ? Specify the remedial measures to be taken in buildings to avoid fire accidents.

19. What is a fire escape in multistoried buildings ? What are its requirements?
20. How the imamates of a multistory building are to be evacuted in the event of a fire/Chemical spill/Toxic Air Situation/ Terrorist attack, (any one may be asked).
21. Describe different fire fighting arrangements to be provided in an Industry.
22. Explain the necessity of disaster warning systems in Industries.
23. Explain how rescue operations have to be carried out in the case of collapse of buildings due to earthquake / blast / Cyclone / flood.
24. What are the necessary steps to be taken to avoid dangerous epidemics after a flood disaster?
25. What relief works that have to be carried out to save the lives of workers when the factory area is suddenly affected by a dangerous gas leak / sudden flooding ?
26. What are the difficulties faced by an Industry when there is a sudden power failure? How such a situation could be managed?
27. What are the difficulties faced by the Management when there is a group clash between the workers? How such a situation could be managed?
28. What will be the problems faced by the management of an Industry when a worker dies because of the failure of a mechanical device due to poor maintenance? How to manage such a situation ?
29. What precautionary measures have to be taken to avoid accidents to labourers in the Industry in a workshop / during handling of dangerous Chemicals / during construction of buildings / during the building maintenance works.
30. Explain the necessity of medical care facilities in an Industry / Project site.
31. Explain the necessity of proper training to the employees of Industries dealing with hazardous products, to act during disasters.
32. What type of disaster is expected in coal mines, cotton mills, Oil refineries, ship yards and gas plants?
33. What is meant by Emergency Plan Rehearsal? What are the advantages of such Rehearsals?
34. What action you will take when your employees could not reach the factory site because of continuous strike by Public Transport workers?
35. What immediate actions you will initiate when the quarters of your factory workers are suddenly flooded due to the breach in a nearly lake / dam, during heavy rain?
36. What steps you will take to avoid a break down when the workers union of your Industry have given a strike notice?
37. List out few possible crisis in an organization caused by its workers? What could be the part of the middle level officials in managing such crisis?
38. What types of warning systems are available to alert the people in the case of predicted disasters, such as floods, cyclone etc.
39. Explain the necessity of Team work in the crisis management in an Industry / Local body.
40. What factors are to be considered while fixing compensation to the workers in the case of severe accidents causing disability / death to them?
41. Explain the legal / financial problems the management has to face if safely measures taken by them are found to be in adequate.
42. Describe the importance of insurance to men and machinery of an Industry dealing with dangerous jobs.
43. What precautions have to be taken while storing explosives in a match/ fire crackers factory?
44. What are the arrangements required for emergency rescue works in the case of Atomic Power Plants?
45. Why residential quarters are not constructed nearer to Atomic Power Plants?

Model Question Papers

SESHASAYEE INSTITUTE OF TECHNOLOGY

ELECTRICAL AND ELECTRONICS ENGINEERING

MODEL QUESTION PAPER

Term : III Time : 3Hrs

Course: ELECTRICAL CIRCUIT THEORY Max.marks: 75

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PART – A

NOTE : (1) 5 questions are to be answered out of 8 questions.
(2) Question No. 8 will be compulsory.
(3) Each question carries 2 marks.

1. Define "Electric flux density".
2. State ohm's law.
3. State Maximum Power Transfer Theorem.
4. Define "Average value"
5. Draw Impedance Triangle for RC series circuit.
6. Define "Q Factor"
7. Mention any two advantages of 3 phase system over single phase system.
8. What is phase sequence?

PART – B

NOTE : (1) 5 questions are to be answered out of 8 questions.
(2) Question No. 16 will be compulsory.
(3) Each question carries 3 marks.

9. Define " Horse Power"
10. Obtain an expression for Energy stored in a Capacitor.
11. State Super position Theorem
12. Define "Form factor" and "Peak factor"
13. A RL series circuit draws a current of 5A at 0.8 pf from 230V,50Hz supply. Calculate R and L value.
14 .Define " Bandwidth"
15. What is meant by unbalanced load?
16. Obtain an expression for resonant frequency in Series Resonance

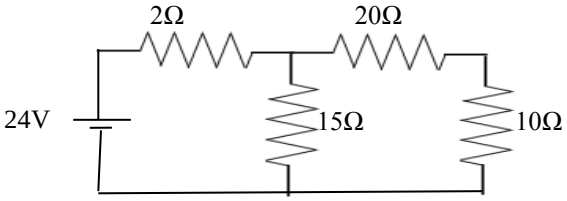
PART – C

NOTE : (1) Answer all questions from 17 to 21 either (a) or (b).
(2) Each question carries 10 marks.

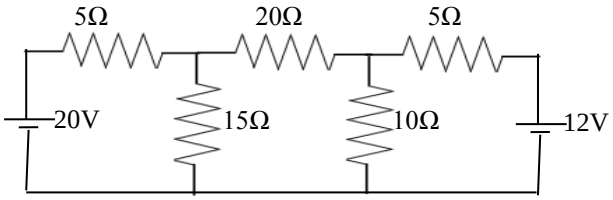
17 (a) Derive an expression for equivalent capacitance of three capacitors connected in (i) Series (ii) Parallel .

(OR)

(b) Find current through 10 Ω resistor by Kirchoff's law.



18 (a) Find current through 20Ω resistor by using Mesh current analysis.



(OR)

(b) Derive equations for Star resistances from the given Delta resistances.

19 (a) Derive an expression for RMS value of ac sinusoidal current.

(OR)

(b) A RLC series circuit with a resistance of 20 Ω, an inductance of 0.05 H and a capacitance of 75 MFd is connected across 230V, 50Hz ac supply. Determine (i) Impedance (ii) Current (iii) Power factor and (iv) Power drawn by the circuit.

20. (a) Two impedances Z1 =(8+j6) Ω and Z2 =(5 – j4) Ω are connected in parallel across a 230V, 50Hz ac supply. Calculate (i) Current in each branch (ii) Total Current (iii) Circuit Power factor and (iv) Power drawn by the circuit.

