RADHA GOVIND UNIVERSITY
RAMGARH, JHARKHAND

Department of Electrical Engineering

Under Faculty of Engineering and Technology

Choice Based Credit System Curriculum for Diploma in Electrical Engineering

(Effective from Academic Session 2025-26)

29/3/25

Scheme of Teaching and Examination for
1st Semester of 3 Years Diploma in Engineering (All Branches except Non Tech

Duration of : **14 Weeks**
Semester Student : **36 Hrs**
Total Marks : **800**

Sl. No.	Name of Subject	Subject Code	Subject	Teaching Scheme			Examination Scheme					
				L	T	P	Hours of Exam	Full Marks of Subject	Final Exam / committee marks	Internal Assessment	Pass Marks Final / Ext. Exam	Pass Marks in Subjects
1.	Communication Skill – I	101	Theory	3	-	-	3	100	80	20	26	40
2.	Engineering Math – I	102	Theory	3	1	-	3	100	80	20	26	40
3.	Engineering Physics - I	103	Theory	3	-	-	3	100	80	20	26	40
4.	Engineering Chemistry – I	104	Theory	3	-	-	3	100	80	20	26	40
5.	Engineering Graphics – I Th	105	Theory	2	-	-	4	50	40	10	13	20
6.	Fundamental of Computer	106	Theory	2	-	-	3	50	40	10	13	20
7.	Engineering Physics Lab – I	107	Practical	-	-	2	4	50	40	10	13	20
8.	Engineering Chemistry Lab- I	108	Practical	-	-	2	4	50	40	10	13	20
9	Engineering Graphics – I SS	109	Sessional	-	-	4	-	50	30	20	-	25
10	Communication Skill I	110	Sessional	-	-	2	-	50	30	20	-	25
11.	Fundamental of Computer - I	111	Sessional	-	-	2	-	50	30	20	-	25
12.	Workshop - I	112	Sessional	-	-	4	-	50	30	20	-	25
Total Hours of Teaching per week :				**16**	**1**	**16**						

Note:
1. Period of Class hours should be of 1 hrs duration as per AICTE norms.
2. Remaining Hrs every week has been marked for students Library and Student Centered Activities.
3. Drawing / Graphics / Practical / Sessional examinations will be held at parent institution.
4. Board will depute examiner for Practical examination.
5. Regarding sessional examination the parent institution will form a three member committee and this committee will examine the sessional records and hold viva of the examinee for 60 % marks allotted to the subject. Marks for remaining 40 % will be provided by the Faculty concerned on the basis of evaluation of each job / work throughout the semester.

Mishra Rupak

25/3/25

Scheme of Teaching and Examination for

2nd Semester of 3 Years Diploma in Engineering (All Branches except Non Tech)

Duration of Semester : **14 Weeks**
Student Contact Hours : **36 Hrs**
Total Marks : **800**

Sl. No.	Name of Subject	Subject Code	Subject	Teaching Scheme			Examination Scheme					
				L	T	P	Hours of Exam	Full Marks of Subject	Final Exam / committee marks	Internal Assessment	Pass Marks Final / Ext. Exam	Pass Marks in Subjects
1.	Communication Skill – II	201	Theory	3	-	-	3	100	80	20	26	40
2.	Engineering Math – II	202	Theory	3	1	-	3	100	80	20	26	40
3.	Engineering Physics - II	203	Theory	3	-	-	3	100	80	20	26	40
4.	Engineering Chemistry - II	204	Theory	3	-	-	3	100	80	20	26	40
5.	Programming in C	205	Theory	3	-	-	3	100	80	20	26	40
6.	Engineering Physics II	206	Practical	-	-	2	3	50	40	10	13	20
7.	Engineering Chemistry II	207	Practical	-	-	2	3	50	40	10	13	20
8.	Programming in C	208	Sessional	-	-	4	3	50	30	20	-	25
9.	Workshop Practices	209	Sessional	-	-	4	4	100	60	40	-	50
10.	Professional Practice I	210	Sessional	-	-	4	-	50	30	20	-	25
Total Hours of Teaching per week :				**15**	**1**	**16**						

Note:
1. Period of Class hours should be of 1 hrs duration as per AICTE norms.
1. Remaining Hrs every week has been marked for students for Library and Student Centered Activities.
2. Drawing / Graphics / Practical / Sessional examinations will be held at parent institution.
3. Board will depute examiner for Practical examination.
4. Regarding sessional examination the parent institution will form a three member committee and this committee will examine the sessional records and hold viva of the examinee for 60 % marks allotted to the subject. Marks for remaining 40 % will be provided by the Faculty concerned on the basis of evaluation of each job / work throughout the semester.

Vishwa Deepak
29/3/25

Scheme of Teaching and Examination for

3rd Semester of 3 Years Diploma in Electrical Engineering.

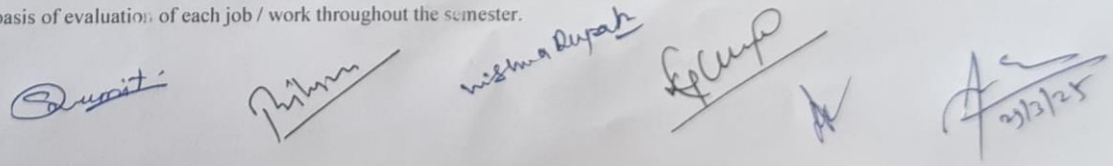
Duration of Semester : 14 Weeks
Student Contact Hours : 36 Hrs
Total Marks : 800

Sl. No.	Name of Subject	Subject Code	Subject	Teaching Scheme			Examination Scheme					
				L	T	P	Hours of Exam	Full Marks of Subject	Final Exam / committee marks	Internal Assessment	Pass Marks Final / Ext. Exam	Pass Marks in Subjects
1.	Math III	301	Theory	4			3	100	80	20	26	40
2.	Electrical Engineering	ELE303	Theory	3			3	100	80	20	26	40
3.	Measurement	ELE304	Theory	3			3	100	80	20	26	40
4.	Basic Engineering(C&M)	ELE305	Theory	3			3	100	80	20	26	40
5.	Electronics Engineering	ELE306	Theory	3			3	100	80	20	26	40
6.	Electrical Engineering Lab	ELE307	Practical			4	4	100	80	20		40
7.	Measurement Lab	ELE308	Practical			2	4	50	40	10		20
8.	Electronics Lab	ELE309	Practical			2	4	50	40	10		20
9.	Basic Engineering Lab	ELE310	Sessional			2		50	30	20		25
10	Development of Life Skils	302	Sessional			4		50	30	20		25
	Total Hours of Teaching per week :			**16**		**14**						

Total Marks : Theory : Practical : Sessional :

L : Lecture, T : Tutorial P : Practical

Note:
1. Period of Class hours should be of 1 hrs duration as per AICTE norms.
2. Remaining Hrs every week has been marked for students for Library and Student Centered Activities.
3. Drawing / Graphics / Practical / Sessional examinations will be held at parent institution.
4. Board will depute examiner for Practical examination.
5. Regarding sessional examination the parent institution will form a three member committee and this committee will examine the sessional records and hold viva of the examinee for 60 % marks allotted to the subject. Marks for remaining 40 % will be provided by the Faculty concerned on the basis of evaluation of each job / work throughout the semester.



