PERIYAR CENTENARY POLYTECHNIC COLLEGE

PERIYAR NAGAR – VALLAM – THANJAVUR – 613 403

(AUTONOMOUS INSTITUTION)

DIPLOMA IN

ELECTRICAL AND ELECTRONICS ENGINEERING

SYLLABUS
EEC/16/00

SEMESTER SYSTEM
C - SCHEME

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PERIYAR CENTENARY POLYTECHNIC COLLEGE

Periyar Nagar – Vallam – 613 403, Thanjavur

AUTONOMOUS INSTITUTION

DIPLOMA COURSES IN ENGINEERING/TECHNOLOGY

(Implemented from 2015-2016)

C SCHEME

RULES AND REGULATIONS

1. Description of the course

a) Full Time (3 years)

The course for the full time Diploma in Engineering shall extend over a period of three academic years, consisting of 6 semesters* and the first year is common to all Engineering branches.

b) Sandwich (3 $^{1}/_{2}$ years)

The course for the Diploma in Engineering (sandwich) shall extend over a period of three and half academic years consisting of 7 semesters *and the First year is common to all Engineering Branches. The subjects of three years full time diploma course being regrouped for academic convenience.

During 4th and 7th semester the students undergo industrial training for six months. Industrial training examination will be conducted after completion of every 6 months of industrial training.

* Each semester will have 15 weeks duration of studies with 35 hours per week for all diploma courses.

2. Conditions for Admission

Condition for admission to the diploma course shall be required to have passed in the S.S.L.C Examination of the Board of Secondary Education, Tamil Nadu.

(or)

The Anglo Indian High School Examination with Eligibility for Higher Secondary Course in Tamil Nadu.

(or)

The Matriculation Examination of Tamil Nadu.

(or)

Any other examinations recognized as equivalent to the above by the board of Secondary Education, Tamil Nadu.

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)] course mentioned in the Higher Secondary Schools in Tamil Nadu Affiliated to the Tamil Nadu Higher Secondary board with eligibility for university Courses of study or equivalent examination, & Should have studied the following subjects.

Sl.No	Course	H.Sc Academic	H.Sc Vocational	
			Subjects studied	
		Subjects studied	Related subjects	Vocational subjects
1	All the Regular and Sandwich Diploma Courses	Maths, Physics & Chemistry	Maths/Physics / Chemistry	Related vocational subjects Theory & Practical
2	Diploma in Modern Office Practice	English & Accountancy English & Elements of Economics English & Elements of Commerce	English & Accountancy, English & Elements of Economics, English & Management Principles & Techniques, English & Typewriting	Accountancy & Auditing Banking, Business Management , Co-operative Management, International Trade, Marketing & Salesmanship, Insurance & Material Management, Office Secretaryship.

- For the Diploma courses related with Engineering /Technology, the related/equivalent subjects prescribed along with Practicals may also be taken for arriving the eligibility.
- Branch will be allotted according to merit through counselling by the respective Principal as per communal reservation.
- For Admission to the Modern Office Practice Diploma course the candidates studied the related subjects will be given first preference.
- Candidates who have studied Commerce Subjects are not eligible for Engineering Diploma Course.

4. Readmission of Candidates

A student who had discontinued his/her studies in the middle of a semester or who had not appeared for Autonomous Examination of current semester of study, can apply and get readmission in the same semester in the following subsequent academic years if he/she desires to complete the course and satisfies the following conditions:

The candidate should not have exhausted the total period of study (given below) permitted to complete the course.

Full time(Regular) - 6 years
Full time (Sandwich) - 6 ½ years
Full time(Lateral Entry) - 5 years

He/She, on readmission, should be able to complete his/her full course of study within the above stipulated total period. A candidate who had discontinued his/her studies continuously or in spells for more than 3 years shall not be recommended for readmission.

Readmissions are not permissible in first year (I semester) for regular students and in third semester for lateral entry students, who have not written any Autonomous Examinations, before their discontinuance of study. They have to forego their candidature and seek admission again fresh.

5. Age Limit

No Age Limit

6. Procedure for completing the Diploma Course

A candidate will be permitted to appear for the Examination only if, he/she secures 80% of attendance.

- A student having shortage of attendance in a semester should repeat the same semester in the next academic year. Similarly, a student who had not attended at least a single paper(theory or practical) of a particular semester examination, cannot continue his/her studies in the next semester, even if he / she had enough attendance in that semester with usual conditions.

- The candidate on completion of studies in each semester should necessarily register himself / herself for the examinations of all the subjects of the semester as well as for all arrear subjects of all the previous semester and shall appear for the Autonomous Examinations.

7. **Reasons for disqualifying a student from appearing Autonomous Examinations**

- A student who had failed to acquire the minimum required percentage of attendance during a semester of study or discontinued his/her studies in the middle of a semester and who had not paid the examination fee in time shall not be permitted to appear for the Autonomous Examination
- A Student who had paid the examination fee in time, but do not have enough attendance in the course of study, shall not be permitted to appear for the Autonomous Examination however, will be permitted to write the supplementary examinations of previous semesters.

8. 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 academic years in any institution affiliated to the State Board of Technical Education and Training, Tamil Nadu, when joined in first year and two years if joined under Lateral Entry scheme in the second year and passed the prescribed examination.

The minimum and maximum period for completion of Diploma Course are as given below

Diploma Course	Minimum period	Maximum Period
Full time	3 years	6 years
Full time (lateral Entry)	2 years	5 years
Sandwich	3 $^{1}/_{2}$ years	6 ½ years

9. Subjects of study and Curriculum outline:

The subjects of study shall be in accordance with the syllabus prescribed from time to time, both in theory and practical. The Curriculum outline is given in Annexure – I

10. Examinations

Autonomous Examinations in all subjects of all the semesters under the scheme of examinations will be conducted at the end of each semester.

The Internal assessment marks for all the subjects will be awarded on the basis of continuous internal assessment earned during the semester concerned. For each subject 25 marks are allotted for Internal Assessment Marks and 75 marks are allotted for Autonomous Examination.

11. Continuous Internal Assessment

A. Theory Subjects - For II & III year

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

i)	Attendance	-	5 Marks
ii)	Test	-	10 Marks
iii)	Assignment	-	5 Marks
iv)	Seminar	-	5 Marks

	Total	-	**25 Marks**
			---

i) Subject Attendance **5 Marks**

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

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

ii) Test **10 Marks**

2 Tests each of 2 hours duration for a total of 50 marks are to be conducted. Out of which the best one will be taken and the marks to be reduced to: **5 Marks**

The test – III is to be the Model Test covering all the five units and the marks so obtained will be reduced to: **5 Marks**

Total **10 Marks**

Test	Units	When to conduct	Marks	Duration
Test – I	Unit I & II	End of 6th week	50	2 hrs
Test – II	Unit III & IV	End of 12th week	50	2 hrs
Test – III	**Model Examination – Compulsory** Covering all the 5 units (Autonomous Examination – question paper pattern)	End of 15th Week	75	3 hrs

Question paper pattern for the periodical Test (Test – I & Test – II)

With no Choice:

Part A	4 Questions x 2 Marks	:	08 marks
Part B	4 Questions x 3 marks	:	12 marks
Part C	3 Questions x 10 marks	:	30 marks

	Total	**:**	**50 marks**
			---

iii) Assignment **5 marks**

For each subject three assignments are to be given each for 20 marks and the average marks scored should be reduced for 5 marks.

Assignment 1: Written notes in relevant topics from the subjects.

Assignment 2: Science/Technical projects – To acquire practical knowledge.

Assignment 3: Objective type online test-to understand the principles and thereby gain in-depth knowledge about the subject.

iv) Seminar **5 marks**

For seminar the total seminar 15 hours (15 weeks x 1 hour) should be distributed equally to total theory subject per semester(i.e. 15 hours divided by 3/4 subject). A topic from subject or current scenario is given to students. During the seminar hour students have to present the paper and submit seminar material to the respective staff member, who is handling the subject. It should be preserved for 2 Semesters and produced to the flying squad and the inspection team at the time of inspection/verification.

All Test papers, Assignments and Seminar Materials 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 semesters and produced to the flying squad and the inspection team at the time of inspection/ verification

For I Year General Engineering

Theory Subjects

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

i)	Attendance	-	5 Marks
ii)	Test	-	10 Marks
iii)	Assignment	-	10 Marks

	Total	-	**25 Marks**
			---

i) Subject Attendance **5 Marks**

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

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

ii) Test **10 Marks**

2 Tests each of 2 hours duration for a total of 50 marks are to be conducted. Out of which the best one will be taken and the marks to be reduced to: **5 Marks**

The test – III is to be the Model Test covering all the five units and the marks so obtained will be reduced to: **5 Marks**

Total **10 Marks**

Test	Units	When to conduct	Marks	Duration
Test – I	Unit I & II	End of 6th week	50	2 hrs
Test – II	Unit III & IV	End of 12th week	50	2 hrs
Test – III	**Model Examination – Compulsory** Covering all the 5 units (Autonomous Examination – question paper pattern)	End of 15th Week	75	3 hrs

Question paper pattern for the periodical Test (Test – I & Test – II)

With no Choice:

Part A	5 Questions x 1 Mark	:	05 marks
Part B	10 Questions x 2 marks	:	20 marks
Part C	5 Questions x 5 marks	:	25 marks

	Total	**:**	**50 marks**
			---

iii) Assignment **10 marks**

For each subject, three assignments are to be given each for 20 marks and the average marks scored should be reduced for 10 marks.

Assignment 1: Written notes in relevant topics from the subjects.

Assignment 2: Science/Technical projects – To acquire practical knowledge.

Assignment 3: Objective type online test-to understand the principles and thereby gain in-depth knowledge about the subject.

All Test papers and Assignments 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 semesters and produced to the flying squad and the inspection team at the time of inspection/ verification.

B. Practicals Subjects

I, II and III year

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

a) Attendance : 5 marks – (Award of marks same as theory subjects)

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 Semester, the average marks of all the exercise should be calculated for 20 marks and the marks awarded for attendance is to be added to arrive at the Internal Assessment Mark for Practical.(20+5=25 Marks)
- 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, Seminars 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 Subjects.

12. Life and Employability skills Practical

The Life and Employability skills Practical with more emphasis is being introduced in IV Semester for Circuit Branches and in III Semester for other branches of Engineering. Much Stress is given to increase the employability of students.

Internal Assessment Marks **- 25 Marks**

13. Project Work

The Students of all the Diploma courses have to do a Project Work as part of the Curriculum and in Partial fulfillment for the award of Diploma by the State Board of Technical Education and Training, Tamil Nadu. In order to encourage students to do worthwhile and innovative projects, every year prizes are awarded for the best three projects i.e. institution wise, region wise and state wise. **The Project work must be reviewed twice in the same semester.**

a) Internal Assessment Mark for Project Work & Viva Voce

Project Review I	:	10 Marks	
Project Review II	:	10 marks	
Attendance	:	05 marks	(Award of marks same as theory subject pattern)
Total	**:**	**25 marks**	

Proper record to be maintained for the two project reviews, and it should be preserved for 2 semesters and produced to the flying squad and the inspection team at the time of inspection/ verification.

b) Allocation of Marks for project work & Viva Voce in Autonomous Examination

i) Viva Voce	:	30 marks
ii) Report Preparation & Demonstration of Project	:	35 marks
Total	**:**	**65 marks**

iii) Written Test Mark (from 2 topics for 30 minutes duration) #

a) Environment Management	2 questions x 2 ½ marks	=	5 marks
b) Disaster Management	2 questions x 2 ½ marks	=	5 marks
			10 marks

(# Selection of questions should be from Question Bank, by the External Examiner, No Choice need be given to the candidates

Viva Voce	-	30 Marks
Report Preparation & Demonstration of Project	-	35 Marks
Written Test Mark	-	10 Marks
Total		**75 marks**

A neatly prepared PROJECT REPORT as per the format has to be submitted by individual student during the project Work & Viva voce Autonomous Examination.

14. Practical Training and Project Work for Architectural Assistantship (SW)

i. Practical Training

In IV and VII semesters, students should undergo the practical training under the registered architects without fail. During this period, they should have 80% of attendance. Candidates not fulfilling the above are not eligible to appear for the practical examinations. The candidates should redo the practical training in the next academic year.

The internal Assessment is based on the Monthly Report, Weekly Report, Attendance and Feedback given by the architects.

Work diary (internal Assessment) - 25 marks

Allocation of Marks

i) Monthly Report	- 10 Marks
ii) Weekly Report	- 5 Marks
iii) Attendance	- 5 Marks
iv) Feedback given by the architects	- 5 Marks
Total	**- 25 Marks**

Architect office and studio practice – I &II (IV & VII Sem)

Report writing	- 50 marks
Viva- voce	- 25 marks
Total	**- 75 marks**

ii. Project work

For the project work, to allocate internal assessment for the project work two reviews to be conducted and the average of two should be taken for the final assessment.

Average of two review marks (internal Assessment) – 25 marks

Project work & Viva Voce – Autonomous Examination

Record	-	20 marks
Drawing and presentation	-	30 marks
Model	-	15 marks
Viva-Voce	-	10 marks
Total	**-**	**75 marks**

A neatly prepared PROJECT REPORT as per the format has to be submitted by individual student during the project Work & Viva Voce Autonomous Examination.

15. Scheme of Examinations:

The Scheme of examination for subjects is given in **Annexure – II**

16. 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 subjects prescribed in the curriculum.
2. A candidate shall be declared to have passed the examination in a subject if he/she secures not less than 40 % in theory subjects and 50% in practical subject out of the total prescribed maximum marks including both the internal assessment and the Autonomous Examination 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.

17. Classification of successful candidates

Classification of candidates who will pass out the final examinations from April - 2018 onwards (joined in first year in 2015-2016) 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 subjects and passes all the semesters in the first appearance itself and passes all subjects within the stipulated period of study 3/ 3 ½ 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 marks in all the semesters put together and passes all the semesters except the I and II semester in the first appearance itself and passes all subjects within the stipulated period of study 3/3 ½ 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 the semesters put together and passes all the subjects within the stipulated period of study 3 / 3 ½ years (Full time/Sandwich) without any break in study.

Second Class

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

18. 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)

19. Issue of mark sheets / Diploma Certificates – Regarding with –held results

The final semester mark sheets of candidates who pass in the final semester examination, but do have arrears in the lower semester examinations will be **with-held** till they clear all the arrears.

20. Revaluation of Examination papers

- Any candidates can apply for revaluation of his / her answer script of any theory paper he/she had appeared.
- The candidates has to fill in the prescribed application form and remit fee (Rs.100/- per paper) for getting the Xerox copy of answer script within 15 days from the date of publication of results.
- The Xerox copy of the semester script will be sent to the candidate's address directly within 15 days from the date of receipt of application.
- If the candidate desires for revaluation of his/her answer script, he/she has to fill the application form enclosed with Xerox copy, pay the revaluation fee (Rs. 400/- per paper) within one week from the date of sending Xerox copy.
- The script will be revalued and the revised marks will be intimated to the candidates.
- The revaluation system is applicable for the practical subjects and project work.
- Applications received after the prescribed due dates will not be entertained.

Conclusion

The above rules and regulations can be amended, revised and altered as per the DOTE norms and Academic Board.

ANNEXURE –I

ELECTRICAL AND ELECTRONICS ENGINEERING

CURRICULUM OUTLINE

III SEMESTER

Sl. No	Subject Code	Subject Name	Theory Hours/ Week	Practical Hours/ Week	Total Hours
1	EEC 310	Electrical Circuit Theory	6		6
2	EEC 320	Electrical Machines - I	5		5
3	EEC 330	Electronic Devices and Circuits	5		5
4	EEC 340	Electrical Circuits and Machines Practical		5	5
5	EEC 350	Electronic Devices and Circuits Practical		5	5
6	EEC 360	Electrical Work Shop Practical		3	3
7	EEC 370	Computer Applications Practical		4	4
		Library	1		1
		Seminar	1		1
		Total Hours	**18**	**17**	**35**

IV SEMESTER

Sl. No	Subject Code	Subject Name	Theory Hours/ Week	Practical Hours/ Week	Total Hours
1	EEC 410	Electrical Machines II	5		5
2	EEC 420	Measurements and Instruments	5		5
3	EEC 430	Digital Electronics	5		5
4	EEC 440	Transducers and Signal Conditioners	4		4
5	EEC 450	Electrical Machines and Instrumentation Practical		5	5
6	EEC 460	Integrated Circuits Practical		5	5
7	EEC 470	Life and Employability Skill Practical		4	4
		Library	1		1
		Seminar	1		1
		Total Hours	**21**	**14**	**35**

V SEMESTER

Sl. No	Subject Code	Subject Name	Theory Hours/ Week	Practical Hours/ Week	Total Hours
1	EEC 510	Generation Transmission and Switch gear	6		6
2	EEC 520	Micro Controller	5		5
3	EEC 530	Electrical Estimation and Energy Auditing	5		5
4	**Elective Theory I**		5		5
	EEC 541	Control of Electrical Machines			
	EEC 542	Programmable Logic Controller			
	EEC 543	Electrical Machine Design			
5	EEC 550	Computer Aided Electrical Drawing Practical		4	4
6	EEC 560	Micro Controller Practical		4	4
7	**Elective Practical I**			4	4
	EEC 571	Control of Electrical Machines Practical			
	EEC 572	Programmable Logic Controller Practical			
	EEC 573	Electrical Machine Design Practical			
		Library	1		1
		Seminar	1		1
		Total Hours	**23**	**12**	**35**

VI SEMESTER

Sl. No	Subject Code	Subject Name	Theory Hours/ Week	Practical Hours/ Week	Total Hours
1	EEC 610	Distribution and Utilization	5		5
2	EEC 620	Operation and Maintenance of Electrical Equipment	5		5
3	**Elective Theory II**		5		5
	EEC 631	Power Electronics			
	EEC 632	Bio-Medical Instrumentation			
	EEC 633	Computer Hardware and Networks			
4	EEC 640	Wiring and Winding Practical		5	5
5	EEC 650	Electrical Circuits Simulation Practical		4	4
6	**Elective Practical II**			5	5
	EEC 661	Power Electronics Practical			
	EEC 662	Bio – Medical Instrumentation Practical			
	EEC 663	Computer Hardware and Networks Practical			
7	EEC 670	Project Work		4	4
		Library	1		1
		Seminar	1		1
		TOTAL	**17**	**18**	**35**

ANNEXURE –II

ELECTRICAL AND ELECTRONICS ENGINEERING

SCHEME OF EXAMINATION

III SEMESTER

Si No	Subject code	Subject Name	Examination Marks			Min. for pass	Duration of Exam/ Hours
			Internal Assessment Marks	Autonomous Exam Marks	Tot. Marks		
1	EEC 310	Electrical Circuit Theory	25	75	100	40	3
2	EEC 320	Electrical Machines - I	25	75	100	40	3
3	EEC 330	Electronic Devices and Circuits	25	75	100	40	3
4	EEC 340	Electrical Circuits and Machines Practical	25	75	100	50	3
5	EEC 350	Electronic Devices and Circuits Practical	25	75	100	50	3
6	EEC 360	Electrical Work Shop Practical	25	75	100	50	3
7	EEC 370	Computer Applications Practical	25	75	100	50	3

IV SEMESTER

Si No	Subject code	Subject Name	Examination Marks			Min. for pass	Duration of Exam/ Hours
			Internal Assessment Marks	Autonomous Exam Marks	Tot. Marks		
1	EEC 410	Electrical Machines II	25	75	100	40	3
2	EEC 420	Measurements and Instruments	25	75	100	40	3
3	EEC 430	Digital Electronics	25	75	100	40	3
4	EEC 440	Transducers and Signal Conditioners	25	75	100	40	3
5	EEC 450	Electrical Machines and Instrumentation Practical	25	75	100	50	3
6	EEC 460	Integrated Circuits Practical	25	75	100	50	3
7	EEC 470	Life and Employability Skill Practical	25	75	100	50	3

V SEMESTER

Si No	Subject code	Subject Name	Examination Marks			Min. for pass	Duration of Exam/ Hours
			Internal Assessment Marks	Autonomous Exam Marks	Tot. Marks		
1	EEC 510	Generation Transmission and Switch gear	25	75	100	40	3
2	EEC 520	Micro Controller	25	75	100	40	3
3	EEC 530	Electrical Estimation and Energy Auditing	25	75	100	40	3
4	**Elective Theory I**		25	75	100	40	3
	EEC 541	Control of Electrical Machines					
	EEC 542	Programmable Logic Controller					
	EEC 543	Electrical Machine Design					
5	EEC 550	Computer Aided Electrical Drawing Practical	25	75	100	50	3
6	EEC 560	Micro Controller Practical	25	75	100	50	3
7	**Elective Practical I**		25	75	100	50	3
	EEC 571	Control of Electrical Machines Practical					
	EEC 572	Programmable Logic Controller Practical					
	EEC 573	Electrical Machine Design Practical					

VI SEMESTER

Si No	Subject code	Subject Name	Examination Marks			Min. for pass	Duration of Exam/ Hours
			Internal Assessment Marks	Autonomous Exam Marks	Tot. Marks		
1	EEC 610	Distribution and Utilization	25	75	100	40	3
2	EEC 620	Operation and Maintenance of Electrical Equipment	25	75	100	40	3
3	**Elective Theory II**		25	75	100	40	3
	EEC 631	Power Electronics					
	EEC 632	Bio-Medical Instrumentation					
	EEC 633	Computer Hardware and Networks					
4	EEC 640	Wiring and Winding Practical	25	75	100	50	3
5	EEC 650	Electrical Circuits Simulation Practical	25	75	100	50	3
6	**Elective Practical II**		25	75	100	50	3
	EEC 661	Power Electronics Practical					
	EEC 662	Bio – Medical Instrumentation Practical					
	EEC 663	Computer Hardware and Networks Practical					
7	EEC 670	Project Work	25	75	100	50	3

EEC 310 ELECTRICAL CIRCUIT THEORY

TEACHING AND SCHEME OF EXAMINATION

No. of weeks per Semester: 15 Weeks

Course	Instructions		Examination			
	Hours / Week	Hours / Semester	Assessment Marks			Duration
			Internal Assessment	Semester End Examination	Total	
ELECTRICAL CIRCUIT THEORY	6 Hours	90 Hours	25	75	100	3 Hours

TOPICS AND ALLOCATION OF HOURS

UNIT	TOPIC	TIME (Hrs)
I	(a) Electrostatics (b) D C Circuits	16
II	Circuit Theorems	16
III	Single Phase Circuits	16
IV	Resonant Circuits	15
V	Three phase Circuits	15
	Revision and Tests	12
	TOTAL	**90**

COURSE DESCRIPTION

Electric circuit analysis is the process of finding the voltages across, and the currents through, every component in the network. There are many different techniques for calculating these values.

This subject is course on the basics of Network Analysis, introduction to network elements and explained all the possible method for finding voltage and current across any network Component with DC, single phase AC and 3 phase ac sources.

It aims at making the student conversant with different techniques of solving the

problems in the field of Electric circuits and analysis.

OBJECTIVES

The students should be able to:

- Explain the concept of electrostatics and capacitance effect and analyze different Circuit Elements, Energy Sources and analysis of Network by Kirchhoff's Laws.
- Analyze the concept of Node and Mesh Analysis; analyze different theorems for dc circuits.
- Analyze single phase circuits using resistor, inductor & capacitor elements.
- Explain and analyze series and parallel resonant behavior of a circuit.
- Analysis of balanced three phase ac circuit and three phase power measurement

COURSE OUTCOMES:

EEC 310 ELECTRICAL CIRCUIT THEORY	
After successful completion of this course the students will be able to	
C310.1	Explain about the basics of electrostatics and DC circuits.
C310.2	Analyze the different theorems for DC circuits
C310.3	Analyze and evaluate the single phase AC circuits
C310.4	Explain and analyze the resonant circuits
C310.5	Analyze and evaluate the three phase circuits

EEC 310 ELECTRICAL CIRCUIT THEORY

DETAILED SYLLABUS

UNIT	NAME OF THE TOPICS	HOURS
	(a) ELECTROSTATICS	**16 hours**
	Electric Flux-Electric Flux Density electric	1hr
	Field Intensity electric potential	1hr
	Coulomb's laws of electrostatics	1hr
	concept of capacitance	1hr
	Relationship between Voltage, Charge and capacitance	1hr
	energy stored in a capacitor,	1hr
	capacitors in series and in parallel –	1hr
	Capacitance of Parallel Plate Capacitor – derivation.	1hr
	Problems in above topics.	1hr
	(b) D C CIRCUITS	
	Basic concepts of current, emf, potential difference, resistivity, temperature coefficient of resistance	1hr
	Ohm's Law –application of Ohm's law – work, power energy	2 hrs
	Relationship between electrical, mechanical and thermal units resistance – series circuits	2 hrs
	parallel and Series parallel circuits Kirchhoff's laws –Problems in the above topics.	2 hrs
II	**CIRCUIT THEOREMS**	**16 hours**
	Mesh equations	2 hrs
	Nodal equations	2 hrs
	star/delta transformations	2 hrs
	Superposition theorem	2 hrs
	Voltage source and current source transformation.	2 hrs
	Thevenin's theorem –	2 hrs
	Norton's theorem	2 hrs
	Maximum power transfer theorem. (Problems in DC circuits only)	2 hrs
III	**SINGLE PHASE CIRCUITS**	**16 hours**
	'j' notations – rectangular and polar coordinates – Sinusoidal voltage and current	2hrs
	instantaneous, peak, average and effective values – form factor and peak factor(derivation for sine wave)	2hrs
	pure resistive, inductive and capacitive circuits	2hrs
	RL,RC, RLC series circuits – impedance	2hrs
	phase angle – phasor diagram – power and power factor – power triangle, apparent power, active and reactive power –	2hrs
	parallel circuits(two branches only) Conductance	2hrs
	susceptance and admittance – problems on all above topics.	2hrs
	Power Measurement by single phase 3 ammeter & voltmeter methods	2hrs

IV	**RESONANT CIRCUITS**	**15 hours**
	Series resonance – parallel resonance (R,L &C; RL&C only) quality factor – dynamic resistance comparison of series and parallel resonance Problems in the above topics – Applications of resonant circuits	2 hrs 2 hrs 2 hrs 2 hrs 2 hrs 3 hrs 2 hrs
V	**THREE PHASE CIRCUITS**	**15 hours**
	Three phase systems-phase sequence –necessity of three phase system- Voltage source and current source transformation. concept of balanced and unbalanced load – balanced star & delta connected loads relation between line and phase voltages and currents phasor diagram – three phase power power factor measurement by single wattmeter and two wattmeter methods Interconnection of three phases. Problems in all above topics.	2 hrs 2 hrs 2 hrs 2 hrs 2 hrs 2 hrs 1 hr
	Revision and Test	12 hrs

TEXT BOOKS

S.No	Name of the Book	Author	Publisher
1	Electrical Circuit Theory	Dr.M.Arumugam Dr.N.Premkumaran	Khanna Publishers, New Delhi

REFERENCE BOOK

S.No	Name of the Book	Author	Publisher
1	Circuits and Networks Analysis and Synthesis.	A. Sudhakar Shyammohan S Palli	Tata McGraw Hill Education Private Ltd., 2007
2	Electric Circuits	Mahamood Nahvi Joseph A Edminister	Tata McGraw Hill Education Private Ltd., 2007

LEARNING WEBSITES

https://byjus.com › Physics › Physics Article
https://circuitglobe.com/dc-circuit.html
https://www.elprocus.com/basics-of-network-theorems-in-electrical-engineering/
https://nptel.ac.in/courses/108106025/Chapter%201.pdf
https://www.electronics-tutorials.ws/accircuits/parallel-resonance.html
https://www.electrical4u.com/three-phase-circuit-star-and-delta-system/

CONTINUOUS INTERNAL ASSESSMENT

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

i) Attendance	- 5 Marks
ii) Test	- 10 Marks
iii) Assignment	- 5 Marks
iv) Seminar	- 5 Marks

Total	**- 25 Marks**

CO-POs & PSOs MAPPING MATRIX

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2	PSO3
CO310.1	3	3	3	-	-	-	3	3	3	3
CO310.2	3	3	3	-	-	-	3	3	3	3
CO310.3	3	3	3	-	-	-	3	3	3	3
CO310.4	3	3	3	-	-	-	3	3	3	3
CO310.5	3	3	3	-	-	-	3	3	3	3
Total	15	15	15	-	-	-	15	15	15	15
Correlation level	3	3	3	-	-	-	3	3	3	3

Correlation level 1 – Slight (Low)
Correlation level 2 – Moderate (Medium)
Correlation level 3 – Substantial (High)

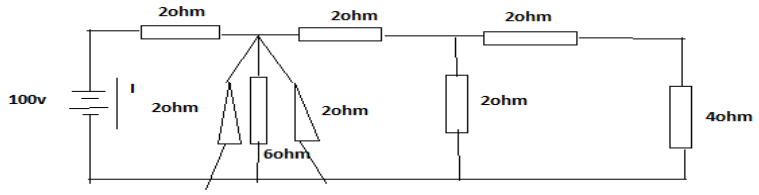
QUESTION PAPER SETTING

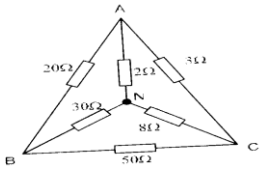
The teaching learning process and assessment are being carried out in accordance with the revised Bloom's Taxonomy. The question paper should consist of 90% questions based on Lower Order Thinking (LOTs) and the remaining 10% based on Higher Order Thinking (HOTs) as detailed below.

Bloom's Taxonomy	Lower Order Thinking Skills (LOTs)	Higher Order Thinking Skills (HOTs)
Level	R-Remember, U-Understand, Ap-Apply	An-Analyze, E-Evaluate, C-Create
% to be included	90%	10%

EEC 310 ELECTRICAL CIRCUIT THEORY

Time: 3Hrs **Max marks : 75**

PART – A (5X 2 =10 MARKS)				
Note : (i) All questions carry equal marks			Unit	Blooms Level
1		State Ohm's Law	I	R
2		Write the formula for capacitance of a parallel plate capacitor.	I	R
3		What is a node?	II	R
4		Write the expression for star to delta transformation	II	R
5		Define cycle	III	R
6		Define form factor	III	R
7		Define dynamic resistance	III	R
8		Write the expression for power in three phase system	IV	R
PART – B (5X3=15 MARKS)				
Note : (i) All questions carry equal marks			Unit	Blooms Level
9		State electric flux density	I	R
10		Write the relationship between charge ,voltage and capacitance	I	R
11		Give the current equivalent of voltage source	II	R
12		State the condition for maximum power transferred from source to load.	II	R
13		Convert 50 30 into rectangular form.	II	U
14		Draw the vector diagram for RC series circuit.	II	R
15		State the condition for series resonance.	III	R
16		Define phase sequence	V	R
PART –C (5X 10 =50 MARKS)				
Note: (i) Answer all the question choosing sub- division (A) or Sub division (B) of each question. (ii) All questions carry equal marks.			Unit	Blooms Level	Maximum Marks
17	A	Three resistors 12 ohm, 18 ohm and 36 ohm are connected in parallel. This parallel circuit is connected in series with a resistor 'r'. The whole circuit is connected is supplied at 60 volt and it is found that power developed in 12 ohm resistor is 48 watts. Determine the value of r and total power.	I	E	10
		[OR]			
	B	Determine the power p in the circuit shown below 	I	E	10
18	A	Derive the expression for delta connection	II	AN	10
		[OR]			

	B	In the circuit shown below find the equivalent resistance between 'A' and 'B'?  	II	R	10
19	A	The alternating current passing through a circuit is given by 141.4 sin 314.2t. Find the values of (a) r.m.s current, (b) the frequency (c) the instantaneous value of the current when t=0.02 second.	III	R	10
		[OR]			
	B	A current of 5A flows through a non-inductive resistance in series with a choking coil when supplied at 250V, 50Hz. If the voltage across the resistance is 125V and across the coil 200V, calculate (a) the impedance, reactance and resistance of coil (b) the power absorbed by the coil and the total power. Draw the vector diagram	III	C	10
20	A	A circuit contains two impedances z1 = (3 + j4) ohms and z2 = (4 + j3) ohms in parallel and connected to 50v, 50 hz supply. Determine the currents through impedances, total current, power and power factor.	IV	E	10
		[OR]			
	B	A coil of 10 ohm and 0.4 henry is in series with a capacitor of 40 mfd. A voltage of 200 volt at variable frequency is applied to the circuit. At what frequency will the current be maximum? Also calculate current, voltage across the coil and capacitor at this frequency.	IV	E	10
21	A	Derive the relation between the line and phase current in a delta connected circuit.	V	AN	10
		[OR]			
	B	A balance delta connected load of (8+j6) ohms per phase is connected to a three Phase 400v supply. Calculate the total power consumed. Also find out the readings of the Two wattmeters connected to measure power.	V	R	10

Note: the question paper setters are requested to follow the revised Bloom's Taxonomy levels as presented below:

Bloom's taxonomy level	Lower Order Thinking Skills (LOTs)	Higher Order Thinking Skills (HOTs)
	R-Remember, U-Understand, Ap-Apply	An-Analyse, E-Evaluate, C- Create
% to be included	90%	10%

EEC 320 ELECTRICAL MACHINES - I

TEACHING AND SCHEME OF EXAMINATION

No. of weeks per Semester: 15 Weeks

Course	Instructions		Examination			
	Hours / Week	Hours / Semester	Assessment Marks			Duration
			Internal Assessment	Semester End Examination	Total	
ELECTRICAL MACHINES - I	5 Hours	75 Hours	25	75	100	3 Hours

TOPICS AND ALLOCATION OF HOURS

UNIT	TOPIC	TIME (Hrs)
I	D C Generators	13
II	D C Motors	13
III	Single Phase Transformers	12
IV	Three Phase Transformers	13
V	Storage Batteries	12
	Revision and test	12
	TOTAL	**75**

COURSE DESCRIPTION

This subject is classified under core technology group which intends to teach the facts, concepts, principles of electrical machines, such as DC generators, DC motors, single & three phase transformers and DC electrical source (battery).

Student will be able to analyze the characteristics of DC generators and motors, Transformers, battery & Qualitative parameters of these static and dynamic machines. These machines are used in transmission, distribution and utilization systems.

Knowledge gained by students will be helpful in study of technological subjects such as utilization of electrical energy, switchgear & protection, manufacturing processes & maintenance of electrical machines

OBJECTIVES

Students will be able to:

- Know the constructional details & working principles of dc machines and transformers.
- Evaluate the performance of dc generators, motors & transformers.
- Decide the suitability of dc generator, motor & transformer for particular purpose.
- Write the specifications of dc machines & transformers as per requirement.
- Know the constructional details, working principle, testing and capacity of battery.

COURSE OUTCOMES:

EEC 320 ELECTRICAL MACHINES - I	
After successful completion of this course, the students should be able to	
C320.1	Know the constructional details & working principles of DC generators
C320.2	Evaluate the performance of DC Motors.
C320.3	Decide the suitability of single phase transformer for particular purpose.
C320.4	Decide the suitability of three phase transformer for particular purpose.
C320.5	Know the constructional details, working principle, testing and capacity of battery.

EEC 320 ELECTRICAL MACHINES - I

DETAILED SYLLABUS

UNIT	NAME OF THE TOPICS	HOURS
I	**D C GENERATORS**	13 Hours
	Review of electromagnetic induction Faraday's laws – Fleming's right hand rule –	2hrs
	Principle of operation of D.C. generators– Construction of D.C. generators – Field system–	1hr
	Types of armature windings – Principles of lap and wave windings EMF equation - Types of D.C. generators	2hrs
	Building up of voltage of D.C. Shunt generators	
	No load characteristics of Shunt generator	1hr
	Determination of critical field resistance	1hr
	Causes of failure to build-up voltage and remedy Load characteristics of series and shunt generators –	1hr
	load characteristics of cumulatively and differentially compounded generators	
	Applications – Problems in above topics	2hrs
	armature reaction – methods of compensating armature reaction	
	process of commutation – sparking in commutators – methods of improving commutation.	1hr 1hr
II	**D C MOTORS**	13 Hours
	Principle of operation of D.C. Motors – Fleming's left hand rule	1hr
	Construction – Back emf – Torque equation	2hrs
	Types of motors – Torque-current, Speed-current, Speed-Torque different motors	2hrs
	Speed control of DC motors characteristics of – Field control and armature control	2hrs
	necessity of Starters 3 Point and 4 Point starters	1hr
	losses in D.C. Machines	1hr
	Testing of D.C. machines - Predetermination of efficiency of motor and generator by Swinburne's test	2hrs
	Problems in above topics – Applications of DC Motors.	2hrs
III	**SINGLE PHASE TRANSFORMERS**	12 Hours
	Principle of operation – Constructional details of core, shell type transformers	2hrs
	coil assembly – EMF Equation – Voltage ratio	1hr
	Transformer on No load – Transformer on load – Current ratio Phasor diagram on no load and on load at different power factors	2hrs
	O.C. test, S.C. test	1hr
	Determination of equivalent circuit constants – Determination of voltage regulation and efficiency	2hrs
	Condition for maximum efficiency – All day efficiency – Problems on the above topics	2hrs
	polarity test – Parallel operation of single phase transformers – Auto transformer – principle – saving of copper – applications.	1hr 1hr

IV	**THREE PHASE TRANSFORMERS** Three phase Transformer construction Types of connections – Star-star, Star-Delta, Delta-Star, Delta-delta connections – Scott connection V connection of transformer – Parallel operation of three phase transformers grouping of transformers – Conditions – Phasing out test Pairing of transformer - Load sharing of transformers with equal and unequal ratings Cooling 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.	13 Hours 1hr 2hrs 2hrs 2hrs 1hr 1hr 1hr 1hr 1hr 1hr 1hr
V	**STORAGE BATTERIES** Classification of cells – construction chemical action and physical changes during charging, 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.	12 Hours 2hr 2hr 2hr 2hr 2hr 1hr 1hr

TEXT BOOKS

S.No	Name of the Book	Author	Publisher
1	A Text Book Of Electrical Technology Volume II	B.L. Theraja	S.Chand & Co. New Delhi
2	Electrical Technology	Edward Hughes	Addision – Wesley International Student Edition

REFERENCE BOOK

S.No	Name of the Book	Author	Publisher
1	Elements of Electrical Engineering	Maria Louis	Prentice - Hall of India Pvt Ltd
2	Electrical Machines	Nagarath	TMH Publications

WEBSITES

https://www.electrical4u.com/principle-of-dc-generator/
https://www.electrical4u.com/dc-motor-or-direct-current-motor/
https://www.electronics-tutorials.ws/transformer/transformer-basics.html
https://circuitglobe.com/three-phase-transformer-connections.html
www.altenergy.org/renewables/battery-storage.html

CONTINUOUS INTERNAL ASSESSMENT

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

i) Attendance	- 5 Marks
ii) Test	- 10 Marks
iii) Assignment	- 5 Marks
iv) Seminar	- 5 Marks

Total	**- 25 Marks**

CO-POs & PSOs Mapping matrix

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2	PSO3
CO320.1	2	2	3	1	1	-	-	3	2	3
CO320.2	2	2	3	1	1	-	-	3	2	3
CO320.3	2	2	3	2	1	-	-	3	3	1
CO320.4	2	2	3	1	1	-	-	3	3	2
CO320.5	2	2	3	1	1	-	-	3	3	3
Total	10	10	15	6	5	-	-	15	13	12
Correlation level	2	2	3	1.2	1	-	-	3	2.6	2.4

Correlation level 1 – Slight (Low)
Correlation level 2 – Moderate (Medium)
Correlation level 3 – Substantial (High)

QUESTION PAPER SETTING

The teaching learning process and assessment are being carried out in accordance with the revised Bloom's Taxonomy. The question paper should consist of 90% questions based on Lower Order Thinking (LOTs) and the remaining 10% based on Higher Order Thinking (HOTs) as detailed below.