(OR)

(b) A series RLC circuit contains a resistance of 25 Ω, an inductance of 0.2 H and a variable capacitor across 200V, 50Hz ac supply.
Determine (i) The value of capacitance for resonance (ii) Q- factor of the coil.

21 (a) Derive the relation between line and phase quantities in 3 phase delta connected circuit.

(OR)

(b) Three impedances of (10+j12) ohm are connected in star across a 3 phase supply of 400 V. Calculate line current and power taken by the load.

SESHASAYEE INSTITUTE OF TECHNOLOGY

ELECTRICAL AND ELECTRONICS ENGINEERING

MODEL QUESTION PAPER

Term : III Time : 3Hrs

Course: ELECTRICAL MACHINE - I Max.marks: 75

.

PART – A

NOTE : (1) 5 questions are to be answered out of 8 questions.
(2) Question No. 8 will be compulsory.
(3) Each question carries 2 marks.

01. Define MMF
02. Define critical field resistance of a d.c shunt generator.
03. What are the losses in a D.C machine?
04. State the applications of DC shunt motor.
05. Define voltage regulation of a transformer.
06. What is all day efficiency?
07. Mention the different connections of three phase distribution transformer.
08. What are the indications of fully charged cell?

PART – B

NOTE : (1) 5 questions are to be answered out of 8 questions.
(2) Question No. 16 will be compulsory.
(3) Each question carries 3 marks.

09. State Faraday's laws of electromagnetic induction.
10. What is the function of commutator?
11. What are the conditions for self excitation?
12. State the causes for voltage drop in d.c generators.
13. What is counter e.m.f in a d.c motor?
14. What is the need for starter in a DC motor?
15. Mention the use of breather.
16. State the applications of Alkaline cell.

PART – C

NOTE: (1) Answer all questions from 17 to 21 either (a) or (b).
(2) Each question carries 10 marks.

17. A) With neat sketch, explain the constructional details of a D.C generator.

[OR]

B) Explain in detail about armature reaction in D.C generator.

18. A) Explain in detail about the principle of operation of D.C motor with neat sketch.

[OR]

B) With a neat sketch, explain construction and working of 3 point starter.

19 .A) Derive the E.M.F equation of a transformer.

[OR]

B). Explain the principle of auto transformer and state the applications of an auto transformer.

20. A) Explain about any two methods of cooling of transformers.

[OR]

B) Briefly explain about OFF load tap changer.

21. A) Explain the construction of lead acid cell with neat diagram.

[OR]

B) Explain the chemical reaction takes place in nickel Iron cell.

SESHASAYEE INSTITUTE OF TECHNOLOGY

ELECTRICAL AND ELECTRONICS ENGINEERING

MODEL QUESTION PAPER

Term : III Time : 3Hrs

Course: ELECTRONICS DEVICES AND CIRCUITS Max.marks: 75

.

PART – A

NOTE : (1) 5 questions are to be answered out of 8 questions.
(2) Question No. 8 will be compulsory.
(3) Each question carries 2 marks.

1. What is meant by doping?
2. List out the applications of PN junction diode.
3. What is meant by amplifier?
4. List out the applications of emitter follower.
5. State Barkhausan Criterion.
6. Mention any two difference between BJT and JFET.
7. Define latching current.
8. Mention the applications of solar cell.

PART – B

NOTE : (1) 5 questions are to be answered out of 8 questions.
(2) Question No. 16 will be compulsory.
(3) Each question carries 3 marks.

9. Define PIV and Ripple factor.
10. What is the necessity of filters?
11. What is transistor biasing? What is the need for transistor biasing?
12. Mention the advantages of negative feedback.
13. Define drain resistance and transconductance.
14. Draw the equivalent circuit of UJT.
15. Draw the two transistor analogy of SCR.
16. Compare LED and LCD.

PART – C

NOTE : (1) Answer all questions from 17 to 21 either (a) or (b).
(2) Each question carries 10 marks.

17. (A) (i) Explain the working of PN junction diode with neat sketch
(ii) Explain the zener diode as a voltage regulator.
[OR]
(B) Explain the working of bridge rectifier with relevant waveforms.

18. (A) Explain the operation and input and output characteristics of common emitter transistor
[OR]
(B) Draw the circuit, frequency response and explain the operation of RC coupled amplifier

19. (A) (i) With the diagram explain the operation of crystal oscillator.
(ii) Explain the characteristics of UJT with necessary diagram.
[OR]
(B) Explain the drain and transfer characteristics of JFET.

20. (A) Explain the construction and working of SCR with its characteristics.
[OR]
(B) Explain the operation of speed control of fan using DIAC and TRIAC.

21. (A) Explain briefly about LDR.
[OR]
(B) Explain the different types of clipper circuits

SESHASAYEE INSTITUTE OF TECHNOLOGY

ELECTRICAL AND ELECTRONICS ENGINEERING

MODEL QUESTION PAPER

Term : III Time : 3Hrs

Course: C++ Programming Max.marks: 75

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PART – A

NOTE : (1) 5 questions are to be answered out of 8 questions.
(2) Question No. 8 will be compulsory.
(3) Each question carries 2 marks.

01) Give any two difference between procedure oriented and object oriented programming
02) What is meant by initialization of variables .
03) Give the general structure of if .. else statement.
04) Define friend functions with its rule.
05) Define inheritance.
06) What is stream what are stream classes.
07) Explain about command line arguments.
08) Write short notes on cout object.

PART – B

NOTE : (1) 5 questions are to be answered out of 8 questions.
(2) Question No. 16 will be compulsory.
(3) Each question carries 3 marks.