Scheme of Teaching and Examination for

4th Semester of 3 Years Diploma in Electrical Engineering

Duration of Semester : **14 Weeks**
Student Contact Hours : **36 Hrs**
Total Marks : **800**

Sl. No.	Name of Subject	Subject Code	Subject	Teaching Scheme			Examination Scheme					
				L	T	P	Hours of Exam	Full Marks of Subject	Final Exam / committee marks	Internal Assessment	Pass Marks Final / Ext. Exam	Pass Marks in Subjects
1.	Network Theory	ELE402	Theory	3	-	-	3	100	80	20	26	40
2.	Electrical Machine I	ELE403	Theory	3	-	-	3	100	80	20	26	40
3.	Digital Circuits & Microprocessor	ELE404	Theory	3	-	-	3	100	80	20	26	40
4.	Elect Estimation & Costing	ELE405	Theory	3	-	-	3	100	80	20	26	40
5.	Power System I	ELE406	Theory	3	-	-	3	100	80	20	26	40
6.	Network Theory Lab	ELE407	Practical	-	-	2	4	50	80	20	-	40
7.	Electrical Machine I Lab	ELE408	Practical	-	-	2	4	50	40	10	-	20
8.	Digital Circuits & Microprocessor Lab	ELE409	Practical	-	-	2	4	50	40	10	-	20
9.	Electrical Workshop	ELE410	Sessional	-	-	4	-	100	60	40	-	50
10	Professional Practices II	401	Sessional	-	-	4	-	50	30	20	-	25
Total Hours of Teaching per week :				**15**		**14**						

Total Marks: Theory : Practical : Sessional :

L : Lecture, T : Tutorial P : Practical

Note: 1. Period of Class hours should be of 1 hrs duration as per AICTE norms.

2. Remaining Hrs every week has been marked for students for Library and Student Centered Activities

3. Drawing / Graphics / Practical / Sessional examinations will be held at parent institution.

4. Board will depute examiner for Practical examination.

5. Regarding sessional examination the parent institution will form a three member committee and this committee will examine the sessional records and hold viva of the examinee for 60 % marks allotted to the subject. Marks for remaining 40 % will be provided by the Faculty concerned on the basis of evaluation of each job / work throughout the semester

29/3/25

Scheme of Teaching and Examination for

5th Semester of 3 Years Diploma in Electrical Engineering

Duration of Semester : **14 Weeks**
Student Contact Hours : **36 Hrs**
Total Marks : **800**

Sl. No.	*Name of Subject*	*Subject Code*	*Subject*	*Teaching Scheme*			*Examination Scheme*					
				L	*T*	*P*	*Hours of Exam*	*Full Marks of Subject*	*Final Exam / committee marks*	*Internal Assessment*	*Pass Marks Final / Ext. Exam*	*Pass Marks in Subjects*
1.	Power System II	ELE 503	Theory	3	-	-	3	100	80	20	26	40
2.	Electrical Machines II	ELE 504	Theory	3	-	-	3	100	80	20	26	40
3.	Traction	ELE 505	Theory	3	-	-	3	100	80	20	26	40
4.	Elective I	ELE 506/CSE503/ECE505	Theory	3	-	-	3	100	80	20	26	40
5.	Elective II	ELE 507/ECE406/ECE503/ELE508	Theory	3	-	-	3	100	80	20	26	40
6.	Electrical Machines II Lab	ELE 509	Practical	-	-	2	4	50	40	10	-	20
7.	Power System Lab	ELE 510	Practical	-	-	2	4	50	40	10	-	20
8.	Elective I lab	ELE 511/ELE 512/ELE 513	Sessional			2	-	50	30	20	-	25
9	Elective II Lab	ELE 514/ECE409/ECE512/ELE515	Sessional	-	-	2	-	50	30	20	-	25
10.	In Plant Training	502	sessional	-	-	-	-	50	30	20	-	25
11.	DLS	501	Sessional	-	-	4	-	50	30	20	-	25
Total Hours of Teaching per week :				**15**		**12**						

Elective I (Illumination Engineering- ELE 506/ Micro. Processor & Micro. Controller- CSE503/ Programmable Logic Controller - ECE 505) Elective II (Maintenance of Electrical Machines ELE507/Control System ECE406/Instrumentation ECE503/ Robotics & Smart System ELE508)

Total Marks : Theory : Practical : Sessional :

L : Lecture, T : Tutorial P : Practical

Note: 1. Period of Class hours should be of 1 hrs duration as per AICTE norms.

2. Remaining Hrs every week has been marked for students for Library and Student Centered Activities.

3. Drawing / Graphics / Practical / Sessional examinations will be held at parent institution.

4. Board will depute examiner for Practical examination.

5. Regarding sessional examination the parent institution will form a three member committee and this committee will examine the sessional records andhold viva of the examinee for 60 % marks allotted to the subject. Marks for remaining 40 % will be provided by the Faculty concerned on the basis of evaluation of each job / work throughout the semester.