Bloom's Taxonomy	Lower Order Thinking Skills (LOTs)	Higher Order Thinking Skills (HOTs)
Level	R-Remember, U-Understand, Ap-Apply	An-Analyze, E-Evaluate, C-Create
% to be included	90%	10%

ELECTRICAL MACHINES - I

Time : 3 Hrs Max.Marks :75

PART – A (5X 2 =10 MARKS)			
Note : (i) Answer any Five Questions (ii) All questions carry equal marks		Unit	Blooms Level
1	Mention the any one condition for self-excitation .	I	R
2	Mention the two types of armature winding used in DC generator.	I	R
3	Mention the two methods of speed control of DC motor	II	R
4	Name the types of starters used in DC motors.	II	R
5	What is All day efficiency ?	III	R
6	What is the condition maximum efficiency of a transformer ?	IV	R
7	What are the types of tap changers used in distribution transformer ?	IV	R
8	What are the active material used Nickel iron shell?	V	R
PART – B (5X3=15 MARKS)			
Note : (i) Answer any Five Questions (ii) All questions carry equal marks		Unit	Blooms Level
9	State the difference between cumulative differential compound generator .	I	R
10	State the application of DC shunt generator .	I	R
11	Give three applications of DC series motor .	II	R
12	Enumerate the losses occurring in a shunt motor .	II	C
13	Draw the no load diagram of single phase transformer .	III	U
14	What is the function of explosion vent .	IV	R
15	Mention the use of conservator .	IV	R
16	State the applications of Alkaline shell .	V	R

PART –C (5X 10 =50 MARKS)					
Note: (i) Answer all the question choosing sub- division (A) or Sub division (B) of each question. (ii) All questions carry equal marks.			Unit	Blooms Level	Maximum Marks
17	A	Draw and explain the no load circuits characteristics of a DC generator .	I	U	10
		[OR]			
	B	Explain with sketches the effect of armature reaction in DC generator .	I	U	10
18	A	Draw and explain about the characteristics of a DC shunt motor .	II	U	10
		[OR]			
	B	Explain with neat sketch the construction and working principal of three point starter .	II	U	10
19	A	Derive the EMF equation of transformer	III	AN	10
		[OR]			
	B	Explain the principle of Auto Transformer and state	III	U	10

		the applications of an Auto Transformer.			
20	A	Explain the Scott connection of transformer .	IV	U	10
		[OR]			
	B	Explain Earth resistance is measured by using earth tester .	IV	U	10
21	A	Explain the indications of fully charged cell.	V	U	10
		[OR]			
	B	Explain the various defects and the remedies of lead acid cell.	V	U	10

Note: the question paper setters are requested to follow the revised Bloom's Taxonomy levels as presented below:

Bloom's taxonomy level	Lower Order Thinking Skills (LOTs)	Higher Order Thinking Skills (HOTs)
	R-Remember, U-Understand, Ap-Apply	An-Analyse, E-Evaluate, C- Create
% to be included	90%	10%

EEC 330 ELECTRONIC DEVICES AND CIRCUITS

TEACHING AND SCHEME OF EXAMINATION

No. of weeks per Semester: 15 Weeks

Course	Instructions		Examination			
	Hours / Week	Hours / Semester	Assessment Marks			Duration
			Internal Assessment	Semester End Examination	Total	
ELECTRONIC DEVICES AND CIRCUITS	5 Hours	75 Hours	25	75	100	3 Hours

TOPICS AND ALLOCATION OF HOURS

UNIT	TOPIC	TIME (Hrs)
I	Semiconductor and Diodes	12
II	Bipolar Junction Transistor	12
III	Transistor oscillators and FET and UJT	13
IV	SCR,DIAC,TRIAC,MOSFET and IGBT	13
V	Opto Electronic Devices and Wave shaping Circuits	13
	Revision and test	12
	TOTAL	**75**

COURSE DESCRIPTION

Every Electronics Engineer should have sound knowledge about the components used in Electronics Industry. This is vital in R&D Department for chip level troubleshooting. To meet the industrial needs, diploma holders must be taught about the most fundamental subject, Electronic Devices and Circuits. By studying this subject, they will be skilled in handling all types of electronic devices and able to apply the skill in electronics system.

OBJECTIVES

Students will be able to:

- Study the working principle of PN junction diode and transistor
- Understand the working principle of different types of rectifier
- Understand the different transistor configurations
- 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, and TRIAC
- Study the performance of MOSFET and IGBT
- Know the construction and working principle of optoelectronic devices
- Study the performance of Solar cell with principle and applications
- Explain the concept of Wave shaping circuits
- Study the working principle of clippers and clampers

COURSE OUTCOMES:

EEC 330 ELECTRONIC DEVICES AND CIRCUITS	
After successful completion of this course, the students should be able to	
C330.1	Understand the current voltage characteristics of semiconductor devices, diodes and rectifier
C330.2	Understand the different transistor configurations
C330.3	Understand the operation of transistors, FET and UJT
C330.4	Understand the operation of SCR, DIAC, TRIAC, and MOSFET
C330.5	Understand the operation of Op to Electronic devices and wave shaping circuits

EEC 330 ELECTRONIC DEVICES AND CIRCUITS

DETAILED SYLLABUS

UNIT –I

SEMICONDUCTOR AND DIODES **[12 HRS]**

Semiconductor - Definition, classification, intrinsic and extrinsic N type & P type - drift current &diffusion current [2 Hrs]

Diodes – PN junction diode [1Hr]

Forward and Reverse bias characteristics – specification [1Hr]

Zener diode construction &working principle-characteristics [1 Hr]

Zener break down-avalanche break down -Zener Diode as a voltage regulator applications – specifications [1 Hr]

Rectifier – introduction-classification of rectifiers [1Hr]

half wave rectifier-full wave Rectifier(center tapped, bridge) [2 Hrs]

(no mathematical equations)-comparison [1Hr]

Applications-filters-C, LC and PI filters [2Hrs]

UNIT-II

BIPOLAR JUNCTION TRANSISTOR **[12 HRS]**

Transistor – NPN and PNP transistor – operation [1 Hr]

Transistor as an amplifier– Transistor as a switch-Transistor biasing [2 Hrs]

Fixed bias, Collector base bias, Self bias [1 Hr]

CB, CE, CC Configurations – Characteristics [1Hr]

Comparison between three configurations in terms of input impedance [2Hrs]

Output impedance, Current gain, Voltage gain

Classification of amplifiers [1 Hr]

RC coupled amplifier – Emitter follower and its application [2Hrs]

Negative feedback Concept – effect of negative feedback [1Hr]

Types of Negative feedback connections [1 Hr]

UNIT-III

TRANSISTOR OSCILLATORS AND FET AND UJT **[13 HRS]**

Transistor oscillator – Classifications [2 Hrs]

Condition for oscillations (Barkhausen criterion) [1Hr]

General form of LC oscillator – Hartley Oscillator Colpitts Oscillator [2Hrs]

RC Phase shift oscillator, Crystal oscillator. [2Hrs]

Field Effect Transistor – Construction – Working principle of FET [1Hr]

Difference between FET and BJT- Classification of FET [1Hr]

Characteristics of FET – Applications [1 Hr]

FET amplifier(Common source amplifier) [1 Hr]

UniJunctionTransistor – Construction – Equivalent circuit [1 Hr]

Operation – Characteristics – UJT as a relaxation oscillator. [1Hr]

UNIT IV

SCR, DIAC,TRIAC & MOSFET **[13 HRS]**

SCR -Introduction – Working VI Characteristics [2 Hrs]

Comparison between SCR and transistor [1Hr]

SCR as a switch, Controlled rectifier [2Hrs]

TRIAC working principle Characteristics [1Hr]

DIAC–characteristics - DIAC as bi-directional switch. [2 Hrs]

MOSFET – types & characteristics of N channel MOSFET and P channel MOSFET[2Hrs]

Characteristics of enhancement and depletion mode MOSFET [1Hr]

MOSFET as a switch.Applications of SCR,TRIAC, DIAC and MOSFET. [1 Hr]

IGBT Structure and Characteristics [1Hr]

UNIT V

OPTO ELECTRONICS DEVICES AND WAVESHAPING CIRCUITS [13Hrs]

Classification of opto electronic devices [2 Hrs]

Symbols, Characteristics, working of LDR, LED, 7 segment LED and LCD [2Hrs]

opto coupler - Photo transistor [2 Hrs]

Clipper, Clamper Circuits and waveforms only [1Hr]

Solar Cell - Principles -Applications. [1Hr]

Astable, Monostable and Bi-stable Multivibrators using Transistors [2Hrs]

Schmitt Trigger using Transistors

Solar Cell Series and Parallel Connection of Solar Cells –Types-Application. [1 Hr]

SMD Components-SMD Capacitor SMD Diode-SMD Resistor SMD LED [2Hrs]

TEXT BOOKS

S.No	Name of the Book	Author	Publisher
1	Electronic Devices and Circuits	Sallaivahanan, N.Suresh Kumar, A.Vallavaraj	Tata McGraw Publication 3rd Edition 2016
2	Electronics Devices and circuit theory	Boyestad&Nashelsky	PHI, New Delhi 2009

REFERENCE BOOK

S.No	Name of the Book	Author	Publisher
1	Electronic Principles	Malvino	Tata McGraw Hill Publication 2010
2	Electronics Devices & Circuits	Allen Mottershed	PHI, 2009
3	Electronics Devices & Circuits	Jacob Millman and Halkias	Tata McGraw – Hill publication 3rd Edition 2010
4	Optical Fiber Communication	GerdKeiser	Tata McGraw – Hill Publication 5th Edition 2013

WEBSITES

https://www.electronics-tutorials.ws/diode/diode_1.html
https://www.electronics-tutorials.ws/transistor/tran_1.html
https://www.electronics-tutorials.ws/power/unijunction-transistor.html
https://www.elprocus.com/diac-and-triac-working-and-characteristics/
https://www.electronics-tutorials.ws/diode/diode_8.html

CONTINUOUS INTERNAL ASSESSMENT

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

i) Attendance - 5 Marks
ii) Test - 10 Marks
iii) Assignment - 5 Marks
iv) Seminar - 5 Marks

Total - 25 Marks

CO-POs & PSOs Mapping matrix

Course Outcome	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2	PSO3
C330.1	3	-	3	-	-	-	3	3	-	3
C330.2	3	-	3	-	-	-	3	3	-	3
C330.3	3	-	3	-	-	-	3	3	-	3
C330.4	3	-	3	-	-	-	3	3	-	3
C330.5	3	-	3	-	-	-	3	3	-	3
C330 Total	15	-	15	-	-	-	15	15	-	15
Correlation Level	3	-	3	-	-	-	3	3	-	3

Correlation level 1 – Slight (Low)
Correlation level 2 – Moderate (Medium)
Correlation level 3 – Substantial (High)

QUESTION PAPER SETTING

The teaching learning process and assessment are being carried out in accordance with the revised Bloom's Taxonomy. The question paper should consist of 90% questions based on Lower Order Thinking (LOTs) and the remaining 10% based on Higher Order Thinking (HOTs) as detailed below.

Bloom's Taxonomy	Lower Order Thinking Skills (LOTs)	Higher Order Thinking Skills (HOTs)
Level	R-Remember, U-Understand, Ap-Apply	An-Analyze, E-Evaluate, C-Create
% to be included	90%	10%

ELECTRONIC DEVICES AND CIRCUITS

Time : 3 Hrs Max.Marks :75

PART – A (5X 2 =10 MARKS)				
Note : (i) Answer any Five Questions (ii) All questions carry equal marks			Unit	Blooms Level
1		Define peak inverse voltage and reverse leakage current of diode.	I	R
2		Define rectifier efficiency and ripple factor.	I	R
3		Define transistor and mention its types.	II	R
4		State the characteristics of emitter follower.	II	R
5		Define amplification factor of JFET.	III	R
6		Define SCR and draw its symbol.	IV	R
7		Define opto electronic devices and mention its types.	V	R
8		Define LED and draw its symbol.	V	R
PART – B (5X3=15 MARKS)				
Note : (i) Answer any Five Questions (ii) All questions carry equal marks			Unit	Blooms Level
9		Explain P type semiconductor.	I	U
10		Draw the circuit diagram and waveform of fullwave rectifier.	I	U
11		How is transistor used as an amplifier.	II	R
12		Explain the effects of feedback.	II	U
13		Differentiate FET and BJT.	III	An
14		Draw and explain the VI characteristics of Triac.	IV	U
15		Explain field effect LCD.	V	U
16		Explain solar cell.	V	U
PART –C (5X 10 =50 MARKS)				
Note: (i) Answer all the question choosing sub- division (A) or Sub division (B) of each question. (ii) All questions carry equal marks.			Unit	Blooms Level	Maximum Marks
17	A	Explain the working principle of PN Junction diode under forward and reverse bias with its VI characteristics.	I	U	10
		[OR]			
	B	Draw the circuit diagram of bridge rectifier and explain its operation with suitable waveforms.	I	U	10
18	A	Explain the operation of transistor as i) an amplifier ii) a switch	II	U	10
		[OR]			
	B	Draw the circuit diagram of RC coupled amplifier and explain its operation.	II	U	10
19	A	Explain the operation of Colpitts oscillator with a neat diagram.	III	U	10
		[OR]			
	B	Draw the circuit diagram of common source FET amplifier and explain its working principle.	III	U	10

20	A	Explain the principle of operation SCR with VI characteristics.	IV	U	10
		[OR]			
	B	Draw the structure of N channel depletion MOSFET and explain its principle of operation.	IV	U	10
21	A	Explain positive and negative clamper with suitable diagrams.	V	U	10
		[OR]			
	B	Draw the circuit diagram of Schmitt trigger using transistors and explain its operation with suitable waveforms.	V	U	10

Note: the question paper setters are requested to follow the revised Bloom's Taxonomy levels as presented below:

Bloom's taxonomy level	Lower Order Thinking Skills (LOTs)	Higher Order Thinking Skills (HOTs)
	R-Remember, U-Understand, Ap-Apply	An-Analyse, E-Evaluate, C- Create
% to be included	90%	10%

EEC 340 ELECTRICAL CIRCUITS AND MACHINES PRACTICAL

TEACHING AND SCHEME OF EXAMINATION

No. of weeks per Semester: 15 Weeks

Course	Instructions		Examination			
	Hours / Week	Hours / Semester	Assessment Marks			Duration
			Internal Assessment	Semester End Examination	Total	
ELECTRICAL CIRCUITS AND MACHINES PRACTICAL	5 Hours	75 Hours	25	75	100	3 Hours

COURSE DESCRIPTION

To impart practical knowledge to the diploma students, practical subjects are introduced for every corresponding theory subject. This practical supports the aim and objective of Electrical Machines I and Electrical Circuit Theory Subjects.

OBJECTIVES

On completion of this practical subject, the students will be able to

- Make the various circuit connections
- Practically prove all the theorems dealing with dc current flow
- Understand the characteristics of electrical machine and to determine the efficiency of the machines.
- Test the transformer to find its efficiency, voltage regulation and characteristics.
- Various speed control methods of DC motor.

COURSE OUTCOMES:

EEC 340 ELECTRICAL CIRCUITS AND MACHINES PRACTICAL	
After successful completion of this course, the students should be able to	
C340.1	Identify the physical parts of the DC machines, Alternator and special machines.
C340.2	Conduct suitable experiments to draw and interpret the performance characteristics of DC Machines
C340.3	Interpret and apply the Speed Control methods of a DC Motor.
C340.4	Explain the need for starter, connect and run a DC shunt Motor using 3 point Starter
C340.5	Test the transformer to find its efficiency, voltage regulation and characteristics.

LIST OF EQUIPMENTS

S.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.	1 phase Transformer 1KVA (or more) 220V/110V	3
7.	3 phase Transformer 1KVA (or more) 440V/220V	1
8.	1 phase Variac 15 amps	3
9.	3 phase Variac 15 amps	1
10.	Dual Regulated Power Supply 0-30V/2A	2
11.	Single Regulated Power Supply 0-30V / 2A	2

Equipments to be in the electrical machines laboratory

1) Electrical Circuits and Machines Practical

2) Electrical Machines and Instrumentation Practical.

S.NO	LIST OF EQUIPMENTS	QUANTITY REQUIRED
1	Single phase Resistive Load 3/5 KW, 220V	2
2	Three Phase Resistive Load 3KW,415V	1
3	Tachometer Analog type	2
4	Tachometer Digital	1
5	Rheostat – various ranges 50Ω/5A,100 Ω/5A, 300 Ω/2A,15 600 Ω/2 equivalent)	1
6	AC Ammeter – various ranges 0-500mA, 0-1/2A, 0-5/10A,0-10/20A (or equivalent)	12
7	DC Ammeter – various ranges 0-500mA, 0-2A,0-5A,0-10A,0-15/30A (or equivalent)	15
8	DC Voltmeter – 0-5/10V, 0-30V, 0-300V	10
9	AC Voltmeter – 0-75V, 0-150V, 0-300V, 0-600V	10
10	Wattmeter – various ranges LPF 150/300/600V 2.5A/5A,1/2.5A	6
11	Wattmeter – various ranges UPF 75/150/300,5/10A	6
12	Wattmeter – various ranges UPF 150/300/600V 10/20A	8

EEC 340 ELECTRICAL CIRCUITS AND MACHINES PRACTICAL

Si.No	List of Experiments	Course Outcome
1	a). Verification of Superposition Theorem with two different DC voltages for a common load. b). Verification of Thevenin's Theorem with DC supply.	C340.1
2	a) Verification of Norton's Theorem with DC supply. b) Verification of Maximum Power Transfer Theorem	C340.1
3	Measure the power in RLC series circuit. Calculate the power factor and draw the phasor diagram.	C340.1
4	Construct RLC Circuit for Series Resonance and draw the Frequency versus Impedance curve.	C340.1
5	No Load and Load characteristics of self-excited DC shunt Generator.	C340.2
6	Load Characteristics of self-excited DC series Generator.	C340.2
7	Load Test on DC shunt motor and draw the Performance Curves.	C340.2
8	Load Test on DC series motor and draw the performance curve.	C340.2
9	Predetermine the efficiency of DC machine by Swinburn's test.	C340.2
10	Load Test on DC Compound Motor and draw the performance curve.	C340.2
11	Speed Control of DC Shunt motor by a) Armature control method. b) Field control method.	C340.2
12	Load Test on a Single phase Transformer.	C340.5
13	Load test on a Three-Phase Transformer.	C340.5
14	Predetermination the efficiency and regulation of a Single phase Transformer by conducting OC and SC test	C340.5
15	Find the equivalent circuit constants of a Single phase Transformer by conducting OC and SC tests.	C340.5
16	Connect two single phase transformer for parallel operation by conducting Polarity test.	C340.5

Continuous Internal Assessment

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

a) Attendance : 5 marks – (Award of marks same as theory subjects)

b) Procedure/ observation and tabulation/ Other Practical related work : 10 marks

c) Record writing : 10 marks

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Total 25 marks

LEARNING WEBSITES

https://www.allaboutcircuits.com › ... › DC Network Analysis

https://www.electrical4u.com/principle-of-dc-generator/

https://www.electrical4u.com/dc-motor-or-direct-current-motor/

https://www.electrical4u.com/what-is-transformer-definition-working-principle-of-transformer/

CO-POs & PSOs Mapping matrix

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2	PSO3
CO340.1	3	-	3	3	-	-	-	3	3	3
CO340.2	3	-	3	3	-	-	-	3	3	3
CO340.3	3	-	3	3	-	-	-	3	3	3
CO340.4	3	-	3	3	-	-	-	3	3	3
CO340.5	3	-	3	3	-	-	-	3	3	3
Total	15	-	15	15	-	-	-	15	3	15
Correlation level	3	-	3	3	-	-	-	3	15	3

Correlation level 1 – Slight (Low)
Correlation level 2 – Moderate (Medium)
Correlation level 3 – Substantial (High)

EEC 350 ELECTRONIC DEVICES AND CIRCUITS PRACTICAL

TEACHING AND SCHEME OF EXAMINATION

No. of weeks per Semester: 15 Weeks

Course	Instructions		Examination			
	Hours / Week	Hours / Semester	Assessment Marks			Duration
			Internal Assessment	Semester End Examination	Total	
ELECTRONIC DEVICES AND CIRCUITS PRACTICAL	5Hours	75 Hours	25	75	100	3 Hours

COURSE DESCRIPTION

Today communication engineering has developed to a great extent that there is always the need for study of various communication concepts. This practical fulfills the need for students to have a through knowledge of various types of Components, Transistors, Amplifiers and oscillators.

OBJECTIVES

On completion of this practical subject, the students will be able to

- To verify the components.
- To construct and verify the characteristics of diode
- To construct and verify the characteristics of rectifiers.
- To construct and verify the characteristics Transistors.
- To construct and verify the characteristics Oscillators

COURSE OUTCOMES:

EEC 350 ELECTRONIC DEVICES AND CIRCUITS PRACTICAL	
After successful completion of this course, the students should be able to	
C350.1	Identify and check the working condition of passive & active components and switches and construct semiconductor diodes, transistors ,amplifiers and analyze their characteristics.
C350.2	Construct different types of rectifiers and analyze their characteristics
C350.3	Construct and analyze the V-I characteristics of switching devices. (SCR,TRIAC,DIAC).
C350.4	Construct and understand the characteristics of LDR and phototransistor.
C350.5	Use of multimeter to check the continuity and construct simple circuits using LEDS.

EQUIPMENTS REQUIRED

S.No	Name of the Equipment	Range	Required Nos.
1.	DC Regulated power supply	0-30V, 1A	10
2.	High Voltage Power Supply	0-250V, 1A	2
3.	Signal Generator	1MHz	4
4.	Dual trace CRO	20 MHz / 30MHz	5
5.	Digital Multi meter	-	10
6.	DC Voltmeter (Analog/Digital)	Different Ranges	15
7.	DC Ammeter (Analog/Digital)	Different Ranges	15
7.	Computers for simulation Experiments	-	2
8.	Software - PSPICE/ multisim / orcad / tina(Any 1)	-	

EEC 350 ELECTRONIC DEVICES AND CIRCUITS PRACTICAL

Si.No	List of Experiments	Course Outcome
1	Construct and plot the VI characteristics of PN junction diode and find the cut-in voltage.	C350.1
2	Construct and plot the VI characteristics of Zener diode and find the break down voltage	C350.1
3	Construct and plot the regulation characteristics (by varying either load or line voltage) of Half wave rectifier with and without filters.	C350.2
4	Construct and plot the regulation characteristics (by varying either load or line voltage) of Full wave rectifier with and without filters.	C350.2
5	Construct and plot the regulation characteristics (by varying either load or line voltage) of Bridge rectifier with filters.	C350.2
6	Construct and draw the Input and output characteristics of CE Transistor configuration and find its input & output resistance.	C350.1
7	Construct and draw the frequency response of RC coupled amplifier and determine the 3-db bandwidth	C350.1
8	Construct and plot the drain characteristics of JFET and find its pinch off voltage.	C350.1
9	Construct and plot UJT characteristics and find its Ip and Vv.	C350.1
10	Construct and draw SCR characteristics and find its break over voltage.	C350.3
11	Construct and plot the DIAC characteristics.	C350.3
12	Construct and plot the TRIAC characteristics.	C350.3
13	Construct and draw the waveforms of positive clipper and clamper.	C350.1
14	Construct and draw the characteristics of LDR.	C350.4
15	Construct and draw the characteristics of a photo transistor.	C350.4
16	By using a multimeter check the given wire continuity, check 2 & 3way mains card7 and identify line ground and earth point.	C350.5
17	Construct a circuit to glow the different colour LED alternatively.	C350.5

Continuous Internal Assessment

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

a) Attendance : 5 marks – (Award of marks same as theory subjects)

b) Procedure/ observation and tabulation/ Other Practical related work : 10 marks

c) Record writing : 10 marks

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Total 25 marks

LEARNING WEBSITES

https://www.quora.com/What-are-some-best-sites-to-learn-the-basic-of-electronics-for-Electronicsengineer
https://www.pannam.com/blog/free-resources-to-learn-electrical-engineering/
http://www.pvpsiddhartha.ac.in/autonomus1
http://www.circuitstoday.com/4-great-books-to-study-basic-electronics
http https://www.edx.org/course/circuits-and-electronics-1-basic-circuitanalysiss:// www.scribd.com/document/161565322/

CO-POs & PSOs Mapping matrix

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2	PSO3
CO350.1	3	-	3	3	-	-	-	3	3	3
CO350.2	3	-	3	3	-	-	-	3	3	3
CO350.3	3	-	3	3	-	-	-	3	3	3
CO350.4	3	-	3	3	-	-	-	3	3	3
CO350.5	3	-	3	3	-	-	-	3	3	3
Total	15	-	15	15	-	-	-	15	3	15
Correlation level	3	-	3	3	-	-	-	3	15	3

Correlation level 1 – Slight (Low)
Correlation level 2 – Moderate (Medium)
Correlation level 3 – Substantial (High)

EEC 360 ELECTRICAL WORKSHOP PRACTICAL

TEACHING AND SCHEME OF EXAMINATION

No. of weeks per Semester: 15 Weeks

Course	Instructions		Examination			
	Hours / Week	Hours / Semester	Assessment Marks			Duration
			Internal Assessment	Semester End Examination	Total	
ELECTRICAL WORKSHOP PRACTICAL	3 Hours	45 Hours	25	75	100	3 Hours

COURSE DESCRIPTION

To impart practical knowledge to the diploma students servicing of domestic appliances. This subject is assigned to develop skill on assembling and test of household electrical appliances.

OBJECTIVES

On completion of this practical subject, the students will be able to

- Identify and use the tools used in servicing of electrical appliances.
- Assemble the various parts of domestic appliances.
- Make the electrical connections and test its performance.

COURSE OUTCOMES:

EEC 360 ELECTRICAL WORKSHOP PRACTICAL	
After successful completion of this course, the students should be able to	
C360.1	Identify and use the tools used in servicing of electrical appliances.
C360.2	Assemble the various parts of domestic appliances.
C360.3	Make the electrical connections and test its performance.
C360.4	Identify the faults in domestic appliances
C360.5	Test the connections in domestic appliances

LIST OF EQUIPMENTS

S.No	LIST OF EQUIPMENTS	QUANTITY REQUIRED
1.	Tools: Screw driver, Cutting pliers, Wire Stripper, Hammer, Spanner set, Line Tester, Nose pliers.	Each 2 set
2.	Personal Protective Equipments: Safety helmet, Google, Safety gloves, Nose mask, Ear plug, Safety Belt.	Each 2 Set
3.	Automatic Iron Box	2
4.	Wet Grinder	2
5.	Mixer Grinder	2
6.	Ceiling Fan	2
7.	LED Light, PCB, Driver Circuit and Outer Cover	10
8.	Lead Acid Battery	2
9.	Inverter	2
10.	Solar Photo Voltaic Module	2
11.	Charge controller	2
12.	Microwave oven	1
13.	Multimeter	8
14.	Induction Heater	1

EEC 360 ELECTRICAL WORKSHOP PRACTICAL

List of Experiments

Si.No	List of Experiments	Course Outcome
1	Familiarization of tools used for electrical repair works and personal protection equipments.	C360.1
2	Dismantling of Electrical iron box, identifying the parts, checking the conditions, assembling and testing.	C360.2
3	Dismantling of Mixer Grinder, identifying the parts, checking the conditions, assembling and testing.	C360.2
4	Dismantling of Wet Grinder, identifying the parts, checking the conditions, assembling and testing.	C360.2
5	Assembling the accessories of ceiling fan, test the connections of winding & capacitor and run the fan with speed regulator.	C360.2
6	Connect the battery and inverter to supply partial load in a domestic wiring during mains failure.	C360.2
7	Assembling and testing of 15 watts LED light.	C360.2
8	Battery charging through solar panel. Connect solar panel to charge battery through charge controller.	C360.2
9	Dismantling of induction heater, identifying the parts, checking the conditions, assembling and testing	C360.2
10	Dismantling of microwave oven, identifying the parts, checking the conditions, assembling and testing.	C360.2
11	Assembling the accessories of Table fan, test the connections.	C360.2

Continuous Internal Assessment

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

a) Attendance : 5 marks – (Award of marks same as theory subjects)

b) Procedure/ observation and tabulation/ Other Practical related work : 10 marks

c) Record writing : 10 marks

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Total 25 marks

LEARNING WEBSITES

https://dir.indiamart.com/impcat/home-appliance-repair.html
https://www.housejoy.in/appliances-services
https://dir.indiamart.com/impcat/electrical-appliances-repairing-services.html

CO-POs & PSOs Mapping matrix

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2	PSO3
CO360.1	3	-	-	3	3	-	-	3	3	3
CO360.2	3	-	-	3	3	-	-	3	3	3
CO360.3	3	-	-	3	3	-	-	3	3	3
CO360.4	3	-	-	3	3	-	-	3	3	3
CO360.5	3	-	-	3	3	-	-	3	3	3
Total	15	-	-	15	15	-	-	15	15	15
Correlation level	3	-	-	3	3	-	-	3	3	3

Correlation level 1 – Slight (Low)

Correlation level 2 – Moderate (Medium)

Correlation level 3 – Substantial (High)

EEC 370 COMPUTER APPLICATIONS PRACTICAL

TEACHING AND SCHEME OF EXAMINATION

No. of weeks per Semester: 15 Weeks

Course	Instructions		Examination			
	Hours / Week	Hours / Semester	Assessment Marks			Duration
			Internal Assessment	Semester End Examination	Total	
COMPUTER APPLICATIONS PRACTICAL	4 Hours	60 Hours	25	75	100	3 Hours

COURSE DESCRIPTION

The application of Computer knowledge is essential the students of all disciplines of Engineering in addition to their respective branch of study. The Computer Application Practical course facilitates the necessary knowledge and skills regarding creating, working and maintaining the documents and presentation of documents with audio visual effects in a computer and produces necessary skills in E- Learning and Chatting tools.

OBJECTIVES

On completion of this practical subject, the students will be able to

- Use the GUI operating systems
- Familiarize and customize the desktop
- Use the different facilities available in the word processor
- Prepare Power Point presentation with different formats
- Expose E-learning tools and chatting tools Analyze the datasheet
- Create and manipulate the database
- Create different types of charts
- Prepare PowerPoint presentation
- Understand Internet concepts and usage of e-mail

COURSE OUTCOMES:

EEC 370 COMPUTER APPLICATIONS PRACTICAL	
After successful completion of this course, the students should be able to	
C370.1	Use the GUI operating systems
C370.2	Use the different facilities available in the word processor
C370.3	Create and manipulate the database and excel
C370.4	Prepare Power Point presentation with different formats
C370.5	Expose E-learning tools and chatting tools Analyze the datasheet

Hardware Requirements:

- Computers – 36Nos
  - Intel Core i3 Processor
  - 500 GB Hard Disk, 2 MB RAM
  - 14" Monitor
- Projector – 1 Nos
- Laser Printer – 1 No
- Internet Connection – Minimum of 512 KB

Software Requirement

- Any GUI Operating System
- Open Source Software / MS- Office

EEC 370 COMPUTER APPLICATIONS PRACTICAL

<table>
<tr><th>Si.No</th><th>List of Experiments</th><th>Course Outcome</th></tr>
<tr><td></td><td>SECTION – I</td><td></td></tr>
<tr><td></td><td>GRAPHICAL OPEARTING SYSTEM</td><td></td></tr>
<tr><td>1</td><td>a)Installing screen saver and change the monitor resolution by 1280X960
b) Setting wall papers
c) Creating, moving, deleting and renaming a folder
d)Copy, paste and cut a folder/file
e)Displaying the properties for a file or folder</td><td>C370.1</td></tr>
<tr><td>2</td><td>a)Restoring files and folders from Recycle bin
b)Creating short cuts for folder/file
c)Finding a file or folder by name
d)Selecting and moving two or more files/folders using mouse
e)Sorting folders/files.</td><td>C370.1</td></tr>
<tr><td></td><td>WORD PROCESSING</td><td></td></tr>
<tr><td>3</td><td>Create the following table and perform the operations given below
<table>
<tr><th>DAYS</th><th>1</th><th>2</th><th>3</th><th>4</th><th>5</th><th>6</th><th>7</th><th>8</th></tr>
<tr><td>MON</td><td colspan="2">TEST</td><td colspan="2">A: JPP
B: RDBMS</td><td>CA</td><td>RDBMS</td><td>TUT</td></tr>
<tr><td>TUE</td><td>CA</td><td>OOP</td><td>CN</td><td>RDBMS</td><td colspan="3">A: RDBMS
B: JPP</td></tr>
<tr><td>WED</td><td>CN</td><td>RDBMS</td><td>OOP</td><td>RDBMS</td><td colspan="2">COMMUNICATION</td><td>CN</td><td>CA</td></tr>
<tr><td>THU</td><td>OOP</td><td colspan="2">A: JPP
B: RDBMS</td><td>CA</td><td>RDBMS</td><td>CN</td><td>OOP</td></tr>
<tr><td>FRI</td><td colspan="2">COMMUNICATION</td><td colspan="2">A: RDBMS
B: JPP</td><td>OOP</td><td>CN</td><td>RDBMS</td><td>CA</td></tr>
<tr><td>SAT</td><td>OOPS</td><td>RDBMS</td><td>CN</td><td>CA</td><td colspan="4">----</td></tr>
</table></td><td>C370.2</td></tr>
<tr><td>4</td><td>Create a standard covering letter and use mail merge to generate the customized letters for applying to a job in various organizations. Also, create a database and generate labels for the applying organizations.</td><td>C370.2</td></tr>
<tr><td>5</td><td>Create a news letter of three pages with two columns text. The first page contains some formatting bullets and numbers. Set the document background color and add ‘confidential’ as the watermark. Give the document a title which should be displayed in the header. The header/ footer of the first page should be different from other two pages. Also, add author name and date/ time in the header. The footer should have the page number.</td><td>C370.2</td></tr>
</table>

<table>
<tr><td></td><td>SPREADSHEET</td><td></td></tr>
<tr><td>6</td><td>Create a result sheet containing Candidate's Register No., Name, Marks for six subjects. Calculate the total and result. The result must be calculated as below and failed candidates should be turned to red.
Result is Distinction if Total >= 70 %
First Class if Total > = 60 % and < 70 %
Second Class if Total >= 50 % and < 60 %
Pass if Total >= 35 % and < 50 %
Fail otherwise
Create a separate table based on class by using auto filter feature.</td><td>C370.3</td></tr>
<tr><td>7</td><td>Create a table of records with columns as Name and Donation Amount. Donation amount should be formatted with two decimal places. There should be at least twenty records in the table. Create a conditional format to highlight the highest donation with blue color and lowest donation with red colour. The table should have a heading.</td><td>C370.3</td></tr>
<tr><td>8</td><td>Create line and bar chart to highlight the sales of the company for three different periods for the following data.
SALES BAR CHART
<table>
<tr><th>Period</th><th>Product1</th><th>Product2</th><th>Product3</th><th>Total</th></tr>
<tr><td>JAN</td><td>35</td><td>40</td><td>50</td><td>125</td></tr>
<tr><td>FEB</td><td>46</td><td>56</td><td>40</td><td>142</td></tr>
<tr><td>MAR</td><td>70</td><td>50</td><td>40</td><td>160</td></tr>
</table></td><td>C370.3</td></tr>
<tr><td></td><td>SECTION – II</td><td></td></tr>
<tr><td></td><td>DATABASE</td><td></td></tr>
<tr><td>9</td><td>Create Database to maintain at least 10 addresses of your class mates with the following constraints
➢ Roll no. should be the primary key.
➢ Name should be not null</td><td>C370.3</td></tr>
<tr><td>10</td><td>Create a student’s table with the following fields: Sr.No, Reg. No, Name, Marks in 5 subjects. Calculate total and percentage of 10 students. Perform the following queries.
➢ To find the details of distinction student
➢ To find the details of first class students
➢ To find the details of second class students</td><td>C370.3</td></tr>
<tr><td>11</td><td>Design a report for the above exercise to print the consolidated result sheet and mark card for the student.</td><td>C370.3</td></tr>
<tr><td></td><td>PRESENTATION</td><td></td></tr>
<tr><td>12</td><td>Make a marketing presentation of any consumer product with at least 10 slides. Use different customized animation effects on pictures and clip art on any four of the ten slides.</td><td>C370.4</td></tr>
<tr><td>13</td><td>Create a Presentation about our institution or any subject with different slide transition with sound effect.</td><td>C370.4</td></tr>
</table>

	INTERNET	
14	Create an e-mail id and perform the following ➢ Write an e-mail inviting your friends to your Birthday Party. ➢ Make your own signature and add it to the e-mail message. ➢ Add a word attachment of the venue route ➢ Send the e-mail to at least 5 of your friends.	C370.5
15	Create a presentation on Google docs. Ask your friend to review it and comment on it. Use "Discussion" option for your discussions on the presentation.	C370.5

Continuous Internal Assessment

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

a) Attendance : 5 marks – (Award of marks same as theory subjects)

b) Procedure/ observation and tabulation/ Other Practical related work : 10 marks

c) Record writing : 10 marks

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Total 25 marks

LEARNING WEBSITES

https://www.tutorialspoint.com/computer_fundamentals/computer_applications.htm
https://www.inc.com/encyclopedia/computer-applications.html
https://courses.lumenlearning.com/computerapps/chapter/welcome-to-computer-applications-and-concepts/
https://searchsoftwarequality.techtarget.com/definition/application

CO-POs & PSOs Mapping matrix

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2	PSO3
CO370.1	**3**	**-**	**-**	**3**	**3**	**-**	**3**	**3**	**-**	**3**
CO370.2	**3**	**-**	**-**	**3**	**3**	**-**	**3**	**3**	**-**	**3**
CO370.3	**3**	**-**	**-**	**3**	**3**	**-**	**3**	**3**	**-**	**3**
CO370.4	**3**	**-**	**-**	**3**	**3**	**-**	**3**	**3**	**-**	**3**
CO370.5	**3**	**-**	**-**	**3**	**3**	**-**	**3**	**3**	**-**	**3**
Total	**15**	**-**	**-**	**15**	**15**	**-**	**15**	**15**	**-**	**15**
Correlation level	**3**	**-**	**-**	**3**	**3**	**-**	**3**	**3**	**-**	**3**

Correlation level 1 – Slight (Low)

Correlation level 2 – Moderate (Medium)

Correlation level 3 – Substantial (High)

EEC 410 ELECTRICAL MACHINES - II

TEACHING AND SCHEME OF EXAMINATION

No. of weeks per Semester: 15 Weeks

Course	Instructions		Examination			
	Hours / Week	Hours / Semester	Assessment Marks			Duration
			Internal Assessment	Semester End Examination	Total	
ELECTRICAL MACHINES - II	5 Hours	75 Hours	25	75	100	3 Hours

TOPICS AND ALLOCATION OF HOURS

UNIT	TOPIC	TIME (Hrs)
I	Alternator principles and construction	13
II	Alternator performance and testing	13
III	Three phase induction motor	12
IV	A)Single phase induction motor B) Synchronous motor	13
V	A)Special AC machines B)Special DC machines	12
	Revision and test	12
	TOTAL	**75**

COURSE DESCRIPTION

- This subject is classified under core technology group intended to teach students facts, concepts, Principles 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.
- These machines are widely used in industries and for generation of electricity.
- The knowledge gained by the student is useful in the study of technological subjects such as Utilization System, Manufacturing Processes and Testing and maintenance of Electrical machines.
- The knowledge and skills obtained will be helpful in discharging technical functions such as Supervision, controlling and as R & D technician.