09) Write any four features of OOP.
10) Give the syntax of 'do … while ' loop.
11) How will you define member function outside the class? Give Example
12) Define constructors and destructors
13) Give the general form for overloading unary operator and calling a overloaded function.
14) How pointers to derived classes are created.
15) What is the use of the function setprecision().
16) What is the purpose of the function write()

PART – C

NOTE : (1) Answer all questions from 17 to 21 either (a) or (b).
(2) Each question carries 10 marks.

17) A i) Write notes on a) keywords b) Logical operators.
ii) List down the applications of C++.

(or)

B i) Write a program to find the sum of even numbers from 0 to 100
ii) Give the syntax of 'for' loop. Explain with an example.

18) A i) Write the syntax of a function. Briefly explain with an example.
ii) How memory is allocated for objects

(or)

B i) How arrays are used within a class
ii) With an example, Explain nesting of member functions.

19) A i) Write notes on copy constructors?
ii) Define operator overloading. Give the rules for overloading operators.

(or)

B) Explain with an example, how can you overload a casting operator to convert an user defined data type to basic data type.

20) A Explain briefly the following with suitable example and diagrammatic representation. i) single inheritance ii) multiple inheritance

(or)

B i) Give the rules for virtual functions.
ii) Explain the use of a 'this' pointer with a simple program.

21) A Explain the different methods available to format the output data item.

(or)

B i) What are file pointers. Explain seekg() and tellp()
ii) Explain how will you open a file using constructor and function open().

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SESHASAYEE INSTITUTE OF TECHNOLOGY

ELECTRICAL AND ELECTRONICS ENGINEERING

MODEL QUESTION PAPER

Term : IV Time : 3Hrs

Course: ELECTRICAL MACHINE - II Max.marks: 75

.

PART – A

NOTE : (1) 5 questions are to be answered out of 8 questions.
(2) Question No. 8 will be compulsory.
(3) Each question carries 2 marks.

1. What are the two types of alternator?
2. Define pitch factor.
3. Define synchronous reactance.
4. Mention the methods used for synchronisation of alternator.
5. Define slip in induction motor.
6. What is meant by cogging in 3 phase induction motor?
7. Why single phase induction motor is not self starting?
8. Mention the different types of stepper motor.

PART – B

NOTE : (1) 5 questions are to be answered out of 8 questions.
(2) Question No. 16 will be compulsory.
(3) Each question carries 3 marks.

9. State the advantages of rotating field system in alternator.
10. What are the advantages of hydrogen cooling?
11. Write the reasons for voltage drop in alternator.
12. What are the conditions to be fulfilled for parallel operation of alternator?
13. Derive the relation between slip and slip frequency of three phase induction motor.
14. Compare squirrel cage and slip ring induction motor (any three points).
15. Name the methods of starting synchronous motor.
16. What is linear induction motor?

PART – C

NOTE : (1) Answer all questions from 17 to 21 either (a) or (b).
(2) Each question carries 10 marks.

17. A) Derive the E.M.F equation of an alternator.

[OR]

B) Explain the methods of obtaining sine wave in salient pole alternator with neat sketch.

18. A) Explain the synchronous reactance method of predetermining the voltage regulation of an alternator.

[OR]

B) Explain briefly the synchronizing of two three phase alternators by synchroscope method.

19. A) Explain slip- torque characteristics of 3-phase induction motor.

[OR]

B) Explain with a neat diagram, the working of DOL starter.

20. A) Explain V curves and inverted V curves of the synchronous motor at constant input power

[OR]

B) Explain the construction and working principle of split phase induction motor.

21. A) Explain the construction and working of permanent magnet synchronous motor.

[OR]

B) Explain the construction and working of variable reluctance stepper motor.

SESHASAYEE INSTITUTE OF TECHNOLOGY

ELECTRICAL AND ELECTRONICS ENGINEERING

MODEL QUESTION PAPER

Term : IV Time : 3Hrs

Course: ANALOG & DIGITAL ELECTRONICS Max.marks: 75

.

PART – A

NOTE : (1) 5 questions are to be answered out of 8 questions.
(2) Question No. 8 will be compulsory.
(3) Each question carries 2 marks.

01) What is open loop voltage gain?
02) What are the uses of IC 555.
03) Convert the decimal number 852.25 to its equivalent binary number.
04) What is half adder.
05) Define FAN-IN.
06) What is flipflop and also write the types of flipflop.
07) What is Ring counter.
08) Define 'Conversion Time' in ADC.

PART – B

NOTE : (1) 5 questions are to be answered out of 8 questions.
(2) Question No. 16 will be compulsory.
(3) Each question carries 3 marks.

09) What are the four stages of OP-AMP.
10) Why is the NAND gate called universal logic gate.
11) Construct the logic diagram for the Boolean expression Y = AB + B'C + A'C.
12) What are the advantages of CMOS Gates.
13) Write notes on 'Edge triggering in flipflops'.
14) Write the applications of shift register.
15) Explain the operation of R-2R ladder DAC.
16) What are the features of IC regulator using LM317

PART – C

NOTE : (1) Answer all questions from 17 to 21 either (a) or (b).
(2) Each question carries 10 marks.

17) (A) Explain the the operation of OPAMP as inverting amplifier with diagram.

(or)

(B) Explain the operation astable multivibrator using 555 IC.

18) (A) State and prove the De-Morgan's theorems.

(or)

(B) Simplify the given functions by using K –map simulates its output
Y = (0,1,2,3,4,5,8,9,10,11,12)

19) (A) With neat sketch explain the operation of full subtractor.

(or)

(B) Draw and Explain the circuit diagram of TTL NAND gate.

20) (A) Explain with a neat sketch the operation of JKMS flip flop.

(or)

(B) Explain the operation of MOD 16 binary up counter.

21) (A) Explain the successive approximation method A/D converter.

(or)

(B) Explain Static RAM organisation with neat sketch.

SESHASAYEE INSTITUTE OF TECHNOLOGY

ELECTRICAL AND ELECTRONICS ENGINEERING

MODEL QUESTION PAPER

Term : IV Time : 3Hrs

Course: MEASUREMENTS & INSTRUMENTS Max.marks: 75

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PART – A

NOTE : (1) 5 questions are to be answered out of 8 questions.
(2) Question No. 8 will be compulsory.
(3) Each question carries 2 marks.