3/3/25

Scheme of Teaching and Examination for

6th Semester of 3 Years Diploma in Electrical Engineering

Duration of Semester : **14 Weeks**

Student Contact Hours : **36 Hrs**

Total Marks : **800**

Sl. No.	Name of Subject	Subject Code	Subject	Teaching Scheme			Examination Scheme					
				L	T	P	Hours of Exam	Full Marks of Subject	Final Exam / committee marks	Internal Assessment	Pass Marks Final / Ext. Exam	Pass Marks in Subjects
1.	Industrial Engineering & Management	601	Theory	3	-	-	3	100	80	20	26	40
2.	Utilization of Electrical Energy	ELE 604	Theory	3	-	-	3	100	80	20	26	40
3.	Power Electronics	ECE 504	Theory	3	-	-	3	100	80	20	26	40
4.	Elective III	ELE 605/606/607	Theory	3	-	-	3	100	80	20	26	40
5.	Elective IV	ELE608/ECE507/ ECE511/ELE609	Theory	3	-	-	3	100	80	20	26	40
6.	Power Electronics Lab	ECE513	Sessional	-	-	2	-	50	30	20	-	25
7.	Utilization of Electrical Energy Lab	ELE 610	Sessional	-	-	2	-	50	30	20	-	25
8.	Elective III lab	ELE611/612/613	Sessional	-		2	-	50	30	20	-	25
9.	Elective IV Lab	ELE614/ECE515/ ECE519/ELE615	Sessional	-		2	-	50	30	20	-	25
10	Project Work	603	Sessional	-	-	4	-	50	30	20	-	25
11	Professional Practices	602	Sessional	-	-	4	-	50	30	20	-	25
	Total Hours of Teaching per week :			**15**		**16**						

Elective III (Energy Conservation & Audit- ELE605/ Renewable Energy Sources-ELE606/Bye laws for Electrical Enginers-ELE607) Elective IV (Smart Grid-ELE608/VLSI-ECE507 /DSP-ECE511/ Communication System-ELE609)

Total Marks: Theory : Practical : Sessional :

L : Lecture, T : Tutorial P : Practical

Note:

1. Period of Class hours should be of 1 hrs duration as per AICTE norms.
2. Remaining Hrs every week has been marked for students for Library and Student Centered Activities.
3. Drawing / Graphics / Practical / Sessional examinations will be held at parent institution.
4. Board will depute examiner for Practical examination.
5. Regarding sessional examination the parent institution will form a three member committee and this committee will examine the sessional records and hold viva of the examinee for 60 % marks allotted to the subject. Marks for remaining 40% will be provided by the Faculty concerned on the basis of evaluation of each job / work throughout the semester.

Scheme of Teaching and Examination for
1st Semester of 3 Years Diploma in Engineering (All Branches except Non Tech

Duration of Semester : **14 Weeks**
Student Contact Hours : **36 Hrs**
Total Marks : **800**

Sl. No.	Name of Subject	Subject Code	Subject	Teaching Scheme			Examination Scheme					
				L	T	P	Hours of Exam	Full Marks of Subject	Final Exam / committee marks	Internal Assessment	Pass Marks Final / Ext. Exam	Pass Marks in Subjects
1.	Communication Skill – I	101	Theory	3	-	-	3	100	80	20	26	40
2.	Engineering Math – I	102	Theory	3	1	-	3	100	80	20	26	40
3.	Engineering Physics - I	103	Theory	3	-	-	3	100	80	20	26	40
4.	Engineering Chemistry – I	104	Theory	3	-	-	3	100	80	20	26	40
5.	Engineering Graphics – I Th	105	Theory	2	-	-	4	50	40	10	13	20
6.	Fundamental of Computer	106	Theory	2	-	-	3	50	40	10	13	20
7.	Engineering Physics Lab – I	107	Practical	-	-	2	4	50	40	10	13	20
8.	Engineering Chemistry Lab- I	108	Practical	-	-	2	4	50	40	10	13	20
9	Engineering Graphics – I SS	109	Sessional	-	-	4	-	50	30	20	-	25
10	Communication Skill I	110	Sessional	-	-	2	-	50	30	20	-	25
11.	Fundamental of Computer - I	111	Sessional	-	-	2	-	50	30	20	-	25
12.	Workshop - I	112	Sessional	-	-	4	-	50	30	20	-	25
Total Hours of Teaching per week :				**16**	**1**	**16**						

Total Marks : Theory : Practical : Sessional :
L : Lecture, T : Tutorial P : Practical

Note:
1. Period of Class hours should be of 1 hrs duration as per AICTE norms.
2. Remaining Hrs every week has been marked for students Library and Student Centered Activities.
3. Drawing / Graphics / Practical / Sessional examinations will be held at parent institution.
4. Board will depute examiner for Practical examination.
5. Regarding sessional examination the parent institution will form a three member committee and this committee will examine the sessional records and hold viva of the examinee for 60 % marks allotted to the subject. Marks for remaining 40 % will be provided by the Faculty concerned on the basis of evaluation of each job / work throughout the semester.

Scheme of Teaching and Examination for

2nd Semester of 3 Years Diploma in Engineering (All Branches except Non Tech)

Duration of Semester : **14 Weeks**
Student Contact Hours : **36 Hrs**
Total Marks : **800**
Effective from : 2017 -18 Session

Sl. No.	Name of Subject	Subject Code	Subject	Teaching Scheme			Examination Scheme					
				L	T	P	Hours of Exam	Full Marks of Subject	Final Exam / committee marks	Internal Assessment	Pass Marks Final / Ext. Exam	Pass Marks in Subjects
1.	Communication Skill – II	201	Theory	3	-	-	3	100	80	20	26	40
2.	Engineering Math – II	202	Theory	3	1	-	3	100	80	20	26	40
3.	Engineering Physics - II	203	Theory	3	-	-	3	100	80	20	26	40
4.	Engineering Chemistry - II	204	Theory	3	-	-	3	100	80	20	26	40
5.	Programming in C	205	Theory	3	-	-	3	100	80	20	26	40
6.	Engineering Physics II	206	Practical	-	-	2	3	50	40	10	13	20
7.	Engineering Chemistry II	207	Practical	-	-	2	3	50	40	10	13	20
8.	Programming in C	208	Sessional	-	-	4	3	50	30	20	-	25
9.	Workshop Practices	209	Sessional	-	-	4	4	100	60	40	-	50
10.	Professional Practice I	210	Sessional	-	-	4	-	50	30	20	-	25
Total Hours of Teaching per week :				**15**	**1**	**16**						

Total Marks : Theory : Practical : Sessional :
L : Lecture, T : Tutorial P : Practical

Note:
1. Period of Class hours should be of 1 hrs duration as per AICTE norms.
2. Remaining Hrs every week has been marked for students for Library and Student Centered Activities.
3. Drawing / Graphics / Practical / Sessional examinations will be held at parent institution.
4. Board will depute examiner for Practical examination.
5. Regarding sessional examination the parent institution will form a three member committee and this committee will examine the sessional records and hold viva of the examinee for 60 % marks allotted to the subject. Marks for remaining 40 % will be provided by the Faculty concerned on the basis of evaluation of each job / work throughout the semester.

Course Name : 03 Years Diploma in Engineering

Semester : First

Subject Title : Communication skills-I

Subject Code : 101

Teaching and Examination Scheme:

Teaching Scheme			Examination Scheme					
L TH	T	P	Full Marks.	External Exam Marks	Internal Exam Marks	External Pas Marks	Total Pass Marks	Duration of External Exams
03	1		100	80	20	26	40	3 Hrs

NOTE:

Internal marks will be allotted on the basis of two snap tests and 2 assignment of equal marks to be conducted by the faculty teaching the subject.