OBJECTIVES

The students should be able to

- Alternator Principle, Construction, Types, EMF Induced and cooling
- Performance of an Alternator, Testing, Characteristics, parallel operation, Load sharing etc.,
- 3-Φ Induction Motor, Principle, Construction, Types Characteristics and Applications, starting Methods
- 1-Φ Motor types, Construction, Characteristics and Applications Synchronous Motor, Starting, Construction, Characteristics and Applications
- Special AC machines and DC machines Construction, Characteristics and Applications

COURSE OUTCOMES:

EEC 410 ELECTRICAL MACHINES - II	
After successful completion of this course, the students should be able to	
C410.1	Know the constructional details & working principles of Alternators
C410.2	Evaluate the performance of Alternators
C410.3	Understating construction and working principal three phase induction motor
C410.4	Understating construction and working principal single phase induction motor
C410.5	Analyses of special construction DC and AC machines

EEC 410 ELECTRICAL MACHINES - II

DETAILED SYLLABUS

UNIT	NAME OF THE TOPICS	HOURS
I	**ALTERNATOR PRINCIPLES AND CONSTRUCTION**	**13 Hours**
	Basic principle of alternators – Types of alternators	1hr
	Stationary armature rotating field – advantages of rotating field	1hr
	Construction details of alternator	1hr
	Salient pole rotor – Cylindrical type rotor	1hr
	Types of A.C. armature windings	1hr
	Types of slots – Full pitch and short pitched windings	1hr
	Phase spread angle and effect of distribution factor	1hr
	pitch factor – relation between frequency	1hr
	speed and number of poles – EMF equation	1hr
	Problems	1hr
	methods of obtaining sine wave	1hr
	Critical speed of rotor Ventilation of turbo alternators	1hr
	advantages of hydrogen cooling and its precaution – excitation and exciters.	1hr
II	**ALTERNATOR PERFORMANCE AND TESTING**	**13 Hours**
	Load characteristics of alternators – reason for change in terminal voltage	1hr
	Qualitative treatment of armature reaction for various power factor loads effective resistance	1hr
	leakage reactance – synchronous reactance	1hr
	synchronous impedance – Voltage regulation	1hr
	Determination of voltage regulation by synchronous impedance method (simple problems)	1hr
	MMF method – potier method	1hr
	Necessity and conditions for parallel operation of alternators	1hr
	synchronizing by dark lamp method, bright lamp method, dark - bright lamp method and synchroscope method	2hrs
	synchronizing current, synchronizing power and synchronizing torque –	2hrs
	load sharing of alternators –infinite bus bar	1hr
	OC and SC test of alternator	1hr
III	**THREE PHASE INDUCTION MOTOR**	**12 Hours**
	Rotating magnetic field	1hr
	Principle of operation of three phase induction motors	1hr
	slip and slip frequency – comparison between cage and slip ring induction motors development of phasor diagram	1hr
	expression for torque in synchronous watts – slip-torque characteristics	1hr
	stable and unstable region – no load test and blocked rotor test –	1hr
	development of approximate equivalent circuit	1hr

	problems on the above topics – simplified circle diagram determination of maximum torque, slip (problems not required) – starting torque and starting current expression	1hr
	relationship between starting torque and full load torque speed control of induction motors.	1hr
	Starters of induction motors – direct on line starter and its merits for cage motors	1hr 1hr
	star delta starter- auto transformer starter	1hr
	rotor resistance starter – cogging –crawling in induction motor double cage induction motor-induction generator.	1hr
IV	**A)SINGLE PHASE INDUCTION MOTOR**	**13 Hours**
	single phase induction motors – not self starting – methods of making itself starting	1hr
	construction, working principle – phasor diagram	1hr
	slip torque characteristics- split phase motor –	2hr
	capacitor motor - shaded pole motor	2hr
	repulsion motor – universal motor – operation of three phase motor with single phase supply.	2hr
	B) SYNCHRONOUS MOTOR	
	Principle of operation –not self starting – methods of starting	2hr
	effects of excitation on armature current and power factor– 'V' curve and inverted 'V" curve of synchronous motor	1hr
	the phenomenon of hunting and prevention of hunting by damper winding	1hr
	comparison between synchronous motor and three phase induction motor applications -problems on power factor improvement.	1hr
V	**A)SPECIAL AC MACHINES**	**12 Hours**
	Permanent magnet Synchronous motors – Construction and performance – Advantages – Applications –Synchros –	2hr
	Constructional features	1hr
	Control Transmitter – Control receiver	1hr
	Applications of synchros– A.C. Servo motors	1hr
	Two phase A.C. Servo motor – Linear induction motor. – AC Series Motor	
	B)SPECIAL DC MACHINES	
	Permanent Magnet D.C. Motor	1hr
	Construction–Working principle – Speed control – Advantages – Applications – Servo motors	2hr
	D.C. Servomotors – Stepper motors	2hr
	Variable reluctance stepper motor – Permanent magnet stepper motor. – Brushless DC Motor	2hr

TEXT BOOKS

S.No	Name of the Book	Author	Publisher
1	A Text Book of Electrical Technology Volume II	B.L. Theraja	S.Chand & Co.New Delhi
2	Electrical Technology	Edward Hughes	Addision – Wesley International Student Edition

REFERENCE BOOK

S.No	Name of the Book	Author	Publisher
1	Performance And Design of AC machines	M.G.Say	Pitman Publishing Ltd.
2	Electrical Machines	Nagarath	TMH Publications

WEBSITES

https://www.electrical4u.com/working-principle-of-alternator/

https://www.elprocus.com/synchronous-generator-construction-and-working/

https://www.electrical4u.com/working-principle-of-three-phase-induction-motor/

https://www.electrical4u.com/single-phase-induction-motor/

https://www.electrical4u.com/synchronous-motor-working-principle/

https://circuitglobe.com/ac-motor.html

CONTINUOUS INTERNAL ASSESSMENT

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

i) Attendance	- 5 Marks
ii) Test	- 10 Marks
iii) Assignment	- 5 Marks
iv) Seminar	- 5 Marks

	Total - 25 Marks

CO-POs & PSOs Mapping matrix

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2	PSO3
CO410.1	3	3	3	-	-	-	3	3	-	3
CO410.2	3	3	3	-	-	-	3	3	-	3
CO410.3	3	3	3	-	-	-	3	3	-	3
CO410.4	3	3	3	-	-	-	3	3	-	3
CO410.5	-	-	-	-	-	-	3	3	-	3
Total	12	12	12	-	-	-	15	15	-	15
Correlation level	3	3	3	-	-	-	3	3	-	3

Correlation level 1 – Slight (Low)
Correlation level 2 – Moderate (Medium)
Correlation level 3 – Substantial (High)

QUESTION PAPER SETTING

The teaching learning process and assessment are being carried out in accordance with the revised Bloom's Taxonomy. The question paper should consist of 90% questions based on Lower Order Thinking (LOTs) and the remaining 10% based on Higher Order Thinking (HOTs) as detailed below.

Bloom's Taxonomy	Lower Order Thinking Skills (LOTs)	Higher Order Thinking Skills (HOTs)
Level	R-Remember, U-Understand, Ap-Apply	An-Analyze, E-Evaluate, C-Create
% to be included	90%	10%

ELECTRICAL MACHINES - II

Time : 3 Hrs Max.Marks :75

PART – A (5X 2 =10 MARKS)				
Note : (i) Answer any Five Questions (ii) All questions carry equal marks			Unit	Blooms Level
1		What is hunting in alternator?	I	R
2		Define Slot angle	I	R
3		What is leakage reactance?	II	R
4		What is meant by load characteristics?	II	R
5		Define Slip in induction motor.	III	R
6		Write the expression for synchronous speed of motor.	IV	R
7		Mention the three types of capacitor motor	IV	R
8		What are the types of synchros?	V	R
PART – B (5X3=15 MARKS)				
Note : (i) Answer any Five Questions (ii) All questions carry equal marks			Unit	Blooms Level
9		Derive pitch factor.	I	An
10		What is speed of a 4 pole of alternator of frequency 50Hz?	I	R
11		What is meant by voltage regulation?	II	R
12		What is synchronizing current?	II	R
13		What is use of circle diagram?	III	R
14		Name the types of speed control of three phase induction motor	III	R
15		Draw the ‘V’ curve and inverted ‘V’ curve.	IV	U
16		Mention any three applications of synchronous motor.	V	R

PART –C (5X 10 =50 MARKS)					
Note: (i) Answer all the question choosing sub- division (A) or Sub division (B) of each question. (ii) All questions carry equal marks.			Unit	Blooms Level	Maximum Marks
17	A	Explain the stator and rotor constructional details of salient pole alternator.	I	U	10
		[OR]			
	B	Write any three methods of cooling of alternator.	I	R	10
18	A	Explain the armature reaction in alternator for various power factor loads.	II	U	10
		[OR]			
	B	Explain the synchronizing of alternator by dark lamp method.	II	U	10
19	A	Explain the slip – torque characteristics of three phase induction motor.	III	U	10

		[OR]			
	B	Explain with neat diagram, the operation of auto transformer starter.	III	U	10
20	A	Explain the construction and working principle of shaded pole motor.	IV	U	10
		[OR]			
	B	Explain the principle of operation of synchronous motor.	IV	U	10
21	A	Explain the construction and working principle of AC servo motor.	V	U	10
		[OR]			
	B	Explain the construction and working of permanent magnet stepper motor.	V	U	10

Note: the question paper setters are requested to follow the revised Bloom's Taxonomy levels as presented below:

Bloom's taxonomy level	Lower Order Thinking Skills (LOTs)	Higher Order Thinking Skills (HOTs)
	R-Remember, U-Understand, Ap-Apply	An-Analyse, E-Evaluate, C- Create
% to be included	90%	10%

EEC 420 MEASUREMENTS AND INSTRUMENTS

TEACHING AND SCHEME OF EXAMINATION

No. of weeks per Semester: 15 Weeks

Course	Instructions		Examination			
	Hours / Week	Hours / Semester	Assessment Marks			Duration
			Internal Assessment	Semester End Examination	Total	
MEASUREMENTS AND INSTRUMENTS	5 Hours	75 Hours	25	75	100	3 Hours

TOPICS AND ALLOCATION OF HOURS

UNIT	TOPIC	TIME (Hrs)
I	Classification and Characteristics of Instruments	13
II	Measurement of current Voltage and Resistance	13
III	Measurement of Power and Energy	13
IV	Measurement of Power factor Frequency and Phase Difference	12
V	Measurement of L,C and waveforms	12
	Revision and test	12
	TOTAL	**75**

COURSE DESCRIPTION

Measurement is the basic and primary operation, the result of which is used only to describe the system and hence treated as an independent operation. Automation of any kind begins with the measurement of certain system parameters; In fact, industrial growth moves hand in hand with the growth of the measurement of Science and technology. Therefore it is highly essential for Electrical students to study about the measurement of various electrical parameters in a system and the construction and working of different instruments used in measurement of such parameters.

OBJECTIVES

The students should be able to

- To define basic measurement terms.
- To learn about various operating forces and effects used in instruments.
- To study the construction and working of Moving coil and Moving Iron instruments, CT and PT and electrostatic voltmeter.
- To understand the measurement of resistance using different means.
- To study Single phase and Three phase power measurement using wattmeter.
- To study the construction and working of single phase, three phase energy meter and study about calibration
- To study the construction and working of Power factor meters, and phase sequence indicators.
- To study about the frequency measurement using different types of frequency meters.
- To learn about the measurement of inductance and capacitance using bridges.
- To study about CRO and its applications.

COURSE OUTCOMES:

EEC 420 MEASUREMENTS AND INSTRUMENTS	
After successful completion of this course, the students should be able to	
C420.1	Analyze the performance characteristics of each instrument
C420.2	Illustrate basic meters such as voltmeters and ammeters.
C420.3	Study Single phase and Three phase power measurement using wattmeter.
C420.4	Study the construction and working of Power factor meters, and phase sequence indicators.
C420.5	Recognize the usage of Multimeter and Cathode ray Oscilloscope

EEC 420 MEASUREMENTS AND INSTRUMENTS

DETAILED SYLLABUS

UNIT	NAME OF THE TOPICS	HOURS
I	Classification and Characteristics of Instruments	**13 Hours**
	General - Definition of Measurement –	1hr
	functions of Measurement system (Indicating, Recording and controlling function)	1hr
	Applications of measurement systems	1hr
	classification – Absolute and secondary instruments – Indicating, Recording and Integrating Instruments	1hr
	Analog and Digital	1hr
	Definition of True value, accuracy, precision, error and error correction	1hr
	Instrument efficiency – Effects used in instruments	1hr
	operating forces –Deflecting, controlling and damping forces	1hr
	constructional details of moving system	1hr
	Types of Supports - Balancing – Torque weight ratio control system (spring control and gravity control)	2hrs
	Damping systems – Magnets – pointers and scales.	2hrs
II	**MEASUREMENT OF CURRENT, VOLTAGE AND RESISTANCE**	**13 Hours**
	Types of Instruments – construction, working and torque equation of moving coil, Moving iron, dynamometer type (Shaded pole) Instruments	1hr
	Extension of instrument range using shunts and multipliers. (Calculation, requirements and simple problems).	2hrs
	Tong tester – Electrostatic voltmeter	1hr
	Rectifier type instruments –Instruments transformers CT and PT –	2hrs
	Testing, Errors and characteristics of CT and PT –	
	Classification of Resistance measurement using conventional method – (Ammeter – voltmeter method)	1hr
	Measurement of low resistance using Kelvin's Bridge	1hr
	ohmmeter – measurement of Medium resistance using	1hr
	Wheatstone bridge High resistance using Megger -	2hrs
	Earth resistance- – using Earth tester – Multimeters.	2hrs
III	MEASUREMENT OF POWER AND ENERGY	13 Hours
	Power in D.C and A.C Circuits	2hrs
	watt meters in power measurement	1hr
	Electrodynamometer type and LPF watt meters	1hr
	Three phase power measurement using Three phase wattmeter	2hr
	Reactive power measurement in balanced load.	1hr
	Measurement of Energy in AC circuits	1hr
	Single phase and Three phase energy meters construction and operation	2hrs
	Errors and Error correction -- calibration using RSS meter	2hrs

	Digital Energy meter	1hr
IV	MEASUREMENT OF POWER FACTOR, FREQUENCY AND PHASE DIFFERENCE Power factor meters – single phase and Three phase – Electro dynamometer type construction and working – phase sequence Indicator phase difference measurement using synchroscope Trivector meter Merz price maximum demand Indicator Frequency measurement – Frequency meter Weston type - Digital Frequency meter – (Simplified Block diagram)	12 Hours 2hrs 2hrs 1hr 1hr 1hr 1hr 2hrs 2hrs
V	MEASUREMENT OF L,C AND WAVEFORMS Measurement of Inductance – Maxwell's Inductance bridge Andersons bridge Measurement of capacitance using Schering bridge CRO – Block diagram – CRT – Applications Measurements of voltage, frequency and phase difference using CRO Time base and synchronization Dual trace CRO Digital storage oscilloscope – Block diagram	12 Hours 2hrs 1hr 1hr 2hrs 2hrs 1hr 1hr 2hrs

TEXT BOOKS

S.No	Name of the Book	Author	Publisher
1	A Course in Electrical and Electronics Measurements and Instrumentation	A.K. Sawhney	Puneet Sawhney Dhanpat Rai & Co (P) Ltd., New Delhi 1993

REFERENCE BOOK

S.No	Name of the Book	Author	Publisher
1	Electronic Instrumentation	HS Kalsi	Tata Mc Graw Hill Publishing Co., Delhi
2	Modern Electronic Instrumentation and Measurement techniques	Albert D. Helfrick William David Cooper	Prentice – Hall of India (P) Ltd., New Delhi
3	Electronics and Instrumentation	Dr.S.K.Battachariya Dr. Renu Vig	S.K. Kataria & Sons, New Delhi
4	A course in Electrical and Electronic Measurement and Instrumentation	Umesh Sinha	Satya Prakashan, New Delhi

WEBSITES

https://circuitglobe.com/classification-of-measuring-instruments.html
https://www.electronics-tutorials.ws/dccircuits/dcp_1.html
https://www.electrical4u.com/measurement-of-electrical-energy/
https://www.electronics-tutorials.ws/accircuits/phase-difference.html
https://myclassbook.org › Basic Electronics

CONTINUOUS INTERNAL ASSESSMENT

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

i) Attendance	- 5 Marks
ii) Test	- 10 Marks
iii) Assignment	- 5 Marks
iv) Seminar	- 5 Marks

Total	**- 25 Marks**

CO-POs & PSOs Mapping matrix

CO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PSO1**	**PSO2**	**PSO3**
CO420.1	3	3	1	-	-	-	-	3	3	3
CO420.2	3	3	1	-	2	-	-	3	2	3
CO420.3	3	3	-	1	2	-	-	3	3	2
CO420.4	3	3	2	3	2	-	-	3	3	3
CO420.5	3	3	2	3	2	-	-	3	3	3
Total	15	15	6	7	8	-	-	15	14	14
Correlation level	3	3	1.2	1.4	1.6	-	-	3	2.4	2.4

Correlation level 1 – Slight (Low)
Correlation level 2 – Moderate (Medium)
Correlation level 3 – Substantial (High)

QUESTION PAPER SETTING

The teaching learning process and assessment are being carried out in accordance with the revised Bloom's Taxonomy. The question paper should consist of 90% questions based on Lower Order Thinking (LOTs) and the remaining 10% based on Higher Order Thinking (HOTs) as detailed below.

Bloom's Taxonomy	Lower Order Thinking Skills (LOTs)	Higher Order Thinking Skills (HOTs)
Level	R-Remember, U-Understand, Ap-Apply	An-Analyze, E-Evaluate, C-Create
% to be included	90%	10%

MEASUREMENTS AND INSTRUMENTS

Time : 3 Hrs Max.Marks :75

PART – A (5X 2 =10 MARKS)				
Note : (i) Answer any Five Questions (ii) All questions carry equal marks			Unit	Blooms Level
1		Define Error and Error correction.	I	R
2		State types of supports?	I	R
3		Write the formula to find shunt and multiplier resistance.	II	R
4		What are the two types of moving coil instruments?	II	R
5		Define energy. Write a formula of energy.	III	R
6		List the different types of wattmeter.	III	R
7		What is frequency meter.	IV	R
8		Name the fluorescent materials used in CRO screen.	V	R
PART – B (5X3=15 MARKS)				
Note : (i) Answer any Five Questions (ii) All questions carry equal marks			Unit	Blooms Level
9		What are the advantages of digital instruments?	I	R
10		Explain Torque – weight ratio.	I	U
11		Why moving iron instruments are used for both AC & DC?	II	R
12		What are the requirements of multiplier?	II	R
13		Draw the circuit diagram of two elements 3ϕ wattmeter.	III	U
14		Write short notes on creep. How it is prevented?	III	R
15		What are the types of frequency meter?	IV	R
16		Draw the circuit diagram of Schering bridge.	V	U

PART –C (5X 10 =50 MARKS)					
Note: (i) Answer all the question choosing sub- division (A) or Sub division (B) of each question. (ii) All questions carry equal marks.			Unit	Blooms Level	Maximum Marks
17	A	Mention the various operating forces of measuring instruments.	I	R	10
		[OR]			
	B	Explain with neat sketches the various types of supports used in indicating instruments.	I	U	10
18	A	Explain with neat sketch, construction and working of PMMC meter.	II	U	10
		[OR]			
	B	Explain the construction and working of Megger with neat sketch.	II	U	10
19	A	Explain the construction and working of 3 phase Watt meter with neat sketch.	III	U	10
		[OR]			

	B	(i) What are errors and the adjustment procedures in energy meters? (ii) Draw the diagram only of 3 – phase energy meter.	III	R/U	10
20	A	Explain the working of Trivector meter with sketch.	IV	U	10
		[OR]			
	B	Explain the working of single – phase dynamometer power factor meter with suitable sketch.	IV	U	10
21	A	(i) Explain Schering bridge method to find unknown capacitance in a circuit. (ii) State the applications of digital storage oscilloscope.	V	U/R	10
		[OR]			
	B	Draw and explain the block diagram of a general purpose CRO.	V	U	10

Note: the question paper setters are requested to follow the revised Bloom's Taxonomy levels as presented below:

Bloom's taxonomy level	Lower Order Thinking Skills (LOTs)	Higher Order Thinking Skills (HOTs)
	R-Remember, U-Understand, Ap-Apply	An-Analyse, E-Evaluate, C- Create
% to be included	90%	10%

EEC 430 DIGITAL ELECTRONICS

TEACHING AND SCHEME OF EXAMINATION

No. of weeks per Semester: 15 Weeks

Course	Instructions		Examination			
	Hours / Week	Hours / Semester	Assessment Marks			Duration
			Internal Assessment	Semester End Examination	Total	
DIGITAL ELECTRONICS	5 Hours	75 Hours	25	75	100	3 Hours

TOPICS AND ALLOCATION OF HOURS

UNIT	TOPIC	TIME (Hrs)
I	Number System, Boolean Algebra, Logic Gates and Digital Logic Families	13
II	Combinational Logic	13
III	Sequential Logic	13
IV	Memory Devices	12
V	Microprocessor – 8085	12
	Revision and test	12
	TOTAL	75

COURSE DESCRIPTION

The subject of Digital Electronics holds applications in all branches of engineering. This subject will impart in depth knowledge of Number systems, Logics of Combinational & Sequential circuits and also about various & recent Memory devices and microprocessor. The concept of Digital Electronics will be implemented in all processor.

COURSE OUTCOMES:

EEC 430 DIGITAL ELECTRONICS	
After successful completion of this course, the students should be able to	
C430.1	Explain Number systems, Codes
C430.2	Analyse different Combinational logic circuits.
C430.3	Illustrate various Sequential logic circuits.
C430.4	Classify different types of memories.
C430.5	Analyse the evolution of microprocessor

EEC 430 DIGITAL ELECTRONICS

DETAILED SYLLABUS

UNIT - I

NUMBER SYSTEM AND BOOLEAN ALGEBRA **[13 Hrs]**

Binary, Octal, Decimal, Hexadecimal - Conversion from one to another. [2 Hrs]

Binary codes – BCD code, Gray code, Excess 3code.Boolean Algebra [1 Hr]

Boolean postulates and laws. De-Morgan's theorem [1 Hr]

Simplification of Boolean expressions using Karnaugh map (up to 4 variables-pairs, quad, octets) - Don't care conditions and constructing the logic circuits for the Boolean expressions [2 Hrs]

Principle of duality [1 Hr]

LOGIC GATES AND DIGITAL LOGIC FAMILIES:

Gates – AND, OR, NOT, NAND, NOR, EX-OR, EX-NOR [1 Hr]

Implementation of logic functions using gates, Realization of gates using universal gates. [2 Hrs]

Simplification of expression using Boolean techniques, Boolean expression for outputs [1 Hr]

Digital logic families - Fan in, Fan out, Propagation delay ,TTL CMOS Logics and their characteristics - comparison and applications [2 Hrs]

Tristate logic

UNIT -II

COMBINATIONAL CIRCUITS **[13 Hrs]**

Arithmetic circuits - Binary – Addition, subtraction, 1's and 2's complement. Signed binary numbers. [2 Hrs]

Half Adder and Full Adder [2 Hrs]

Half Subtractor and Full Subtractor. [2 Hrs]

Parallel and serial Adders- BCD adder.

Encoder, Decoder [1 Hr]

3to 8 decoder, BCD to seven segment decoder [2 Hrs]

Multiplexer - basic 2 to 1 MUX, 4 to 1 MUX, 8 to 1 MUX – applications of the MUX – Demultiplexer - 1 to 2 demultiplexer, 1 to 4 demultiplexer, 1 to8 demultiplexer - Parity Checker and generator. [2 Hrs]

Magnitude comparator [2 Hrs]

UNIT- III

SEQUENTIAL CIRCUITS **[13 Hrs]**

FLIP -FLOPS – SR, JK, T, D FF	[2 Hrs]
JK- MS FF, Triggering of FF – edge & level	[1 Hr]
Counters – 4 bit Up - Down Asynchronous / ripple counter,	
Decade counter	[1 Hr]
Mod3, Mod7 counter, 4 bit Synchronous Up – Down counter	[2 Hrs]
Johnson counter, Ring counter	
Design of synchronous counters – state diagram, state table,	[2 Hrs]
State assignment, circuit implementation	

REGISTERS

4-bit shift register- Serial IN Serial OUT	[2 Hrs]
Serial IN parallel OUT	[1 Hr]
Parallel IN Serial OUT	
Parallel IN Parallel OUT	[2 Hrs]

UNIT-IV

MEMORY DEVICES **[12 Hrs]**

Classification of memories, RAM organization - Address Lines and	[3 Hrs]
Memory Size, Read/write operations	
Static RAM - Bipolar RAM cell, Dynamic RAM	[2 Hrs]
SD RAM, DDR RAM. Read only memory – ROM organization	[2 Hrs]
Expanding memory, PROM	[2 Hrs]
EPROM, and EEPROM	[2 Hrs]
Flash memory, Anti Fuse Technologies	[1 Hr]
Memory cycle, timing waveforms, memory decoding, memory expansion	

UNIT -V

MICROPROCESSOR – 8085 **[12 Hrs]**

Evolution of microprocessor 8085 – Architecture of 8085	[2 Hrs]
Pin diagram of microprocessor 8085	[2 Hrs]
Instruction sets	
Addressing modes	[2 Hrs]
Memory mapped I/O and I/O mapped I/O and its Comparison	[1 Hr]
Machine cycle – Opcode fetch, memory read, memory write	[1 Hr]
I/O read, I/O write	[1 Hr]
Instruction cycle (Timing diagram) for MOV r1, r2 instructions	[2 Hrs]
Interrupts (types & Priorities)	[1 Hr]

TEXT BOOKS

S.No	Name of the Book	Author	Publisher
1	Principles of Digital Electronics	K.Meena	PHI – 2011
2	Modern Digital Electronics	R.P.Jains	TMH -2003
3	Microprocessor architecture programming and application	Ramesh S. Gaonkar	Wiley Eastern Limited. 2rd Edition 2002

REFERENCE BOOK

S.No	Name of the Book	Author	Publisher
1	Digital principles & Applications	Albert Paul Malvino & Donald P.Leach	TMH - 4th Edition 2002
2	Digital Electronics	William H.Gothmann	prentice Hall of India – 2nd Edition, 1995
3	Introduction to Microprocessor	Aditya P Mathur	Tata McGraw-Hil publishing Company Limited 1989
4	Digital Electronics	Roger L.Tokheim Macmillan	McGraw hill -1994
	Digital Electronics- an introduction to theory and practice	William H.Gothmann	PHI 1998

WEBSITES

https://www.tutorialspoint.com/computer_logical.../digital_number_system.html

https://www.tutorialspoint.com/computer_logical.../combinational_circuits.html

https://www.tutorialspoint.com/computer_logical.../sequential_circuits.html

https://www.tutorialspoint.com/computer_logical_organization/memory_devices.html

https://www.tutorialspoint.com/microprocessor/microprocessor_8085_architecture.html

CONTINUOUS INTERNAL ASSESSMENT

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

i) Attendance	- 5 Marks
ii) Test	- 10 Marks
iii) Assignment	- 5 Marks
iv) Seminar	- 5 Marks

Total	**- 25 Marks**

CO-POs & PSOs Mapping matrix

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2	PSO3
CO430.1	3	3	3	-	-	-	3	3	3	3
CO430.2	3	3	3	-	-	-	3	3	3	3
CO430.3	3	3	3	-	-	-	3	3	3	3
CO430.4	3	3	3	-	-	-	3	3	3	3
CO430.5	-	-	-	-	-	-	3	3	3	3
Total	12	12	12	-	-	-	15	15	15	15
Correlation level	3	3	3	-	-	-	3	3	3	3

Correlation level 1 – Slight (Low)
Correlation level 2 – Moderate (Medium)
Correlation level 3 – Substantial (High)

QUESTION PAPER SETTING

The teaching learning process and assessment are being carried out in accordance with the revised Bloom's Taxonomy. The question paper should consist of 90% questions based on Lower Order Thinking (LOTs) and the remaining 10% based on Higher Order Thinking (HOTs) as detailed below.

Bloom's Taxonomy	Lower Order Thinking Skills (LOTs)	Higher Order Thinking Skills (HOTs)
Level	R-Remember, U-Understand, Ap-Apply	An-Analyze, E-Evaluate, C-Create
% to be included	90%	10%

DIGITAL ELECTRONICS

Time : 3 Hrs Max.Marks :75

PART – A (5X 2 =10 MARKS)				
Note : (i) Answer any Five Questions (ii) All questions carry equal marks			Unit	Blooms Level
1		Convert the hexadecimal number A9.B2 to its equivalent decimal number.	I	U
2		Define fan-in and fan-out.	I	R
3		Define parallel addition.	II	R
4		State the applications of multiplexer.	II	R
5		Define serial-in and parallel out modes of operation of shift resister.	III	R
6		Define synchronous and asynchronous counters.	III	R
7		Define flash memory.	IV	R
8		What are the types of instruction sets	V	R
PART – B (5X3=15 MARKS)				
Note : (i) Answer any Five Questions (ii) All questions carry equal marks			Unit	Blooms Level
9		Explain Gray code.	I	U
10		Explain redundant groups.	I	U
11		Explain 1 to 2 demultiplexer.	II	U
12		Explain half subtractor.	II	U
13		Explain JK flip flop.	III	U
14		Explain Johnson counter.	III	U
15		State the difference between PROM, EPROM and EEPROM.	IV	R
16		Explain the machine cycles used in 8085	V	U

PART –C (5X 10 =50 MARKS)					
Note: (i) Answer all the question choosing sub- division (A) or Sub division (B) of each question. (ii) All questions carry equal marks.			Unit	Blooms Level	Maximum Marks
17	A	Explain CMOS logic with diagram and mention its advantages and disadvantages.	I	U	10
		[OR]			
	B	Simplify the following function using K map and Simulate its output by using basic gates. F=∑ (0,2,4,6,8,10,12,14)	I	AN	10
18	A	i) Explain BCD adder with diagram. (ii) With the diagram explain full subtractor.	II	U	10
		[OR]			
	B	(i) Explain 3 to 8 decoder. (ii) Explain parity generator.	II	U	10
19	A	With the logic diagram explain the operation of 4 bit ripple up-down counter.	III	U	10

		[OR]			
	B	(i) Explain JKMS flip flop. (ii) Explain decade counter.	III	U	10
20	A	(i) Explain ROM organization. (ii) Explain DDR RAM.	IV	U	10
		[OR]			
	B	Explain PROM- EPROM- and EEPROM	IV	U	10
21	A	Draw and explain the architecture of 8085 microprocessor.	V	U	10
		[OR]			
	B	Explain the various types of data transfer instructions used in 8085.	V	U	10

Note: the question paper setters are requested to follow the revised Bloom's Taxonomy levels as presented below:

Bloom's taxonomy level	Lower Order Thinking Skills (LOTs)	Higher Order Thinking Skills (HOTs)
	R-Remember, U-Understand, Ap-Apply	An-Analyse, E-Evaluate, C- Create
% to be included	90%	10%

EEC 440 TRANSDUCER AND SIGNAL CONDITIONERS

TEACHING AND SCHEME OF EXAMINATION

No. of weeks per Semester: 15 Weeks

Course	Instructions		Examination			
	Hours / Week	Hours / Semester	Assessment Marks			Duration
			Internal Assessment	Semester End Examination	Total	
TRANSDUCERS AND SIGNAL CONDITIONERS	4 Hours	60 Hours	25	75	100	3 Hours

TOPICS AND ALLOCATION OF HOURS

UNIT	TOPIC	TIME (Hrs)
I	Classification and Sensing elements	9
II	Passive Transducers	9
III	Active Transducers	9
IV	Operational amplifiers	11
V	Signal Conditioners in Industrial Instrumentation	10
	Revision and test	12
	TOTAL	**60**

COURSE DESCRIPTION

Sensors and transducers are used in automation in construction, domestic appliances industries, transport, space exploration, defense equipment, health services and other applications. Transducers have achieved substantial accuracy and control in Industrial automation; Transducers lie at the heart of instrumentation. Hence it becomes imperative to study about the principles and applications of various types of transducers in a single volume in Diploma level.

OBJECTIVES

The students should be able to

- To understand the necessity and advantages of transducer.
- To learn about different types of transducers.
- To study the principle of working of resistive type passive transducers and it's applications.
- To learn the operation and applications of capacitive and inductive transducer.
- To learn about various active transducers and their applications.
- To understand the concept of Digital encoding transducers.
- To know the concept of signal conditioning using op.amp
- To study the characteristics and various applications of op.amp.
- To understand the use of signal conditioners in Instrumentation.
- To learn about the selected applications of op.amp in Industrial Instrumentation.

COURSE OUTCOMES:

EEC 440 TRANSDUCER AND SIGNAL CONDITIONERS	
After successful completion of this course, the students should be able to	
C440.1	Understand the necessity and advantages of transducer.
C440.2	Understand the principle of working of resistive type passive transducers and its applications.
C440.3	Learn about various active transducers and their applications.
C440.4	Learn about the selected applications of op.amp in Industrial Instrumentation.
C440.5	Understand the use of signal conditioners in Instrumentation.

EEC 440 TRANSDUCERS AND SIGNAL CONDITIONERS

DETAILED SYLLABUS

UNIT	NAME OF THE TOPICS	HOURS
I	**CLASSIFICATION AND SENSING ELEMENTS**	**9 Hours**
	General – Definition - Necessity	1hr
	Types - classification based on the principle of operation	1hr
	Active and passive – Primary and Secondary	1hr
	Examples in each - Advantages	1hr
	Primary sensing elements	1hr
	Bourdon tubes. Bellows – Load cells	1hr
	Thermistors –Types	1hr
	construction and operation of Metal Resistance thermometer	1hr
	Digital encoding transducer	1hr
II	**PASSIVE TRANSDUCERS**	**9 Hours**
	Resistive Transducer	1hr
	Strain Gauge	1hr
	construction and working of Strain gauge	1hr
	Strain gauge in measurement of displacement	1hr
	Capacitive transducer and its applications	1hr
	Liquid level measurement using capacitive transducers	1hr
	Inductive transducer - Basic structure	1hr
	proximity sensor - Measurement of pressure using inductive transducer	1hr
	Construction and operation of LVDT, RVDT.	1hr
III	**ACTIVE TRANSDUCERS**	**9 Hours**
	Thermocouple - construction and principle	1hr
	Measurement of angular velocity using Tachogenerator	1hr
	Piezoelectric transducers	1hr
	principle - measurement of pressure and vibrations	2hrs
	Hall effect Transducer	1hr
	photo voltaic transducers (solar cell)	2hrs
	photo Conductive transducer Measurement of radiation using Geiger Muller tube.	1hr
IV	**OPERATIONAL AMPLIFIERS**	**11 Hours**
	Block diagram - DC, AC signal conditioning	1hr
	operational amplifiers IC 741 – Pin details – Important terms	1hr
	characteristics of Ideal op amp	1hr
	inverting and Non inverting mode	1hr
	Gain – Applications of op. amps	1hr
	Adders, Subtractor, Scale charger	1hr
	integrator, Differentiator,	1hr
	Voltage to current converter	1hr
	current to voltage converters - Differential amplifiers	2hrs
	Comparators (inverting and non- inverting).	1hr

	SIGNAL CONDITIONERS IN INDUSTRIAL INSTRUMENTATION	**10 Hours**
	Operational amplifier with capacitive transducer	1hr
	Operational amplifier as Instrumentation amplifiers	1hr
	Bridge amplifier	1hr
	active filters using op.amp	1hr
V	LPF, HPF	1hr
	LPF as integrator	1hr
	HPF as differentiator	1hr
	Clipper, Clamper using op.amp. Successive approximation ADC	1hr
	R - 2R ladder network DAC	1hr
	wein bridge oscillator using op.amp - op. amp as Zero crossing Detector	1hr

TEXT BOOKS

S.No	Name of the Book	Author	Publisher
1	Transducers and Instrumentation	DVS Murty	PHI 2009

REFERENCE BOOK

S.No	Name of the Book	Author	Publisher
1	Sensor and Transducers	D. Patranabis	PHI 2011
2	A Course in Electrical and Electronics Measurements and Instrumentation.	1.A.K. Sawhney 2.Puneet Sawhney	Dhanpat Rai & Co (P) Ltd., New Delhi 1993
3	Measurement and Instrumentation	Arun. K	PHI 2010
4	Operational Amplifiers and Linear Integrated Circuits	1.Robert F. Coughlin 2.Frederick F. Driscoll	PHI 1992
5	Op. amp & Linear Integrated Circuits	Ramakant. A. Gayakwad	PHI 1992

WEBSITES

https://www.globalspec.com/reference/75971/.../chapter-6-classification-of-sensors
https://circuitglobe.com/difference-between-active-and-passive-transducer.html
https://www.tutorialspoint.com/.../electronic_measuring_instruments_active_transduce.
https://www.electronics-tutorials.ws/opamp/opamp_1.html
https://nptel.ac.in/courses/108105064/40

CONTINUOUS INTERNAL ASSESSMENT

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

i) Attendance	- 5 Marks
ii) Test	- 10 Marks
iii) Assignment	- 5 Marks
iv) Seminar	- 5 Marks

Total	**- 25 Marks**

CO-POs & PSOs Mapping matrix

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2	PSO3
CO440.1	3	-	-	3	3	-	3	3	-	3
CO440.2	3	-	-	3	3	-	3	3	-	3
CO440.3	3	-	-	3	3	-	3	3	-	3
CO440.4	3	-	-	3	3	-	3	3	-	3
CO440.5	3	-	-	3	3	-	3	3	-	3
Total	15	-	-	15	15	-	15	15	-	15
Correlation level	3	-	-	3	3	-	3	3	-	3

Correlation level 1 – Slight (Low)
Correlation level 2 – Moderate (Medium)
Correlation level 3 – Substantial (High)

QUESTION PAPER SETTING

The teaching learning process and assessment are being carried out in accordance with the revised Bloom's Taxonomy. The question paper should consist of 90% questions based on Lower Order Thinking (LOTs) and the remaining 10% based on Higher Order Thinking (HOTs) as detailed below.