01. Define true value.
02. Give an example of absolute instrument.
03. What is multiplier resistance?
04. Write the relation between power and energy
05. Write the uses of synchroscope.
06. Define transducer.
07. What is the use of LVDT?
08. What are the types of Recorders ?

PART – B

NOTE : (1) 5 questions are to be answered out of 8 questions.
(2) Question No. 16 will be compulsory.
(3) Each question carries 3 marks.

09. List the three types of operating forces.
10. Write any 3 application of CRO.
11. What are the types of power factor meter.
12. List the errors in induction type energy meter.
13. What are the uses of multimeter?
14. What is thermistor?
15. Write the name of the bridge circuit for inductance & capacitance
16. What is synchroscope?

PART – C

NOTE : (1) Answer all questions from 17 to 21 either (A) or (B).
(2) Each question carries 10 marks.

17.A) Explain three operating forces in measuring instruments.

[OR]

B) Draw and explain the block diagram of CRO

18. A) With neat sketch, explain the construction and working of attraction type MI instruments

[OR]

B) explain construction and working of Megger with neat sketch.

19. A) Explain with neat sketch, construction and working of Maximum Demand Indicator.

[OR]

B) Explain the construction and working of three phase energy meter with neat sketch

20. A) Explain varley loop test for cable fault location.

[OR]

B) Explain the construction and working of X-Y recorder with neat sketch.

21.A) compare analog and digital transducer

[OR]

B) explain the construction and operation of LVDT

SESHASAYEE INSTITUTE OF TECHNOLOGY

ELECTRICAL AND ELECTRONICS ENGINEERING

MODEL QUESTION PAPER

Term : V Time : 3Hrs

Course: POWER SYSTEM - I Max.marks: 75

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PART – A

NOTE : (1) 5 questions are to be answered out of 8 questions.
(2) Question No. 8 will be compulsory.
(3) Each question carries 2 marks.

(01) Classify hydro power plants
(02) State the advantages of interconnected grid system
(03) Define Skin effect
(04) Write brief notes on any one material of insulator
(05) Define RRRV and state its unit
(06) What are the causes of overvoltage?
(07) Write the types of neutral grounding
(08) State the types of protection in relays

PART – B

NOTE : (1) 5 questions are to be answered out of 8 questions.
(2) Question No. 16 will be compulsory.
(3) Each question carries 3 marks.

(09) State the significance of a load curve
(10) Define sag. State the factors affecting sag
(11) State the reasons for failure of insulators
(12) Draw any one oil pressure cable and name its parts
(13) Explain briefly, DC breaking with a figure
(14) Draw the block diagram of a static relay
(15) List the advantages of neutral grounding
(16) Write notes on routine tests on insulators

PART – C

NOTE : (1) Answer all questions from 17 to 21 either (a) or (b).
(2) Each question carries 10 marks.

17. a) Explain nuclear power plant with its schematic

[OR]

b) State and explain the types of tariff

18 .a) With neat diagram, explain the typical ac power supply scheme

[OR]

b) Draw and explain different DC links used in HVDC transmission system

19. a) Explain various types of line insulators

[OR]

b) Explain the construction of UG cable with a neat sketch

20. a) With neat sketch, explain the construction and working of SF_6 Circuit breaker

[OR]

b) Explain low voltage HRC fuse with a sketch

21 .a) Explain the construction and working of induction type, non-directional over current relay

[OR]

b)Explain Peterson coil earthing with a neat sketch and vector diagram

SESHASAYEE INSTITUTE OF TECHNOLOGY

ELECTRICAL AND ELECTRONICS ENGINEERING

MODEL QUESTION PAPER

Term : V Time : 3Hrs

Course: CONTROL& MAINTENANCE OF ELECTRICAL MACHINES Max.marks: 75

.

PART – A

NOTE : (1) 5 questions are to be answered out of 8 questions.
(2) Question No. 8 will be compulsory.
(3) Each question carries 2 marks.

1. Write the two types of push button switches.
2. Write the uses of proximity switch.
3. Define current limit acceleration.
4. Define dynamic breaking.
5. State the use of skip hoist.
6. Name any two trouble spot in a control circuit.
7. What is meant by degreasing?
8. Mention the causes for the noise in transformer.

PART – B

NOTE : (1) 5 questions are to be answered out of 8 questions.
(2) Question No. 16 will be compulsory.
(3) Each question carries 3 marks.

9. Explain a drum type switch.
10. What is a Latching relay?
11. Explain field failure protection.
12. What are the precautions to be taken while reversing a DC motor?
13. Explain the current speed characteristics of an AC motor during acceleration.
14. Explain plug stop and plug reversal.
15. How variation of temperature is achieved in electric oven?
16. State the quality of good transformer oil.

PART – C

NOTE : (1) Answer all questions from 17 to 21 either (a) or (b).
(2) Each question carries 10 marks.

17. (A) Draw the control circuit of electrical interlock and mechanical interlock and explain.

[OR]

(B) Discuss the principle of operation of pneumatic timer.

18. (A) State and explain the closed circuit transition in autotransformer starter for induction motor.

[OR]

(B) Draw the control circuit for automatic rotor resistance starter for 3Φ induction motor and explain.

19. (A) Explain the control circuit of skip hoist with neat sketch.

[OR]

(B) Explain air compressor and its control circuit.

20. (A) Explain the methods of drying out process carried out in case of induction motor.

[OR]

(B) Explain briefly the steps taken in order to maintain the bearing of an induction motor.

21. (A) Write a note on short circuit and mechanical forces on transformer.

[OR]

(B) What are the precautions needed for paralleling of two transformers?