RATIONALE:

The comprehensive knowledge of communication and communication skill is essential for role of technicians in industry. Diploma pass outs are key persons between workforce and management and they need to be most effective in communication skills. The communication often includes grammar of the language in practice which is these days English. The inhouse practice before the faculty as part of scheme will develop the abilities in students a practical aspect of effective communication. Further exercises have been included for improving oral communication. Practical exposure gives a comprehensive communication skill effectiveness.

OBJECTIVES:

1. Comprehend the given passage
2. Answer correctly the questions on seen and unseen passages
3. Increase the vocabulary
4. Apply rules of grammar for correct writing

CONTENTS: Theory

Name of Topic	Hours	Marks
PART : 1 TEXT • Comprehension- Responding to Questions from text (Spectrum) • Vocabulary-Understanding meaning of new word from text. • Identifying part of Speech from text.	10	18

PART-II : Application of Grammar • Verbs • Tense • Do as directed (active/passive, Direct/Indirect, affirmative/negative/assertive/interrogative, question tag, remove too, use of article, preposition, conjunction, punctuation) • Correct the errors from the sentences.	10	18
PART-III : Paragraph Writing • Types of Paragraph (Narrative, Descriptive, Technical) • Unseen passage for Comprehension.	04	8
PART-IV : Vocabulary Building. • Synonyms • Antonyms • Homophones • Use of Contextual word in a given Paragraph	06	12
PART-V : Soft Skill Development • Speaking Skill • Introduction to Group Discussion • Process of Group Discussion • Leadership skill • Instant public speaking	08	16
PART-VI Etiquettes &Body Language • Telephone etiquettes listening/speaking • Problems of telephonic Conversation • Verbal/ oral etiquettes • Physical appearance • Eye Contact/Body Language • Group Discussion	4	8
Total	42	80

List of Assignment :

1. **Building of Vocabulary**
   25 words from the glossary given at the end of each chapter, to be used to make sentences.
2. **Applied Grammar**
   Identify the various parts of speech and insert correct parts of speech in the sentences given by the teachers.
3. **Punctuation**
   Punctuation 20 sentences given by the teachers.
4. **Tenses**
   List 12 tenses and give two examples for each tense.
5. **Dialogue Writing**
   Write at least two dialogues on different situations. (Conversation between two friends, conversation between two politicians etc.)
6. **Identifying the Error**
   Identify the error in the sentences given by the teachers. (20 Sentences)
7. **Idioms and Phrases**
   Use of Idioms and Phrases in sentences. (20 Examples)
8. **Biography**
   Write a short biography on your favorite role model approximately. (250-300 words with pictures)

ACTIVITIES TO BE CONDUCTED DURING PRACTICALS

01. Student should perform role-plays on the situations given by the teachers. (04 Hours)
02.(e.g. V. Sasikumar & Dhamija 2nd edition (04 Hrs) or Linuga Phon L-21 Multimedia (Desirable)

Learning Resources :

Reference Books :

Sl. No.	Title	Author	Publisher
01.	Spectrum-A Text Book on English	--------	SBTE, Maharastra
02.	Contemporary English Grammar structures and composition	David Green	Macmillan

03.	English for practical Purpose	Z.N. Patil et el	Macmillan
04.	English Grammar and composition	R.C.Jain	Macmillan
05	Grammer & Composition	Nesfield	
06	Technical English		Longman
07	English Workplace	Editor- Mukti Sanyal	Macmillan
08	Thesaurus	Rodgers	Macmillan
09	Dictionary	Oxford	Oxford University
10	Dictionary	Longman	Oriental Longman

Web Sites for Reference :

Serial No.	Website Address
01	www. edufind.com
02	www.english_the _the_easy_eay.com
03	www.englishclub.com
04	www.english_grammar_lessons.com
05	www.wikipedia.org/wiki/english_grammar

Course Name : 03 Years Diploma in Engineering

Semester : First

Subject Title : Engineering Chemistry-I

Subject Code : 104 / 108

Teaching and Examination Scheme:

Teaching Scheme			Examination					
L	T	P	Full Marks.	External Exam Marks	Internal Exam Marks	External Pas Marks	Total Pass Marks	Duration of External Exams
03			100	80	20	26	40	3 Hrs
Practical		2	50	40	10	13	20	4 Hrs

NOTE:

Internal marks will be allotted on the basis of two snap tests and 2 assignment of equal marks to be conducted by the faculty teaching the subject.

RATIONALE:

Chemistry is a basic science subject which is essential to all engineering courses. It gives knowledge of engineering materials, their properties, related applications & selection of materials for engineering applications.

Due to technological progress there are hazardous effects on environment & human life. The core knowledge of environmental effects will bring awareness in students about the precautions & preventions to be taken to reduce the ill effects.

This subject will generate curiosity of carrying out further development in engineering fields.

OBJECTIVES: The student will be able to:

1. Draw the orbital configuration of different elements.
2. Represent the formation of molecules schematically.
3. Describe the mechanism of electrolysis.
4. Identify the properties of metals & alloys related to engineering applications.
5. Identify the properties of non metallic materials, related to engineering applications.
6. Compare the effects of pollutants on environments & to suggest preventive measures & safety.