Bloom's Taxonomy	Lower Order Thinking Skills (LOTs)	Higher Order Thinking Skills (HOTs)
Level	R-Remember, U-Understand, Ap-Apply	An-Analyze, E-Evaluate, C-Create
% to be included	90%	10%

TRANSDUCERS AND SIGNAL CONDITIONERS

Time : 3 Hrs Max.Marks :75

PART – A (5X 2 =10 MARKS)				
Note : (i) Answer any Five Questions (ii) All questions carry equal marks			Unit	Blooms Level
1		Define passive transducer and give examples.	I	R
2		Define themistor and mention its types.	I	R
3		Mention the application of proximity sensor.	II	R
4		What is thermocouple? and state its advantage.	III	R
5		What do you mean piezoelectric transducer?	III	R
6		Define signal conditioning.	IV	R
7		Define comparator and mention its uses	IV	R
8		Define clipper and clamper.	V	R
PART – B (5X3=15 MARKS)				
Note : (i) Answer any Five Questions (ii) All questions carry equal marks			Unit	Blooms Level
9		Define transducer and mentions its necessity.	I	R
10		Explain primary and secondary transducers.	I	U
11		Explain semiconductor strain gauge.	II	U
12		State the difference between LVDT and RVDT.	II	R
13		Draw the structure of photovoltaic cell and mention its parts.	III	U
14		Explain about Hall effect transducer.	III	U
15		Explain about scale changer.	IV	U
16		Explain zero crossing detector using op –amp with diagram.	V	U

PART –C (5X 10 =50 MARKS)					
Note: (i) Answer all the question choosing sub- division (A) or Sub division (B) of each question. (ii) All questions carry equal marks.			Unit	Blooms Level	Maximum Marks
17	A	Explain with necessary diagram. (i) Digital encoding Transducer (ii) Metal Resistance Thermometer.	I	U	10
		[OR]			
	B	Explain with necessary diagram. (i) Bellows (ii) Bourdon tubes.	I	U	10
18	A	Explain the operation of LVDT with neat sketch.	II	U	10
		[OR]			
	B	With the diagram explain the various types of capacitive transducer for measuring liquid level.	II	U	10
19	A	Explain the construction and working of Geiger Muller Tube.	III	U	10

		[OR]			
	B	With neat sketch explain the operation of angular velocity measurement using tachogenerator.	III	U	10
20	A	Explain inverting amplifier with necessary diagram and derivation.	IV	U	10
		[OR]			
	B	With the block diagram explain DC signal conditioning system.	IV	U	10
21	A	With a neat sketch explain the operation of instrumentation amplifier using op-amp.	V	U	10
		[OR]			
	B	Explain about successive approximation ADC..	V	U	10

Note: the question paper setters are requested to follow the revised Bloom's Taxonomy levels as presented below:

Bloom's taxonomy level	Lower Order Thinking Skills (LOTs)	Higher Order Thinking Skills (HOTs)
	R-Remember, U-Understand, Ap-Apply	An-Analyse, E-Evaluate, C- Create
% to be included	90%	10%

EEC 450 ELECTRICAL MACHINES AND INSTRUMENTATION PRACTICAL

TEACHING AND SCHEME OF EXAMINATION

No. of weeks per Semester: 15 Weeks

Course	Instructions		Examination			
	Hours / Week	Hours / Semester	Assessment Marks			Duration
			Internal Assessment	Semester End Examination	Total	
ELECTRICAL MACHINES AND INSTRUMENTATION PRACTICAL	5 Hours	75 Hours	25	75	100	3 Hours

COURSE DESCRIPTION

To impart practical knowledge to the diploma students, practical subjects are introduced for every corresponding theory subject. This practical supports the aim and objective of Electrical Machines II and Measurements and Instrumentation subjects.

OBJECTIVES

On completion of this practical subject, the students will be able to

- Understand the characteristics of AC machines.
- Make various electrical measurements.
- Use transducers in non electrical quantity measurement

COURSE OUTCOMES:

EEC 450 ELECTRICAL MACHINES AND INSTRUMENTATION PRACTICAL	
After successful completion of this course, the students should be able to	
C450.1	Identify the physical components of transformer, 3 Ph Induction motor, synchronous motor, 1 ph Induction motors and AC motor starters.
C450.2	Identify the physical parts of the AC machines and Alternator.
C450.3	Conduct suitable experiments to draw and interpret the performance characteristics of AC Machines.
C450.4	Understand the characteristics of AC machines.
C450.5	Use transducers in non electrical quantity measurement

EQUIPMENTS REQUIRED

S.NO	LIST OF EQUIPMENTS	QUANTITY REQUIRED
1.	Three Phase Squirrel cage Induction motor 5 HP, 440V,1440 rpm with starting and loading arrangement	2
2.	Three Phase Squirrel cage Induction motor 5 HP,440V,1440 rpm without starting and loading arrangement	1
3.	Three phase Slip ring Induction motor 5HP, 440V, 940/1450 rpm with starting and loading arrangement	1
4.	Single phase induction motor with staring and loading arrangement 2HP, 250V, 10A, 1440 rpm.	1
5.	Wheatstone bridge.	2
6.	Anderson Bridge.	2
7.	Schering Bridge.	2
8.	1 Phase Energy meter induction type, 250V, 10A.	2
9.	3 Phase Energy meter Induction type 440V, 10/20A.	2
10.	Earth megger with necessary connecting leads and rods.	1
11.	3 phase Alternator with prime mover.	2
12.	Synchronizing panel.	1
13.	PF meter (power factor meter).	2
14.	LVDT trainer.	2
15.	3 phase capacitor bank rating of 1KVAR, 400/440 V.	1

EEC 450 ELECTRICAL MACHINES INSTRUMENTATION PRACTICAL

Si.No	List of Experiments	Course Outcome
1	Predetermine the regulation of alternator.	C450.1
2	Load test on 3 phase alternator.	C450.3
3	Synchronisation of 3Φ alternators.	C450.3
4	Load test on 1 phase induction motor.	C450.3
5	Load test on 3 phase induction motor.	C450.3
6	Determine the equivalent circuit constants of 3 phase induction motor.	C450.3
7	Predetermine the performance of a 3 phase induction motor.	C450.3
8	Improvement of power factor of an induction motor with load.	C450.3
9	Calibration of given ammeter and voltmeter.	C450.5
10	Calibration of given wattmeter.	C450.5
11	Calibration of 3 phase energy meter.	C450.5
12	Measurement of alternator winding resistance using Wheatstone bridge	C450.5
13	Measurement of value of unknown capacitance using Schering Bridge.	C450.5
14	Measurement of value of unknown inductance using Anderson Bridge.	C450.5
15	Displacement measurement using LVDT.	C450.5
16	Measurement of earth resistance by using megger.	C450.5
17	Circle diagram of 3 phase induction motor.	C450.5

Continuous Internal Assessment

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

a) Attendance : 5 marks – (Award of marks same as theory subjects)

b) Procedure/ observation and tabulation/ Other Practical related work : 10 marks

c) Record writing : 10 marks

Total 25 marks

LEARNING WEBSITES

http://www.directindustry.com/industrial-manufacturer/three-phase-alternator-81713.html
https://www.electrical4u.com/induction-motor-types-of-induction-motor/
https://www.brighthubengineering.com/hvac/50002-calibration-of-the-measuring-instruments/
https://www.emerson.com/en-in/automation/measurement-instrumentation

CO-POs & PSOs Mapping matrix

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2	PSO3
CO450.1	3	3	3	3	-	-	3	3	3	3
CO450.2	3	3	3	3	-	-	3	3	3	3
CO450.3	3	3	3	3	-	-	3	3	3	3
CO450.4	3	3	3	3	-	-	3	3	3	3
CO450.5	3	3	3	3	-	-	3	3	3	3
Total	15	15	15	15	-	-	15	15	15	15
Correlation level	3	3	3	3	-	-	3	3	3	3

Correlation level 1 – Slight (Low)
Correlation level 2 – Moderate (Medium)
Correlation level 3 – Substantial (High)

EEC 460 INTEGRATED CIRCUITS PRACTICAL

TEACHING AND SCHEME OF EXAMINATION

No. of weeks per Semester: 15 Weeks

Course	Instructions		Examination			
	Hours / Week	Hours / Semester	Assessment Marks			Duration
			Internal Assessment	Semester End Examination	Total	
INTEGRATED CIRCUITS PRACTICAL	5 Hours	75 Hours	25	75	100	3 Hours

COURSE DESCRIPTION

Today Integrated circuits has developed to a great extent that there is always the need for study of various communication concepts. This lab fulfills the need for students to have a thorough knowledge of various types of Integrated circuits, Op-amp and applications of Op-amp, PLL, DAC, ADC and Timers circuits

OBJECTIVES

On completion of this practical subject, the students will be able to

- To discuss above ICS and their advantages
- To study basic op amp and its characteristics
- To understand linear circuits using op amp
- To teach linear applications of op amp
- To know about PLL & its applications
- To teach the theory of DAC and its types
- To teach the theory of ADC and its types
- To introduce special function IC – 555 timer
- To study about applications of IC 555
- To learn about fixed IC voltage regulators
- To understand adjustable voltage regulator using IC
- To discuss about general purpose regulator using IC

COURSE OUTCOMES:

EEC 460 INTEGRATED CIRCUITS PRACTICAL	
After successful completion of this course, the students should be able to	
C460.1	Learn about the linear IC's like 723, 555 timer.
C460.2	Test the working of Logic gates, flip flop, Counters, MUX and DeMUX.
C460.3	Analyze sequential circuit and can apply the knowledge of flip flops for designing
C460.4	Understand linear circuits using op amp
C460.5	Learn about the linear IC's like 78**, 79**

EQUIPMENTS REQUIRED:

S.No	Name of the Equipments	Range	Required Nos
1.	IC Tranier Kit	-	06
2.	Function Generator	-	02
3.	Power Supply	(0-30V)	02
4.	CRO	20MHZ	02

EEC 460 INTEGRATED CIRCUITS PRACTICAL

List of Experiments

Sl.No	List of Experiments	Course Outcome
1	Verification of truth table of OR, AND, NOT, NOR, NAND, EX-OR gates.	C460.1
2	Realization of basic gates using NAND & NOR gates.	C460.2
3	Realization of logic circuit for a given Boolean expression.	C460.2
4	Half adder using IC's.	C460.1
5	Full adder using IC's.	C460.1
6	Half subtractor using IC's.	C460.1
7	Full subtractor using IC's.	C460.1
8	Construction and verification of truth table for Decoder/Encoder.	C460.1
9	Multiplexer using multiplexer IC's.	C460.2
10	De-multiplexer using multiplexer IC's.	C460.2
11	Parity generator and checker using parity checker/ generator IC's.	C460.2
12	Construction and verification of truth table for RS, D, T & JK, flip-flop.	C460.3
13	4- bit ripple counter using FF	C460.3
14	Construct a Single digit Decade Counter with 7 segment display.	C460.1
15	Astable multivibrator using IC 555.	C460.1
16	DAC using R-2R network	C460.2
17	Construction of simple power supply using IC 78XX.	C460.2

Continuous Internal Assessment

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

a) Attendance : 5 marks – (Award of marks same as theory subjects)

b) Procedure/ observation and tabulation/ Other Practical related work : 10 marks

c) Record writing : 10 marks

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Total 25 marks

LEARNING WEBSITES

https://medium.com/i-math/intro-to-truth-tables-boolean-algebra-73b331dd9b94
https://www.tutorialspoint.com/computer_logical_organization/logic_gates
https://www.elprocus.com/half-adder-and-full-adder/
https://www.elprocus.com/half-subtractor-circuit-construction-using-logic-gates/
https://electronicsforu.com/resources/learn-electronics/flip-flop-rs-jk-t-d

CO-POs & PSOs Mapping matrix

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2	PSO3
CO460.1	3	-	-	3	3	-	3	3	3	3
CO460.2	3	-	-	3	3	-	3	3	3	3
CO460.3	3	-	-	3	3	-	3	3	3	3
CO460.4	3	-	-	3	3	-	3	3	3	3
CO460.5	3	-	-	3	3	-	3	3	3	3
Total	15	-	-	15	15	-	15	15	15	15
Correlation level	3	-	-	3	3	-	3	3	3	3

Correlation level 1 – Slight (Low)
Correlation level 2 – Moderate (Medium)
Correlation level 3 – Substantial (High)

EEC 470 LIFE AND EMPLOYABILITY SKILLS PRACTICAL

TEACHING AND SCHEME OF EXAMINATION

No. of weeks per Semester: 15 Weeks

Course	Instructions		Examination			
	Hours / Week	Hours / Semester	Assessment Marks			Duration
			Internal Assessment	Semester End Examination	Total	
LIFE AND EMPLOYABILITY SKILLS PRACTICAL	4 Hours	60 Hours	25	75	100	3 Hours

COURSE DESCRIPTION

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 scope 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.

OBJECTIVES

On completion of this practical subject, the students will be able to

- Emphasize and Enhance Speaking Skills
- Increase Ability to Express Views & Opinions
- Develop and Enhance Employability Skills
- Induce Entrepreneurship and Plan for the Future
- Expose & Induce Life Skills for Effective Managerial Ability
- To understand adjustable voltage regulator using IC
- To discuss about general purpose regulator using IC

COURSE OUTCOMES:

EEC 470 LIFE AND EMPLOYABILITY SKILLS PRACTICAL	
After successful completion of this course, the students should be able to	
C470.1	Emphasize and Enhance Speaking Skills
C470.2	Increase Ability to Express Views & Opinions
C470.3	Develop and Enhance Employability Skills
C470.4	Induce Entrepreneurship and Plan for the Future
C470.5	Expose & Induce Life Skills for Effective Managerial Ability

LABORATORY REQUIREMENT:

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

EEC 470 LIFE AND EMPLOYABILITY SKILLS PRACTICAL

S.NO	SECTION	SKILLS TO BE ACQUIRED	ACTIVITY	NO. OF HOURS	COURSE OUTCOME
1	**Part – A** LISTENING ACTIVITY TOPICS: Global Warming, Pollution, Environment	➢ Deductive / Reasoning Skills ➢ Cognitive Skills ➢ Retention Skills	• Taking down notes / hints • Answering questions • Fill in the blanks the exact words heard	04 04 04	C470.1
2	**Part – B** SPEAKING ACTIVITY TOPICS: Communication; Behavioral Skills; Productivity – Comparison with developed countries; Occupational Safety, Health Hazard; Accident & Safety, First-Aid;	➢ Personality/ Psychological Skills ➢ Pleasing & Amiable Skills ➢ Assertive Skills ➢ Expressive Skills ➢ Fluency/Compatibility Skills ➢ Leadership/Team Spirit Skills	• Instant sentence Making • Say Expressions / phrases • Self- Introduction / another higher official in company • Describe/explain products • Dialogues on technical grounds • Discuss & interact • Group Discussion	02 02 04 06 06 08	C470.1

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 questions based on patterns • Make sentences based on patterns • Prepare a resume • Prepare an outline of a project to obtain loan from bank in becoming an entrepreneur	02 02 02 02	C470.3
4	**Part – D** GOOGLE SEARCH AND PRESENTATION in Record Note (for Continuous Assessment as Assignments on any five topics) TOPICS: Productivity; Quality Tools, Quality Circles, Quality Consciousness; Labour Welfare Legislation, Labour Welfare Acts; Gender Sensitisation (a.Important Constitutional & Legal Provisions for Women In India, b. Harassment of Women at Workplace (Prevention & Prohibition & Redressal) Act 2013, c. Guidelines & Norms laid down by Hon'ble Supreme Court in Vishaka And Others, d. National Commission for Protection of Child Rights (NCPCR), e. Protection of Children from Sexual Offences (POCSO) Act & Rule 6 of POCSO Rules, 2012.	➢ Cognitive Skills ➢ Presentation Skills & Interactive Skills	• Search in the website • Prepare a presentation • Discuss & interact • Record as assignment	12	C470.5

Continuous Internal Assessment

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

a) Attendance : 5 marks – (Award of marks same as theory subjects)

b) Procedure/ observation and tabulation/ Other Practical related work : 10 marks

c) Record writing : 10 marks

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Total 25 marks

LEARNING WEBSITES

https://www.wikijob.co.uk/content/interview-advice/competencies/communication
https://corporatefinanceinstitute.com/resources/careers/soft-skills/communication/
https://www.mindtools.com/pages/article/newCS_99.htm
https://www.skillsyouneed.com/ips/communication-skills.html
https://www.indeed.co.in/career-advice/resumes-cover-letters/communication-skills

CO-POs & PSOs Mapping matrix

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2	PSO3
CO470.1	-	-	-	-	3	-	3	-	-	-
CO470.2	-	-	-	-	3	-	3	-	-	-
CO470.3	-	-	-	-	3	-	3	-	-	-
CO470.4	-	-	-	-	3	-	3	-	-	-
CO470.5	-	-	-	-	3	-	3	-	-	-
Total	-	-	-	-	15	-	15	-	-	-
Correlation level	-	-	-	-	3	-	3	-	-	-

Correlation level 1 – Slight (Low)
Correlation level 2 – Moderate (Medium)
Correlation level 3 – Substantial (High)

EEC 510 GENERATION, TRANSMISSION AND SWITCHGEAR

TEACHING AND SCHEME OF EXAMINATION

No. of weeks per Semester: 15 Weeks

Course	Instructions		Examination			
	Hours / Week	Hours / Semester	Assessment Marks			Duration
			Internal Assessment	Semester End Examination	Total	
GENERATION TRANSMISSION AND SWITCHGEAR	6 Hours	90 Hours	25	75	100	3 Hours

TOPICS AND ALLOCATION OF HOURS

UNIT	TOPIC	TIME (Hrs)
I	Generation of Electrical Power	16
II	A.C. and H.V.D.C Transmission	16
III	Line Insulators and Underground Cables	15
IV	Circuit Breakers and Over Voltage Protection	16
V	Protective Relays and Grounding	15
	Revision and Tests	12
	TOTAL	**90**

COURSE DESCRIPTION

Energy is the basic necessity for the economic development of a country. As a matter of fact, there is a close relationship between the energy used per person and his standard of living. The greater the per capita consumption of energy in a country, the higher is the standard of living of its people. The modern society is so much dependent upon the use of electrical energy that it has become a part of our life. So to have adequate knowledge in Electrical power generation and transmission it becomes necessary to include this subject

OBJECTIVES

- ✓ Conventional power plants-Layout and choice of site
- ✓ Renewable energy sources and power generation
- ✓ Grid system and Economics of power generation
- ✓ A.C Transmission-Supports, conductors, Effects, Regulation and Efficiency
- ✓ H.V.D.C Transmission
- ✓ Line Insulators and underground cables
- ✓ Circuit breakers, Fuses and Lightning arresters

COURSE OUTCOMES:

EEC 510 GENERATION, TRANSMISSION AND SWITCHGEAR	
After successful completion of this course, the students should be able to	
C510.1	Understand the source of power and units.
C510.2	Describe about the transmission of power
C510.3	Select appropriate insulators and cables.
C510.4	Apply Provide the circuit breakers and protection.
C510.5	Understand about the relays and grounding.

EEC 510 GENERATION, TRANSMISSION AND SWITCHGEAR

UNIT	NAME OF THE TOPICS	HOURS
I	**GENERATION OF ELECTRICAL POWER**	**16 Hours**
	Introduction- Conventional methods of power generations –	1hr
	schematic arrangement and choice of site for Hydel, Thermal, Nuclear power plants	2hrs
	Advantages and Disadvantages-comparison of these power plants -	1hr
	Principle and types of co generation.	1hr
	Schematic arrangement of Diesel, Gas, Pumped storage schemes-	1hr
	Advantages and Disadvantages	1hr
	Renewable Energy sources-Basic principle of Solar Energy, Grid	1hr
	Connected Solar PV System, Standalone Solar PV System, Hybrid	1hr
	Solar PV System, Wind Power Generation.	1hr
	Grid or Inter connected system-Advantages of Inter connected systems-	1hr
	Load Transfer through Inter connector-Load curves and Load duration curves-connected load-	1hr
	Average load-Maximum Demand Factor	1hr
	Plant capacity factor-Load factor and its significance-Diversity factor-	1hr
	Tariff – Types- Factors influencing tariff, Simple problem	1hr
	Load sharing between base load and peak load plants-Load Dispatching centre stand- alone system – simple problems	1hr
II	**A.C. AND H.V.D.C TRANSMISSION**	**16 Hours**
	A.C. Transmission:	
	Introduction-Typical Layout of A.C. Power supply scheme various system of power Transmission-Advantages and Disadvantages of A.C Transmission	2hrs
	High Transmission Voltage- Advantages-Economic choice of Transmission voltage	1hr
	Elements of a Transmission Line- Economic choice of conductor size	1hr
	Kelvin's Law- Its limitation-over Head Line	1hr
	Conductor materials and their properties-Line supports-its properties	2hrs
	Types of supports and their applications-spacing between conductors length of span-Sag in over head lines-Calculation of Sag-When the supports are at equal and unequal levels	
	Problems- Effect of wind and ice loading over the line conductor	2hrs
	(Qualitative treatment only) - constants of a Transmission line-	
	Transposition of Transmission lines-Skin Effect- Ferranti Effect-Corona formation and corona loss	1hr
	Factors affecting corona-Advantages and Disadvantages-Classification of O.H. Transmission lines	1hr
	performance of single phase short Transmission line - voltage regulation and Transmission Efficiency-Problems. harmonics of power	1hr

	H.V.D.C Transmission: Advantages and Disadvantages of D.C Transmission- Comparison between constant current and constant voltage HVDC System- Layout Scheme and principle of High Voltage D.C Transmission-D.C link configurations (monopolar, Bipolar and Homopolar)-HVDC convertor Station (Schematic diagram only) Comparison between constant current and constant voltage HVDC System	 2hrs 1hr 1hr
III	**LINE INSULATORS AND UNDERGROUND CABLES** **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. **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-Laying of underground cables-Direct laying, Drawing system, Advantages and Disadvantages Grading of cables- capacitance grading Inter sheath grading (No derivation and Problems) cable faults-O.C, S.C and Earth faults. Murray loop test	**15 Hours** 1hr 2hrs 1hr 1hr 1hr 1hr 1hr 2hrs 2hrs 2hrs 1hr
IV	**CIRCUIT BREAKERS AND OVER VOLTAGE PROTECTION** Switch gear-Essential features of Switch gear-faults in a Power system (definition only). **Circuit Breakers** 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 Circuit Breakers – Construction and Working principle of Oil Circuit Breaker, Air blast Circuit Breaker E.L.C.B, Miniature circuit breaker (M.C.B) , Residual current circuit breaker , SF6 and vacuum Circuit Breaker D.C breaking -Problems of D.C breaking-Schematic for HVDC CB producing current zero. Fuses-Desirable characteristics-Fuse Element materials-current rating of fuse elements-fusing current-Cut off current-	**16 Hours** 2hr 1hr 1hr 1hr 1hr 1hr 1hr 1hr 1hr 1hr

	L.V fuses-Rewirable fuse, HRC cartridge fuse, HRC fuse with tripping device – H.V. fuses & cartridge type, liquid type and metal clad-fuses-Comparison of fuse and circuit breaker. **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.	1hr 1hr 1hr 1hr 1hr
V	**PROTECTIVE RELAYS AND GROUNDING** **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, Negative sequence relay, Induction type reverse power relay Earth leakage relay. Static relays- Basic elements of static relay **Grounding:** Introduction-Equipment grounding- system grounding- ungrounded grounding, Resistance grounding Reactance grounding, resonant Neutral system-Necessity of Neutral grounding – methods-solid grounding-Earthing Transformer	**15 Hours** 2hrs 1hr 1hr 2hrs 2hrs 2hrs 2hrs 2hrs 1hr

TEXT BOOKS

S.No	Name of the Book	Author	Publisher	Edition
1	Principles of Power System	V.K.Metha	S.Chand & Company, New Delhi	4th Edition Reprint 2007

REFERENCE BOOK

S.No	Name of the Book	Author	Publisher	Edition
1	Electrical Power System	CLWadhawa	New Age International, New Delhi	Fourth Edition, 2009
2	A Course in Electrical Power	Soni, Gupta	Dhanpath Rai &Co (P) Ltd, New Delhi	--
3	Electrical Power	S.L Uppal	Khanna Publishers, New Delhi	--
4	A Course in Electrical Power	J.B. Gupta	Kaison Publishing House	Reprint 2004
5	HVDC Power Transmission System & Technology	KR. Padiyar	New Age International, New Delhi	Reprint 2005
6	Digital Protection – Protective Relaying from Electromechanical to Microprocessor	LP Singh	New Age International	Second Edition 1997

WEBSITES

https://www.electrical4u.com/electric-power-generation\
https://www.elp.com/articles/print/volume.../primer-on-transmission-ac-vs-dc.html
https://www.amprion.net/.../Underground-cable/Structure-of-an-underground-cable
https://ieeexplore.ieee.org/document/7845829/

CONTINUOUS INTERNAL ASSESSMENT

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

i) Attendance - 5 Marks
ii) Test - 10 Marks
iii) Assignment - 5 Marks
iv) Seminar - 5 Marks

Total - 25 Marks

CO-POs & PSOs Mapping matrix

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2	PSO3
CO510.1	3	3	-	-	3	-	3	3	-	3
CO510.2	3	3	-	-	3	-	3	3	-	3
CO510.3	3	3	-	-	3	-	3	3	-	3
CO510.4	3	-	-	3	3	-	3	3	-	3
CO510.5	3	-	-	3	3	-	3	3	-	3
Total	15	9	-	6	15	-	15	15	-	15
Correlation level	3	3	-	3	3	-	3	3	-	3

Correlation level 1 – Slight (Low)
Correlation level 2 – Moderate (Medium)
Correlation level 3 – Substantial (High)

QUESTION PAPER SETTING

The teaching learning process and assessment are being carried out in accordance with the revised Bloom's Taxonomy. The question paper should consist of 90% questions based on Lower Order Thinking (LOTs) and the remaining 10% based on Higher Order Thinking (HOTs) as detailed below.

Bloom's Taxonomy	Lower Order Thinking Skills (LOTs)	Higher Order Thinking Skills (HOTs)
Level	R-Remember, U-Understand, Ap-Apply	An-Analyze, E-Evaluate, C-Create
% to be included	90%	10%

GENERATION, TRANSMISSION AND SWITCHGEAR

Time : 3 Hrs Max.Marks :75

PART – A (5X 2 =10 MARKS)				
Note : (i) Answer any Five Questions (ii) All questions carry equal marks			Unit	Blooms Level
1		What are the conventional sources to general Electrical power?	I	R
2		What is the purpose of surge tank?	I	R
3		List the elements of a transmission line.	II	R
4		Give any two limitations of Kelvin's law.	II	R
5		Give the types of line supports.	III	R
6		State any two faults occurring in the cables.	III	R
7		State two types of oil circuit breakers.	IV	R
8		State the operating condition of Distance relay.	V	R
PART – B (5X3=15 MARKS)				
Note : (i) Answer any Five Questions (ii) All questions carry equal marks			Unit	Blooms Level
9		State the merits and demerits of Thermal power station.	I	R
10		Explain Base load and peak load on power station with curves.	I	R
11		Explain Kelvin's law.	II	R
12		What is skin effect?	II	R
13		Name the types of Insulators.	III	R
14		Name the methods of laying underground cable	III	R
15		What is switch gear?	IV	R
16		What is the necessity of neutral grounding?	V	R

PART –C (5X 10 =50 MARKS)					
Note: (i) Answer all the question choosing sub- division (A) or Sub division (B) of each question. (ii) All questions carry equal marks.			Unit	Blooms Level	Maximum Marks
17	A	Draw and explain the schematic arrangement of thermal power plant	I	E	10
		[OR]			
	B	List and explain the advantages of interconnected system.	I	R	10
18	A	Derive an expression for the sag in a transmission line conductor suspended between two supports at the same level.	II	AN	10
		[OR]			
	B	Explain how to find the regulation and efficiency of short transmission lines.	II	U	10

19	A	Bring out the reasons for the failure of Insulator.	III	AN	10
		[OR]			
	B	Explain any two methods to improve the string efficiency.	III	U	10
20	A	Explain the construction and working principle of sulphur hexa fluoride circuit breaker and state its advantages.	IV	U	10
		[OR]			
	B	Explain the construction and working of HRC fuse with tripping device	IV	U	10
21	A	Explain the construction and working principle of earth leakage relay	V	U	10
		[OR]			
	B	With necessary diagram explain resistance grounding.	V	E	10

Note: the question paper setters are requested to follow the revised Bloom's Taxonomy levels as presented below:

Bloom's taxonomy level	Lower Order Thinking Skills (LOTs)	Higher Order Thinking Skills (HOTs)
	R-Remember, U-Understand, Ap-Apply	An-Analyse, E-Evaluate, C- Create
% to be included	90%	10%

EEC 520 MICROCONTROLLER

TEACHING AND SCHEME OF EXAMINATION

No. of weeks per Semester: 15 Weeks

Course	Instructions		Examination			
	Hours / Week	Hours / Semester	Assessment Marks			Duration
			Internal Assessment	Semester End Examination	Total	
MICROCONTROLLER	5 Hours	75 Hours	25	75	100	3 Hours

TOPICS AND ALLOCATION OF HOURS

UNIT	TOPIC	TIME (Hrs)
I	Architecture & Instruction set of 8051	13
II	Programming Examples	13
III	I/O and Timer	13
IV	Interrupt and Serial Communication	12
V	Interfacing Techniques.	12
	Revision and Tests	12
	TOTAL	**75**

COURSE DESCRIPTION

The exponential growth of Engineering and Technology has benefited the mankind with extreme sophistication and comfort. To sustain this development, continuous research and development should take place not only in Engineering and Technology but also in Basic Science such as Physics. The various divisions of Physics like Optics, Acoustics, Dynamics, Semiconductor Physics, Surface Physics, Nuclear Physics, Energy Studies, Materials Science, etc provide the Foundation by enlightening the Fundamental facts, Principles, Laws and Correct sequence of events to develop the Engineering and Technology field for the prosperity of human beings.

OBJECTIVES

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

- Explain Architecture of 8051 Microcontroller.
- Explain the functions of various registers.
- Understand interrupt structure of 8051.
- Understand serial data communication concepts.
- Understand the programming techniques.
- Explain various addressing modes.
- Write simpler 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

COURSE OUTCOMES:

EEC 520 MICROCONTROLLER	
After successful completion of this course, the students should be able to	
C520.1	Identify the detailed architecture (hardware feature) and operation of microcontroller and distinguish the properties of microcontroller and microprocessor
C520.2	Develop the assembly language programs using instruction set of 8051.
C520.3	Handle the I/O ports and timers through programs.
C520.4	Analyze the data transfer information through serial ports and develop programs using interrupts.
C520.5	Illustrate how the pheripherals (8255, 0808 etc) are interfaced with microcontroller.

EEC 520 MICROCONTROLLER

UNIT – I

ARCHITECTURE & INSTRUCTION SET OF 8051: **[13Hrs]**

Comparison of Microprocessor and Microcontroller [2 Hrs]

Block diagram of Microcontroller – Functions of each block –

Pin details of 8051 [1 Hr]

ALU – ROM – RAM – Memory Organization of 8051

Special function registers – Program Counter – PSW register [2 Hrs]

Stack - I/O Ports – Timer – Interrupt – Serial Port [1 Hr]

Oscillator and Clock – Clock Cycle – State - Machine Cycle – Instruction cycle [2 Hrs]

Reset – Power on Reset – Overview of 8051 Family

Instruction set of 8051 – Classification of 8051 Instructions [2 Hrs]

Data transfer Instructions – Arithmetic Instructions – Logical Instructions [2 Hrs]

Branching Instructions – Bit Manipulation Instructions. [1 Hr]

UNIT – II

PROGRAMMING EXAMPLES: [**13 Hrs]**

Assembler and addressing modes

Assembling and running an 8051 program [1 Hr]

Structure of Assembly Language – Assembler directives [1 Hr]

Different addressing modes of 8051 – Programmes – Multibyte Addition [2 Hrs]

8 Bit Multiplication and Division [1 Hr]

Biggest Number / Smallest Number – Ascending order / Descending order [2 Hrs]

BCD to HEX Conversion – HEX to BCD Conversion [2 Hrs]

BCD to ASCII Conversion – ASCII to Binary Conversion [2 Hrs]

Odd Parity Generator - even Parity Generator – Time delay routines. [2 Hrs]

UNIT – III

I/O AND TIMER: **[13 Hrs]**

Bit addresses for I/O and RAM – I/O programming [1 Hr]

I/O bit manipulation programming [2 Hrs]

Programming 8051 Timers – Timer 0 and Timer 1 registers [3 Hrs]

Different modes of Timer – Mode 0 Programming – Mode 1 Programming

Mode 2 Programming [2Hrs]

Counter programming – Different modes of Counter [1 Hr]

Mode 0 Programming – Mode 1 Programming [2 Hrs]

Mode 2 Programming – (simple programs). [2Hrs]

UNIT – IV

INTERRUPT AND SERIAL COMMUNICATION: **[12 Hrs]**

SERIAL COMMUNICATION

Basics of Serial programming [1 Hr]

RS 232 Standards – 8051 connection to RS 232 [2 Hrs]

8051 Serial Communication Programming [2 Hrs]

Programming 8051 to transmit data serially –

Programming 8051 to Receive data serially [2 Hrs]

8051 Interrupts – Programming Timer Interrupts [2 Hrs]

Programming External Hardware Interrupts –

Programming the Serial Communication Interrupt [2Hrs]

Interrupt Priority in 8051 (simple Programs) [1 Hrs]

UNIT – V

INTERFACING TECHNIQUES: **[12 Hrs]**

IC 8255

IC 8255 – Block Diagram – Modes of 8255 [2 Hrs]

INTERFACING TECHNIQUES

Interfacing External Memory to 8051 – 8051 Interfacing with the 8255 [2 Hrs]

ASM Programming [1 Hrs]

Relays – Sensor Interfacing [2 Hrs]

ADC Interfacing – DAC Interfacing [2 Hrs]

Keyboard Interfacing – Seven segment LED Display Interfacing [2 Hrs]

Stepper Motor Interfacing – DC Motor Interfacing using PWM [1 Hrs]

TEXT BOOKS

S.No	Name of the Book	Author	Publisher	Edition
1	Microcontrollers, Principles and Applications	Ajit pal	PHI Ltd.,	2011
2	Microprocessor and Microcontroller	A.P.Godse & D.A.Godse	Technical Publication.,	2011

REFERENCE BOOK

S.No	Name of the Book	Author	Publisher	Edition
1	8051 Microcontroller and Embedded Systems using Assembly and C	Mazidi, Mazidi and D.MacKinlay	Pearson Education	2006
2	Microprocessor and Microcontroller	R.Theagarajan	Sci Tech Publication, Chennai	2000
3	8051 Microcontroller	Kenneth J.Ayala.	Tata McGraw Hill	1994
4	Programming & Customizing the 8051 Microcontroller	Myke Predko	TATA McGraw – Hill	1994
5	Microprocessor and Microcontroller	B.P.Singh, Galgotia Publication Pvt.Ltd	PHI Ltd.,	1994

WEBSITES

https://www.electronicshub.org › ... › Embedded › 8051 Microcontroller

https://what-when-how.com/8051-microcontroller/8051-io-programming/

https://www.slideshare.net/mobile/.../introduction-to-interfacing-technique

https://www.electronicwings.com/8051/8051-interrupts

CONTINUOUS INTERNAL ASSESSMENT

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

i) Attendance	- 5 Marks
ii) Test	- 10 Marks
iii) Assignment	- 5 Marks
iv) Seminar	- 5 Marks

Total	**- 25 Marks**

CO-POs & PSOs Mapping matrix

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2	PSO3
CO520.1	3	2	2	-	-	-	-	3	-	2
CO520.2	3	2	3	-	2	2	2	3	-	2
CO520.3	3	2	3	-	2	2	2	3	-	
CO520.4	3	2	2	-	2	2	2	3	-	2
CO520.5	3	2	2	2	2	2	3	3	-	2
Total	15	10	12	2	8	8	9	15	-	8
Correlation level	3	2	2	2	2	2	2	3	-	2

Correlation level 1 – Slight (Low)
Correlation level 2 – Moderate (Medium)
Correlation level 3 – Substantial (High)

QUESTION PAPER SETTING

The teaching learning process and assessment are being carried out in accordance with the revised Bloom's Taxonomy. The question paper should consist of 90% questions based on Lower Order Thinking (LOTs) and the remaining 10% based on Higher Order Thinking (HOTs) as detailed below.