SESHASAYEE INSTITUTE OF TECHNOLOGY

ELECTRICAL AND ELECTRONICS ENGINEERING

MODEL QUESTION PAPER

Term : V Time : 3Hrs

Course: MICRO CONTROLLER Max.marks: 75

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PART – A

NOTE : (1) 5 questions are to be answered out of 8 questions.
(2) Question No. 8 will be compulsory.
(3) Each question carries 2 marks.

01) What is the purpose of register ACCUMULATOR
02) What are the flags used in 8051 and 8085.
03) Explain the logical AND operation of 8051.
04) What is the purpose of the instruction "MOV A,@R1"
05) What is the difference between the flags CY and OV.
06) What is interrupt signal.
07) Mention the ports placed in 8255.
08) What is the purpose of the instruction "JNZ"

PART – B

NOTE : (1) 5 questions are to be answered out of 8 questions.
(2) Question No. 16 will be compulsory.
(3) Each question carries 3 marks.

09) State any three differences between microprocessor and microcontroller.
10) Give the format of PSW in 8051.
11) Explain direct addressing mode with examples.
12) Explain the instruction " MUL AB " in 8051 with suitable example.
13) How will you start and stop the timer/counter.
14) Give the format of IE register in 8051.
15) Name the six different modes of external timers.
16) Explain the purpose of the instruction 'MOVX' IN 8051.

PART – C

NOTE : (1) Answer all questions from 17 to 21 either (a) or (b).
(2) Each question carries 10 marks.

17) (A) Draw and Explain the Architecture of 8051.

(or)

(B) (i) Draw the pin diagram of microcontroller 8051.
(ii) List down any 10 SFRs with their byte and bit addresses.

18) (A) Explain how to assemble and run an 8051 program using assembler .

(or)

(B) Explain the instructions "CJNE & DJNZ" with example .

19) (A) Explain mode 1 and mode 2 operation of timer.

(or)

(B) Write an assembly language program to generate a square wave of 2 KHz on port pin 1.0 using timer 0 mode 2. Assume crystal frequency to be 11.0592 MHz.

20) (A) Write the steps to transfer character bytes serially in 8051.

(or)

(B) Write the format of SCON and PCON registers and explain.

21) (A) Explain LCD display interfacing with 8051.

(or)

(B) Explain DC motor interfacing with 8051.

SESHASAYEE INSTITUTE OF TECHNOLOGY

ELECTRICAL AND ELECTRONICS ENGINEERING

MODEL QUESTION PAPER

Term : V Time : 3Hrs

Course: VLSI Max.marks: 75

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PART – A

NOTE : (1) 5 questions are to be answered out of 8 questions.
(2) Question No. 8 will be compulsory.
(3) Each question carries 2 marks.

1. What is CMOS ?
2. List few combinational circuit.
3. What is simulation.
4. Write VHDL code for OR gate.
5. Define sequential circuit.
6. Write different modes of shift register.
7. Define state diagram.
8. Write major parts in FPGA.

PART – B

NOTE : (1) 5 questions are to be answered out of 8 questions.
(2) Question No. 16 will be compulsory.
(3) Each question carries 3 marks.

9. Write short notes on Hazards?
10. Relate variable and function .
11. Wtite different level of obstraction in VHDL
12. Write VHDL code for 4x1 multiplexer.
13. Difference between Latch and flip -flop.
14. Define moore & mealy machine.
15. Write VHDL code for D latch.
16. What is the difference between PLA & PAL ?

PART – C

NOTE : (1) Answer all questions from 17 to 21 either (a) or (b).
(2) Each question carries 10 marks.

17. (A) With necessary diagrams explain the working of NOT, AND and OR plane using CMOS.

OR

(B) Implement the function F=∑m (0,2,3,7,12,14,15)
Implement the above function with a 4 to 1 multiplexer.

18. (A) Write VHDL code for decoder and single bit comparator.

OR

(B) Write VHDL code for 4 bit adder.

19. (A) Write and explain excitation table of RS and D flip-flop .

OR

(B) Design modulo 5 counter using D flip-flop.

20. (A) Write VHDL code for JK and D flip-flop with reset input.

OR

(B) Write VHDL code for 4 bit up counter.

21. (A) What is PLA? How do you realize the given function with a PLA .
F1 (x,y,z) = ∑m (0,1,3,4)
F2 (x,y,z) = ∑m (1,2,3,4,5)

OR

(B) With a block diagram, explain the working of CPLD**.**

SESHASAYEE INSTITUTE OF TECHNOLOGY

ELECTRICAL AND ELECTRONICS ENGINEERING

MODEL QUESTION PAPER

Term : III Time : 3Hrs

Course: ELECTRICAL MACHINE DESIGN Max.marks: 75

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PART – A

NOTE : (1) 5 questions are to be answered out of 8 questions.
(2) Question No. 8 will be compulsory.
(3) Each question carries 2 marks.

1. What are the main dimensions of a rotating machine?
2. Name a few insulating materials that are used in transformers.
3. What is magnetic circuit and what are its constituents?
4. Define specific magnetic loading.
5. What is tertiary winding?
6. What are the types of windings commonly used for LV winding?
7. What are the factors that decide the choice of specific electric loading?
8. What is run-away speed?

PART – B

NOTE : (1) 5 questions are to be answered out of 8 questions.
(2) Question No. 16 will be compulsory.
(3) Each question carries 3 marks.

9. What are the factors that affect the size of rotating machines?
10. What are the important properties of steel used in transformer core?
11. What is magnetic leakage and leakage coefficient?
12. What is magnetization curve?
13. What are the advantages and disadvantages of stepped cores?
14. List the different methods of cooling of transformers.
15. What is Carter's coefficient? What is its usefulness in the design of DC machines?
16. List out the methods to improve the power factor of an induction motor.

PART – C

NOTE : (1) Answer all questions from 17 to 21 either (a) or (b).
(2) Each question carries 10 marks.

17. (A) Discuss about the various types of thermal ratings of the electrical machines.

[OR]

(B) Discuss about the various insulating materials and their grades.