Content: Theory

Chapter No.	Name of the Topic	Hours	Marks
01	**Atomic Structure** Definition of Atom, Fundamental Particles of Atom – their Mass, Charge, Location, Definition of Atomic no, Atomic Mass no., Isotopes & Isobars, & their distinction with suitable examples, Bohr's Theory, Definition, Shape of the orbitals & distinction between Orbits & Orbitals, Hund's Rule, Aufbau's Principle (till Atomic no. 30), Definition & types of valency (Electrovalency & Covalency), Octet Rule, Duplet Rule, Formation of Electrovalent & Covalent Compounds e.g. Nacl, $CaCl_2$, MgO, $AlCl_3$, CO_2, H_2O, Cl_2, NH_3, C_2H_4, N_2, C_2H_2. Distinction between electrovalent & covalent compounds.	06	12
02	**Electrochemistry** Electrolytic dissociation, Arrhenius Theory of Ionisation, Degree of Ionisation & factors affecting degree of ionization. Significance of the terms involved in Electrolysis- Such as Conductors, Insulators , Dielectrics, Electrolyte, Non Electrolyte, Electrolysis, Electrolytic Cell, Electrodes. Mechanism of Electrolysis. Concept of electrode potential such as reduction potential & oxidation potential. Electrochemical Series, Electrolysis of $CuSO_4$ Solution by using Cu Electrode & Platinum Electrode, Electrolysis of NaCl solution & fused NaCl by using carbon electrode, Faraday's first & second law of Electrolysis & Numericals, Electrochemical Cells & Batteries, Definition, types such as Primary & Secondary Cells & their examples. Construction, Working & Applications of Dry Cell & Lead – Acid Storage Cell, Applications of Electrolysis such as Electroplating & Electro refining, Electrometallurgy & Electrotyping	08	16
03	**Metals & Alloys** **3.1 Metals (Marks:10)** Occurrence of Metals, Definition of Metallurgy, Mineral, Ore, Gangue, Flux & Slag, Mechanical Properties of metals such as Hardness, Toughness, Ductility, Malleability, Tensile strength, Machinability, Weldability, Forging, Soldering, Castability. Stages of Extraction of Metals from its Ores in detail i.e. Crushing, Concentration, Reduction, Refining. Physical Properties & Applications of some commonly used metals such as Fe, Cu, Al, Cr, Ni, Sn, Pb, Zn, Co, Ag, W. **3.2 Alloys (Marks: 08)** Definition of Alloy, Purposes of Making alloy. Preparation Methods, Classification of Alloys such as Ferrous & Non Ferrous & their examples. Composition, Properties & Applications of Alnico, Duralumin, Dutch Metal, German Silver / Nickel Silver, Gun Metal, Monel metal, Wood's Metal, Babbit metal.	10	18

04	**Non Metallic Materials** **4.1 Plastics (Marks: 04)** Definition of Plastic, Formation of Plastic by Addition & Condensation Polymerisation by giving e.g. of Polyethylene & Backelite plastic Respectively, Types of Plastic, Thermosoftening & Thermosetting Plastic, with Definition, Distinction & Compounding of Plastics – Resins, Fillers, Plasticizers, Accelerators, Pigments & their examples, Engineering Applications of Plastic based on their properties. **4.2 Rubber (Marks: 04)** Natural Rubber: Its Processing, Drawbacks of Natural Rubber, Vulcanisation of Rubber with Chemical Reaction. Synthetic Rubber: Definition, Distinction Between natural & synthetic rubber. Properties of rubber such as elasticity, abrasion resistant, stress & strain and related engg. application. **4.3 Thermal Insulating Materials (Marks: 04)** Definition ,& types. Characteristics of insulators. Thermal insulators. Properties & Applications o f glasswool, Asbestos, Cork.	06	12
05	**Environmental Effects (Awareness Level)** **5.1 Pollution & Air pollution (Marks 10)** Definition of pollution & pollutant, Causes of Pollution, Types of Pollution - Air & Water Pollution. **Air Pollution** Definition, Types of Air pollutants their Sources & Effects, Such as Gases, Particulates, , Radio Active Gases, Control of Air Pollution, Air Pollution due to Internal Combustion Engine & Its Control Methods, Deforestation their effects & control measures. Causes , Effects & control measures of Ozone Depletion & Green House Effects**.** **5.2 Water Pollution & Wastes (Marks 12)** Definition, Causes & Methods of Preventing Water Pollution, Types of Waste such as Domestic Waste, Industrial Waste, their Physical & Biological Characteristics, Concept & significance of BOD, COD, Biomedical Waste & E – Waste, their Origin, Effects & Control Measures. Preventive Environmental Management (PEM) Activities.	12	22
	Total	**42**	**80**

Practical:

Intellectual Skills: 1. Analyse given solution
2. Interpret the results

Motor Skills : 1. Observe Chemical Reactions
2. Measure the quantities Accurately
3. Handle the apparatus carefully

List of Experiments:

01 – 07 Qualitative Analysis of **four salts ,** Containing One Basic & One Acidic Radical Listed below

Basic Radicals:

Pb^{+2}, Cu^{+2}, Al^{+3}, Fe^{+2}, Fe^{+3}, Cr^{+3}, Zn^{+2}, Ni^{+2}, Ca^{+2}, Ba^{+2}, Mg^{+2}, K^{+}, NH_4^{+}.

Acidic Radicals:

Cl^{-}, Br^{-}, I^{-}, CO_3^{-2}, SO_4^{-2}, NO_3^{-}.

05 To Determine E.C.E. of Cu by Using $CuSO_4$ Solution & Copper Electrode

06 To standardize KMnO4 using Sodium oxalate.

07 To determine percentage of Fe in the given mohr's salt.

08 To Prepare a chart to showing application of metals like Fe, Cu, Al, Cr, Ni, Sn, Pb, Co.

09 To determine Carbon Monooxide, CO_2 content emission from petrol vehicle

10 To Determine Dissolved Oxygen in a Water Sample.

Learning Resources:

Reference Books:

Sr. No.	Author	Name of the book	Publisher
01	Jain & Jain	Engineering Chemistry	Dhanpat Rai and Sons
02	S. S. Dara	Engineering Chemistry	S. Chand Publication
03	B. K. Sharma	Industrial Chemistry	Goel Publication
04	S. S. Dara	Environmental Chemistry & Pollution Control	S. Chand Publication
05	Vedprakash Mehta	Polytechnic Chemistry	Jain brothers
06	Uppal	Engineering Chemistry	

Course Name : 03 Years Diploma in Engineering

Semester : First

Subject Title : Engineering Graphics-I

Subject Code : 105

Teaching and Examination Scheme:

Teaching Scheme			Examination Scheme					
L	T	P	Full Marks.	External Exam Marks	Internal Exam Marks	External Pas Marks	Total Pass Marks	Duration of External Exams
02	0	4	50+50	40+30	10+20	13 TH	20+25	4 Hrs (TH)

NOTE:

Internal marks for theory will be allotted on the basis of two snap tests and 2 assignment of equal marks to be conducted by the faculty teaching the subject.

RATIONALE:

Normally Graphical representation are used for expressing intents and contents. Engineering Graphics is the language of engineers. The concepts of Engineering Graphics are used to develop, express the ideas, and conveying the instructions which are used to carry out jobs in the field Engineering. The course illustrates the techniques of graphics in actual practice. This preliminary course aims at building a foundation for the further course in drawing and other allied subjects.

OBJECTIVES:

The student should be able to:-

1) Draw different engineering curves and know their applications.
2) Draw orthographic projections of different objects.
3) Visualize three dimensional objects and draw Isometric Projections.
4) Use the techniques and able to interpret the drawing in Engineering field.
5) Use computer aided drafting packages.