Bloom's Taxonomy	Lower Order Thinking Skills (LOTs)	Higher Order Thinking Skills (HOTs)
Level	R-Remember, U-Understand, Ap-Apply	An-Analyze, E-Evaluate, C-Create
% to be included	90%	10%

MICROCONTROLLER

Time : 3 Hrs Max.Marks :7

PART – A (5X 2 =10 MARKS)				
Note : (i) Answer any Five Questions (ii) All questions carry equal marks			Unit	Blooms Level
1		What is program counter?	I	R
2		Define machine cycle.	I	R
3		Mention the structure of assembly language program.	II	R
4		Write any two Bit manipulation instructions.	II	R
5		Mention the control register involved in timer operation.	III	R
6		What is RS 232?	IV	R
7		List the interrupt and its vector address.	IV	R
8		What are the modes of 8255?	V	R
PART – B (5X3=15 MARKS)				
Note : (i) Answer any Five Questions (ii) All questions carry equal marks			Unit	Blooms Level
9		Compare Microcontroller and Microprocessor.	I	U
10		Give short notes on ROM organization.	I	R
11		Define assembler Directives.	II	R
12		Write program for the 8 bit division of two numbers.	II	R
13		Write down the steps for programming of 8051 timer.	III	R
14		Write down the various types of SFRS are involved in serial communication.	IV	R
15		Write down the IP register format.	V	R
16		Draw the interfacing diagram of relay with 8051.	V	U

PART –C (5X 10 =50 MARKS)					
Note: (i) Answer all the question choosing sub- division (A) or Sub division (B) of each question. (ii) All questions carry equal marks.			Unit	Blooms Level	Maximum Marks
17	A	Explain the block diagram of 8051 microcontroller.	I	U	10
		[OR]			
	B	List out the instruction set of 8051. Explain logical instruction set.	I	U	10
18	A	Explain the different addressing modes of 8051.	II	U	10
		[OR]			
	B	Write an Assembly Language program to convert Hexadecimal number into Decimal number.	II	R	10
19	A	Explain the Bit address for I/O and RAM.	III	U	10
		[OR]			
	B	Explain the various modes of timer operation with diagram.	III	U	10
20	A	Explain about 8051 serial communication programming.	IV	U	10
		[OR]			
	B	Explain about programming about two external hardware interrupts with an example.	IV	U	10

21	A	Explain IC 8255 with block diagram.	V	U	10
		[OR]			
	B	Explain about keyboard interfacing with 8051.	V	U	10

Note: the question paper setters are requested to follow the revised Bloom's Taxonomy levels as presented below:

Bloom's taxonomy level	Lower Order Thinking Skills (LOTs)	Higher Order Thinking Skills (HOTs)
	R-Remember, U-Understand, Ap-Apply	An-Analyse, E-Evaluate, C- Create
% to be included	90%	10%

EEC 530 ELECTRICAL ESTIMATION AND ENERGY AUDITING

TEACHING AND SCHEME OF EXAMINATION

No. of weeks per Semester: 15 Weeks

Course	Instructions		Examination			
	Hours / Week	Hours / Semester	Assessment Marks			Duration
			Internal Assessment	Semester End Examination	Total	
ELECTRICAL ESTIMATION AND ENERGY AUDITING	5 Hours	75 Hours	25	75	100	3 Hours

TOPICS AND ALLOCATION OF HOURS

UNIT	TOPIC	TIME (Hrs)
I	Systems of Internal Wiring and Earthing	14
II	Domestic and Industrial Estimate	12
III	Energy Management & Audit	13
IV	Electric Motors & Lighting System	12
V	Diesel Generating System & Energy Efficient Technologies in Electrical Systems	12
	Revision and Tests	12
	TOTAL	**75**

COURSE DESCRIPTION

Energy Audit is the key to a systematic approach for decision-making in the area of energy management. The effective use of energy to maximize profits (minimize costs) and enhance competitive positions, it is necessary to conserve energy. Hence it is necessary to study energy auditing methods and energy saving opportunities in electrical system. The Fundamental facts, Principles, Laws and Correct sequence of events to develop the Engineering and Technology field for the prosperity of human beings.

OBJECTIVES

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

- Draw conventional symbols for various electrical installations.
- To quote the relevant IE rules for a given electrical installation, earthing and clearance of service lines.
- Familiarize the types of wiring.
- List the points to be considered for selection wiring.
- Determine the size of wire for internal wiring.
- Explain the necessity and types of earthing.
- Estimate the quantity of materials required for earthing.
- Differentiate between neutral and earth wire.
- Estimate the quantity of materials required for domestic and industrial wiring.
- Explain the concept and types of Energy of energy audit.
- Explain the energy saving opportunities in Transformer, Induction motor, lighting and DG system.
- Explain the roll of power factor controller in energy saving system.
- Explain the roll of sensors in energy saving system.
- Explain the energy efficient technologies in electrical system.

COURSE OUTCOMES:

EEC 530 ELECTRICAL ESTIMATION AND ENERGY AUDITING	
After successful completion of this course, the students should be able to	
C530.1	Identify the types of wiring and earthing and able to know the IE rules
C530.2	Able to prepare the wiring diagram, estimation and material required for the domestic &industrial
C530.3	To know the types of energy audit and energy conservation
C530.4	Understand the energy saving opportunities and energy efficient technology for the transformers, induction motors and lighting systems
C530.5	Explain the role of power factor controller and sensors in energy saving systems

EEC 530 ELECTRICAL ESTIMATION AND ENERGY AUDITING

UNIT	NAME OF THE TOPICS	HOURS
I	**SYSTEMS OF INTERNAL WIRING AND EARTHING** Need of electrical symbols – List of symbols – Brief study of important Indian Electricity Rules 1956 Methods of representation for wiring diagrams – Looping back system and Joint box system and tree system of wiring Types of internal wiring – Serviceconnection (Overhead and Underground) - Protection of electrical installation against overload, short circuit and earth fault protection against electric shock – Effects of electric shock – Recommended first aid for electric shock - Treatment for electric Shock Construction and working of ELCB – Overview of Busbar Trunking and Cable tray. Necessity – General requirements of Earthing – Earthing and Soil Resistivity Earth electrodes – Methods of earthing - Plate earthing - Pipe earthing - Rod earthing Soil Resistivity –Methods of improving earth resistance Size of earth continuity conductor - Difference between Neutral and Earth Wires. Safety signs showing type of PPE to be worn, Prohibition Signs, Warning Signs, Mandatory Signs, Advisory or Safe Condition Signs.	**14 Hours** 2hr 1hr 2hr 2hr 1hr 1hr 1hr 1hr 1hr 2hr
II	**DOMESTIC AND INDUSTRIAL ESTIMATE** General requirements of electrical installations for Residential, Commercial and Industrial – Lighting and power sub- circuits Diversity factor for sub circuits - Location of outlets, control switches, main board and distribution boards Permissible voltage drops and size of wires - Steps to be followed in preparing electrical estimate. Estimate the quantity of material required in Electrical InstallationFor 1. Small residential building/Flat 2. Factory Lighting scheme 3. Computer centre having 10 computers, a/c unit, UPS, light and fan. 4. Street Light service having 12 lamp light fitting 5. Workshop with one number of 3Φ, 15hp induction motor 6. Small Workshop with 3 or 4 Machines.	**12Hours** 2hr 2hr 1hr 2hr 1hr 1hr 1hr 1hr 1hr 1hr
III	**ENERGY MANAGEMENT AUDIT AND ELECTRICAL SYSTEM:** **Energy Management & Audit** Definition, Energy audit- need, Types of energy audit, Energy management (audit) approach Understanding energycosts, Bench marking, Energy performance, Matching energy use to requirement, Maximizing system efficiencies,	**13 Hours** 2hrs 2hrs 1hr 1hr 1hr

	Optimizing the input energy requirements, Fuel and energy substitution, Energy audit Instruments-Energy Conservation Building Code-Mandatory requirements	2hrs
	Energy Conservation Building Code-Mandatory requirements. Maximum allowable power transformer losses	1hr
	Electrical system:	
	Electricity billing, Electrical load management and maximum demand control,	1hr
	Power factor improvement and its benefit, Selection and location of capacitors,	1hr
	Performance assessment of PF capacitors,	1hr
	Distribution and transformer losses, Maximum allowable power transformer losses.	
IV	**ELECTRIC MOTORS & LIGHTING SYSTEM**	**12 Hours**
	Electric motors	
	Types, Losses in induction motors,	1hr
	Motor efficiency,	1hr
	Factors affecting motor performance,	1hr
	Rewinding and motor replacement issues,	2hrs
	Energy saving opportunities with energy efficient motors. Constructional features of centrifugal pumps	1hr 1hr
	Lighting System	
	Light source,	1hr
	Choice of lighting,	2hrs
	Luminance requirements,	1hr
	and Energy conservation avenues.	1hr
V	**DIESEL GENERATING SYSTEM & ENERGY EFFICIENT TECHNOLOGIES IN ELECTRICAL SYSTEMS**	**12 Hours**
	Diesel Generating system	
	Factors affecting selection,	1hr
	Energy performance assessment of diesel conservation avenues.	2hrs
	Energy Efficient Technologies in Electrical Systems:	
	Maximum demand controllers,	1hr
	Automatic power factor controllers,	1hr
	Energy efficient motors,	1hr
	Soft starters with energy saver, Variable speed drives,	1hr
	Energy efficient transformers,	1hr
	Electronic ballast, Occupancy sensors,	2hrs
	Energy efficient lighting controls, Energy saving potential of each technology.	1hr
	Constructional features of centrifugal pumps	1hr

TEXT BOOKS

S.No	Name of the Book	Author	Publisher	Edition
1	Electrical Design Estimating And Costing	K.B.Raina& S.K.Battacharya	New age International Ltd	Reprint - 2011

REFERENCE BOOK

S.No	Name of the Book	Author	Publisher	Edition
1	Electrical Wiring, Estimating and Costing	Dr.S.L.Uppal G.C. Garg	Khanna Publishers.	Sixth-2011
2	Electrical Estimation and Costing	Surjit Singh	Khanna Publishers.	Sixth-2001
3	Energy Auditing in Electrical Utilities	Rajiv Shankar	Viva Books - 2010	2011
4	Energy engineering and Management	Amlan Chakrabarti	PHI Learning Pvt Ltd - 2011	2006

WEBSITES

https://www.electricaltechnology.org › Protection

https://www.slideshare.net/pinaki50/energy-management-audit

https://ethw.org/Edison%27s_Electric_Light_and_Power_System

https://www.slideshare.net/eecfncci/energy-efficiency-in-diesel

CONTINUOUS INTERNAL ASSESSMENT

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

i) Attendance - 5 Marks
ii) Test - 10 Marks
iii) Assignment - 5 Marks
iv) Seminar - 5 Marks

Total - 25 Marks

CO-POs & PSOs Mapping matrix

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2	PSO3
CO530.1	2	2	2	1	-	-	-	3	1	3
CO530.2	2	2	3	1	1	1	2	3	1	3
CO530.3	2	2	1	-	2	2	1	3	2	3
CO530.4	-	1	2	-	2	1	2	3	-	2
CO530.5	1	1	-	3	2	-	-	3	2	1
Total	7	8	8	5	7	4	5	15	6	12
Correlation level	2	2	2	1	2	1	2	3	2	3

Correlation level 1 – Slight (Low)
Correlation level 2 – Moderate (Medium)
Correlation level 3 – Substantial (High)

QUESTION PAPER SETTING

The teaching learning process and assessment are being carried out in accordance with the revised Bloom's Taxonomy. The question paper should consist of 90% questions based on Lower Order Thinking (LOTs) and the remaining 10% based on Higher Order Thinking (HOTs) as detailed below.

Bloom's Taxonomy	Lower Order Thinking Skills (LOTs)	Higher Order Thinking Skills (HOTs)
Level	R-Remember, U-Understand, Ap-Apply	An-Analyze, E-Evaluate, C-Create
% to be included	90%	10%

ELECTRICAL ESTIMATION AND ENERGY AUDITING

Time : 3 Hrs Max.Marks :75

PART – A (5X 2 =10 MARKS)				
Note : (i) Answer any Five Questions (ii) All questions carry equal marks			Unit	Blooms Level
1		State the need for electrical symbols.	I	R
2		Define looping in system.	I	R
3		State the types of sub-circuits.	II	R
4		What is the power rating of tube light?	II	R
5		Define energy audit.	III	R
6		Define bench marking.	III	R
7		How will you reduce the losses in distribution transformer ?	IV	R
8		What is CRI?	V	R
PART – B (5X3=15 MARKS)				
Note : (i) Answer any Five Questions (ii) All questions carry equal marks			Unit	Blooms Level
9		What are the types of wiring?	I	R
10		Define necessity of earthing.	I	R
11		Convert 10HP into watts.	II	U
12		What are the steps to be followed the preparation of electrical estimation?	II	R
13		Explain power costs.	III	U
14		Explain fuel substitution.	IV	U
15		Write short notes an motor losses.	IV	R
16		Explain electronic ballast.	V	U
PART –C (5X 10 =50 MARKS)				
Note: (i) Answer all the question choosing sub- division (A) or Sub division (B) of each question. (ii) All questions carry equal marks.			Unit	Blooms Level	Maximum Marks
17	A	Write the following IE rules (i) Voltage (ii) Testing of consumers installation.	I	R	10
		[OR]			
	B	Explain plate earthing.	I	U	10

<table>
<tr><td rowspan="3">18</td><td>A</td><td>State the general requirements of electrical installations for residential, commercial and industrial.</td><td>II</td><td>R</td><td>10</td></tr>
<tr><td></td><td>[OR]</td><td></td><td></td><td></td></tr>
<tr><td>B</td><td>A residential single bed room flat is to be electrified with PVC conduit concealed type of wiring. Estimate the quantity of materials required with specifications. The details of the fittings are as follows:

<table><tr><th>Name of room</th><th>Size</th><th>No of tube light points</th><th>No of ceiling fan</th><th>No of ordinary lamps</th><th>No of plug point</th></tr><tr><td>Hall</td><td>5.0m x 6.0m</td><td>2</td><td>1</td><td>1</td><td>2</td></tr><tr><td>Bed Room</td><td>4m x 4m</td><td>1</td><td>1</td><td>1</td><td>1</td></tr><tr><td>Kitchen</td><td>4.0m x 2.0m</td><td>1</td><td>-</td><td>1</td><td>1</td></tr><tr><td>Bath Room</td><td>1.5m x 1.5m</td><td>-</td><td>-</td><td>1</td><td>-</td></tr><tr><td>Toilet</td><td>1.5m x 1.5m</td><td>-</td><td>-</td><td>1</td><td>-</td></tr></table></td><td>II</td><td>E</td><td>10</td></tr>
<tr><td></td><td></td><td></td><td></td><td></td><td></td></tr>
<tr><td rowspan="3">19</td><td>A</td><td>Explain in detail about energy management.</td><td>III</td><td>U</td><td>10</td></tr>
<tr><td></td><td>[OR]</td><td></td><td></td><td></td></tr>
<tr><td>B</td><td>Discuss in detail about transformer losses.</td><td>III</td><td>C</td><td>10</td></tr>
<tr><td></td><td></td><td></td><td></td><td></td><td></td></tr>
<tr><td rowspan="3">20</td><td>A</td><td>Explain the factors affecting motor performance.</td><td>IV</td><td>U</td><td>10</td></tr>
<tr><td></td><td>[OR]</td><td></td><td></td><td></td></tr>
<tr><td>B</td><td>Discuss different types of lamps.</td><td>IV</td><td>C</td><td>10</td></tr>
<tr><td></td><td></td><td></td><td></td><td></td><td></td></tr>
<tr><td rowspan="3">21</td><td>A</td><td>Explain the factors affecting the selection of a DG – set.</td><td>V</td><td>U</td><td>10</td></tr>
<tr><td></td><td>[OR]</td><td></td><td></td><td></td></tr>
<tr><td>B</td><td>Describe soft starters.</td><td>V</td><td>U</td><td>10</td></tr>
</table>

Note: the question paper setters are requested to follow the revised Bloom's Taxonomy levels as presented below:

Bloom's taxonomy level	Lower Order Thinking Skills (LOTs)	Higher Order Thinking Skills (HOTs)
	R-Remember, U-Understand, Ap-Apply	An-Analyse, E-Evaluate, C- Create
% to be included	90%	10%

EEC 541 CONTROL OF ELECTRICAL MACHINES

TEACHING AND SCHEME OF EXAMINATION

No. of weeks per Semester: 15 Weeks

Course	Instructions		Examination			
	Hours / Week	Hours / Semester	Assessment Marks			Duration
			Internal Assessment	Semester End Examination	Total	
CONTROL OF ELECTRICAL MACHINES	5 Hours	75 Hours	25	75	100	3 Hours

TOPICS AND ALLOCATION OF HOURS

UNIT	TOPIC	TIME (Hrs)
I	Control circuit components	13
II	AC motor control circuits	12
III	Industrial control circuits	13
IV	Programmable Logic Controller	13
V	PLC Programming	12
	Revision and Tests	12
	TOTAL	**75**

COURSE DESCRIPTION

Various control operations are to be performed on the electrical machines to suit the industrial requirements. Technician is mainly employed to look after the control panels. To make our students employable, they have to be trained in using various control components and circuits. This subject fulfils that requirement.

OBJECTIVES

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

- Electrical control circuit elements including various types of industrial switches, relays, timers, solenoids, contactors and interlocking arrangement.
- AC motor control circuits for acceleration control, speed control, direction control, braking control and jogging using contactors.
- Different control circuits for industrial applications.
- Basics of programmable logic controller.
- PLC Programming.

COURSE OUTCOMES:

EEC 541 CONTROL OF ELECTRICAL MACHINES	
After successful completion of this course, the students should be able to	
C541.1	Describe about basic electrical control circuit elements used in industrial sectors
C541.2	Acquire knowledge about AC motor control circuits using contactors
C541.3	Analyze different control circuits for industrial applications
C541.4	Understand the basics of programmable logic controller
C541.5	Develop the programs using PLC programming

EEC 541 CONTROL OF ELECTRICAL MACHINES

UNIT	NAME OF THE TOPIC	HOURS
I	Control circuit components	13 Hours
	Switches – Push button, selector, drum, limit, pressure,	2hrs
	temperature (Thermostat), float, zero speed and proximity switches.	
	Relays – Voltage relay, DC series current relay, frequency response	2hrs
	relay, latching relay and phase failure relay (single phasing preventer).	1hr
	Over current relay	2hrs
	Bimetallic thermal over load relay and Magnetic dash pot oil filled relay.	1hr
	Timer – Thermal Pneumatic and Electronic timer.	2hrs
	Solenoid Valve, Solenoid type contactor (Air break contactor),	1hr
	Solid state relay,	2hrs
	Simple ON-OFF motor control circuit, Remote control operation and interlocking of drives.	
II	AC motor control circuits	12 Hours
	Motor current at start and during acceleration –	2hrs
	No load speed and final speed of motor – DOL starter	1hr
	Automatic auto transformer starter (open circuit and closed circuit transition)	1hr
	Star/Delta starter(semi automatic and automatic)	2hrs
	Starter for two speed two winding motor	1hr
	Reversing the direction of rotation of induction motor	1hr
	Dynamic Braking	1hr
	Three step rotor resistance starter for wound induction motor- Speed control using UJT and SCR	2hrs
	Secondary frequency acceleration starter.	1hr
III	Industrial control circuits	13 Hours
	Planner machine control	2hrs
	Skip hoist control	2hrs
	Automatic control of a water pump	2hrs
	Control of electric oven – Control of air compressor	2hrs
	Control of over head crane	1hr
	control of conveyor system	1hr
	Control of elevator	1hr
	Trouble spots in control circuits	1hr
	General procedure for trouble shooting.	1hr
IV	Programmable Logic Controller	13 Hours
	Automation – Types of automation (manufacturing and non	2hrs
	manufacturing) – advantages of automation	1hr
	PLC Introduction – Block diagram of PLC	1hr
	principle of operation – modes of operation	1hr
	PLC scan	
	memory organization input module (schematic and wiring diagram)output module	2hrs
	(schematic and wiring diagram)	
	Types of Programming Devices	2hrs

	Comparison between hardwire control system and PLC System PLC Types (Fixed and Modular) – Input Types – Output Types Criteria for selection of suitable PLC – List of various PLCs available.	2hrs 1hr 1hr
V	PLC PROGRAMMING Different programming languages ladder diagram Relay type instruction Timer instruction ON delay and OFF delay Timer Retentive Timer Instruction Cascading Timers Counter Instruction – UP Counter – Down Counter – UP/DOW Counter ladder logic diagram for DOL Starter, Automatic STAR-DELTA Starter rotor resistance starter and EB to Generator changeover system.	12 Hours 1hr 1hr 1hr 1hr 1hr 1hr 1hr 2hrs 1hr 1hr 1hr

TEXT BOOKS

S.No	Name of the Book	Author	Publisher
1	Control of Electrical Machines.	S.K. Bhattacharya	New Age International Publishers, New Delhi
2	Exposing Programmable Logic controllers with Application.	Pradeep Kumar Srivastava.	BPB Publications

REFERENCE BOOK

S.No	Name of the Book	Author	Publisher
1	Industrial motor control.	Stephen Herman	6th Edition, Cengage Learning.

WEBSITES

www.industrial-electronics.com/elec-mach-drvs-pwr-syst_20-0.html

https://www.allaboutcircuits.com › Worksheets › AC Electric Circuits

https://www.industrialcontroldirect.com/motor-control-247/

https://unitronicsplc.com/what-is-plc-programmable-logic-controller/

www.plcmanual.com/plc-programming

CONTINUOUS INTERNAL ASSESSMENT

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

i) Attendance	- 5 Marks
ii) Test	- 10 Marks
iii) Assignment	- 5 Marks
iv) Seminar	- 5 Marks

	Total - 25 Marks

CO-POs & PSOs Mapping matrix

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2	PSO3
CO541.1	3	2	2	-	-	-	-	3	-	2
CO541.2	3	2	2	-	-	-	-	3	-	-
CO541.3	3	2	2	-	-	2	3	3	-	-
CO541.4	3	2	2	2	2	2	3	3	-	-
CO541.5	3	2	2	2	2	2	3	3	-	3
Total	15	10	10	4	4	6	9	15	-	5
Correlation level	3	2	2	2	2	2	3	3	-	2.5

Correlation level 1 – Slight (Low)
Correlation level 2 – Moderate (Medium)
Correlation level 3 – Substantial (High)

QUESTION PAPER SETTING

The teaching learning process and assessment are being carried out in accordance with the revised Bloom's Taxonomy. The question paper should consist of 90% questions based on Lower Order Thinking (LOTs) and the remaining 10% based on Higher Order Thinking (HOTs) as detailed below.

Bloom's Taxonomy	Lower Order Thinking Skills (LOTs)	Higher Order Thinking Skills (HOTs)
Level	R-Remember, U-Understand, Ap-Apply	An-Analyze, E-Evaluate, C-Create
% to be included	90%	10%

CONTROL OF ELECTRICAL MACHINES (ELECTIVE THEORY I)

Time : 3 Hrs Max.Marks :75

PART – A (5X 2 =10 MARKS)				
Note : (i) Answer any Five Questions (ii) All questions carry equal marks			Unit	Blooms Level
1		Draw the symbol of push button and selector switch.	I	U
2		What is solenoid valve?	I	R
3		Draw the current speed characteristics of AC motor during acceleration.	II	U
4		State any four trouble spots in control circuits.	II	R
5		Define the term automation.	III	R
6		What is a modular PLC?	IV	R
7		What is ladder diagram?	V	R
8		What is preset in timer instruction?	V	R
PART – B (5X3=15 MARKS)				
Note : (i) Answer any Five Questions (ii) All questions carry equal marks			Unit	Blooms Level
9		Write short note on zero speed switch.	I	R
10		Draw the control circuit of simple ON / OFF motor control.	I	U
11		Draw the circuit diagram of DOL starter.	II	U
12		What do you mean by dynamic braking in cage induction motor?	II	R
13		What is the use of skip hoist in industry?	III	R
14		Draw a sketch, Explaining detection of ground fault using a test lamp.	IV	U
15		Write short notes on PLC scan.	V	R
16		Why do we need counter instructions?	V	R

PART –C (5X 10 =50 MARKS)					
Note: (i) Answer all the question choosing sub- division (A) or Sub division (B) of each question. (ii) All questions carry equal marks.			Unit	Blooms Level	Maximum Marks
17	A	Draw and explain the working of Magnetic dash pot oil filled relay.	I	U	10
		[OR]			
	B	Explain the working of Remote control operation and interlocking of drives.	I	U	10
18	A	Draw and explain the working of automatic auto transformer starter.	II	U	10
		[OR]			
	B	Explain the operation of Dynamic braking of motor with neat sketch.	II	U	10
19	A	Draw the automatic control of a water pump and explain.	III	U	10

		[OR]			
	B	Explain the general procedure for trouble shooting.	III	U	10
20	A	Draw the block diagram of PLC and explain.	IV	U	10
		[OR]			
	B	Explain the importance of memory organization input module and output module of PLC.	IV	U	10
21	A	Explain the various counter instruction.	V	U	10
		[OR]			
	B	Draw the ladder logic diagram for rotor resistance starter and explain.	V	U	10

Note: the question paper setters are requested to follow the revised Bloom's Taxonomy levels as presented below:

Bloom's taxonomy level	Lower Order Thinking Skills (LOTs)	Higher Order Thinking Skills (HOTs)
	R-Remember, U-Understand, Ap-Apply	An-Analyse, E-Evaluate, C- Create
% to be included	90%	10%

EEC 542 PROGRAMMABLE LOGIC CONTROLLER

TEACHING AND SCHEME OF EXAMINATION

No. of weeks per Semester: 15 Weeks

Course	Instructions		Examination			
	Hours / Week	Hours / Semester	Assessment Marks			Duration
			Internal Assessment	Semester End Examination	Total	
PROGRAMMABLE LOGIC CONTROLLER	5 Hours	75 Hours	25	75	100	3 Hours

TOPICS AND ALLOCATION OF HOURS

UNIT	TOPIC	TIME (Hrs)
I	Introduction To PLC	12
II	Input / Output Modules	13
III	PLC Programming	14
IV	Networking	12
V	Data Acquisition Systems	12
	Revision and Tests	12
	TOTAL	**75**

COURSE DESCRIPTION

Various control operations are to be performed automatically and sequentially on the electrical machines to suit the industrial requirements. Programmable controllers are mainly employed to control the process in industries. In order to impart knowledge on programmable Logic Controller this theory subject is introduced.

OBJECTIVES:

Unit: 1

After completing this chapter, students should able to:

- ✓ Explain the meaning of automation and List the types of automation
- ✓ Define PLC and Explain why their use is valuable
- ✓ Explain what PLC can do
- ✓ Compare fixed and modular PLC
- ✓ Explain the advantages of PLC
- ✓ Explain the functions of various elements of power supply unit

Unit: 2

After completing this chapter, students should able to:

- ✓ Know the difference between digital and analog input and output signals
- ✓ Observe how digital field device information gets into a PLC
- ✓ Observe how analog field device information gets into a PLC
- ✓ Understand I/O addresses and how they are used in a PLC

Unit: 3

After completing this chapter, students should able to:

- ✓ Describe PLC timer instruction and differentiate between a non-retentive and retentive timer
- ✓ Program the control of outputs using the timer instruction
- ✓ List and describe the functions of PLC counter instructions
- ✓ Create PLC programs involving program control instructions, math instructions

Unit: 4

After completing this chapter, students should able to:

- ✓ Explain the functionality of different levels of industrial network
- ✓ Explain the concept of network topology and network protocols
- ✓ Explain the concept of I/O bus networks etc.,

Unit: 5

After completing this chapter, students should able to:

- ✓ Describe the computer control of process
- ✓ Explain the operation of SCADA
- ✓ Explain the functions of the major components of a process control system
- ✓ Explain how on/off control and PID control work.

COURSE OUTCOMES:

EEC 542 PROGRAMMABLE LOGIC CONTROLLER	
After successful completion of this course, the students should be able to	
C542.1	Explain the meaning of automation and List the types of automation
C542.2	Know the difference between digital and analog input and output signals
C542.3	Describe PLC timer instruction and differentiate between a non-retentive and retentive timer
C542.4	Explain the functionality of different levels of industrial network
C542.5	Describe the computer control of process

EEC 542 PROGRAMMABLE LOGIC CONTROLLER

UNIT	NAME OF THE TOPIC	HOURS
I	**INTRODUCTION TO PLC:**	**12 Hours**
	Automation – Types of Automation (manufacturing and Non-Manufacturing) –	1hr
	Advantages of automation - PLC Introduction -	1hr
	Definition – Block diagram of PLC – Principle of operation –	1hr
	Modes of operating – PLC Scan - Hardwire control system compared with PLC system –	2hrs
	Advantages and Disadvantages of PLCs – Criteria for	1hr
	selection of suitable PLC –	1hr
	Memory organization – Input Types –	1hr
	Discrete input – Analog in/out –	1hr
	Elements of Power supply unit - PLC	1hr
	Types (Fixed I/O and Modular I/O) –	1hr
	List of various PLCs available – Applications of PLC.	1hr
II	**INPUT/OUTPUT MODULES**	**13 Hours**
	The I/O Section - Discrete I/O modules(DC and AC) –	2hrs
	Analog I/O modules - Special I/O Modules–	2hrs
	I/O Module Specification - Typical Discrete and Analog I/O field Devices –	2hrs
	Sensors – Limit switch– Reed switch – Proximity sensor (Inductive and Capacitive) –	2hrs
	Types of Photo Electric Sensor - Sinking and Sourcing I/O modules–	2hrs
	TTL output module – Relay output module –	1hr
	Isolated output module- Input/output Addressing scheme in important commercial PLCs.	2hrs
III	**PLC PROGRAMMING**	**14 Hours**
	Types of programming methods – Types of programming devices –	2hrs
	Logic Functions – AND Logic – OR Logic – NOT Logic -	1hr
	Relay type instructions –Timer Instructions –	1hr
	ON Delay and OFF Delay Timer – Retentive Timer Instruction –	1hr
	Cascading Timers – Counter Instruction – UP Counter – DOWN Counter –	1hr
	UP/DOWN Counter – Cascading Counters – Program Control Instructions –	1hr
	Data Manipulation Instruction – Data Compare Instructions –	1hr
	Math Instructions - Sequencer Instructions - PID Instruction –	1hr
	PWM Function – Simple programs using above instructions.	1hr
	Develop ladder logic for: Bottle filling system –	1hr
	Automatic car parking system - EB to Generator Changeover system –	1hr
	Batch process – Elevator system - Automatic Star-Delta Starter – Traffic light control.	2hrs

IV	**NETWORKING** Levels of industrial network – Network Topology – Network Protocol – OSI Reference Model - Networking with TCP / IP Protocol - I/O Bus networks – Block diagram of I/O Bus networks – Types of I/O Bus networks - Protocol standards – Advantages of I/O Bus networks - Gateway – Token passing – Data Highway – Serial Communication – DeviceNet – Control Net – EtherNet – Modbus – Fieldbus – Profibus- Subnetting – Subnet mask - File transfer protocol.	**12 Hours** 1hr 2hrs 1hr 1hr 1hr 1hr 2hrs 1hr 2hrs
V	**DATA ACQUISITION SYSTEMS** Computers in Process control – Types of processes – Structure of control system – ON/OFF Control – Closed loop control - PID Control – Motion Control – Block diagram of Direct Digital Control – Supervisory Control and Data Acquisition (SCADA)– Block diagram of SCADA – Features of SCADA – Functions of SCADA - SCADA software - Data Loggers – Tags – Alarms - landlines for SCADA – use of modems in SCADA.	**12 Hours** 2hrs 1hr 2hrs 1hr 2hrs 1hr 1hr 2hrs

TEXT BOOK

Sl.No.	Title	Author(s)	Publishers
1	Introduction to Programmable Logic Controllers	Gary Dunning	CengageLearning India Pvt Ltd – Third Edition 2011
2	Technician's Guide to Programmable Logic Controllers	Richard A. Cox	Delmer – Sixth Edition 2011
3	Programmable Logic Controllers – Principle and Applications	John W. Webb	Prentice Hall
4	Programmable Logic Controllers	W. Bolton	Newness

REFERENCE BOOK

SL.NO.	TITLE	AUTHOR(S)	PUBLISHERS
1	Programmable Logic Controllers	Frank D.Petruzella	Tata McGraw Hill Edition-Fourth Edition 2011
2	Practical SCADA for industry	David Bailey Edwin Wright	Newnes

WEBSITES

www.industrial-electronics.com/elec-mach-drvs-pwr-syst_20-0.html
https://www.allaboutcircuits.com › Worksheets › AC Electric Circuits
https://www.industrialcontroldirect.com/motor-control-247/
https://unitronicsplc.com/what-is-plc-programmable-logic-controller/
www.plcmanual.com/plc-programming

CONTINUOUS INTERNAL ASSESSMENT

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

i) Attendance	- 5 Marks
ii) Test	- 10 Marks
iii) Assignment	- 5 Marks
iv) Seminar	- 5 Marks

	Total - 25 Marks

CO-POs & PSOs Mapping matrix

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2	PSO3
CO542.1	3	3	3	-	-	-	-	-	-	3
CO542.2	3	3	3	-	-	-	-	-	-	3
CO542.3	3	3	3	-	-	-	-	-	-	3
CO542.4	3	3	3	-	-	-	-	-	-	3
CO542.5	3	3	3	-	-	-	-	-	-	3
Total	15	15	15	-	-	-	-	-	-	15
Correlation level	3	3	3	-	-	-	-	-	-	3

Correlation level 1 – Slight (Low)
Correlation level 2 – Moderate (Medium)
Correlation level 3 – Substantial (High)

QUESTION PAPER SETTING

The teaching learning process and assessment are being carried out in accordance with the revised Bloom's Taxonomy. The question paper should consist of 90% questions based on Lower Order Thinking (LOTs) and the remaining 10% based on Higher Order Thinking (HOTs) as detailed below.

Bloom's Taxonomy	Lower Order Thinking Skills (LOTs)	Higher Order Thinking Skills (HOTs)
Level	R-Remember, U-Understand, Ap-Apply	An-Analyze, E-Evaluate, C-Create
% to be included	90%	10%

PROGRAMMABLE LOGIC CONTROLLERS (ELECTIVE THEORY I)

Time : 3 Hr Max.Marks :75

PART – A (5X 2 =10 MARKS)				
Note : (i) Answer any Five Questions (ii) All questions carry equal marks			Unit	Blooms Level
1		State the use of PLC.	I	R
2		Draw the block diagram of PLC.	I	R
3		Draw the symbol of Float switch	II	R
4		State the purpose of input output interface	II	R
5		What are the types of programming methods?	III	R
6		State the uses of counter in a PLC	III	R
7		What are the classifications of network?	IV	R
8		Expand DAS.	V	U
PART – B (5X3=15 MARKS)				
Note : (i) Answer any Five Questions (ii) All questions carry equal marks			Unit	Blooms Level
9		What are the types of automation ?	I	R
10		What is the function of analog input module?	II	R
11		What are the types of photo electric sensor?	II	R
12		List the different types of programming methods of PLC	III	R
13		Which field bus is required with distributed control system?	III	R
14		What is communication protocol?	IV	R
15		Draw the block diagram of SCADA	V	R
16		Mention some transmission media.	V	R
PART –C (5X 10 =50 MARKS)					
Note: (i) Answer all the question choosing sub- division (A) or Sub division (B) of each question. (ii) All questions carry equal marks.			Unit	Blooms Level	Maximum Marks
17	A	Discuss in detail about advantages of PLC over hardwired system.	I	C	10
		[OR]			
	B	Draw the basic block diagram of PLC and give brief account on each block.	I	R	10
18	A	Draw the discrete input module and explain the operation.	II	U	10
		[OR]			
	B	Discuss in detail about various output module of PLC.	II	C	10
19	A	Explain ON delay and OFF delay timer instructions with simple examples.	III	U	10

		[OR]			
	B	Develop relay logic diagram of star delta starter and convert it into logic diagram	III	AP	10
20	A	Draw a typical architecture of industrial control system showing field bus and explain?	IV	U	10
		[OR]			
	B	Give a note on: i) Ethernet ii) Transport layer	IV	R	10
21	A	What do you understand by DAS. Discuss its function with simple real time example.	V	R	10
		[OR]			
	B	Discuss in detail about SCADA software.	V	C	10

Note: the question paper setters are requested to follow the revised Bloom's Taxonomy levels as presented below:

Bloom's taxonomy level	Lower Order Thinking Skills (LOTs)	Higher Order Thinking Skills (HOTs)
	R-Remember, U-Understand, Ap-Apply	An-Analyse, E-Evaluate, C- Create
% to be included	90%	10%

EEC 543 ELECTRICAL MACHINE DESIGN

TEACHING AND SCHEME OF EXAMINATION

No. of weeks per Semester: 15 Weeks

Course	Instructions		Examination			
	Hours / Week	Hours / Semester	Assessment Marks			Duration
			Internal Assessment	Semester End Examination	Total	
ELECTRICAL MACHINE DESIGN	5 Hours	75 Hours	25	75	100	3 Hours

TOPICS AND ALLOCATION OF HOURS

UNIT	TOPIC	TIME (Hours)
I	Electrical Machine Design –Basic Consideration	12
II	Magnetic Circuit Calculations	12
III	Design of Transformer	14
IV	Design of DC machines	14
V	Design of AC machines	16
	Revision and Test	12
	Total	**75**

COURSE DESCRIPTION

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:

After completing this chapter, students should able to:

- ✓ 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.

COURSE OUTCOMES:

EEC 543 ELECTRICAL MACHINE DESIGN	
After successful completion of this course, the students should be able to	
C543.1	Describe the Static and Rotating Electrical Machine specifications, materials, losses and effects of temperature rise.
C543.2	Explain the Magnetic force, magnetic force gap, teeth and leakage flux in static and rotating electrical machines
C543.3	Designing of single phase, three phase transformer, core and coil.
C543.4	Designing of DC machines.
C543.5	Designing of 3phase induction motor and 3phase synchronous machines.

EEC 543 ELECTRICAL MACHINE DESIGN

Unit	Name of the Topic	Hours
I	**Electrical Machine Design –Basic Consideration** Design definition – Design consideration – limitation – constructional elements of Transformers and rotating machines – Constructional materials of electrical machines – Conducting magnetic and insulating materials standard specification – general design process – main dimensions of rotating machines – electrical and magnetic losses –temperature –rise –class of duty –limits of temperature rise.	**12 Hours** 2hrs 2hrs 2hrs 2hrs 2hrs 2hrs
II	**Magnetic Circuit Calculations** Magnetic circuits of DC machines, round rotation AC machines, salient poles AC machines and Transformer – Specific magnetic and electrical loading – Factor influencing the specific and magnetic loading – Magnetic leakages –magnetizing curves –calculation of magnetizing force for the air gap of rotating machines and for teeth – leakage flux –leakage reactance – armature slot leakage reactance	**12 Hours** 1hr 1hr 1hr 1hr 1hr 1hr 1hr 1hr
III	**Design of Transformer** Important considerations –core and shell types – Distribution transformers and power transformers –core section – clearance –yoke section – main dimension – single phase core type Transformers – three phase core type transformer – output coefficient - voltage per turn – specific magnetic and electric loading of transformer – Winding design –cross over, helix, disc helix.	**14 Hours** 2hrs 2hrs 2hrs 2hrs 2hrs 2hrs 2hrs
IV	**Design of dc machines** Important design consideration –number of poles – Advantages of large number of poles – air gap – armature slot – Current density –field system – commutator – design of large dc motor. Specific magnetic and electric loading of dc machines.	**14 Hours** 2hrs 2hrs 2hrs 2hrs 2hrs 2hrs 2hrs
V	**Design of ac machines** AC machine design consideration –power equation – separation of diameter and length –problems. Three phase induction motor –important design consideration – standard frames and	**16 Hours** 2hr 2hr 2hr

	stampings –gap length –flux density – current density –power factor – efficiency –slot combination – Winding - design of 3 phase induction motors. Three phase synchronous machines –important design consideration – radial gap length –stator slot –stator coil –rotor construction – design of 3 phase synchronous machines.	2hr 2hr 2hr 2hr 1hr 1hr

TEXT BOOK

Title	Author(s)	Publishers	Edition
Course in Electrical Machine Design	A.K.Sawhney	Dhanrai publishing company	2007

REFERENCE BOOKS

Sl.No	Title	Author(s)	Publishers	Edition
1	Principles of Electrical Machine Design	S.K.Sen	Oxford & IBH	2008
2	Principles of Electrical Machine Design	R.K.Agarwal	S.K.Kataria & Sons	2006
3	Design of Electrical Machine	Mittle V.N	Standard Book – House	2006

WEBSITES

www.industrial-electronics.com/elec-mach-drvs-pwr-syst_20-0.html
https://www.allaboutcircuits.com › Worksheets › AC Electric Circuits
https://www.industrialcontroldirect.com/motor-control-247/
https://unitronicsplc.com/what-is-plc-programmable-logic-controller/
www.plcmanual.com/plc-programming

CONTINUOUS INTERNAL ASSESSMENT

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

i) Attendance	- 5 Marks
ii) Test	- 10 Marks
iii) Assignment	- 5 Marks
iv) Seminar	- 5 Marks

Total	**- 25 Marks**

CO-POs & PSOs Mapping matrix

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2	PSO3
CO543.1	3	3	3	-	-	-	-	-	-	3
CO543.2	3	3	3	-	-	-	-	-	-	3
CO543.3	3	3	3	-	-	-	-	-	-	3
CO543.4	3	3	3	-	-	-	-	-	-	3
CO543.5	3	3	3	-	-	-	-	-	-	3
Total	15	15	15	-	-	-	-	-	-	15
Correlation level	3	3	3	-	-	-	-	-	-	3

Correlation level 1 – Slight (Low)
Correlation level 2 – Moderate (Medium)
Correlation level 3 – Substantial (High)

QUESTION PAPER SETTING

The teaching learning process and assessment are being carried out in accordance with the revised Bloom's Taxonomy. The question paper should consist of 90% questions based on Lower Order Thinking (LOTs) and the remaining 10% based on Higher Order Thinking (HOTs) as detailed below.