18. (A) Explain in detail about the MMF calculation for tapered teeth.

[OR]

(B) Discuss in detail about the real and apparent flux densities.

19. (A) Derive the voltage per turn equation of a transformer.

[OR]

(B) Calculate the dimensions of the core, the number of turns and cross sectional area of conductors in the primary and secondary windings of a 100 KVA, 2200/480 V, 50 Hz, single phase core type transformer by assuming the following data. Approximate volt per turn = 7.5 volt, Maximum flux density = 1.2T, ratio of effective cross sectional area of core to square of diameter of circumscribing circle is 0.6, ratio of height to width of window is 2, window space factor = 0.28, current density = 2.5 A/mm^2 .

20. (A) Derive the output equation of a DC machine.

[OR]

(B) Design a suitable commutator for a 350 KW, 600 rpm, 440 V, 6 poles DC generator having an armature diameter of 0.75m. The number of slots is 288. Assume suitable values where its necessary?

21. (A) A 90 KW, 500 V, 50Hz, three phase, 8 pole induction motor has a star connected stator winding accommodated in 63 slots with a 6 conductors/slot. If slip ring voltage in open circuit is to be about 400V at no load, find the suitable rotor winding. Calculate number of rotor slots, number of conductors/slot, coil span, number of slots per pole. P.F = 0.9 and the efficiency is 0.85.

[OR]

(B) Explain in detail about the cooling of turbo alternators.

SESHASAYEE INSTITUTE OF TECHNOLOGY

ELECTRICAL AND ELECTRONICS ENGINEERING

MODEL QUESTION PAPER

Term : VI Time : 3Hrs

Course: POWER SYSTEM - II Max.marks: 75

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PART – A

NOTE : (1) 5 questions are to be answered out of 8 questions.
(2) Question No. 8 will be compulsory.
(3) Each question carries 2 marks.

01. What is aFeeder?
02. Give two advantages of electric drives
03. What are the types of bearings?
04. Define Schedule speed
05. State the causes of end blackening of a fluorescent lamp
06. Define luminous efficiency
07. What are the modes of heat transfer?
08. Write any two differences between resistance & arc welding

PART – B

NOTE : (1) 5 questions are to be answered out of 8 questions.
(2) Question No. 16 will be compulsory.
(3) Each question carries 3 marks.

09. Draw single busbar system
10. Write notes on types of enclosures
11. Draw Metadyne control arrangement for speed control of traction motor
12. Define specific energy consumption and state the factors affecting it.
13. What are the advantages of electric traction?
14. What is stroboscopic effect? How it can be eliminated?
15. Write notes on welding equipments
16. What are the types of substations?

PART – C

NOTE : (1) Answer all questions from 17 to 21 either (a) or (b).
(2) Each question carries 10 marks.

17. a) Explain the equipments used in substations

[OR]

b) Draw and explain radial, ring main & interconnected systems of distribution

18. a) With neat sketches, explain the types of electric drives

[OR]

b) Suggest suitable motors for the following applications. Give reasons for your choice
i) Textile mill, ii) Cranes, iii) Centrifugal pumps, iv) Paper mill, v) Vacuum cleaner

19. a) Explain different methods of supplying power to traction system

[OR]

b) Draw and explain speed time curve of traction motor

20. a) With neat sketch, explain any one law of illumination with its statement.

[OR]

b) Explain various lighting schemes

21. a) Explain construction and working of Ajax Wyatt vertical core furnace with neat sketch

[OR]

b)Explain Electron beam welding with a neat sketch

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SESHASAYEE INSTITUTE OF TECHNOLOGY

ELECTRICAL AND ELECTRONICS ENGINEERING

MODEL QUESTION PAPER

Term : VI Time : 3Hrs

Course: POWER ELECTRONICS Max.marks: 75

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PART – A

NOTE : (1) 5 questions are to be answered out of 8 questions.
(2) Question No. 8 will be compulsory.
(3) Each question carries 2 marks.

1. Give the symbol for the following devices (i) IGBT (ii) SCS
2. What is commutation?
3. State the purpose of free wheeling diode.
4. Mention the types of inverters.
5. Write the applications of chopper.
6. What is the meaning of asymmetrical firing?
7. What is the cuk converter?
8. What is a cyclo converter?

PART – B

NOTE : (1) 5 questions are to be answered out of 8 questions.
(2) Question No. 16 will be compulsory.
(3) Each question carries 3 marks.

9. Explain the following terms. (i) Latching current (ii) Holding current
10. State the requirements of gate triggering circuit
11. Write the expression for average DC output voltage of single phase fully controlled bridge rectifier with RL load.
12. Mention the sources of voltage transients.
13. Draw and explain operating region of armature voltage control and field current control.
14. Draw and explain the block diagram of separately excited DC motor speed control.
15. List the various methods available for AC motor speed control.
16. What are the advantages of AC drive?

PART – C

NOTE : (1) Answer all questions from 17 to 21 either (a) or (b).
(2) Each question carries 10 marks.

17. (a) Explain Class – B and Class – D commutation with a circuit diagram.

[OR]

(b) With neat diagram explain the operation of synchronized UJT triggering

18. (a) Explain the principle of operation of single phase fully controlled bridge converter having RL load with associated waveforms.

[OR]

(b) With relevant waveforms discuss the working principle of a three phase half controlled bridge converter with R-L load in continuous mode.

19. (a) Explain the operation of three phase bridge inverter under 120^0 mode.

[OR]

(b) Explain the operation of Buck – Boost converter.

20. (a) With suitable block diagram explain online UPS.

[OR]

(b) Explain separately excited DC motor speed control with single phase full converter drive.

21. (a) Explain with circuit diagram the slip power recovery scheme.

[OR]

(b) Explain variable voltage and frequency control using inverter.