Chapter	Name of Topic		No. of Sheet	No. of Hr.	
				Theory	Practical
01.	1.1- 1.2- 1.3-	Drawing Instruments and sheet layout Letters and Numbers as per BIS: SP46-2003 Scale (Plane and diagonal scale)	02	01	04

02	2.1- 2.2- 2.3-	Curves and Conic Section To draw ellipse by directrix and arc of circle method To draw parabola by directrix and rectangle method To draw hyperbola by rectangle and directrix method.	01	02	04
03	3.1- 3.2-	Introduction to orthographic projection. Projection of point on principal, auxiliary and profile planes. Idea of shortest distance.	01	01	04
04	4.1- 4.2- 4.3-	Projection of straight line on principal plane in the following cases. Parallel to both H.P and V.P Inclined to one plane and parallel to other plane. Inclined to both plane.	01	02	04
05	5.1-	Projection of different simple shapes eg. Circle, Triangle, Rectangle, Pentagon, & Hexagon on principal plane (Inclined to one plane and to both planes)	01	02	04
06	6.1-	Projection of simple solid. Projection of Prism, Pyramid, Cone, Cylinder, and Cube with their axis inclined to one reference plane and parallel to other.	01	02	04
07	7.1- 7.2-	Section of simple solids with true shape of sectioned portion. Development of solid surfaces eg. Prism, Cylinder, Cone, Pyramid and Cubes.	01	02	04
08	8.1-	Isometric Scale and their use in drawing isometric views of single and compound solids. (Simple case only)	01	02	04
09	9.1-	Intersection of solids. Curves of intersection of the surfaces of the solids in the following case; a. Prism with Prism b. Cylinder with cylinder c. Prism with cylinder d. Cylinder with cone with different axis.	01	02	04

10	10.1-	Prospective Projection	01	02	04
11	11.1-	AutoCAD Basics, Layers, multi-layer images, graphic interfaces, different views to be drawn.	03	10	16
		Total-	**14**	**28**	**56**

Learning Resources:

a. Book-

Sl. No.	Author	Title	Publication
1.	N.D.Bhatt	Engineering Drawing	Charotkar Publishing House
2.	R.K.Dhawan	Engineering Drawing	S.Chand Co.
3.	K.R.Mohan	Engineering Graphics	Dhanpat Rai & Publication Co.
4.	P.J.Shah	Engineering Drawing	----
5.	P.S.Gill	Engineering Drawing	----
6.		Mastering AutoCAD	BPB Publication

Course Name : 03 Years Diploma in Engineering

Semester : First

Subject Title : Engineering Mathematics-1

Subject Code : 102

Teaching and Examination Scheme:

Teaching Scheme			Examination Scheme					
L TH	T	P	Full Marks.	External Exam Marks	Internal Exam Marks	External Pas Marks	Total Pass Marks	Duration of External Exams
03	01		100	80	20	26	40	3 Hrs

NOTE:

Internal marks will be allotted on the basis of two snap tests and 2 assignment of equal marks to be conducted by the faculty teaching the subject.

RATIONALE:

Mathematics provides foundation for all engineering subjects. Deep thought is given while selecting topics of this subject known as “Engineering Mathematics” which intends to teach students basic facts, concepts and principles of mathematics as a tool to analyze engineering problems. It lays down the foundation for understanding core engineering and technology subjects.

OBJECTIVE:

This subject helps the students to develop logical thinking, which is useful in comprehending the principles of all other subjects. Analytical and systematic approach towards any problem is developed through learning of this subject. Mathematics being a versatile subject can be used as a tool at every stage of human life.

Sub Objective:

This subject is divided into four units 1) Algebra, 2) Trigonometry, 3) Coordinate Geometry and 4) Vector. Upon completion of these Units the student shall be able to:

1.1 Use Logarithms in engineering calculations
1.2 Resolve Rational Fraction into sum of Partial Fractions in engineering problems
1.3 Use Matrices for solving engineering problems
1.4 Understand the concept of Binomial Expansion and use of Permutation & Combination

2.1 Solve simple problems on Compound Angles
2.2 Solve problems using the formulae for Multiple and Sub- multiple Angles
2.3 Apply Transformations for solving the problems in Trigonometry
2.4 Use Inverse Trigonometric Functions for solving engineering problems
2.5 Understand Properties of triangles

3.1 Appreciate the concept of position of any point in a plane or in space
3.2 Distance between two points and its application in solving engineering problems
3.3 Solve the problems on straight line
3.4 Solve the problems on Circles

4.1 Appreciate the concept of a new type of physical quantity called Vector
4.2 Algebra of Vectors
4.3 Solve engineering problems like work done, moment of force about a point as well as about a line.

Chaper no	NAME OF TOPICS	Hours	Marks
	ALGEBRA		
1	**1.1 Prerequisites Revision of** ▪ Arithmetic, Geometric and Harmonic Progressions, ▪ Formula of nth term and sum to n-terms of A.P. and G.P. ▪ Expression of $\sum n$, $\sum n^2$ and $\sum n^3$. ▪ Quadratic equations with real coefficients and relation between their roots & coefficient	01	01
	1.2 Logarithms: ▪ Definition of logarithm (Natural and Common logarithm.) ▪ Laws of logarithm ▪ Examples based on 1.2.1 to 1.2.2	03	04
	1.3 PARTIAL FRACTION ▪ Definition of Polynomial Fraction Proper & Improper Fractions and definition of Partial fractions. ▪ To Resolve proper fraction into partial fraction with denominator containing non repeated linear factors, repeated linear factors and irreducible non repeated quadratic factors. ▪ To resolve improper fraction into partial fraction.	03	06