Bloom's Taxonomy	Lower Order Thinking Skills (LOTs)	Higher Order Thinking Skills (HOTs)
Level	R-Remember, U-Understand, Ap-Apply	An-Analyze, E-Evaluate, C-Create
% to be included	90%	10%

ELECTRICAL MACHINE DESIGN (ELECTIVE THEORY I)

Time : 3 Hrs Max.Marks :75

PART – A (5X 2 =10 MARKS)				
Note : (i) Answer any Five Questions (ii) All questions carry equal marks			Unit	Blooms Level
1		List important specification of a DC machine	I	R
2		Which shaft type is generally used in Water wheel generators.	I	R
3		Define leakage coefficient.	II	R
4		What are the effects of leakage flux in electrical machines.	II	R
5		Mention the factors that affect the voltage regulation in transformer	III	R
6		State the use of Distribution transformers.	III	R
7		What are the important considerations in selecting no of poles in DC machine?	IV	R
8		Mention the type of air gap in Turbo alternator	V	R
PART – B (5X3=15 MARKS)				
Note : (i) Answer any Five Questions (ii) All questions carry equal marks			Unit	Blooms Level
9		In which transformer Oil deteriorates faster.	I	R
10		What is leakage flux?	II	R
11		Why power transformers are designed to have maximum efficiency at or near full load	III	R
12		Mention the factors that affect the voltage regulation transformer and rotating machines.	III	R
13		Mention the current density of small wire wound armature.	IV	R
14		Define specific magnetic loading.	IV	R
15		State the factor that governs Diameter in ac machines.	V	R
16		Write the formula for the frequency of flux reversal in armature.	V	R
PART –C (5X 10 =50 MARKS)				
Note: (i) Answer all the question choosing sub- division (A) or Sub division (B) of each question. (ii) All questions carry equal marks.			Unit	Blooms Level	Maximum Marks
17	A	What are the important design and construction elements of a transformer? Discuss about them.	I	R	10
		[OR]			
	B	Discuss in detail about magnetic materials used for machine design.	I	C	10
18	A	Explain in detail about rotating machine leakage reactance.	II	U	10
		[OR]			
	B	Discuss about magnetizing force for teeth.	II	C	10

19	A	Estimate the main dimensions including winding conductor area of a 3-phase, Δ-Y core type transformer rated at 300 kVA, 6600/440 V, 50Hz. A suitable core with 3-steps having a circumscribing circle of 0.25 m diameter and a leg spacing of 0.4 is available. Emf per turn = 8.5V, δ= 2.5 A/mm², Kw =0.28, Sf=0.9 (stacking factor).	III	E	10
		[OR]			
	B	Discuss about helix type transformer winding.	III	C	10
20	A	Arrive the power equation of dc generator and dc motor.	IV	U	10
		[OR]			
	B	Enumerate the advantages of large number of poles in dc machine.	IV	U	10
21	A	Mention the important design considerations of3 phase induction motor& discuss about them.	V	R	10
		[OR]			
	B	Determine approximate values for the stator bore and the effective core length of a 55 KW, 415 V, three phase, star connected, 50 Hz four pole induction motor. Efficiency = 90%; power factor =0.91; winding factor = 0.955.Assume suitable data wherever necessary.	V	E	10

Note: the question paper setters are requested to follow the revised Bloom's Taxonomy levels as presented below:

Bloom's taxonomy level	Lower Order Thinking Skills (LOTs)	Higher Order Thinking Skills (HOTs)
	R-Remember, U-Understand, Ap-Apply	An-Analyse, E-Evaluate, C- Create
% to be included	90%	10%

EEC 550 COMPUTER AIDED ELECTRICAL DRAWING PRACTICAL

TEACHING AND SCHEME OF EXAMINATION

No. of weeks per Semester: 15 Weeks

Course	Instructions		Examination			
	Hours / Week	Hours / Semester	Assessment Marks			Duration
			Internal Assessment	Semester End Examination	Total	
COMPUTER AIDED ELECTRICAL DRAWING PRACTICAL	4 Hours	60 Hours	25	75	100	3 Hours

COURSE DESCRIPTION

This subject is introduced in order to impart skill of making computer aided electrical drawing.

OBJECTIVES

On completion of this practical subject, the students will be able to

- 2D diagrams using Auto CAD
- Symbols widely used in Electrical and Electronics circuits
- Single line diagram of different types of panels.
- Single line diagrams of substation layout.
- Winding diagrams
- Line diagram of distribution panels

COURSE OUTCOMES:

EEC 550 COMPUTER AIDED ELECTRICAL DRAWING PRACTICAL	
After successful completion of this course, the students should be able to	
C550.1	Symbols widely used in Electrical and Electronics circuits
C550.2	Understand CAD Application package for Electrical Drawing.
C550.3	Develop winding diagrams of Electrical Machines
C550.4	Understand and Draw Electrical Wiring, Single line diagrams
C550.5	Understand and Draw Line diagram of distribution panels

EQUIPMENTS REQUIRED

S.NO	NAME OF THE EQUIPMENT	QUANTITY REQUIRED
1.	PC – Pentium Dual Core	30
2.	Electrical CAD Software multi user	01
3.	UPS – 5KVA with half an hour battery backup	01

EEC 550 COMPUTER AIDED ELECTRICAL DRAWING PRACTICAL

List of Experiments

Si.No	List of Experiments	Course Outcome
	ELECTRICAL SYMBOLS-DRAWING	
1	Draw the symbols for components: Resistor, Capacitor, Inductor, Diode, Transistor, FET, SCR, UJT, TRIAC, DIAC, and Gates AND, OR, NOT, NAND, NOR, EXOR.	C550.1
2	Draw the symbols used in electrical wiring: Relays, contactors, fuses, main switch, electric bell, earth, DPST, DPDT, TPST, Neutral link.	C550.1
3	Draw the symbols for instruments: Ammeter, Voltmeter, Wattmeter, Energy meter, Frequency meter, Power factor meter, Timer and Buzzers.	C550.1
4	Draw the symbols for machines: Armatures, Alternators, Field winding (Shunt, Series and Compound) Transformer and Auto transformer	C550.1
	ELECTRICAL CONNECTION DIAGRAMS- DRAWING	
1	Draw the Single Line diagram of Single phase MCB Distribution board.	C550.5
2	Draw the Single Line diagram of three phase MCB Distribution board.	C550.5
3	Draw the Single Line diagram of typical MV Panel.	C550.4
4	Draw the Single Line diagram of Lighting Distribution Board (LDB).	C550.4
5	Draw the Single Line diagram of Motor Control Centre (MCC) Panel	C550.4
6	Draw the Single Line diagram of fire alarm riser arrangement in multi-storey building.	C550.4
7	Draw the Single Line diagram of intercom arrangement in multi-storey building.	C550.4
8	Draw the front end schematic diagram of typical Sub switch board (SSB).	C550.4
9	Draw the winding diagram of lap connected DC armature with commutator connections and brush positions.	C550.4
10	Draw the control and main circuit of automatic star delta starter.	C550.3
11	Draw the mush winding diagram of a three phase induction motor.	C550.3
12	Draw the concentric winding diagram of a single phase induction motor.	C550.3
13	Draw the single line diagram of 110 KV / 11 KV receiving substation.	C550.3
14	Draw the Single Line diagram of DOL Starter.	C550.3

Continuous Internal Assessment

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

a) Attendance : 5 marks – (Award of marks same as theory subjects)

b) Procedure/ observation and tabulation/ Other Practical related work : 10 marks

c) Record writing : 10 marks

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Total 25 marks

LEARNING WEBSITES

https://www.academia.edu/25581894/Subject_Computer_Aided_Electrical_drawing_CAED_Subject_Code_10EE65
https://sites.google.com/a/cmrit.ac.in/kashifahmed786/courses/caed---computer-aided-electrical-drawing-10ee65
https://www.scribd.com/document/58518215/1-Computer-Aided-Electrical-Drawing-Syllabus
https://www.youtube.com/watch?v=q3wa6ZPVWd8

CO-POs & PSOs Mapping matrix

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2	PSO3
CO550.1	-	-	3	-	-	-	-	3	1	1
CO550.2	-	-	3	-	-	-	-	3	1	1
CO550.3	-	-	3	-	-	-	-	3	1	1
CO550.4	-	-	3	-	-	-	-	3	1	1
CO550.5	-	-	3	-	-	-	-	3	1	1
Total	-	-	15	-	-	-	-	15	5	5
Correlation level	-	-	3	-	-	-	-	3	1	1

Correlation level 1 – Slight (Low)
Correlation level 2 – Moderate (Medium)
Correlation level 3 – Substantial (High)

EEC 560 MICROCONTROLLER PRACTICAL

TEACHING AND SCHEME OF EXAMINATION

No. of weeks per Semester: 15 Weeks

Course	Instructions		Examination			
	Hours / Week	Hours / Semester	Assessment Marks			Duration
			Internal Assessment	Semester End Examination	Total	
MICROCONTROLLER PRACTICAL	4 Hours	60 Hours	25	75	100	3 Hours

COURSE DESCRIPTION

Today Microcontroller Engineering has developed to a great extent that there is always the need for study of various controller concepts. This lab is fulfill the need for students to write the assembly language programme for Multibyte Addition, Multiplication, Division, BCD to HEX,ASCII to Binary and execute the same in 8051 kit and also write the assembly language programme for Interfacing Digital I/O board, ADC, DAC, Stepper Motor etc.,

OBJECTIVES

On completion of this practical subject, the students will be able to

- Write the assembly language programme for Multibyte addition, Multiplication, Division, Ascending order.
- Write the assembly language programme for the conversions like BCD to HEX,HEX to BCD,ASCII to Binary
- Write the assembly language programme for Parity generation & Timer, Counter and also the above programmes are executed by using 8051 microcontroller kit.
- Write the assembly language programme for Interfacing Digital I/O Board, Matrix Keyboard, Seven Segment LED Display **,**Traffic Light control, ADC, DAC, Stepper Motor, DC Motor and test it with Application Boards.

COURSE OUTCOMES:

EEC 560 MICROCONTROLLER PRACTICAL	
After successful completion of this course, the students should be able to	
C560.1	Understand and apply the fundamentals of assembly level programming of microcontroller.
C560.2	Provide practical hands on experience with Assembly Language Programming.
C560.3	Familiarize the students with interfacing of various peripheral devices with 8051 microcontroller.
C560.4	Improve programming logic skills and concepts of 8051 microcontroller.
C560.5	Apply the concepts of 8051 microcontroller.

EQUIPMENTS REQUIRED

S.No	Name of the Equipments	Range	Required Nos
1.	8051 Microcontroller Kit	-	14 Nos
2.	Digital I/O Interface Board	-	02 Nos
3.	Matrix keyboard Interface Board	-	02 Nos
4.	Seven segment LED display Interface Board	-	02 Nos
5.	Traffic light Interface Board	-	02 Nos
6.	8 bit ADC Interface Board	-	02 Nos
7.	8 bit DAC Interface Board	-	02 Nos
8.	Stepper Motor Control Interface Board	-	02 Nos
9.	DC motor control Interface Board	-	02 Nos
10.	RS232 serial port cable	-	02 Nos

EEC 560 MICROCONTROLLER PRACTICAL

List of Experiments

Si.No	List of Experiments	Course Outcome
	Part-A	
1	Write an Assembly Language Program for Multi-byte Addition and execute the same in the 8051 Kit.	C560.1
2	Write an Assembly Language Program for Multiplication and Division of two numbers and execute the same in the 8051 Kit.	C560.1
3	Write an Assembly Language Program for Arranging the given data in Ascending order and execute the same in the 8051 Kit.	C560.1
4	Write an Assembly Language Program for ASCII to Binary and execute the same in the 8051 Kit.	C560.1
5	Write an Assembly Language Program for Parity bit generation and execute the same in the 8051 Kit.	C560.1
6	Write an Assembly Language Program for using timer / Counter and execute the same in the 8051 Kit.	C560.1
	Part – B **INTERFACING WITH APPLICATION BOARDS**	
7	Write an Assembly Language Program for interfacing Digital I/O board and test it.	C560.3
8	Write an Assembly Language Program for interfacing Matrix keyboard and test it.	C560.3
9	Write an Assembly Language Program for interfacing seven segment LED displays and test it.	C560.3
10	Write an Assembly Language Program for interfacing Traffic light control and test it.	C560.3
11	Write an Assembly Language Program for interfacing 8 bit ADC and test it.	C560.3
12	Write an Assembly Language Program for interfacing 8 bit DAC and test it.	C560.3
13	Write an Assembly Language Program for interfacing STEPPER MOTOR and test it.	C560.3
14	Write an Assembly Language Program for interfacing DC motor and test it.	C560.3
15	Write an Assembly Language Program for Sending data through serial port between controller kits and test it	C560.3
16	Write an Assembly Language Program for BCD to Hexadecimal and execute the same in the 8051 Kit.	C560.3
17	An application oriented project for interfacing an IR sensor with 8051.	C560.3

Continuous Internal Assessment

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

a) Attendance : 5 marks – (Award of marks same as theory subjects)

b) Procedure/ observation and tabulation/ Other Practical related work : 10 marks

c) Record writing : 10 marks

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Total 25 marks

LEARNING WEBSITES

https://www.scribd.com/doc/52683697/Micro-Controller-Practical-File
https://lecturenotes.in/download/note/23199?utm_source=material- page&utm_medium =web&utm_campaign=download-page
https://lecturenotes.in/download/practical/18635-lab-manuals-for-microprocessor-and-microcontroller-mpmc-by-annu-a

CO-POs & PSOs Mapping matrix

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2	PSO3
CO560.1	3	2	2	3	2	2	2	3	3	3
CO560.2	2	2	3	3	2	2	2	3	3	2
CO560.3	2	2	3	3	2	2	2	3	3	2
CO560.4	3	2	3	3	2	2	2	3	3	2
CO560.5	2	2	2	3	2	2	3	2	3	3
Total	12	10	13	15	10	10	11	14	15	10
Correlation level	2	2	3	3	2	2	2	3	3	2

Correlation level 1 – Slight (Low)
Correlation level 2 – Moderate (Medium)
Correlation level 3 – Substantial (High)

EEC 571 CONTROL OF ELECTRICAL MACHINES PRACTICAL

TEACHING AND SCHEME OF EXAMINATION

No. of weeks per Semester: 15 Weeks

Course	Instructions		Examination			
	Hours / Week	Hours / Semester	Assessment Marks			Duration
			Internal Assessment	Semester End Examination	Total	
CONTROL OF ELECTRICAL MACHINES PRACTICAL	4 Hours	60 Hours	25	75	100	3 Hours

COURSE DESCRIPTION

Various control operations are to be performed on the electrical machines to suits the industrial requirements. Technicians are mainly employed to look after the control panels. To make our students employable, they have to be trained in using various control components and circuits. This subject fulfils that requirement.

OBJECTIVES

On completion of this practical subject, the students will be able to

- Make use of various types of control circuit elements like industrial switches, relays, timers, solenoids, contactors and interlocking arrangement.
- Construct various types of automatic starters for electrical motors.
- Construct control circuits for braking, jogging, reversing operations.
- To make use of PLCs for control applications.
- To program PLCs for controlling the motor.

COURSE OUTCOMES:

EEC 571 CONTROL OF ELECTRICAL MACHINES PRACTICAL	
After successful completion of this course, the students should be able to	
C571.1	Make use of various types of control circuit elements like industrial switches, relays, timers, solenoids, contactors and interlocking arrangement.
C571.2	Construct various types of automatic starters for electrical motors.
C571.3	Construct control circuits for braking, jogging, reversing operations.
C571.4	To make use of PLCs for control applications.
C571.5	To program PLCs for controlling the motor.

EQUIPMENTS REQUIRED

S. No	LIST OF EQUIPMENTS	QUANTITY REQUIRED
1	Transformer oil Tester Kit, Acidity test kit	Each 1
2	Thermal Overload Relay	3
3	AC contactor 230v/440v, 16A	26
4	Push Button With NO/NC Elements	30
5	Induction motor 440 V, 1440 rpm, any HP rating (apart from EM-II lab)	3
6	Proximity switch	2
7	PLC (any brand) suitable for above experiments	5
8	Solenoid valve	2
9.	Three stage lift model, conveyor model	Each 1
10	25KVA, 11KV/400V Distribution Transformer.	1

EEC 571 CONTROL OF ELECTRICAL MACHINES PRACTICAL

Si.No	List of Experiments	Course Outcome
1	a) Perform breakdown test and determine the dielectric strength of transformer oil. b) Conduct acidity test on transformer oil.	C571.1
2	Test the timing characteristics of thermal over load relay.	C571.1
3	Wire and test the control circuit for jogging in cage induction motor.	C571.3
4	Wire and test the control circuit for semi-automatic star –delta starter.	C571.2
5	Wire and test the control circuit for automatic star –delta starter.	C571.2
6	Wire and test the control circuit for dynamic braking of cage motor.	C571.3
7	Wire and test the control circuit for two speed pole changing motor.	C571.2
8	Wire and test the control circuit for forward and reverse operation.	C571.2
9	Wire and test the control circuit for automatic rotor resistance starter.	C571.2
10	Test the working of single phase preventer.	C571.2
11	Wire and test the DOL starter with single phase preventer using PLC.	C571.5
12	Wire and test the Star –Delta starter using PLC.	C571.5
13	Wire and test the control circuit for automatic rotor resistance starter using PLC.	C571.5
14	Develop & execute the ladder logic diagram in PLC for 3 stage lift operation.	C571.5
15	Wire and test the sequential operation of solenoid valve and a motor for tank filling operation using PLC.	C571.5
16	Develop and execute the ladder logic to interface PLC with conveyor model for counting the object moving in the conveyer	C571.5
17	Dismantling & Reassembling of 25KVA, 11KV/400V Distribution Transformer.	C571.5

Continuous Internal Assessment

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

a) Attendance : 5 marks – (Award of marks same as theory subjects)

b) Procedure/ observation and tabulation/ Other Practical related work : 10 marks

c) Record writing : 10 marks

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Total 25 marks

LEARNING WEBSITES

https://www.slideshare.net/venkatdon/control-of-electrical-machines
http://www.alecop.com/wp-content/uploads/2015/07/8-ELECTRONIC-CONTROL-OF-ELECTRICAL-MACHINES.pdf
https://lecturenotes.in/practicals/13630-lab-manuals-for-electrical-machine-1-em1-by-nihar-ranjan-rout
https://www.researchgate.net/publication/274371166_REAL_TIME_CONTROL_OF_ELECTRICAL_MACHINE_AND_DRIVES_A_REVIEW

CO-POs & PSOs Mapping matrix

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2	PSO3
CO571.1	3	-	3	-	-	-	-	3	1	1
CO571.2	3	-	3	-	-	-	-	3	1	1
CO571.3	3	-	3	-	-	-	-	3	1	1
CO571.4	3	-	3	-	-	-	-	3	1	1
CO571.5	3	-	3	-	-	-	-	3	1	1
Total	15	-	15	-	-	-	-	15	5	5
Correlation level	3	-	3	-	-	-	-	3	1	1

Correlation level 1 – Slight (Low)
Correlation level 2 – Moderate (Medium)
Correlation level 3 – Substantial (High)

EEC 572 PROGRAMMABLE LOGIC CONTROLLER PRACTICAL

TEACHING AND SCHEME OF EXAMINATION

No. of weeks per Semester: 15 Weeks

Course	Instructions		Examination			
	Hours / Week	Hours / Semester	Assessment Marks			Duration
			Internal Assessment	Semester End Examination	Total	
PROGRAMMABLE LOGIC CONTROLLER PRACTICAL	4 Hours	60 Hours	25	75	100	3 Hours

COURSE DESCRIPTION

Various control operations are to be performed automatically and sequentially on the electrical machines to suit the industrial requirements. Programmable controllers are mainly employed to control the process in industries. In order to train our students on handling of programmable controllers this practical subject is introduced.

OBJECTIVES

On completion of this practical subject the students will be able to

- Develop ladder logic for different types of starters.
- Develop ladder logic for EB to Generator changeover.
- Develop ladder logic for Automatic load transfer.
- Develop ladder logic for sequential control process like water filling, fire alarm and conveyor sorting etc.,
- To program PLCs for controlling Heater and motors.

COURSE OUTCOMES:

EEC 572 PROGRAMMABLE LOGIC CONTROLLER PRACTICAL	
After successful completion of this course, the students should be able to	
C572.1	Develop ladder logic for different types of starters
C572.2	Develop ladder logic for EB to Generator changeover
C572.3	Develop ladder logic for Automatic load transfer
C572.4	Develop ladder logic for sequential control process like water filling, fire alarm and conveyor sorting etc
C572.5	To program PLCs for controlling Heater and motors

EQUIPMENTS REQUIRED

S.NO	LIST OF EQUIPMENTS	QUANTITY REQUIRED
1	PLC suitable to conduct above experiments	3
2	Limit switch	1
3	Reed switch	1
4	Inductive proximity sensor	1
5	Capacitive proximity sensor	1
6	PC laptop	3

EEC 572 PROGRAMMABLE LOGIC CONTROLLER PRACTICAL

Si.No	List of Experiments	Course Outcome
1	Interfacing of Limit switch, Reed switch and Proximity switch with PLC.	C572.5
2	DOL starter with single phase prevention.	C572.1
3	EB to Generator Change over switch implementation with interlocking	C572.1
4	Star Delta starter Single phasing prevention Adjustable star-delta transfer time Pre-settable overload trip time	C572.1
5	Automatic load transfer Transfers load from one phase to another when one phase in a three phase system fails Automatically restores when power is resumed Time delays are effected to prevent action during short time failure	C572.1
6	Fill the water in water tank and maintain the water level. When water level comes below lower level switch ON the pump When water level reaches the high level switch OFF the pump Include manual switch to operate the pump at any level of water.	C572.4
7	Fire alarm Multiple alarms Sound alarm If not acknowledged, Sound alarms 1 and 2 Similarly go up to 4 alarm conveyor belt sorting	C572.4
8	Three floor Lift control	C572.4
9	Traffic light control	C572.4
10	Automatic operation of double acting pneumatic cylinder – Multi cycle	C572.4
11	Sequential operation of two Double Acting Cylinders for the sequence A+,B+, B-,A-	C572.4
12	Analog input to PLC as a set of valve for a comparator function block The input is multilevel illumination control. The input is setting is by means of a potentiometer in an analog input to the PLC. The outputs turn on several groups of lamps to obtain desired level illumination.	C572.5
13	Heater control with PID function of the PLC A 1000 W water heater is controlled using the PID function of the PLC. The temperature transducer is a temperature transmitter with 4 to 20 mA output and Pt 100 Probe.	C572.5
14	Round table liquid filling system Dropping of Reagents into test tubes. The feedback is from	C572.5

	potentiometer. The program must ensure that the end limits of the pot are never reached by carefully balancing the clockwise and anti-clockwise revolution.	
15	Slow speed motor control using PWM function of the PLC Slow speed 12V DC 18W permanent magnet motor with fly wheel is controlled with the PWM output and feedback from a low resolution encoder.	C572.5

Continuous Internal Assessment

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

a) Attendance : 5 marks – (Award of marks same as theory subjects)

b) Procedure/ observation and tabulation/ Other Practical related work : 10 marks

c) Record writing : 10 marks

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Total 25 marks

LEARNING WEBSITES

https://en.wikipedia.org/wiki/Programmable_logic_controller
https://unitronicsplc.com/what-is-plc-programmable-logic-controller/
https://www.amci.com/industrial-automation-resources/plc-automation-tutorials/what-plc/
https://www.allaboutcircuits.com/textbook/digital/chpt-6/programmable-logic-controllers-plc/
https://www.allaboutcircuits.com/technical-articles/what-is-a-plc-introduction-to-programmable-logic-controllers/

CO-POs & PSOs Mapping matrix

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2	PSO3
CO572.1	3	-	3	-	-	-	-	3	1	1
CO572.2	3	-	3	-	-	-	-	3	1	1
CO572.3	3	-	3	-	-	-	-	3	1	1
CO572.4	3	-	3	-	-	-	-	3	1	1
CO572.5	3	-	3	-	-	-	-	3	1	1
Total	15	-	15	-	-	-	-	15	5	5
Correlation level	3	-	3	-	-	-	-	3	1	1

Correlation level 1 – Slight (Low)
Correlation level 2 – Moderate (Medium)
Correlation level 3 – Substantial (High)

EEC 573 ELECTRICAL MACHINE DESIGN PRACTICAL

TEACHING AND SCHEME OF EXAMINATION

No. of weeks per Semester: 15 Weeks

Course	Instructions		Examination			
	Hours / Week	Hours / Semester	Assessment Marks			Duration
			Internal Assessment	Semester End Examination	Total	
ELECTRICAL MACHINE DESIGN PRACTICAL	4 Hours	60 Hours	25	75	100	3 Hours

COURSE DESCRIPTION

Various winding operations are to be performed automatically and sequentially on the electrical machines to suit the industrial requirements. In order to train our students on handling of Electrical Machine Design this practical subject is introduced.

OBJECTIVES

On completion of this practical subject the students will be able to

- Know the magnetic laws and magnetic field.
- To measure the magnetic flux.
- Design and assembling of ceiling fan.
- Design and assembling of induction motor.
- Design and assembling of alternators.

COURSE OUTCOMES:

EEC 573 ELECTRICAL MACHINE DESIGN PRACTICAL	
After successful completion of this course, the students should be able to	
C573.1	Know the magnetic laws and magnetic field.
C573.2	To measure the magnetic flux
C573.3	Design and assembling of ceiling fan, transformers
C573.4	Design and assembling of induction motor
C573.5	Design and assembling of alternators

EQUIPMENTS REQUIRED

SI.NO	NAME OF THE EQUIPMENTS	REQUIRED QUANTITY
1	Permanent Magnets	2
2	Galvanometers	2
3	Flux meter	1
4	Growler	1
5	3Phase induction motor stator with winding	1
6	1KVA Single phase 230/15 loading Transformer	1
7	1KVA 3 phase Transformers (or) E & I type stampings for 1KVA Transformer, Primary Coils & Secondary Coils for 1KVA Transformer	3 12 9
8	5KW DC armature without winding	1
9	5KW DC machine with inter poles	2
10	Stator with winding, rotor and end covers with bearing of a 3HP cage induction motor	2 sets
11	5KVA Single phase alternator	1
12	3phase 3HP wound rotor induction motor	2
13	Ceiling Fans	2
14	Motor coil winding machines	2

EEC 573 ELECTRICAL MACHINE DESIGN PRACTICAL

Si.No	List of Experiments	Course Outcome
1	By simple experiment, verify the magnetic laws using Coil, permanent magnet and Galvanometer	C573.1
2	Verify the rotating magnetic field with stator and ball	C573.1
3	Measure magnetic flux using flux meter	C573.2
4	Using Crawler test the windings	C573.1
5	Design a 1 phase 1 KVA ,230/15V core type transformer and assemble the core	C573.3
6	Design a 1 phase 1KVA, 230/15V shell type transformer and assemble the core	C573.3
7	Design 3 phase 1 KVA transformer and assemble winding, core, etc.,	C573.3
8	Design 3 phase 1 KVA transformer (delta/star connected) and wind one coil set	C573.3
9	Design armature for 5 KW dc machine and insert one coil set	C573.3
10	Design field pole for 5 KW dc machine and assemble one pole and insert in the body	C573.3
11	Assemble the given dc machine (pole, inter pole, armature, commutator, brush etc).	C573.4
12	Design and assemble ceiling fan.	C573.3
13	Design and assemble a 3 HP induction motor.	C573.4
14	Design and assembled 3phase 3HP synchronous motor.	C573.4
15	Dismantle and assemble a 3 phase wound rotor induction motor	C573.4
16	Design and assembled 1phasesalient pole 5KVA alternator	C573.5

Continuous Internal Assessment

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

a) Attendance : 5 marks – (Award of marks same as theory subjects)

b) Procedure/ observation and tabulation/ Other Practical related work : 10 marks

c) Record writing : 10 marks

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Total 25 marks

LEARNING WEBSITES

https://www.scribd.com/document/240362799/Scet-Electrical-Machine-Design-Manual-Ee-424
https://www.scribd.com/document/365276219/Exp-Machine-Design-Lab
https://www.slideshare.net/badri21/machine-design-lab-manual
https://www.motor-design.com/motor-cad-software/lab/

CO-POs & PSOs Mapping matrix

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2	PSO3
CO573.1	3	-	3	-	-	-	-	3	1	1
CO573.2	3	-	3	-	-	-	-	3	1	1
CO573.3	3	-	3	-	-	-	-	3	1	1
CO573.4	3	-	3	-	-	-	-	3	1	1
CO573.5	3	-	3	-	-	-	-	3	1	1
Total	15	-	15	-	-	-	-	15	5	5
Correlation level	3	-	3	-	-	-	-	3	1	1

Correlation level 1 – Slight (Low)
Correlation level 2 – Moderate (Medium)
Correlation level 3 – Substantial (High)

EEC 610 DISTRIBUTION AND UTILIZATION

TEACHING AND SCHEME OF EXAMINATION

No. of weeks per Semester: 15 Weeks

Course	Instructions		Examination			
	Hours / Week	Hours / Semester	Assessment Marks			Duration
			Internal Assessment	Semester End Examination	Total	
DISTRIBUTION AND UTILIZATION	5 Hours	75 Hours	25	75	100	3 Hours

TOPICS AND ALLOCATION OF HOURS

UNIT	TOPIC	TIME (Hrs)
I	Distribution	12
II	Industrial Drives	12
III	Electric Traction	13
IV	Illumination	13
V	Electric Heating And Welding	13
	Revision and Tests	12
	TOTAL	**75**

COURSE DESCRIPTION

Distribution system is that part of power system which distributes power to the consumers for utilization. So to have adequate knowledge in distribution and utilization of Electrical energy it becomes necessary to include this subject.

OBJECTIVES

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

- Substation arrangements.
- Distribution -classification and scheme of connection.
- Drives-Suitability for different applications.
- Track Electrification-Traction mechanics.
- Traction motors and control.
- Illumination -Design of lighting scheme-sources of light.
- Electric Heating- Different methods.
- Electric furnaces and Temperature control.
- Electric welding and welding equipments.

COURSE OUTCOMES:

EEC 610 DISTRIBUTION AND UTILIZATION	
After successful completion of this course, the students should be able to	
C610.1	Identify different types of distribution and substations
C610.2	Select suitable motors for driving specific applications in the industry
C610.3	Describe electrical traction system
C610.4	Explain Illumination terms, sources of light and recommend illumination levels for specific application
C610.5	Describe types of Electric heating and welding

EEC 610 DISTRIBUTION AND UTILIZATION

UNIT	NAME OF THE TOPICS	HOURS
I	**DISTRIBUTION** **Substation:** Introduction-Sub stations-classification of sub stations-Indoor and outdoor S.S Gas insulated S.S-comparisons-Layout 110/11KV Substation and 11KV/400V Distribution Substation-substation Equipments Bus bar- Types of bus bar arrangement -Advantages and Disadvantages. **Distribution:** Distribution system-Requirements of a Distribution system-part of Distribution system- classification of Distribution systems comparison of different distribution systems (A.C and D.C) -A.C Distribution -Types- connection schemes of Distribution system A. C distribution calculations-Calculation of voltage at load points on single phase distribution systems (With concentrated load only) Distribution 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)	**12 Hours** 2hrs 2hrs 1hr 2hrs 1hr 2hrs 1hr 1hr
II	**INDUSTRIAL DRIVES** Introduction-Electric drive- AC Drives and DC Drives-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 –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 Braking- Features of good braking system- Types of Braking Advantages of- Electric braking-Plugging, Dynamic and Regenerative braking-As applied to various motors	**12 Hours** 2hrs 2hrs 2hrs 2hrs 2hrs 2hrs
III	**ELECTRIC TRACTION** Introduction-Traction systems-Advantages and Disadvantages of Electric Traction. **System of Track Electrification:** Methods of supplying power-Rail connected system and over head system-O.H. equipments-contact wire, centenary and droppers current collection gear for OHE-Bow and pantograph collector Different systems of Track Electrification	**13 Hours** 1hr 2hrs

	Advantages of single phase low frequency A. C. system-Booster Transformer-Necessity- Methods of connecting B.T-Neutral sectioning	2hrs
	Traction Mechanics:	
	Units and notations used in Traction mechanics-Speed time curve for different services - simplified speed time curve-Derivation of maximum speed	2hrs
	crest speed, Average speed, Schedule speed (definitions only)- Tractive effort and power requirement- Specific energy output- specific energy consumption.	2hrs
	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-	2hrs
	Transition- multiple unit control –Regenerative braking. Recent trends in Electric Traction-Magnetic Levitation (MEGLEV) - Suspension systems.	2hrs
IV	**ILLUMINATION**	**13 Hours**
	Introduction - Definition and units of different terms used in illumination-plane Angle, Solids 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	2hrs
	Reduction factor, Luminance, glare Lamp efficiency. Space-height ratio, Depreciation factor Utilization factor, waste light factor,	2hrs
	Absorption factor, Beam factor, Reflection factor	1hr
	Requirements of good lighting system- Laws of Illumination- problems.	2hrs
	Types of lighting scheme- Factors to be 14 considered while designing lighting scheme- Design of lighting Scheme (Indoor and outdoor)	2hrs
	Problems- Lighting systems- Factory lighting, Flood lighting, Street lighting.Sources of light-Arc lamp, Incandescent lamp, Halogen	2hrs
	Lamp, Sodium vapour lamp, High pressure mercury vapour lamp, Fluorescent Tube –Induction Lamp- Energy saving lamps (C.F.L and L.E.D lamps)	1hr
	limitation and disposal of C.F.L-benefits of led lamps-comparison of lumen output for led CFL and incandescent lamp.	1hr
V	**ELECTRIC HEATING AND WELDING**	**13 Hours**
	Electric Heating:	
	Introduction -Advantages of Electric heating-modes of heat transfer classification of Electric Heating - Power frequency electric heating Direct and Indirect resistance heating	2hrs
	Infrared heating-Arc heating –High frequency Electric heating Induction heating-Induction Stove –Eddy current heating and Dielectric heating.	2hrs

	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. **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).	2hrs 1hr 1hr 1hr 2hrs 1hr 1hr

TEXT BOOKS

S.No	Name of the Book	Author	Publisher
1	A Course in Electrical Power	Soni & Gupta	Dhanpat Rai & Sons, Delhi

REFERENCE BOOK

S.No	Name of the Book	Author	Publisher
1	Electric Power	SL Uppal	Khanna Publishers, New Delhi
2	Modern Electric Traction	H Partab	Dhanpat Rai & Sons, New Delhi
3	Electrical Power Distribution System	AS Pabla	Tata McGraw Hill Publishing Co, New Delhi
4	Utilization of Electric Power	NV Suryanarayana	Tata McGraw Hill Publishing Co, New Delhi

WEBSITES

https://www.electricaleasy.com/2018/01/electric-power-distribution-system.html
https://nptel.ac.in/courses/108108077/
https://www.slideshare.net/zunaibali/elec-traction-2
https://mysite.du.edu/~jcalvert/optics/lumens.html
https://www.coursehero.com › ... › ELECTRONICS › ELECTRONICS 101

CONTINUOUS INTERNAL ASSESSMENT

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

i) Attendance	- 5 Marks
ii) Test	- 10 Marks
iii) Assignment	- 5 Marks
iv) Seminar	- 5 Marks

Total	**- 25 Marks**

CO-POs & PSOs Mapping matrix

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2	PSO3
CO610.1	3	3	3	-	3	-	3	3	-	3
CO610.2	3	-	-	-	3	-	3	3	-	3
CO610.3	3	3	3	-	3	-	3	3	-	3
CO610.4	3	3	3	-	3	-	3	3	-	3
CO610.5	3	-	-	-	3	-	3	3	-	3
Total	15	9	9	-	15	-	15	15	-	15
Correlation level	3	3	3	-	3	-	3	3	-	3

Correlation level 1 – Slight (Low)
Correlation level 2 – Moderate (Medium)
Correlation level 3 – Substantial (High)

QUESTION PAPER SETTING

The teaching learning process and assessment are being carried out in accordance with the revised Bloom's Taxonomy. The question paper should consist of 90% questions based on Lower Order Thinking (LOTs) and the remaining 10% based on Higher Order Thinking (HOTs) as detailed below.