SESHASAYEE INSTITUTE OF TECHNOLOGY

ELECTRICAL AND ELECTRONICS ENGINEERING

MODEL QUESTION PAPER

Term : VI Time : 3Hrs

Course: RENEWABLE ENERGY SOURCES & ENERGY AUDITING Max.marks: 75

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PART – A

NOTE : (1) 5 questions are to be answered out of 8 questions.
(2) Question No. 8 will be compulsory.
(3) Each question carries 2 marks.

01. Define energy yield ratio
02. State any two advantages of fuel cells
03. Define solar constant
04. List the system components in on grid solar power plant
05. State the factors determining the output from a wind energy
06. List the categories of biomass resources
07. State the important parts of a wind mill
08. State any 4 roles of an energy manager

PART – B

NOTE : (1) 5 questions are to be answered out of 8 questions.
(2) Question No. 16 will be compulsory.
(3) Each question carries 3 marks.

09. Write brief notes on thermionic converter
10. Draw velocity duration curve & explain
11. State the phases of liquefaction
12. Write notes on fermentation
13. State the types of wave machine converters
14. Explain Energy Conservation Measures in Distribution
15. Compare three types of energy audit
16. Give examples for agricultural & organic wastes

PART – C

NOTE : (1) Answer all questions from 17 to 21 either (a) or (b).
(2) Each question carries 10 marks.

17. a) Explain the conclusions of the study on alternate energy strategies

[OR]

b) Explain thermo electric power generation with a sketch

18. a) Draw & explain the construction and working of Angstrom compensation Pyrheliometer

[OR]

b) Explain the basic PV system for power generation with a block diagram

19. a) Explain the basic components of a WECS with a block diagram

[OR]

b) Explain the construction and working of floating gas holder digester with a sketch

20. a) Draw & explain double basin type tidal power plant

[OR]

b) B)Explain about the material selection for geothermal power plants

21.a) What is comprehensive energy audit? State the steps involved in it

[OR]

b) Explain various energy conservation measures for industries

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SESHASAYEE INSTITUTE OF TECHNOLOGY

ELECTRICAL AND ELECTRONICS ENGINEERING

MODEL QUESTION PAPER

Term : III Time : 3Hrs

Course: PROGRAMMABLE LOGIC CONTROLLER Max.marks: 75

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PART – A

NOTE : (1) 5 questions are to be answered out of 8 questions.
(2) Question No. 8 will be compulsory.
(3) Each question carries 2 marks.

01) Define PLC
02) What are the advantages of PLC over relay logic.
03) Draw the circuit of opto-isolator.
04) Draw the block diagram of A.C input module
05) Draw any 4 symbols used for ladder logic diagram
06) Draw the FBD of Multiplexer.
07) List the advantages of ring topology
08) What is the purpose of Normally open contact/Examine ON instruction.

PART – B

NOTE : (1) 5 questions are to be answered out of 8 questions.
(2) Question No. 16 will be compulsory.
(3) Each question carries 3 marks.

09) What are the features of PLC .
10) What is the Job of CPU in a PLC
11) Draw the configuration of Sinking output module.
12) List the classifications of advanced instructions in PLC.
13) What is the purpose of the instruction “CTU”
14) Draw the ladder diagram of DOL Starter
15) Write the types of communication interface.
16) Name the different layers of OSI model

PART – C

NOTE : (1) Answer all questions from 17 to 21 either (a) or (b).
(2) Each question carries 10 marks.

17) A) Draw and Explain the block diagram of PLC system.

OR

B) i) List down and explain the various types of programming a PLC.
ii) Explain about the additional capabilities of PLC

18) A) Explain the function of "INPUT Modules" with neat diagram.

OR

B) i) Briefly Explain the function of "limit Switch" with neat diagram.
ii) Compare solid state output with Relay output.

19) A) i) Explain the following instruction : i) Output latch ii) ON delay Timer
ii) Draw the FBD for logic operation AND,OR,NOT

OR

B) Design ladder logic diagram to implement Demorgan's theorem.

20) A) List down the various mathematical instructions used in PLC and explain each briefly.

OR

B) Develop ladder logic diagram for jogging control circuit and explain the rung in the ladder diagram.

21) A) i) Draw and Explain about the star topology.
ii) List the advantages and disadvantages of bus topology

OR

B) Draw and Explain the architecture of SCADA

SESHASAYEE INSTITUTE OF TECHNOLOGY

ELECTRICAL AND ELECTRONICS ENGINEERING

MODEL QUESTION PAPER

Term : VI Time : 3Hrs

Course: BIOMEDICAL INSTRUMENTATION Max.marks: 75

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PART – A

NOTE : (1) 5 questions are to be answered out of 8 questions.
(2) Question No. 8 will be compulsory.
(3) Each question carries 2 marks

1. What is half cell potential?
2. What is photometry?
3. How the heart rate is controlled?
4. What is meant by speech audiometer?
5. What is meant by demand pacemaker?
6. What is meant by endoscopy?
7. What are the uses of Biotelemetry?
8. What is meant by tomogram?

PART – B

NOTE : (1) 5 questions are to be answered out of 8 questions.
(2) Question No. 16 will be compulsory.
(3) Each question carries 3 marks.

9. Mention the transducers used in medical field.
10. What is meant by resting and action potential?
11. Draw and explain Einthoven triangle.
12. List the different types of audiometer.
13. Bring out the comparison between external and internal pacemakers.
14. Write short notes on ventilators.
15. Draw the block diagram of components of biotelemetry system.
16. List the applications of LASER in medicine.

PART – C

NOTE : (1) Answer all questions from 17 to 21 either (a) or (b).
(2) Each question carries 10 marks.

17. (A) Give the details of polarized & unpolarized cell during resting & action potential

[OR]

(B) Draw and explain the working of electromagnetic blood flow meter

18. (A) Explain the different lead configurations used in ECG

[OR]

(B) Draw the schematic diagram of Beksey audiometer and explain its working principle

19. (A) Draw and explain the different types of defibrillators.

[OR]

(B) Write short notes on short wave diathermy and microwave diathermy.