	.4 DETERMINANT AND MATRICES. **Determinant ---------- 4 Marks** ▪ Definition and expansion of determinants of order 2 and 3. ▪ Cramer's rule to solve simultaneous equations for 2 and 3 unknowns. **Matrices ---------- 12Marks** ▪ Definition of a matrix of order m X n and types of Matrices with examples. ▪ Algebra of matrices such as equality, addition, subtraction, scalar multiplication and multiplication of two matrices. ▪ Transpose of a matrix. ▪ Minor, Cofactor of an element of a matrix, adjoint of matrix and Inverse of matrix by Adjoint method. ▪ Solution of simultaneous equations containing 2 and 3 unknowns by matrix inversion method. ▪ Idea of Rank of Matrix and their calculation	08	16
	1.5 BINOMIAL THEOREM ▪ Definition of factorial notation, definition of permutation and combinations with formula (without proof). ▪ Derivation of simple identities and solution based on it ▪ Binomial theorem for positive index. ▪ General term, Middle term, independent term and coefficient of x^n ▪ Binomial theorem for negative index (only idea). ▪ Approximate value (only formula)	02	04
2	TRIGONOMETRY		
	2.1 REVISION ▪ Measurement of an angle (degree and radian). Relation between degree and radian. ▪ Trigonometrical ratios of 0^0 , 30^0 , 45^0 , 60^0, 90^0, $90^0 \pm \theta$, $180^0 \pm \theta$ and $360^0 \pm \theta$ ▪ Fundamental identities.	01	01
	2.2 TRIGONOMETRIC RATIOS OF ALLIED, COMPOUND, MULTIPLE & SUBMULTIPLE ANGLES Questions based on numerical computations.	03	06
	2.3 Transformation formula of Product into sums or difference and vice versa, simple problems based on it	03	06
	2.4 INVERSE TRIGONOMETRIC RATIOS ▪ Definition of inverse trigonometric, ratios, Principal values of	02	04

	inverse trigonometric ratios. ▪ Relation between inverse trigonometric ratios.		
	2.5 PROPERTIES OF TRIANGLE Sine, Cosine, Projection and tangent rules (without proof). Simple problems.	02	04
03	COORDINATE DISTANCES		
	3.1 POINT AND DISTANCES ▪ Distance formula, Section formula, midpoint, centroid of triangle. ▪ Area of triangle and condition of collinearity.	**2**	**04**
	3.2 STRAIGHT LINE ▪ Slope and intercept of straight line. ▪ Equation of straight line in slope point form, slope-intercept form, two-point form, two-intercept form, normal form. General equation of line ▪ Angle between two straight lines condition of parallel and perpendicular lines. ▪ Intersection of two lines. ▪ Length of perpendicular from a point on the line and perpendicular distance between parallel lines.	**05**	**10**
	3.3 CIRCLE ▪ Equation of circle in standard form, centre – radius formula and diameter formula. ▪ General equation of circle, its centre and radius, simple problem	**02**	**04**
	VECTOR ALGEBRA		
	4 VECTORS ▪ Definition of vector, position vector, Algebra of vectors (Equality, addition, subtraction and scalar multiplication) ▪ Dot (Scalar) product with properties. ▪ Vector (Cross) product with properties.	03	06
	4.4 Applications 4.4.1 Work done and moment of force/s about a point & line	**02**	04
	TOTAL:	42	80

LEARNING RESOURCES:

Sr. No.	Title	Authors	Publications
1	Mathematics: A Textbook for Class XI Part I &II	National Council of Educational Research and Training	
2	Mathematics: A Textbook for Class XII Part I &II	National Council of Educational Research and Training	
3	Mathematics for Class XI Volume I and II	R. D. Sharma	Dhanpat Rai Publication, New Delhi.
4	Mathematics for Class XII Volume I and II	R. D. Sharma	Dhanpat Rai Publication, New Delhi.
5	Co ordinate Geometry	S. L. Loney	S. Chand Publication
6	Trigonometry	S. L. Loney	S. Chand Publication
7	Higher Algebra	H. S. Hall & S. R. Knight	Metric edition, Book Palace, New Delhi
8	Higher Sr. Secondary School Mathematics for XI & XII	R.S. Agrawal	Bharti Bhawan, Patna
9	Vector Algebra	L Prasad	Bharti Bhawan, Patna

Note:

In board examination, question setter may be advised to select 20% questions of objective, 30% of short type and remaining 50% of long type based on basic concepts, formula and calculations respectively.

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Course Name : 03 Years Diploma in Engineering

Semester : First

Subject Title : Engineering Physics-I

Subject Code : 103/ 107

Teaching and Examination Scheme:

Teaching Scheme			Examination					
L	T	P	Full Marks.	External Exam Marks	Internal Exam Marks	External Pas Marks	Total Pass Marks	Duration of External Exams
03	1		100	80	20	26	40	3 Hrs
Practical		2	50	40	10	13	20	4 Hrs

NOTE:

Internal marks will be allotted on the basis of two snap tests and 2 assignment of equal marks to be conducted by the faculty teaching the subject.

RATIONALE:

Basic science forms the foundation of Engineering. In particular Physics provides fundamental facts, principles, l aws, and proper sequence of events to streamline Engineering knowledge.

OBJECTIVES:

Student will be able to:

- Measure given dimensions by using appropriate instruments accurately.
- Select proper measuring instrument on the basis of range, least count & precision required for measurement.
- Differentiate kinetic and kinematics and solve the problems on kinematics and kinetics.
- Use principles of illumination for enhancing work efficiency.
- Analyze variation of sound intensity with respect to distance.
- Identify different factors affecting acoustical planning of buildings.
- Select proper material for intended purpose by studying properties of materials.
- Identify good & bad conductors of heat.
- Identify, analyze, discriminate and interpret logical sequence of field problems with the study of physics.

CONTENTS: Theory

CHAPTER	CONTENT	HOURS	MARKS
1.	**UNITS AND MEASUREMENTS** **1.1** Need of measurement and unit in engineering and science, definition of unit , requirements of standard unit, systems of units-CGS,MKS and SI, fundamental and derived quantities and their units **1.2** Definition of dimensions with examples, principle of homogeneity of dimensions, limitations of dimensions. **1.3** Definition of accuracy, precision and error, estimation of errors – absolute error, relative error and percentage error, rules and identification of significant figures. **(Numericals on percentage error and significant figures)**	**04**	**06**
2	**MECHANICS** **2.1 Motion along a straight line and Force** Concept of scalar and vector quantities, Equations of motion with constant acceleration (derivation not required), Equations of motion of falling body under gravity, Newton's laws of motion, Force, inertia, Action and reaction, tension, , momentum, impulse and impulsive force with practical examples (basic Idea), Conservation of linear momentum, **(Simple problems on linear motion)**	**04**	**10**
	2.2Angular Motion Definition of angular displacement, angular velocity and angular acceleration, relation between linear velocity and angular velocity, definition of simple harmonic motion (SHM), SHM as a projection of uniform circular motion on any diameter, equation of SHM, derivation of displacement, velocity and acceleration of a body executing SHM.	**05**	**08**
3	**GRAVITATION** Newton's laws of gravitation,Newton's gravitational constant (G) and its SI unit, Acceleration due to gravity (g) and its relation with "G",Variation of g with altitude and latitude(deduction not required) **(Simple problems)**	**03**	**06**
4.	**WORK , ENERGY & POWER** Definition of work, energy and power, equations for P.E. & K.E., Work-Energy principle, Representation of work by using graph, work done by a torque (no derivation) **(Numericals on work, potential and kinetic energy)**	**02**	**06**