Bloom's Taxonomy	Lower Order Thinking Skills (LOTs)	Higher Order Thinking Skills (HOTs)
Level	R-Remember, U-Understand, Ap-Apply	An-Analyze, E-Evaluate, C-Create
% to be included	90%	10%

DISTRIBUTION AND UTILIZATION

Time : 3 Hrs Max.Marks :75

PART – A (5X 2 =10 MARKS)			
Note : (i) Answer any Five Questions (ii) All questions carry equal marks		Unit	Blooms Level
1	Name the three parts of a distribution system.	I	R
2	Name the important equipments used in the sub – station.	I	R
3	State the classification of standard ratings of motor.	II	R
4	What are the important parts of electric drives?	II	R
5	Define average speed.	III	R
6	State any three advantages of electric traction.	III	R
7	Define solid angle.	IV	R
8	What are the modes of heat transfer?	V	R
PART – B (5X3=15 MARKS)			
Note : (i) Answer any Five Questions (ii) All questions carry equal marks		Unit	Blooms Level
9	What are the advantages of interconnected distribution system?	I	R
10	What is the function of instrument transformer used in sub station?	I	R
11	What is meant by individual drive?	II	R
12	What is meant by plugging?	II	R
13	List the motors used for traction purpose.	III	R
14	Explain the function of catenary and droppers.	III	U
15	What are the factors to be considered while designing the lighting scheme?	IV	R
16	State any three requirements of good welding.	V	R

PART –C (5X 10 =50 MARKS)					
Note: (i) Answer all the question choosing sub- division (A) or Sub division (B) of each question. (ii) All questions carry equal marks.			Unit	Blooms Level	Maximum Marks
17	A	Compare the cost of conductor in 3 phase 4 wire and 2 wire DC system.	I	An	10
		[OR]			
	B	Explain with necessary diagram the double bust – bar arrangement in a sub – station. List its advantages.	I	U	10
18	A	Explain briefly the regenerative braking applied to DC shunt motor and DC series motor.	II	U	10
		[OR]			
	B	Explain the factors governing the selection of motors.	II	U	10
19	A	What is the function of booster transformer in traction? Explain with an illustration.	III	R	10
		[OR]			
	B	Explain with neat sketch the multiple unit control.	III	U	10

20	A	Explain the operation of high pressure Mercury Vapour lamp.	IV	U	10
		[OR]			
	B	Explain various types of lighting scheme.	IV	U	10
21	A	Explain the operation of direct core type induction furnace.	V	U	10
		[OR]			
	B	Explain the construction and advantages of laser welding and state its applications.	V	U	10

Note: the question paper setters are requested to follow the revised Bloom's Taxonomy levels as presented below:

Bloom's taxonomy level	Lower Order Thinking Skills (LOTs)	Higher Order Thinking Skills (HOTs)
	R-Remember, U-Understand, Ap-Apply	An-Analyse, E-Evaluate, C- Create
% to be included	90%	10%

EEC 620 OPERATION AND MAINTENANCE OF ELECTRICAL EQUIPMENT

TEACHING AND SCHEME OF EXAMINATION

No. of weeks per Semester: 15 Weeks

Course	Instructions		Examination			
	Hours / Week	Hours / Semester	Assessment Marks			Duration
			Internal Assessment	Semester End Examination	Total	
OPERATION AND MAINTENANCE OF ELECTRICAL EQUIPMENT	5 Hours	75 Hours	25	75	100	3 Hours

TOPICS AND ALLOCATION OF HOURS

UNIT	TOPIC	TIME (Hrs)
I	Earthing Arrangements, Safe Working of Electrical Equipment, Building Electrical Installations	13
II	Operation & Maintenance of Transformer	13
III	Operation & Maintenance of Generators, Sub-Stations and Circuit Breakers	13
IV	Operation & Maintenance AC Motors and Starters	12
V	Operation & Maintenance of Lighting, Transmission and Distribution	12
	Revision and Tests	12
	TOTAL	**75**

COURSE DESCRIPTION

Electricity is generated in power station transmitted through transformer lines and Distributed through Distribution systems. The various activities concerning operation and maintenance of electrical equipments are dealt in this subject.

OBJECTIVES

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

- Understand building electrical installation and electrical safety.
- Understand operation and maintenance of transformer.
- Understand operation and maintenance of Generators, substations and circuit breakers.
- Understand operation and maintenance of AC motors and Starters.
- Understand operation and maintenance of Lighting transmission and distributions.

COURSE OUTCOMES:

EEC 620 OPERATION AND MAINTENANCE OF ELECTRICAL EQUIPMENT	
After successful completion of this course, the students should be able to	
C620.1	Describe the earthing arrangements safe working of electrical equipment
C620.2	Explain the working methodology and maintenance of transformer
C620.3	Analyses the operation and maintenance of generator substation & circuit breaker
C620.4	Able to know the operation and maintenance procedure of AC motors and starters
C620.5	Describe the lighting, transmission and distribution system

EEC 620 OPERATION AND MAINTENANCE OF ELECTRICAL EQUIPMENT

UNIT	NAME OF THE TOPICS	HOURS
I	**EARTHING ARRANGEMENTS, SAFE WORKING ON ELECTRICAL EQUIPMENT, BUILDING ELECTRICAL INSTALLATIONS**	**13 Hours**
	Earthing Arrangements-	
	Points to be earthed, Earthing Procedure, Earth resistance measurement,	2hrs
	Action to be taken to reduce earthing resistance, Earth Leakage Protection(ELCB)	2hrs
	Safe Working on Electrical Equipment-	
	Authorized Person, Procedure for Shutdown, and Testing device for Electricity,	2hrs
	Special shutdown precautions in substations and Power House.	2hrs
	Building Electrical Installations-	
	Points to be inspected, Insulation Resistance Measurement Procedure, Points to be checked in switches & Switches,	2hrs
	Points to be inspected in Potable equipment,	1hr
	Action to be taken if an electrical equipment catches fire,	1hr
	Different types of Fire extinguishers & its applications	1hr
II	**OPERATION & MAINTENANCE OF TRANSFORMER**	**13 Hours**
	Forces generated in transformer during short circuit - Noise in operation – Reason for temperature rise-	2hrs
	Insulation resistance-Drying out- precaution for paralleling transformer-inrush current and remedy-	2hrs
	insulation co-ordination-effect on insulation during star point earthing	2hrs
	–transformer maintenance schedule –	2hrs
	action to be taken while transformer oil,	2hrs
	temperature rises unduly – points to be checked by oil level tends to fall down –	2hrs
	attention required for bushing and insulator.	1hr
III	**OPERATION & MAINTENANCE OF GENERATORS, SUB-STATIONS AND CIRCUIT BREAKER**	**13 Hours**
	Generators-	
	Parallel operation of Alternators, Real power and Reactive power adjustment between alternator running in parallel,	1hr
	AVR role, Causes for Alternator fails to buildup,	1hr
	Instability in Alternator, Cyclic speed irregularity, Protective &	1hr
	Indicative equipments for Alternator, Causes for overheating of armature & field winding of Alternators,	1hr
	Causes for circulating current between Alternators running in parallel,	1hr
	Causes for pitting of Alternator bearings, Reverse current protection &	1hr

	its necessity, **Sub-stations and Circuit Breaker-** Difference between Isolator & Circuit breaker, Rupturing capacity of Circuit breaker, Short-circuit calculations, Conditions can a circuit breaker arranged to trip, Auto reclose breaker, Fault clearance time, Inverse time overload relay, Procedure to ensure proper operation of Circuit breaker in the event of a fault, Maintenance requirement for Oil Circuit Breakers, Attention required for the contacts of Contactors, Maintenance requirement of SF6 Circuit breakers	1hr 1hr 1hr 1hr 1hr 1hr 1hr
IV	**OPERATION & MAINTENANCE 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.	**12 Hours** 1hr 1hr 2hrs 1hr 2hrs 1hr 1hr 1hr 1hr 1hr
V	**OPERATION & MAINTENANCE OF LIGHTING, TRANSMISSION AND DISTRIBUTION** **Lighting** Glare reduction, Stroboscopic Effect and methods to reduce, Steps in Designing Lighting Installation, Troubleshooting in Fluorescent Lamp and Discharge Lighting, Street Light Control methods, Fluorescent Lamp Disposal, precautions in Erecting Lighting Installations. Symptoms to identify the end of the useful life of Lamp, Causes for lowering of Illumination level **Transmission and Distribution** permissible limit for variation of voltage/frequency as per IS Standard, Factor of Safety, Safety devices for overhead Transmission lines, Minimum clearance of between conductors & building, Advantages & Limitations of Steel Cored Aluminium Conductors (ACSR), Purpose of continuous earth wire, Points to be checked when carrying out inspection in overhead transmission line, Prevent rusting of Steel post, Protection requirements for Transmission	**12 Hours** 2hrs 1hr 1hr 1hr 1hr 1hr 1hr 1hr 1hr

	line, Insulation level & Co-ordination, Precautions in erecting UG Cable, Causes for failure of UG Cable, Cable fault locations, Fall of potential method, Murray loop test method, Locating cable discontinuity.	1hr 1hr

TEXT BOOKS

S.No	Name of the Book	Author	Publisher
1	Operation and Maintenance of Electrical Equipment – Volume I & II	B.V.S.Rao	Media Promoters & Publishers Private Limited, Mumbai

REFERENCE BOOK

S.No	Name of the Book	Author	Publisher
1	Testing, Commissioning, Operation and Maintenance of Electrical Equipments	S.Rao	Khanna Publishers, New Delhi

WEBSITES

www.plainhelp.com/purpose-earthing-electrical-installation/

https://www.electrical4u.com/maintenance-of-transformer/

https://smcint.com/electrical-substation-maintenance/

www.marathonelectric.in/marathon-products/ac-motors/three-phase/.../LT-MM.PDF

https://electrical-engineering-portal.com › ... › Electricity generation, t&d guides

CONTINUOUS INTERNAL ASSESSMENT

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

i) Attendance - 5 Marks
ii) Test - 10 Marks
iii) Assignment - 5 Marks
iv) Seminar - 5 Marks

Total - 25 Marks

CO-POs & PSOs Mapping matrix

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2	PSO3
CO620.1	2	1	2	3	2	1	1	3	2	2
CO620.2	2	2	2	3	1	1	-	3	3	3
CO620.3	1	1	3	3	2	-	1	3	1	2
CO620.4	1	1	3	3	1	-	2	3	2	1
CO620.5	2	2	3	2	1	1	1	3	3	2
Total	8	7	13	14	7	3	5	15	11	10
Correlation level	1.6	1.4	2.6	2.8	1.4	1	1.25	3	2.2	2

Correlation level 1 – Slight (Low)
Correlation level 2 – Moderate (Medium)
Correlation level 3 – Substantial (High)

QUESTION PAPER SETTING

The teaching learning process and assessment are being carried out in accordance with the revised Bloom's Taxonomy. The question paper should consist of 90% questions based on Lower Order Thinking (LOTs) and the remaining 10% based on Higher Order Thinking (HOTs) as detailed below.

Bloom's Taxonomy	Lower Order Thinking Skills (LOTs)	Higher Order Thinking Skills (HOTs)
Level	R-Remember, U-Understand, Ap-Apply	An-Analyze, E-Evaluate, C-Create
% to be included	90%	10%

OPERATION AND MAINTENANCE OF ELECTRICAL EQUIPMENT

Time : 3 Hrs Max.Marks :75

PART – A (5X 2 =10 MARKS)			
Note : (i) Answer any Five Questions (ii) All questions carry equal marks		Unit	Blooms Level
1	What are the common types of testing devices used in electrical installation?	I	R
2	Who is the authorized person?	I	R
3	Which instrument is used to measure insulation resistance?	II	R
4	Why drying out is necessary in transformer?	II	R
5	What are the indicating instruments provided on the alternator panel?	III	R
6	What is meant by inverse time over load relay?	III	R
7	What are the protective devices used in motor starters?	IV	R
8	Name the different types of safety devices used in over head lines.	V	R

PART – B (5X3=15 MARKS)			
Note : (i) Answer any Five Questions (ii) All questions carry equal marks		Unit	Blooms Level
9	What are the factors the earth resistance depends on?	I	R
10	What action will take if fire occurs in electrical equipments?	I	R
11	Write short notes on inrush current.	II	R
12	State the different types of installations.	II	R
13	What are the indicating and protecting equipments provided on the alternator panels?	III	R
14	What is the difference between isolator and circuit breaker?	III	R
15	What are the role of relays in motor?	IV	R
16	What is stroboscopic effect?	V	R

PART –C (5X 10 =50 MARKS)					
Note: (i) Answer all the question choosing sub- division (A) or Sub division (B) of each question. (ii) All questions carry equal marks.			Unit	Blooms Level	Maximum Marks
17	A	Explain in detail about earthing procedure	I	U	10
		[OR]			
	B	Explain the common types of testing devices used in electrical installations.	I	U	10
18	A	Explain the causes of noise developed in transformer.	II	U	10
		[OR]			
	B	Describe the precautions required for paralleling of two transformers.	II	U	10
19	A	What are the possible defects occur for the generator to buildup voltage.	III	R	10
		[OR]			
	B	What are the maintenance attention required for the contacts of the contactor?	III	R	10

20	A	Explain the operation of single phasing preventer?	IV	U	10
		[OR]			
	B	Explain in detail the different types of drying out methods used in motors.	IV	U	10
21	A	Explain the different methods of controlling street lighting.	V	U	10
		[OR]			
	B	What are the advantages and disadvantages of ACSR conductors?	V	R	10

Note: the question paper setters are requested to follow the revised Bloom's Taxonomy levels as presented below:

Bloom's taxonomy level	Lower Order Thinking Skills (LOTs)	Higher Order Thinking Skills (HOTs)
	R-Remember, U-Understand, Ap-Apply	An-Analyse, E-Evaluate, C- Create
% to be included	90%	10%

EEC 631 POWER ELECTRONICS

TEACHING AND SCHEME OF EXAMINATION

No. of weeks per Semester: 15 Weeks

Course	Instructions		Examination			
	Hours / Week	Hours / Semester	Assessment Marks			Duration
			Internal Assessment	Semester End Examination	Total	
POWER ELECTRONICS	5 Hours	75 Hours	25	100	100	3 Hours

TOPICS AND ALLOCATION OF HOURS

UNIT	TOPIC	TIME (Hrs)
I	Overview of Power Electronics	13
II	Line Commutated Power Control Circuits	13
III	Forced Commutated Power Control Circuits	13
IV	Applications of Power Electronics	12
V	Motor Drive Applications	12
	Revision and Tests	12
	TOTAL	**75**

COURSE DESCRIPTION

Developments in Electronics have their own impact in other fields of Engineering. Today all the controls and drives for the electrical machines are formed by electronic components and there are many electronic devices available to handle eclectic power in terms Kilo-Amps and Kilo-Volts. This subject gives a comprehensive knowledge base about the devices and circuits used in electrical power control.

OBJECTIVES

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

- Explain the scope and application of power electronics
- Explain the operating region and rating of SCR.
- Draw, explain and state the application for commutation circuits and trigger circuits of SCR.
- Familiarize the phase controlled rectifier and know the applications of the phase controlled rectifier.
- Draw and describe the working of half wave controlled rectifier circuit with R and RL load, single phase Semi Converter Bridge, Single phase full Converter Bridge for RL load, single phase and three phase full converter with RL load.
- Familiarizes the dual converter and twelve pulse converters.
- Study the complete protection of converter circuits.
- Understand the working choppers and inverters.
- Know the applications of choppers and inverters.
- Explain the various types of choppers with circuit diagram.
- Describe the various methods of inverters with circuit diagram.
- Failure of AC voltage controller & cyclo converter.
- Understand the application of power electronics devices as CB,UPS and VAR compensator
- Understand the control of DC Drives.
- Know the various methods of speed control of DC drives.
- Familiarize the control of AC drives.
- Know the torque - speed characteristics of three phase induction motor.
- Study the speed control of three phase induction motor using PWM and slip power recovery scheme.
- Understand the closed loop control of AC drive.
- Know the operation of single phase and three phase cyclo converter.
- Understand the micro controller based fault diagnosis in three phase thyristor converter circuits.
- Study the need of DSP based motor control.

COURSE OUTCOMES:

EEC 631 POWER ELECTRONICS	
After successful completion of this course, the students should be able to	
C631.1	Describe basic operation of various power semiconductor devices, passive components and switching circuits.
C631.2	Analyze the converters and design the components of them under various load types.
C631.3	Analyze power converter circuits and learn to select suitable power electronics devices by assessing the requirements of application fields
C631.4	Recognize the role power electronics play in the improvement of energy usage efficiency and the applications of power electronics in emerging areas.
C631.5	Understand the use of power converter drives in commercial and industrial applications.

EEC 631 POWER ELECTRONICS

UNIT	NAME OF THE TOPICS	HOURS
I	**OVERVIEW OF POWER ELECTRONICS**	**13 hours**
	Power electronics-Definition (A-1.1)-Scope and	2Hrs
	Applications (B-1.3)-Power Electronic Switch Specifications (A- 1.4.3)	2Hrs
	Types of Power Electronic Circuits (A-1.5)-Design of Power Electronics	
	Equipment (A-1.6)-Power module (A-1.9)-Intelligent module (A-1.10)	1Hr
	Silicon Controlled Rectifier(D-2.4.1)-Forward Blocking	1Hr
	Region(D-2.4.2)	
	Forward Conducting Region(D-2.4.3)-Reverse Blocking Region(D-2.4.4)	1Hr
	Effect of dv/dt and Snubber Circuits (D-2.4.7)-Effect of Rate of Rise in	
	Current(di/dt)(D-2.4.8) Thyristor Ratings(D-2.4.11)	1Hr
	Thyristor Gate Requirements(D-3.2)-Triggering Circuits for Thyristor(D-3.3)	
	Resistance Triggering Circuits(D- 3.4.1)-RC Trigger Circuits	1Hr
	(D-3.4.1)-	
	UJT based Trigger Circuits Driver and Buffer Circuits for Thyristor(D-3.4.7)	1Hr
	Thyristor Commutation Techniques	
	Class A, Class B, Class C, Class D, Class E Types(C-5.1 to C-5.6) -	1Hr
	Synchronized UJT firing (Ramp Triggering) Power Devices MOSFET (A.8.3)-	
	IGBT (A.8.5) –GTO (A.4.8.3)	1Hr
		1Hr
II	**LINE COMMUTATED POWER CONTROL CIRCUITS**	**13 hours**
	Line Commutated Converters(Controlled Rectifiers)-	1Hr
	Principle of Phase Controlled Converter Operation(A-10.2)-Single Phase Full	1Hr
	Converters(A-10.3)-	1Hr
	Single Phase Dual Converters (A-10.3)-	1Hr
	Three Phase Full Converters(A-10.6)-	1Hr
	Three Phase Dual Converters(A-10.7)-	1Hr
	12 Pulse converters(A-10.12)	1Hr
	AC Voltage Controllers-Principle of Phase Control(A- 11.3)-Single phase	1Hr
	Bidirectional controllers with Resistive Load(A- 11.4)-	1Hr
	Single Phase Controller with Inductive Load(A-11.5)-	1Hr
	Three Phase Full Wave Controllers(A-11.6)-	1Hr
	Cyclo Converters-	1Hr
	Single PhaseCycloConverters(A-11.9.1)-ThreePhaseCyclo Converters(A-11.9.2)	1Hr
III	**FORCED COMMUTATED POWER CONTROL CIRCUITS**	**13 hours**
	DC-DC Switch-Mode Converters(Choppers)-	1Hr
	Control of DC- DC Converters(B-7.2)-Step-Down(BUCK) Converter(B-7.3)-	1Hr
	Continuous-Conduction Mode(B-7.3.1) - Step-Up(BOOST) Converters(B-	
	7.4)-Continuous Conduction Mode	1Hr

	(B-7.4.1) – BUCK- BOOST Converters (B-7.5) – Continuous Conduction Mode (B- 7.5.1) - Cuk DC-DC Converters(B-7.6) DC-AC Switch-Mode Inverters-Pulse Width Modulated Inverters- Introduction(A-6.1)- Principle of Operation(A-6.2)-Single Phase Bridge Inverters(A-6.4)- Three Phase Inverters(A-6.5)-180^0 Conduction Mode(A-6.5.1)- 120^0 Conduction Mode(A-6.5.2)- Voltage Control of Single Phase Inverters(A-6.6)-Single Pulse Width Modulation(A-6.6.1) -Multiple Pulse Width Modulation(A- 6.6.2)-Sinusoidal Pulse Width Modulation(A-6.6.3)- Voltage Control of Three Phase Inverters(A-6.8)-Sinusoidal PWM(A.6.8.1)	1Hr 1Hr 1Hr 1Hr 2Hrs 2Hrs 2Hrs
IV	**APPLICATIONS OF POWER ELECTRONICS** Switch Mode Power Supplies-Full Bridge Converter type(C-11.1.4)- Uninterrupted Power Supply-ON line(No Break) and OFF line(Short-Break) types(C-11.2)- Static AC Circuit Breaker(C-11.5.1)-AC Solid State Relays(C-11.6.2). High Frequency Fluorescent Lighting (B -16.2.2)- Induction Heating(B16.3.1)- Electric Welding(B -16.3.2)- High Voltage DC Transmission(B -17.2)- Wind and Small Hydro Interconnection(B -17.4.2)- Static VAR Compensators(B -17.3)- Thyristor Controlled Inductors (B -17.3.1)- Thyristor Switched Capacitors(B -17.3.2).	**12 hours** 2Hrs 1Hr 1Hr 1Hr 1Hr 1Hr 1Hr 1Hr 1Hr 1Hr 1Hr 1Hr
V	**MOTOR DRIVE APPLICATIONS** DC Drives-DC Motor with a Separately Excited Field Winding (B -13.4)- Line Frequency Converters (B-13.7.2)-Effect of Discontinuous Armature Current(B -13.7.3)– Control of Adjustable Speed Drives(B -13.7.4)-Switch-Mode DC-DC Converters(B - 13.7.1) Induction Motor Drives-Introduction(B -14.1)-Basic Principle of Induction Motor Operation (B -14.2)- Induction Motor Characteristics at rated(line) frequency and rated voltage(B -14.3)-	**12 hours** 1Hr 1Hr 1Hr 1Hr 1Hr

	Speed Control by Varying Stator frequency and voltage(B - 4.4)- Torque-Speed Characteristics(B -14.4.1)- Start-Up Considerations(B -14.4.2)-Voltage Boost required at low frequencies(B -14.4.3)- Induction Motor Capability below and above the rated speed(B -14.4.4)- Variable frequency Converter classifications(B -14.6)- Variable frequency PWM-VSI Drives (B - 14.7)-Line frequency Variable-Voltage Drives(B -14.11)- Reduced Voltage Starting("Soft Start")-14.12)-Speed Control by Static Slip-Power Recovery(B -14.13). Microcomputer based PWM control of Induction Motor	1Hr 1Hr 1Hr 1Hr 1Hr 1Hr 1Hr

TEXT BOOKS

S.No	Name of the Book	Author	Publisher
1	Power Electronics	MD Singh, KB Dhanchandaniata	McGraw Hill Publishing Company New Delhi

REFERENCE BOOK

S.No	Name of the Book	Author	Publisher
1	Power Electronics	Mohammed H.Rashid	New Age Publication
2	Power Electronics	Mohan, Undeland, Robbins.	Wiley India
3	Power Electronics	Dr.P.S.Bimbhra	Khanna Publishers.
4	Power Electronics	M.S.Jamil Asghar	PHI Learning Private Limited

WEBSITES

https://www.sciencedirect.com/topics/engineering/power-electronics

www.idc-online.com/technical_references/pdfs/.../Types_of_Power_Converters_I.pdf

https://www.pantechsolutions.net/introduction-of-forced-commutation-class-a-b-c-d-e

https://www.electrical4u.com/application-of-power-electronics/

https://www.semikron.com/applications/motor-drives/application-examples.html

CONTINUOUS INTERNAL ASSESSMENT

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

i) Attendance	- 5 Marks
ii) Test	- 10 Marks
iii) Assignment	- 5 Marks
iv) Seminar	- 5 Marks

Total	**- 25 Marks**

CO-POs & PSOs Mapping matrix

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2	PSO3
CO631.1	3	2	2	-	-	-	-	3	2	2
CO631.2	3	2	2	-	-	-	-	3	2	3
CO631.3	3	2	2	-	-	-	2	3	2	2
CO631.4	3	2	2	-	-	-	2	3	2	2
CO631.5	3	2	2	-	-	-	2	3	2	2
Total	15	10	10	-	-	-	6	15	10	11
Correlation level	3	2	2	-	-	-	2	3	2	2.2

Correlation level 1 – Slight (Low)
Correlation level 2 – Moderate (Medium)
Correlation level 3 – Substantial (High)

QUESTION PAPER SETTING

The teaching learning process and assessment are being carried out in accordance with the revised Bloom's Taxonomy. The question paper should consist of 90% questions based on Lower Order Thinking (LOTs) and the remaining 10% based on Higher Order Thinking (HOTs) as detailed below.

Bloom's Taxonomy	Lower Order Thinking Skills (LOTs)	Higher Order Thinking Skills (HOTs)
Level	R-Remember, U-Understand, Ap-Apply	An-Analyze, E-Evaluate, C-Create
% to be included	90%	10%

POWER ELECTRONICS

Time : 3 Hrs Max.Marks :75

PART – A (5X 2 =10 MARKS)				
Note : (i) Answer any Five Questions (ii) All questions carry equal marks			Unit	Blooms Level
1		Define dv/dt and di/dt.	I	R
2		Explain forward conduction region of SCR.	I	U
3		Define twelve pulse converter.	II	R
4		Define cyclo converter.	II	R
5		State the applications of inverter.	III	R
6		Define step down converter and step up converter.	III	R
7		Define uninterrupted power supply and mention its types.	IV	R
8		Define slip and slip speed.	V	R
PART – B (5X3=15 MARKS)				
Note : (i) Answer any Five Questions (ii) All questions carry equal marks			Unit	Blooms Level
9		Explain the design of power electronics equipment.	I	U
10		State thyristor gate requirements.	I	R
11		Explain the principle of phase control in AC voltage controller.	II	U
12		Write short notes on rectifying mode and inverting mode of full converters.	II	R
13		Explain multiple pulse width modulation.	III	U
14		Explain simple DC – DC converter.	III	U
15		Draw the block diagrams of various types of welding.	IV	U
16		State the observations of induction motor.	V	R

PART –C (5X 10 =50 MARKS)					
Note: (i) Answer all the question choosing sub- division (A) or Sub division (B) of each question. (ii) All questions carry equal marks.			Unit	Blooms Level	Maximum Marks
17	A	Explain the VI characteristics of SCR.	I	U	10
		[OR]			
	B	Explain IGBT with diagram.	I	U	10
18	A	Explain the operation of twelve pulse converter with circuit diagram.	II	U	10
		[OR]			
	B	Draw the circuit diagram of three phase full converter and explain its operation.	II	U	10
19	A	With the diagram explain the continuous conduction mode of buck – boost converter.	III	U	10
		[OR]			
	B	With the diagram explain sinusoidal PWM of three phase inverter.	III	U	10

20	A	With the diagram explain thyristor switched capacitor.	IV	U	10
		[OR]			
	B	With the block diagram explain ON line UPS.	IV	U	10
21	A	With the diagram explain line frequency converters.	V	U	10
		[OR]			
	B	With the proper diagram explain switch mode DC-DC converters.	V	U	10

Note: the question paper setters are requested to follow the revised Bloom's Taxonomy levels as presented below:

Bloom's taxonomy level	Lower Order Thinking Skills (LOTs)	Higher Order Thinking Skills (HOTs)
	R-Remember, U-Understand, Ap-Apply	An-Analyse, E-Evaluate, C- Create
% to be included	90%	10%

EEC 632 BIO-MEDICAL INSTRUMENTATION

TEACHING AND SCHEME OF EXAMINATION

No. of weeks per Semester: 15 Weeks

Course	Instructions		Examination			
	Hours / Week	Hours / Semester	Assessment Marks			Duration
			Internal Assessment	Semester End Examination	Total	
BIO-MEDICAL INSTRUMENTATION	5 Hours	75 Hours	25	75	100	3 Hours

TOPICS AND ALLOCATION OF HOURS

UNIT	TOPIC	TIME (Hrs)
I	Bio - electric signals, electrodes and clinical measurement	13
II	Bio - medical recorders	13
III	Therapeutic instruments	13
IV	Biotelemetry and patient safety	14
V	Modern imaging techniques	12
	Revision and Tests	12
	TOTAL	**75**

COURSE DESCRIPTION

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 vizClinical measurement, Bio - medical

recorders, Therapeutic instruments, Biotelemetry and Modern imaging techniques instruments.

OBJECTIVES

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

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

COURSE OUTCOMES:

EEC 632 BIO-MEDICAL INSTRUMENTATION	
After successful completion of this course, the students should be able to	
C632.1	Measure the clinical measurement
C632.2	Measure the bio medical recorders such as ECG, Blood pressure, etc.,
C632.3	Working principles of operations of pacemaker
C632.4	Learn about patient safety
C632.5	Working principle of operation of various imaging techniques

EEC 632 BIO-MEDICAL INSTRUMENTATION

Units	Name of the topic	Hours
I	**BIO-ELECTRIC SIGNALS AND ELECTRODES**	**13 Hours**
	Elementary ideas of cell structure, Bio – potential and their generation –	2hrs
	resting and action potential – propagation of action potential.	2hrs
	Electrodes – Micro – Skin surface – needle electrodes.	2hrs
	CLINICAL MEASUREMENT:	
	Measurement of Blood pressure (direct, indirect) – blood flow meter	2hrs
	(Electro magnetic& ultrasonic blood flow meter) – blood pH	2hrs
	measurement - Measurement of Respiration rate – measurement of	1hr
	lung volume – heart rate measurement – Measurement of body and	1hr
	skin temperature - Chromatography, Photometry, Flurometry.	1hr
II	**BIO - MEDICAL RECORDERS:**	**13 Hours**
	Electro cardiograph (ECG) – Lead system – ECG electrodes –	2hrs
	ECG amplifiers – ECG recording units – analysis of ECG curves.	2hrs
	Nervous system – EEG recorder – 10-20 lead system – recording	2hrs
	techniques – EEG wave types – Clinical use of EEG – brain tumour	2hrs
	Electro – myograph (EMG) – EMG waves –	2hrs
	measurement of conduction velocity – EMG recording techniques –	1hr
	Electro – retinograph (ERG) Audiometer	1hr
	– principle – types – Basics audiometer working.	1hr
III	**THERAPEUTIC INSTRUMENTS:**	**13 Hours**
	Cardiac pacemaker – classification – External pace makers –	2hrs
	implantable pacemaker – pacing techniques – programmable pacemaker –	2hrs
	Cardiac defibrillators – types – AC and DC defibrillators -	1hr
	Heart lung machine with Block diagram. Dialysis – Hemo dialysis –	2hrs
	peritoneal dialysis. Endoscopes Endoscopic laser coagulator and	2hrs
	applications – physiotherapy equipment – short wave diathermy –	2hrs
	micro wave diathermy – ultrasonic therapy unit (block / circuit) –	1hr
	Ventilators – types – modern ventilator block diagram.	1hr
IV	**BIOTELEMETRY AND PATIENT SAFETY:**	**14 Hours**
	Introduction to biotelemetry – physiological – adaptable to biotelemetry	1hr
	– components of a biotelemetry system – application of telemetry –	1hr
	elements of biotelemetry; AM, FM transmitter and receiver –	2hrs
	requirements for biotelemetry system – radio telemetry with sub carrier	1hr
	– single channel and multi channel telemetry –	2hrs
	Telemedicine; introduction, working, applications.	1hr
	Patient safety: Physiological effects of electric current –	1hr
	Micro and macro shock – leakage current –	1hr
	shock hazards from electrical equipment. Methods of Accident Prevention	1hr
	– Grounding – Double Insulation – Protection by low voltage –	1hr
	Ground fault circuit interrupter – Isolation of patient connected parts –	1hr
	Isolated power distribution system. Safety aspects in electro surgical units	

	– burns, high frequency current hazards, Explosion hazards.	1hr
V	**MODERN IMAGING TECHNIQUES:** LASER beam properties – block diagram – operation of CO2 and NDYag LASER – applications of LASER in medicine. X ray apparatus – block diagram – operation – special techniques in X-ray imaging – Tomogram – computerized Axial tomography – Ultrasonic imaging techniques – Echo cardiography – Angiography – CT scanner - Magnetic resonance imaging techniques.	**12 Hours** 2hrs 2hrs 1hr 2hrs 1hr 2hrs 2hrs

TEXT BOOKS

S.No	Name of the Book	Author	Publisher
1	Biomedical Instrumentation (Page no. 1-15, 21-33, 117-136,142-159,164-179, 182-195, 202-209, 212-215, 255 –256, 274-277, 285-286, 266-268, 293-297, 299- 310, 319-320, 329 –340, 347-358, 360-367, 374-390, 390-400)	Dr.M. Arumugam	Anuradha publications, chennai

REFERENCE BOOK

S.No	Name of the Book	Author	Publisher
1	Bio medical Instrumentation and measurements	Leslie Cromwell – Fred j. Wibell, Erich A.P Feither	II Edition
2	Introduction to Biomedical Instrumentation	Mandeep Singh	Printice Hall India 2010

WEBSITES

https://www.sciencedirect.com/topics/engineering/biomedical instrumentation
https://www.eecs.umich.edu/courses/bme458/download/bme458_notes1.pdf
https://www.electrical4u.com/introduction-to-biomedical-instrumentation/
https://www.slideshare.net/PrincyRandhawa/biomedical-instrumentation-60215990
https://en.wikipedia.org/wiki/Bioinstrumentation

CONTINUOUS INTERNAL ASSESSMENT

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

i) Attendance	- 5 Marks
ii) Test	- 10 Marks
iii) Assignment	- 5 Marks
iv) Seminar	- 5 Marks

Total	**- 25 Marks**

CO-POs & PSOs Mapping matrix

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2	PSO3
CO632.1	3	2	2	-	-	-	-	3	2	2
CO632.2	3	2	2	-	-	-	-	3	2	3
CO632.3	3	2	2	-	-	-	2	3	2	2
CO632.4	3	2	2	-	-	-	2	3	2	2
CO632.5	3	2	2	-	-	-	2	3	2	2
Total	15	10	10	-	-	-	6	15	10	11
Correlation level	3	2	2	-	-	-	2	3	2	2

Correlation level 1 – Slight (Low)
Correlation level 2 – Moderate (Medium)
Correlation level 3 – Substantial (High)

QUESTION PAPER SETTING

The teaching learning process and assessment are being carried out in accordance with the revised Bloom's Taxonomy. The question paper should consist of 90% questions based on Lower Order Thinking (LOTs) and the remaining 10% based on Higher Order Thinking (HOTs) as detailed below.

Bloom's Taxonomy	Lower Order Thinking Skills (LOTs)	Higher Order Thinking Skills (HOTs)
Level	R-Remember, U-Understand, Ap-Apply	An-Analyze, E-Evaluate, C-Create
% to be included	90%	10%

BIO MEDICAL INSTRUMENTATION

Time : 3 Hrs Max.Marks :75

PART – A (5X 2 =10 MARKS)				
Note : (i) Answer any Five Questions (ii) All questions carry equal marks			Unit	Blooms Level
1		What are electrodes?	I	R
2		What is Chromatography?	I	R
3		What is the Principle of ERG?	II	R
4		What are the types of defibrillators?	III	R
5		What is Short wave diathermy?	III	R
6		Define Radio telemetry?	IV	R
7		What are the methods of accident prevention?	IV	R
8		Define Echo cardigraphy?	V	R
PART – B (5X3=15 MARKS)				
Note : (i) Answer any Five Questions (ii) All questions carry equal marks			Unit	Blooms Level
9		Explain about Biopotential and its generation?	I	U
10		Explain about photometry?	I	U
11		Explain EEG recorder?	II	U
12		What are External pacemakers?	III	R
13		Mention the types of ventilators?	III	R
14		What is the function of biotelemetry?	IV	R
15		What are the safety measures for explosion hazards?	IV	R
16		Explain the CT scanner?	V	U
PART –C (5X 10 =50 MARKS)				
Note: (i) Answer all the question choosing sub- division (A) or Sub division (B) of each question. (ii) All questions carry equal marks.			Unit	Blooms Level	Maximum Marks
17	A	Explain about action & resting potential?	I	U	10
		[OR]			
	B	Explain with diagram of blood PH measurement?	I	U	10
18	A	Explain the ECG with neat diagram.	II	U	10
		[OR]			
	B	Explain about ERG & audiometer	II	U	10
19	A	Explain about Cardiac Pacemaker	III	U	10
		[OR]			
	B	Explain the working of Ultrasonic therapy	III	U	10
20	A	Explain about the elements of biotelemetry system.	IV	U	10
		[OR]			
	B	Explain about the isolated power distribution system	IV	U	10

21	A	Explain the block diagram of LASER.	V	U	10
		[OR]			
	B	Explain about the Magnetic resonance imaging techniques	V	U	10

Note: the question paper setters are requested to follow the revised Bloom's Taxonomy levels as presented below:

Bloom's taxonomy level	Lower Order Thinking Skills (LOTs)	Higher Order Thinking Skills (HOTs)
	R-Remember, U-Understand, Ap-Apply	An-Analyse, E-Evaluate, C- Create
% to be included	90%	10%

EEC 633 COMPUTER HARDWARE AND NETWORKS

TEACHING AND SCHEME OF EXAMINATION

No. of weeks per Semester: 15 Weeks

Course	Instructions		Examination			
	Hours / Week	Hours / Semester	Assessment Marks			Duration
			Internal Assessment	Semester End Examination	Total	
COMPUTER HARDWARE AND NETWORKS	5 Hours	75 Hours	25	75	100	3 Hours

TOPICS AND ALLOCATION OF HOURS

UNIT	TOPIC	TIME (Hrs)
I	Motherboard Components and Memory Storage Devices	13
II	I/O Devices and Interface	13
III	Maintenance and Trouble Shooting of Desktop and Mobile Phones	12
IV	Computer Network Devices and OSI Layers	12
V	802.X And TCP/IP Protocols	13
	Revision and Tests	12
	TOTAL	**75**

COURSE DESCRIPTION

Maintaining and servicing the computers, laptops and peripherals are essential requirements of the computer students. The clear understanding of computer network devices and protocols are also taught in this subject

OBJECTIVES

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

- ✓ Identify the major components that make up the system unit.

- ✓ Understand the principle of operations of Keyboard, mouse and Displays.
- ✓ Study about the specification of I/O Ports of all I/O devices like serial, parallel, USB – Game Blue tooth and IP Connectors
- ✓ Understand the technology of high quality multiple color graphic output devices like Dot matrix, Inkjet, Laser, Line, MFP and computer system.
- ✓ Understand the operations to Power Supply devices. Know the use of diagnostic Software.
- ✓ Identify the major components of Laptop. Troubles shoot the problems in Laptop.
- ✓ Understand the concept of data communication.
- ✓ Discuss the advantages and disadvantages of different network topologies. Compare different network classifications based on different category.
- ✓ Know the use of different network devices.
- ✓ Understand the different layers of OSI and their functions. Compare different LAN protocols.
- ✓ Identify the protocols used in TCP /IP and compare with OSI model.
- ✓ Understand IP address concepts and TCP/IP suite.

COURSE OUTCOMES:

EEC 633 COMPUTER HARDWARE AND NETWORKS	
After successful completion of this course, the students should be able to	
C633.1	Understand the principle of operations of Keyboard, mouse and Displays
C633.2	Study about the specification of I/O Ports of all I/O devices like serial, parallel, USB –Game Blue tooth and IP Connectors
C633.3	Understand the technology of high quality multiple color graphic output devices like Dot matrix, Inkjet, Laser, Line, MFP and computer system
C633.4	Know the use of different network devices.
C633.5	Understand IP address concepts and TCP/IP suite.