20. (A) (i) Draw the block diagram of biotelemetry system and explain each block
(ii) What are the problems in implant telemetry?

[OR]

(B) (i) What are the physiological effect due to 50Hz current passage?
(ii)What are the cause for leakage current?

21. (A) Draw and explain the block diagram of an X- ray machine

[OR]

(B) Explain the ultrasonic B-mode &T-M mode display of echoes

SESHASAYEE INSTITUTE OF TECHNOLOGY

ELECTRICAL AND ELECTRONICS ENGINEERING

MODEL QUESTION PAPER

Term : VI Time : 3Hrs

Course: COMPUTER HARDWARE NETWORKING Max.marks: 75

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PART – A

NOTE : (1) 5 questions are to be answered out of 8 questions.
(2) Question No. 8 will be compulsory.
(3) Each question carries 2 marks.

1. What are the different types of cabling supported by Ethernet standard?
2. List the 2 advantages of networking
3. What is NIC?
4. Define broadband.
5. List 2 drawbacks of ring topology
6. What is the responsibility of network layer?
7. Define FTP
8. What is SLIP?

PART – B

NOTE : (1) 5 questions are to be answered out of 8 questions.
(2) Question No. 16 will be compulsory.
(3) Each question carries 3 marks.

9. What are the different types of data flow?
10. What are the characteristic of network transmission media?
11. What is protocol?
12. What is flow control?
13. What are the different types of error?
14. What is ICMP?
15 .Define POP
16. Define URL, Give suitable example.

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PART – C

NOTE : (1) Answer all questions from 17 to 21 either (a) or (b).
(2) Each question carries 10 marks.

17. a) Explain Different data flow methods.
(or)
b) Explain BUS & STAR topology with diagram mentions its merits & Demerits.

18. a) Explain the TCP/IP protocol suite in details.
(or)
b) Explain the Network Layer protocol.

19. a) Explain the error correction & Detection methods.
(or)
b) Explain Digital transmission modes.

20. a) Explain about RARP & IGMP protocols.
(or)
b) Explain OSI Model

21. (a) Explain about FTP & IMAP protocols & its functions
(or)
(b) Explain about DNS in details

Equivalent Papers

EQUIVALENT PAPER

FOR D SCHEME COURSES IN E SCHEME CURRICULUM

III TERM

D-SCHEME		E-SCHEME	
Course Code	**Course Title**	**Course Code**	**Course Title**
2D3204	Electrical Circuit Theory	2E3201	Electrical Circuit Theory
2D3205	Electrical Machines - I	2E3202	Electrical Machines – I
2D3206	Electronic Devices And Circuits	2E3203	Electronic Devices & Circuits
2D3207	Measurements And Instrumentation	2E4206	Measurements And Instrumentation (IV TERM)
2D3208	Electrical Machines And Circuits Lab	2E3204	Electrical Machines-I Lab
2D3209	Electronic Devices And Circuits Lab	2E3205	Electronic Devices & Circuits Lab
2D3401	C++ Programming Lab	2E3402	C++ Programming Lab

IV TERM

D-SCHEME		E-SCHEME	
Course Code	**Course Title**	**Course Code**	**Course Title**
2D4301	Electrical Machines - II	2E4301	Electrical Machines – II
2D4302	Power System - I	2E5306	Power System – I (V TERM)
2D4303	Analog And Digital Electronics	2E4302	Analog & Digital Electronics
2D4210	Basics Of Mechanical Engineering	---	No Equivalent Paper
2D4304	Electrical Machines And Instrumentation Lab	2E4303	Electrical Machines-II Lab
2D4305	Analog And Digital Electronics Lab	2E4304	Analog & Digital Electronics Lab
2D4211	Workshop Practice III	---	No Equivalent Paper
2D4501	Environmental Studies	---	No Equivalent Paper

V TERM

D-SCHEME		E-SCHEME	
Course Code	**Course Title**	**Course Code**	**Course Title**
2D5306	Power System – II	2E6310	Power System – II (VI TERM)
2D5307	Control of Electrical Machines	2E5307	Control & Maintenance of Electrical Machines
2D5308	Wiring, Winding & Estimation Lab	2E5309	Wiring, Winding & Estimation Lab
2D5402.1	Microcontroller	2E5403.1	Microcontroller
2D5402.2	Computer Hardware & Networking	2E6406.3	Computer Hardware & Networking (VI TERM)
2D5402.3	VLSI Design	2E5403.2	VLSI Design
2D5309	Control of Electrical Machines Lab	2E5308	Control & Maintenance of Electrical Machines Lab
2D5404	English Communication Skills	2E4207	Life &Employability skill Practical (IV TERM)
2D5403.1	Microcontroller Lab	2E5404.1	Microcontroller Lab
2D5403.2	Computer Hardware & Networking Lab	2E6407.3	Computer Hardware & Networking Lab (VI TERM)
2D5403.3	VLSI Design Lab	2E5404.2	VLSI Design Lab
2D5502	Disaster Management	---	No Equivalent Paper

VI TERM

D-SCHEME		E-SCHEME	
Course Code	**Course Title**	**Course Code**	**Course Title**
2D6310	Programmable Logic Controller	2E6406.1	Programmable Logic Controller
2D6311	Power Electronics	2E6311	Power Electronics
2D6405.1	Renewable Energy Sources & Energy Auditing	2E6312	Renewable Energy Sources & Energy Auditing
2D6405.2	Special Electrical Machines	---	No Equivalent Paper
2D6405.3	Bio-Medical Instrumentation	2E6406.2	Bio-Medical Instrumentation
2D6312	Programmable Logic Controller Lab	2E6407.1	Programmable Logic Controller Lab
2D6313	Power Electronics Lab	2E6313	Power Electronics Lab
2D6314	CAD & Simulation Lab	2E5405	CAD & Simulation Lab (V TERM)
2D6406	Project Work	2E6408	Project Work
2D6503	Entrepreneurship	---	No Equivalent Paper