EEC 633 COMPUTER HARDWARE AND NETWORKS

UNIT I MOTHERBOARD COMPONENTS AND MEMORY STORAGE DEVICES		**13 HOURS**
1.1	**Introduction:** Parts - Mother board, sockets, expansion slots, memory, power supply, drives and front panel and rear panel connectors –Hardware, Software and Firmware.	3 Hrs
1.2	**Processors:** Architecture and block diagram of multi core Processor(any one), Features of new processor(Definition only)-chipsets (Concepts only)	2 Hrs
1.3	**Bus Standards** Overview and features of PCI, AGP, USB, PCMCIA, Processor BUS – High	2 Hrs
1.4	**Primary Memory**: Introduction-Main Memory, Cache memory –DDR2-DDR3, RAM versions –1TB RAM –Direct RDRAM	1 Hrs
1.5	**Secondary Storage:** Hard Disk –Construction –Working Principle – Specification of IDE, Ultra ATA, Serial ATA; HDD Partition - Formatting. Troubleshooting hard disk drives	3 Hrs
1.6	**Removable Storage:** CD&DVD construction –reading & writing operations; CD-R,CD- RW; DVD-ROM, DVD-RW; construction and working of DVD Reader / Writer. Blue-ray: Introduction –Disc Parameters –Recording and Playback Principles –Solid state memory devices.	2 Hrs
UNIT II I/O DEVICES AND INTERFACE		**13 HOURS**
2.1	**Keyboard and Mouse:** Keyboard: Signals –operation of membrane and mechanical keyboards–troubleshooting; wireless Keyboard**.** Mouse- types, connectors, operation of Optical mouse and Troubleshooting.	3 Hrs
2.2	**Printers:** Introduction –Types of printers–Dot Matrix, Laser, line printer, MFP (Multi Function Printer), Thermal printer - Operation –Construction –Features and Troubleshooting	4 Hrs
2.3	**I/O Ports:** Serial, Parallel, USB, Game Port, Bluetooth interface, IR connector, fire ware, Signal specification problems with interfaces.	2 Hrs
2.4	**Displays and Graphic Cards:** Panel Displays–Principles of LED, LCD and TFT Displays. SVGA Port signals –common problems and solutions.	2 Hrs
2.5	**Power Supply:** SMPS: Principles of Operation and Block Diagram of ATX Power Supply, connector specifications	2 Hrs
UNIT III BIOS, POST and Mobile Phone Servicing		**12 HOURS**
3.1	**BIOS:** Standard CMOS setup, Advanced BIOS setup, Power management, advanced chipset features, PC Bios communication – upgrading BIOS, Flash BIOS - setup.	2 Hrs
3.2	**POST:** Definition –IPL hardware –POST Test sequence –beep codes and error messages.	2 Hrs

3.3	M**obile phone components:** Basics of mobile communication. Components - battery- antenna-ear piece- microphone -speaker-buzzer- LCD- keyboard. Basic circuit board components –Names and functions of different ICs used in mobile phones.	2 Hrs
3.4	**Tools & Instruments used in mobile servicing**: Mobile servicing kit – soldering and de-soldering components using different soldering tools - Use of multi- meter and battery booster.	2 Hrs
3.5	**Installation & Troubleshooting:** Assembling and disassembling of different types of mobile phones –Installation of OS - Fault finding & troubleshooting- Jumpering techniques and solutions.	2 Hrs
3.6	**Software and Antivirus**: Flashing- Formatting- Unlocking -Use of secret codes- Downloading- Routing;Mobile Viruses –Precautions –Antivirus Software.	2 Hrs
UNIT –IV COMPUTER NETWORK DEVICES AND OSI LAYERS		**12 HOURS**
4.1	**Data Communication:** Components of a data communication –Data flow: simplex – half duplex –full duplex; Networks –Definition - Network criteria –Types of Connections: Point to point –multipoint; Topologies: Star, Bus, Ring, Mesh, Hybrid – Advantages and Disadvantages of each topology.	3 Hrs
4.2	**Types of Networks:** LAN –MAN –WAN –CAN –HAN –Internet – Intranet –Extranet ,Client-Server, Peer To Peer Networks.	2 Hrs
4.3	**Transmission Media:** Classification of transmission media - Guided – Twisted pair, Coaxial, Fiber optics; Unguided –Radio waves –Infrared – LOS –VSAT –cabling and standards.	3 Hrs
4.4	**Network devices:** Features and concepts of Switches –Routers(Wired and Wireless) –Gateways.	2 Hrs
4.5	**Network Models:** Protocol definition - standards - OSI Model –layered architecture –functions of all layers.	2 Hrs
UNIT V 802.X AND TCP/IP PROTOCOLS		**13 HOURS**
5.1	**Overview of TCP / IP :** OSI & TCP/IP –Transport Layers Protocol – connection oriented and connectionless Services –Sockets –TCP & UDP.	3 Hrs
5.2	**802.X Protocols :** Concepts and PDU format of CSMA/CD (802.3) – Token bus (802.4) –Token ring (802.5) –Ethernet –type of Ethernet (Fast Ethernet, gigabit Ethernet) – Comparison between 802.3, 802.4 and 802.5	3 Hrs
5.3	**Network Layers Protocol:** IP –Interior Gateway Protocols (IGMP, ICMP, ARP, RARP Concept only).	3 Hrs
5.4	**IP Addressing :** Dotted Decimal Notation –Subnetting & Supernetting – VLSM Technique-IPv6 (concepts only)	2 Hrs
5.5	**Application Layer Protocols:** FTP–Telnet –SMTP–HTTP –DNS –POP	2 Hrs

TEXT BOOKS

S.No	Title	Author	Publisher	Year of Publishing / Edition
1.	Computer Installation and Servicing	D.Balasubramanian	Arasan Ganesan Institute of Technology	1993
2.	The complete PC upgrade and Maintenance	Mark Minasi	BPB Publication	1997
3.	Troubleshooting, Maintaining and Repairing PCs	Stephen J Bigelow	Tata McGraw Hill Publication	2004
4.	Computer Networks	Andrew S.Tanenbaum	Prentice-Hall of India, New Delhi	2002
5.	Data Communication and networking	Behrouz A.Forouzan	Tata Mc-Graw Hill, New Delhi	2006
6.	Data and Computer Communications	William Stallings	Prentice-Hall of India	Eighth Edition 2007

REFERENCE BOOKS

S.No	Title	Author	Publisher	Year of Publishing / Edition
1.	Computer Networks	Achyut Godbole	Tata Mc-Graw Hill - New Delhi	2002
2.	Principles of Wireless Networks–A unified Approach	Kaveh Pahlavan and Prashant krishnamoorthy	Pearson Education	2002

WEBSITES

https://www.sarvgyan.com/courses/computer-hardware-networking
https://www.jetking.com/blog/guide-for-computer-hardware-and-networking-courses/
http://www.indiaeducation.net/careercenter/computers-it/hardwareandnetworking/
https://en.wikipedia.org/wiki/Networking_hardware
https://www.educba.com/computer-hardware-vs-networking/

CONTINUOUS INTERNAL ASSESSMENT

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

i) Attendance	- 5 Marks
ii) Test	- 10 Marks
iii) Assignment	- 5 Marks
iv) Seminar	- 5 Marks

	Total - 25 Marks

CO-POs & PSOs Mapping matrix

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2	PSO3
CO633.1	3	2	2	-	-	-	-	3	2	2
CO633.2	3	2	2	-	-	-	-	3	2	3
CO633.3	3	2	2	-	-	-	2	3	2	2
CO633.4	3	2	2	-	-	-	2	3	2	2
CO633.5	3	2	2	-	-	-	2	3	2	2
Total	15	10	10	-	-	-	6	15	10	11
Correlation level	3	2	2	-	-	-	2	3	2	2

Correlation level 1 – Slight (Low)
Correlation level 2 – Moderate (Medium)
Correlation level 3 – Substantial (High)

QUESTION PAPER SETTING

The teaching learning process and assessment are being carried out in accordance with the revised Bloom's Taxonomy. The question paper should consist of 90% questions based on Lower Order Thinking (LOTs) and the remaining 10% based on Higher Order Thinking (HOTs) as detailed below.

Bloom's Taxonomy	Lower Order Thinking Skills (LOTs)	Higher Order Thinking Skills (HOTs)
Level	R-Remember, U-Understand, Ap-Apply	An-Analyze, E-Evaluate, C-Create
% to be included	90%	10%

COMPUTER HARDWARE AND NETWORKS

Time : 3 Hrs Max.Marks :75

PART – A (5X 2 =10 MARKS)				
Note : (i) Answer any Five Questions (ii) All questions carry equal marks			Unit	Blooms Level
1		Define the term virtual memory	I	R
2		What is cache memory?	I	R
3		What are the various types of printers	II	R
4		What are the types of mouse?	II	R
5		Define BIOS?	III	R
6		What are the types of modem?	IV	R
7		What is router?	IV	R
8		What are the various file formats?	V	R
PART – B (5X3=15 MARKS)				
Note : (i) Answer any Five Questions (ii) All questions carry equal marks			Unit	Blooms Level
9		Write short notes on Flash drive?	I	R
10		Explain DOT matrix printer in detail?	II	U
11		Define computer Viruses?	III	R
12		What is formatting.	III	R
13		What are the network types? Explain any one.	IV	R
14		What are the types of routers?	IV	R
15		Write short notes on MIDI?	V	R
16		What is SMTP?	V	R

PART –C (5X 10 =50 MARKS)					
Note: (i) Answer all the question choosing sub- division (A) or Sub division (B) of each question. (ii) All questions carry equal marks.			Unit	Blooms Level	Maximum Marks
17	A	Explain the various types of processor and compare with each other?	I	U	10
		[OR]			
	B	What are the types of bus standard? Explain any two in detail?	I	R	10
18	A	Explain the working principle and construction of HDD?	II	U	10
		[OR]			
	B	What are the types of display adapter explain any one in detail	II	R	10
19	A	What is modem? Explain the operation of modem in detail?	III	R	10
		[OR]			
	B	What are the various types of I/O Ports explain any two of them?	III	R	10

20	A	Define POST explain in detail about the POST Test Sequence?	IV	R	10
		[OR]			
	B	Explain in detail about antivirus software	IV	U	10
21	A	Explain the OSI layer model in detail	V	U	10
		[OR]			
	B	Explain in detail about windows NT2003 user accounts and Groups	V	U	10

Note: the question paper setters are requested to follow the revised Bloom's Taxonomy levels as presented below:

Bloom's taxonomy level	Lower Order Thinking Skills (LOTs)	Higher Order Thinking Skills (HOTs)
	R-Remember, U-Understand, Ap-Apply	An-Analyse, E-Evaluate, C- Create
% to be included	90%	10%

EEC 640 WIRING AND WINDING PRACTICAL

TEACHING AND SCHEME OF EXAMINATION

No. of weeks per Semester: 15 Weeks

Course	Instructions		Examination			
	Hours / Week	Hours / Semester	Assessment Marks			Duration
			Internal Assessment	Semester End Examination	Total	
WIRING AND WINDING PRACTICAL	5 Hours	75 Hours	25	75	100	3 Hours

COURSE DESCRIPTION

To provide hands on experience in Electrical wiring and winding it becomes necessary to include this subject.

OBJECTIVES

On completion of this practical subject, the students will be able to

- Execute the wiring to control three lamps Individually
- Execute the stair case wiring for G+n floors
- Execute the emergency alarm circuit
- Execute the wiring to connect a single phase motor with main switch , D.O.L starter and M.C.B
- Execute the wiring to connect a 3 phase Induction motor with main switch, star/delta starter and E.L.C.B.
- Execute the wiring for 1 phase service connection with necessary items.
- Execute the wiring to control lamps (Sodium vapour lamp, mercury vapour lamp, Fluorescent Tube and Neon sign lamp with a provision of fuse/M.C.B/Electronic chock /switches
- Execute the wiring for test board with necessary items.
- Know the consequences of disconnection of Neutral in 3 phase 4 wire system.
- Execute the Tunnel wiring
- Prepare winding for potential Transformer and No volt coil with the knowledge of Design.
- Give end connections for 3 phase Induction motor winding.

COURSE OUTCOMES:

EEC 640 WIRING AND WINDING PRACTICAL	
After successful completion of this course, the students should be able to	
C640.1	Acquire knowledge about tools, equipment and Instruments required for different types of wiring systems & testing.
C640.2	Acquire skills in house wiring.
C640.3	Acquire skills in Industrial wiring.
C640.4	Understand the various types of wiring systems & to select suitable.
C640.5	Understand domestic wiring procedures practically.

EQUIPMENTS REQUIRED

S.NO.	DESCRIPTION	SPECIFICATION	QTY
1	SPST Flush type switch	250V/5A	15
2	Batten Lamp holder	-	10
3	Round block		20
4	Switch board	20cm*15 cm	4
5		10cm*10cm	15
6	M.C.B.	250V/10A ,2 pole	2
7	Push button switch	250V/5A	5
8	2 plate ceiling rose	250V/5A	10
9	Electric bell	250V/5A	3
10	Single phase D.P.I.C. Main switch	250V/16A	3
11	Single phase D.O.L. Starter	250V/10A	1
12	Three phase T.P.I.C. Main switch	500V/30A	2
13	Star / delta starter	440V/5HP	1
14	E.L.C.B.	30mA/100mA	1
15	Single phase, Digital Energy meter	250V/15A,50HZ	1
16	Cut out	16A	1
17	Single phase, 4 way distribution Box	250V/15A	2
18	Mercury vapour lamp with accessories		1 Set
19	Sodium vapour lamp with accessories		1 Set
20	Fluorescent tube light with electronic choke and holder	40W	2 Set

21	Two way flush type switch	250V/5A	10
22	Wooden box	30 cm*15cm	4
23	PVC pipe	¾”/1″	Req.Qty
24	Saddle clips	¾”/1 ″	Req.Qty
25	Copper wire	2.5 Sq.Mm, 1.5 Sq.Mm	Req.Qty
26	1” junction box	1 way,2way,3way	Req.Qty
27	Screws		Req.Qty
28	Bare copper wire	2.5 Sq.Mm	Req.Qty
29	Lamps (C.F.L. or Incandescent)	Different ratings	Req.Qty
30	EI60 type stampings of 0.35 mm thickness	--	55
31	Readymade bobbins (EI60/21)	25 SWG	Req.Qty
32	Enameled copper wire	36 SWG 37 SWG 38 SWG	Req.Qty
33	Varnish	--	Req.Qty
34	Winding machine	--	1
35	Ceiling fan	--	2
36	Single phase induction motor	0.5 HP/50HZ,240V	1
37	Three phase squirrel cage induction motor	--	1
38	Gauge plate for measurement of SWG		
39	Winding study motor	(3Φ squirrel Cage)	1

EEC 640 WIRING AND WINDING PRACTICAL

Si.No	List of Experiments	Course Outcome
	WIRING	
1	Control three lamps with individual switch and provide MCB for master control	C640.2
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	C640.2
3	Stair case wiring for G+3 floors	C640.2
4	Emergency alarm wiring with 3 bells and 3 push buttons	C640.2
5	Wiring of single phase motor using single phase main switch, D.O.L starter and MCB	C640.3
6	Wiring of Three phase induction motor with main switch, Star/delta starter and ELCB	C640.3
7	House wiring for a service connection with single phase digital Energy meter cutout, main switch, 4way D.B, Indicator lamp	C640.2
8	Wiring of sodium vapour and mercury vapour Lamp	C640.2
9	Wiring and troubleshooting the Fluorescent Tube light	C640.2
10	Make a switch board to control two lamps and one fan with plug point, provide four switches, one regulator and one 3 pin 5A plug point	C640.2
11	Design and implement a test board with indicator lamp, fuse unit to test electrical appliances	C640.4
12	Tunnel wiring using 4 lamps.	C640.4
	WINDING	
1	Design, construct and test a 230/12-0-12 volt, 500mA Transformer.	C640.5
2	Design No volt coil for a 230/440 AC contactor.	C640.5
3	Dismantling a faulty ceiling fan and identify the fault, run the fan after rectifying the fault	C640.5
4	Demonstrate the end connection for a 3 phase induction motor winding for a 2 poles / 4pole operations	C640.5

Continuous Internal Assessment

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

a) Attendance : 5 marks – (Award of marks same as theory subjects)

b) Procedure/ observation and tabulation/ Other Practical related work : 10 marks

c) Record writing : 10 marks

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Total 25 marks

LEARNING WEBSITES

https://www.slideshare.net/amirmohammad16144/electrical-and-electronics-lab-manual
http://www.moeller.net/binary/schabu/wiring_man_en.pdf
https://mechatrofice.com/electrical/wiring/staircase-wiring

CO-POs & PSOs Mapping matrix

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2	PSO3
CO640.1	3	-	-	3	3	-	3	3	-	3
CO640.2	3	-	-	3	3	-	3	3	-	3
CO640.3	3	-	-	3	3	-	3	3	-	3
CO640.4	3	-	-	3	3	-	3	3	-	3
CO640.5	3	-	-	3	3	-	3	3	-	3
Total	15	-	-	15	15	-	15	15	-	15
Correlation level	3	-	-	3	3	-	3	3	-	3

Correlation level 1 – Slight (Low)
Correlation level 2 – Moderate (Medium)
Correlation level 3 – Substantial (High)

EEC 650 ELECTRICAL CIRCUITS SIMULATION PRACTICAL

TEACHING AND SCHEME OF EXAMINATION

No. of weeks per Semester: 15 Weeks

Course	Instructions		Examination			
	Hours / Week	Hours / Semester	Assessment Marks			Duration
			Internal Assessment	Semester End Examination	Total	
ELECTRICAL CIRCUITS SIMULATION PRACTICAL	5 Hours	75 Hours	25	75	100	3 Hours

COURSE DESCRIPTION

All the Engineering applications are simulated through computers. They are tested and then built using real components for commercial implementation. Simulation software is 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.

OBJECTIVES

On completion of this practical subject, the students will be able to

- Know the various aspects of 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.
- Give end connections for 3 phase Induction motor winding.

COURSE OUTCOMES:

EEC 650 ELECTRICAL CIRCUITS SIMULATION PRACTICAL	
After successful completion of this course, the students should be able to	
C650.1	Apply working knowledge of MATLAB package to simulate and solve Electrical circuits.
C650.2	Solve, Simulate and prove the simple theorems.
C650.3	Simulate and test the wave generating circuits.
C650.4	Simulate and test the performance characteristics of converters
C650.5	Design and verify the results of various electric circuits using simulation software.

EQUIPMENTS REQUIRED

S.No.	LIST OF EQUIPMENTS	QUANTITY REQUIRED
1.	PC with any suitable simulation software	30
2.	UPS 5KVA with half an hour battery back up	1
3.	Printer	1

EEC 650 ELECTRICAL CIRCUITS SIMULATION PRACTICAL

List of Experiments

Si.No	List of Experiments	Course Outcome
1	a)Generate sinusoidal waveform for a RMS voltage ____ V and frequency of ___ Hz b) Generate a complex signal comprising of fundamental, 5^{th} harmonics and 7^{th} harmonics frequency	C650.2
2	Step response of RL & RC series circuits	C650.2
3	a) Simulation of RLC series response circuits b) Simulation of RLC parallel response circuits	C650.2
4	Verification of Superposition theorem	C650.2
5	Verification of Thevenin's theorem	C650.2
6	Simulation of half wave rectifier	C650.2
7	Simulation of full wave rectifier	C650.2
8	Simulation of single phase, half wave converter using SCR with R-load	C650.2
9	Simulation of single phase, semi converter with RL load	C650.4
10	Simulation of single phase full converter with RL load	C650.4
11	Simulation of DC steps down chopper	C650.2
12	Simulation of single phase inverter	C650.2
13	Simulation of three phase voltage source inverter supplying R-load	C650.2
14	a) Simulation of three phase star connected balanced load b) Simulation of three phase star connected unbalanced load	C650.2
15	a) Simulation of three phase delta connected balanced load b) Simulation of three phase delta connected unbalanced load	C650.5
16	a) Simulation of three phase non-linear star connected load with three phase 3 wire system. b) Simulation of three phase non-linear star connected load with three phase 4 wire system	C650.5
17	Simulation of Square wave	C650.2
18	Simulation of Sawtooth wave generation	C650.2

Continuous Internal Assessment

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

a) Attendance : 5 marks – (Award of marks same as theory subjects)

b) Procedure/ observation and tabulation/ Other Practical related work : 10 marks

c) Record writing : 10 marks

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Total 25 marks

LEARNING WEBSITES

https://www.iare.ac.in/sites/default/files/lab1/Electrical%20Circuits%20Laboratary.pdf
http://docplayer.net/42468651-Electrical-circuits-simulation-lab.html
https://www.asti.edu.in/images/pdf/departments/eee-downloads/academic-manuals/lab-manual/ecsl/electrical-circuit%20-simulation-lab.pdf
http://kgr.ac.in/beta/wp-content/uploads/2018/09/Basic-Electrical-Simulation.pdf

CO-POs & PSOs Mapping matrix

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2	PSO3
CO650.1	3	-	-	3	3	-	3	3	-	3
CO650.2	3	-	-	3	3	-	3	3	-	3
CO650.3	3	-	-	3	3	-	3	3	-	3
CO650.4	3	-	-	3	3	-	3	3	-	3
CO650.5	3	-	-	3	3	-	3	3	-	3
Total	15	-	-	15	15	-	15	15	-	15
Correlation level	3	-	-	3	3	-	3	3	-	3

Correlation level 1 – Slight (Low)
Correlation level 2 – Moderate (Medium)
Correlation level 3 – Substantial (High)

EEC 661 POWER ELECTRONICS PRACTICAL

TEACHING AND SCHEME OF EXAMINATION

No. of weeks per Semester: 15 Weeks

Course	Instructions		Examination			
	Hours / Week	Hours / Semester	Assessment Marks			Duration
			Internal Assessment	Semester End Examination	Total	
POWER ELECTRONICS PRACTICAL	5 Hours	75 Hours	25	75	100	3 Hours

COURSE DESCRIPTION

The advent of thyristors has revolutionized the art of electric power conversation and its control. The use of the power electronic devices has pervaded the industrial applications relating to the field of Electrical, Electronics, Instrumentation and Control Engineering. This subject is introduced to impart practical skills to the students in using some important power electronic devices and circuits.

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OBJECTIVES

On completion of this practical subject, the students will be able to

- Construct and test DC-DC, DC-AC, AC-DC, AC-AC converters using power switching devices and control circuits for the same.

COURSE OUTCOMES:

EEC 661 POWER ELECTRONICS PRACTICAL	
After successful completion of this course, the students should be able to	
C661.1	Demonstrate the characteristics of power semiconductor devices.
C661.2	Analyze the operation of converters.
C661.3	Develop power semiconductor circuits to electrical power system
C661.4	Construct power semiconductor circuits for industrial applications
C661 .5	Analyze power semiconductor circuits for domestic applications

EEC 661 POWER ELECTRONICS PRACTICAL

List of Experiments

Si.No	List of Experiments	Course Outcome
1	Construct the Line synchronized Ramp trigger circuit using UJT with AC load to measure firing angles.	C661.1
2	Construct and test the SCR commutation circuits (Class B & Class D)	C661.1
3	Construct and test the Single phase semi controlled bridge with R-Load	C661.2
4	Construct and test the Single phase fully controlled bridge with RL-Load	C661.2
5	Construct and test the Half wave controlled rectifier with R- Load	C661.3
6	Construct and test the DC chopper control circuit using thyristor (any class)	C661.3
7	Construct and test the step up chopper	C661.3
8	Design the PWM based step down DC chopper using MOSFET/IGBT	C661.3
9	Construct and test the Single phase Single pulse / Sinusoidal PWM inverter using MOSFET/IGBT	C661.4
10	Construct and test the SMPS using MOSFET/IGBT	C661.4
11	Construct and test the open loop speed control circuit for DC shunt motor	C661.4
12	Construct and test the control circuit using TRIAC for Universal motor	C661.4
13	Construct and test the Open loop speed control of Single phase AC motor	C661.5
14	Construct and test the Single phase parallel inverter using MOSFET/IGBT	C661.4
15	Construct and test the Single phase to single phase cyclo converter	C661.1
16	Microcomputer based PWM control of Induction Motor	C661.1

Continuous Internal Assessment

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

a) Attendance : 5 marks – (Award of marks same as theory subjects)

b) Procedure/ observation and tabulation/ Other Practical related work : 10 marks

c) Record writing : 10 marks

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Total 25 marks

LEARNING WEBSITES

https://www.iitk.ac.in/new/power-electronics-laboratory
https://www.bits-pilani.ac.in/hyderabad/EEE/PowerElectronicsLab
https://www.scientechworld.com/education-software-training-and-skill-development/power-electronics/power-electronics-lab
https://www.scientechworld.com/education-software-training-and-skill-development/power-electronics/high-voltage-power-electronics-lab
https://www.ee.iitb.ac.in/~apel/

CO-POs & PSOs Mapping matrix

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2	PSO3
CO661.1	2	2	3	3	3	-	2	3	3	2
CO661.2	2	3	3	2	2	2	2	3	3	2
CO661.3	3	2	2	2	3	3	3	3	3	2
CO661.4	3	2	2	2	2	3	3	3	3	3
CO661.5	3	3	2	2	2	3	3	3	3	2
Total	13	12	12	11	12	11	13	15	15	11
Correlation level	2.6	2.4	2.4	2.2	2.4	2.75	2.6	3	3	2.2

Correlation level 1 – Slight (Low)
Correlation level 2 – Moderate (Medium)
Correlation level 3 – Substantial (High)

EEC 662 BIO MEDICAL INSTRUMENTATION PRACTICAL

TEACHING AND SCHEME OF EXAMINATION

No. of weeks per Semester: 15 Weeks

Course	Instructions		Examination			
	Hours / Week	Hours / Semester	Assessment Marks			Duration
			Internal Assessment	Semester End Examination	Total	
BIO MEDICAL INSTRUMENTATION PRACTICAL	5 Hours	75 Hours	25	75	100	3 Hours

COURSE DESCRIPTION

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.

COURSE OUTCOMES:

EEC 662 BIO MEDICAL INSTRUMENTATION PRACTICAL	
After successful completion of this course, the students should be able to	
C662.1	Know the instrumentation amplifiers
C662.2	Measure the bio medical recorders such as ECG, Blood pressure, etc.,
C662.3	Working principles of operations of pacemaker
C662.4	Learn about patient safety
C662.5	Working principle of operation of various imaging techniques

EEC 662 BIO MEDICAL INSTRUMENTATION PRACTICAL

List of Experiments

Si.No	List of Experiments	Course Outcome
1	Construction and Testing of Differential amplifier	C662.1
2	Construction and Testing of Instrumentation amplifier	C662.1
3	Measurement of pH of given solution	C662.2
4	Measurement of Blood pressure	C662.2
5	Measurement of ECG waveform	C662.2
6	Construction and verification of pacemaker circuit	C662.3
7	Construction and testing of high gain amplifier	C662.1
8	Measurement of Body and Skin temperature	C662.4
9	Study, handle and use the 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.	C662.5

Continuous Internal Assessment

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

a) Attendance : 5 marks – (Award of marks same as theory subjects)

b) Procedure/ observation and tabulation/ Other Practical related work : 10 marks

c) Record writing : 10 marks

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Total 25 marks

LEARNING WEBSITES

https://www.sciencedirect.com/topics/engineering/biomedical instrumentation
https://www.eecs.umich.edu/courses/bme458/download/bme458_notes1.pdf
https://www.electrical4u.com/introduction-to-biomedical-instrumentation/
https://www.slideshare.net/PrincyRandhawa/biomedical-instrumentation-60215990
https://en.wikipedia.org/wiki/Bioinstrumentation

CO-POs & PSOs Mapping matrix

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2	PSO3
CO662.1	3	-	-	3	3	-	3	3	-	3
CO662.2	3	-	-	3	3	-	3	3	-	3
CO662.3	3	-	-	3	3	-	3	3	-	3
CO662.4	3	-	-	3	3	-	3	3	-	3
CO662.5	3	-	-	3	3	-	3	3	-	3
Total	15	-	-	15	15	-	15	15	-	15
Correlation level	3	-	-	3	3	-	3	3	-	3

Correlation level 1 – Slight (Low)
Correlation level 2 – Moderate (Medium)
Correlation level 3 – Substantial (High)

EEC 663 COMPUTER HARDWARE AND NETWORKS PRACTICAL

TEACHING AND SCHEME OF EXAMINATION

No. of weeks per Semester: 15 Weeks

Course	Instructions		Examination			
			Assessment Marks			Duration
	Hours / Week	Hours / Semester	Internal Assessment	Semester End Examination	Total	
COMPUTER HARDWARE AND NETWORKS PRACTICAL	5 Hours	75 Hours	25	75	100	3 Hours

COURSE DESCRIPTION

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

OBJECTIVES

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

- Know the various indicators, switches and connectors used in Computers.
- 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.
- Assemble PC system and checking the working condition.
- Installation of Dual OS in a system.

- Identify the problems in Computer systems, software installation and rectification
- Assembling and disassembling of Laptop to identify the parts and to install OS and configure it.
- Enable to perform different cabling in a network.
- Configure Internet connection and use utilities to debug the network issues.
- Configure router for any topology
- Install and configure Windows 2008 / 2013 Server
- Design Windows server Active directory Services.
- Install and configure server hardware devices.

COURSE OUTCOMES:

EEC 663 COMPUTER HARDWARE AND NETWORKS PRACTICAL	
After successful completion of this course, the students should be able to	
C663.1	Know the various indicators, switches and connectors used in Computers
C663.2	Install various secondary storage devices with memory partition and formatting
C663.3	Identify the problems in Computer systems, software installation and rectification
C663.4	Assembling and disassembling of Laptop to identify the parts and to install OS and configure it
C663.5	Design Windows server Active directory Services

EQUIPMENTS REQUIRED

Hardware Requirements :	**Quantity required :**
Desktop Systems	30 Nos
Hard disk drive	06 Nos
DVD, Blu-ray Drive	06 Nos
Blank DVD , Blu-ray Disc	20 Nos
Head cleaning CD	--
Dot matrix Printer	02 Nos
Laser Printer	02 Nos
Server	01 No
Mobile phones	06 Nos
Network Requirements:	
Crimping Tool	06 Nos
Screwdriver set	06 Nos
Network Cables	--
Modem	02 Nos
Hub	01 No

Router	01 No
Switch	02 Nos
Software Requirements:	
Windows OS	
Windows Server 2008 / 2013 and LINUX.	
Antivirus Software.	
DVD and Blu-Ray Burning S/W.	
Mobile Phone Flashing S/W	

EEC 663 COMPUTER HARDWARE AND NETWORKS PRACTICAL

List of Experiments

Si.No	List of Experiments	Course Outcome
	PART – A	
1	HARD DISK a) Install Hard Disk. b) Configure CMOS-Setup. c) Partition and Format Hard Disk. d) Identify Master /Slave / IDE Devices. e) Practice with scan disk, disk cleanup, disk De-fragmentation, Virus Detecting and Rectifying Software.	C663.1
2	a) Install and Configure a DVD Writer & Blu-ray Disc Writer. b) Recording a Blank DVD & Blu-ray Disc.	C663.1
3	Assemble a system with add on cards and check the working condition of the system and install Dual OS	C663.4
4	Identification of mobile phone components (Study Exercise) a) Basic mobile phone components. b) Familiarizing the basic circuit board components: Marking position of different IC and Switches in the Network and Power sections of the PCB.	C663.2
5	Flashing, Unlocking and Formatting memory cards in Mobile phones	C663.2
6	Do the following cabling works in a network a) Cable Crimpling b) Standard Cabling c) Cross Cabling d) I/O Connector Crimping e) Testing the Crimped cable using a Cable tester	C663.3
7	a) Configure Host IP, Subnet Mask and Default Gateway in a system in LAN (TCP/IP Configuration). b) Configure Internet connection and use IPCONFIG, PING / Tracert and Netstat utilities to Debug the Network issues.	C663.3
8	Transfer files between systems in LAN using FTP Configuration. Install a printer in LAN and share it in the network.	C663.4
	PART B	
9	Installation of Windows 2008 / 2013 Server.	C663.5
10	Installation and configuration of DHCP Server.	C663.5
11	Installation and configuration of Mail Server.	C663.4
12	a) Installation of Red Hat Linux using Graphical mode. b) Installation of Red Hat Linux using VMware.	C663.4
13	a) Creating a user in Linux Server and assigning rights. b) Configuring and troubleshooting of /etc/inittab	C663.4
14	a) Configuring and troubleshooting of /etc/grub.conf b) Configuring and trouble shooting of /etc/passwd	C663.4

Continuous Internal Assessment

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

a) Attendance : 5 marks – (Award of marks same as theory subjects)

b) Procedure/ observation and tabulation/ Other Practical related work : 10 marks

c) Record writing : 10 marks

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Total 25 marks

LEARNING WEBSITES

https://www.sarvgyan.com/courses/computer-hardware-networking
https://www.jetking.com/blog/guide-for-computer-hardware-and-networking-courses/
http://www.indiaeducation.net/careercenter/computers-it/hardwareandnetworking/
https://en.wikipedia.org/wiki/Networking_hardware
https://www.educba.com/computer-hardware-vs-networking/

CO-POs & PSOs Mapping matrix

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2	PSO3
CO663.1	3	-	-	3	3	-	3	3	-	3
CO663.2	3	-	-	3	3	-	3	3	-	3
CO663.3	3	-	-	3	3	-	3	3	-	3
CO663.4	3	-	-	3	3	-	3	3	-	3
CO663.5	3	-	-	3	3	-	3	3	-	3
Total	15	-	-	15	15	-	15	15	-	15
Correlation level	3	-	-	3	3	-	3	3	-	3

Correlation level 1 – Slight (Low)
Correlation level 2 – Moderate (Medium)
Correlation level 3 – Substantial (High)

EEC 670 PROJECT WORK

TEACHING AND SCHEME OF EXAMINATION

No. of weeks per Semester: 15 Weeks

Course	Instructions		Examination			
	Hours / Week	Hours / Semester	Assessment Marks			Duration
			Internal Assessment	Semester End Examination	Total	
PROJECT WORK	4 Hours	60 Hours	25	75	100	3 Hours

OBJECTIVES

On completion of this practical subject, the students will be able to

- Construct and test DC-DC, DC-AC, AC-DC, AC-AC converters using power switching devices and control circuits for the same.

COURSE OUTCOMES:

EEC 670 PROJECT WORK	
After successful completion of this course, the students should be able to	
C670.1	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 Understand the facts and importance of environmental management.
C670.2	Get exposure on industrial environment and its work ethics.
C670.3	Understand what entrepreneurship is and how to become an entrepreneur.
C670.4	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.
C670.5	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.

EEC 670 PROJECT WORK

Syllabus

1. 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.

2. 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.

CO-POs & PSOs Mapping matrix

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2	PSO3
CO670.1	-	-	-	-	-	3	-	-	-	-
CO670.2	-	-	-	-	-	3	-	-	-	-
CO670.3	-	-	-	-	-	3	-	-	-	-
CO670.4	-	-	-	-	-	3	-	-	-	-
CO670.5	-	-	-	-	-	3	-	-	-	-
Total	-	-	-	-	-	15	-	-	-	-
Correlation level	-	-	-	-	-	3	-	-	-	-

Correlation level 1 – Slight (Low)
Correlation level 2 – Moderate (Medium)
Correlation level 3 – Substantial (High)

DIPLOMA IN ELECTRICAL AND ELECTRONICS ENGINEERING

Equivalent Papers for B-Scheme to C-Scheme

SUB. CODE	SUBJECT	SUB. CODE	SUBJECT
B-SCHEME			C-SCHEME
III SEMESTER (With effect from October 2016)			
EEB 310	Electrical Circuit Theory	EEC 310	Electrical Circuit Theory
EEB 320	Electrical Machines - I	EEC 320	Electrical Machines - I
EEB 330	Electronic Devices and Circuits	EEC 330	Electronic Devices and Circuits
EEB 340	Electrical Circuits and Machines Practical	EEC 340	Electrical Circuits and Machines Practical
EEB 350	Electronic Devices and Circuits Practical	EEC 350	Electronic Devices and Circuits Practical
EEB 360	Wiring & Winding Practical		Equivalent to VI Sem EEC 640
EEB 370	Computer Applications Practical	EEC 360	Computer Applications Practical
	--	EEC 370	Electrical Workshop Practical
IV SEMESTER (With effect from April 2017)			
EEB 410	Electrical Machines II	EEC 410	Electrical Machines II
EEB 420	Measurements and Instruments	EEC 420	Measurements and Instruments
EEB 430	Digital Electronics	EEC 430	Digital Electronics
EEB 440	Transducers and Signal Conditioners	EEC 440	Transducers and Signal Conditioners
EEB 450	Electrical Machines and Instrumentation Practical	EEC 450	Electrical Machines and Instrumentation Practical
EEB 460	Integrated Circuits Practical	EEC 460	Integrated Circuits Practical
EEB 470	Communication and Life Skill Practice	EEC 470	Life and Employability Skill Practical
V SEMESTER (With effect from October 2017)			
EEB 510	Power System – I	EEC 510	Generation Transmission and Switch gear
EEB 520	Micro Controller	EEC 520	Micro Controller
EEB 530	Special Electrical Machines		No Equivalent
	---	EEC 530	Electrical Estimation and Energy Auditing
Elective Theory I		Elective Theory I	
EEB 541	Control of Electrical Machines	EEC 541	Control of Electrical Machines
EEB 542	Programmable Logic Controller	EEC 542	Programmable Logic Controller
EEB 543	Electrical Machine Design	EEC 543	Electrical Machine Design

EEB 550	Electrical Circuits Simulation Practical		Equivalent to VI Sem EEC 650
	---	EEC 550	Computer Aided Electrical Drawing Practical
EEB 560	Micro Controller Practical	EEC 560	Micro Controller Practical
Elective Practical I		**Elective Practical I**	
EEB 571	Control of Electrical Machines Practical	EEC 571	Control of Electrical Machines Practical
EEB 572	Programmable Logic Controller Practical	EEC 572	Programmable Logic Controller Practical
EEB 573	Electrical Machine Design Practical	EEC 573	Electrical Machine Design Practical
VI SEMESTER (With effect from April 2018)			
EEB 610	Power System II	EEC 610	Distribution and Utilization
EEB 620	Electrical Estimation and Energy Auditing		Equivalent to V Sem EEC 530
	---	EEC 620	Operation and Maintenance of Electrical Equipment
Elective Theory II		**Elective Theory II**	
EEB 631	Power Electronics	EEC 631	Power Electronics
EEB 632	Bio-Medical Instrumentation	EEC 632	Bio-Medical Instrumentation
EEB 633	Non Conventional Energy Sources		No Equivalent
	---	EEC 633	Computer Hardware and Networks
EEB 640	Computer Servicing and Networks Practical	EEC 663	Computer Hardware and Networks Practical
	---	EEC 640	Wiring and Winding Practical
EEB 650	Computer Aided Electrical Drawing		Equivalent to V Sem EEC 550
	---	EEC 650	Electrical Circuits Simulation Practical
Elective Practical II		**Elective Practical II**	
EEB 661	Power Electronics Practical	EEC 661	Power Electronics Practical
EEB 662	Bio – Medical Instrumentation Practical	EEC 662	Bio – Medical Instrumentation Practical
EEB 663	Non Conventional Energy Sources Practical		No Equivalent
EEB 670	Project Work	EEC 670	Project Work