5.	**GENERAL PROPERTIES OF MATTER** **5.1 Elasticity** Deforming force, restoring force, elastic and plastic body, stress and strain with their types. elastic limit, Hooke's law, Young's modulus, bulk modulus, modulus of rigidity and relation between them (no derivation). **(Numerical on stress, strain and Young's modulus)**	**04**	**08**
	5.2 Surface Tension. Molecular force, cohesive and adhesive force, Molecular range , sphere of influence, Laplace's molecular theory, Definition of surface tension and its S.I. unit, angle of contact, capillary action with examples, shape of meniscus for water and mercury, relation between surface tension , capillary rise and radius of capillary (no derivation),effect of impurity and temperature on surface tension **(Numerical on relation between surface tension, capillary rise and radius)**	**04**	**08**
	5.3 Viscosity Definition of viscosity, viscous force, velocity gradient, Newton's law of viscosity, coefficient of viscosity and its S.I. unit, streamline and turbulent flow with examples, critical velocity, Reynolds's number and its significance, derivation of viscous force for free fall of spherical body through viscous medium, upthrust, terminal velocity, Stoke's law (statement and formula). **(Numerical on coefficient of viscosity, Reynolds number and Stoke's formula)**	**04**	**08**
CHAPTER	**CONTENT**	**HOURS**	**MARKS**
6	**HEAT** **Transmission of heat and expansion of solids:** Three modes of transmission of heat -conduction, convection and radiation, good and bad conductor of heat with examples, law of thermal conductivity, coefficient of thermal conductivity and its S.I. unit, Definition of linear, aerial and cubical expansion and relation between them. (no derivation) (Numericals on law of thermal conductivity, and coefficients of expansions)	**04**	**08**
7	**ACOUSTICS** **7.1 Sound** Definition of wave motion, amplitude, period, frequency, and wavelength, relation between velocity, frequency and wavelength , longitudinal and transverse wave, definition of stationary wave , node and antinode, forced and free vibrations, definition of resonance with examples, derivation of formula for velocity of sound with end correction. **(Numericals on relation $v = n\lambda$ and resonance)**	**04**	**06**

	7.2 Acoustics of Building Acoustics-concept and definition, Intensity and loudness of sound, echo, Reverberation standard reverberation time, Sabine's formula, Conditions for good acoustics, Factors affecting Acoustical planning of auditorium. **(Numericals on Sabine's formula)**	**04**	**06**
	TOTAL	**42**	**80**

Practical:

Skills to be developed

1) **Intellectual skills-**

Proper selection of measuring instruments on the basis of range, least count, precision and accuracy required for measurement.

Analyze properties of matter & their use for the selection of material.

To verify the principles, laws, using given instruments under different conditions.

To read and interpret the graph.

To interpret the results from observations and calculations.

To use these results for parallel problems.

2) **Motor skills-**

Proper handling of instruments.

Measuring physical quantities accurately.

To observe the phenomenon and to list the observations in proper tabular form.

To adopt proper procedure while performing the experiment.

To plot the graphs.

List of Experiments:

1. To know your Physics Laboratory.
2. To use Vernier Callipers for the measurement of dimensions of given object.
3. To use Micrometer Screw Gauge for the measurement of dimensions (Length, Thickness, Diameter) of given object.
4. To use spherometer for the measurement of thickness of a given glass piece.
5. To calculate Young's modulus of elasticity of steel wire by Vernier method
6. To study capillary phenomenon and to verify that the height of liquid in capillary is inversely proportional to the radius of capillary
7. To determine coefficient of viscosity of given liquid using Stoke's Method
8. To calculate the Linear Thermal coefficient of expansion for copper by using Pullinger's apparatus.
9. To determine refractive index of a glass using glass slab by pin method. (sin i/sin r=μ).
10. To determine the velocity of sound by using resonance tube.

Reference Books:

Sr. No.	Name of book	Author	Publisher & Address
1.	Physics-I	V. Rajendran	Tata McGraw- Hill raw- Hill publication, New Delhi
2.	Applied physics	Arthur Beiser	Tata McGraw- Hill raw- Hill Publication, New Delhi
3.	Engineering Physics	by R.K.Gaur and S.L.Gupta	Dhanpat Rai Publication, New Delhi.
4.	Fundamentals of Physics	Resnick ,Halliday & Walker	Wiley India Pvt. Ltd.
5.	Core Physics-I	A. Kumar	Bharti Bhavan
6.	Pradeep's Fundamental Physics-XI	K.L. Gomber & K.L Gogia	Pradeep Publication
7.	S. Chand's Principles of Physics-XI	V.K Mehta & Rohit Mehta	S. Chand Publication
8.	Dinesh New Millennium Physics-XI	S. K Sharma	Dinesh Publication

Course Name:- All Branches of Diploma in Engineering

Semester: First

Subject Title: Fundamental of Computer

Subject Code; 106/111

Teaching and Examination Scheme:

Teaching Scheme			Examination Scheme					
L	T	P	Full Marks.	External Exam Marks	Internal Exam Marks	External Pas Marks	Total Pass Marks	Duration of External Exams
02	0		50	40	10	13	20	3 Hrs
Sessional		2	50	30	20		25	

NOTE:

Internal marks will be allotted on the basis of two snap tests and 2 assignment of equal marks to be conducted by the faculty teaching the subject.

RATIONALE:

In Engineering Education role of computers and its knowledge is day by day increasing and every documentation and analysis requires basic fundamentals of computers. The accessibility to internet and presentation techniques are essential elements these days which is fully dependent on knowhow of computers irrespective of branches or discipline.

OBJECTIVES:

Student will be able to:

1. Understand a computer system that has hardware and software components, which controls and makes them useful.
2. Understand the operating system as the interface to the computer system.
3. Use the basic function of an operating system.
4. Set the parameter required for effective use of hardware combined with and Application software's.
5. Compare major OS like Linux and MS- Windows.
6. Use file managers, word processors, spreadsheets, presentation software's and Internet.
7. Have hands on experience on operating system and different application software.
8. Use the Internet to send mail and surf the World Wide Web.

CONTENTS : Theory

Chapter	Name of Topic	Hr	Marks
1.	**Fundamentals of Computer** 1.1 Introduction 1.2 Type of Computer 1.3 Components of PC 1.4 Inputs & Output Devices 1.5 Computer Languages 1.6 Memory of Computer	4	6
2.	**Introduction to MS Office** 3.1 MS- Word : Introduction, Starting MS-Word Screen and its Components, Elementary Working with MS-Word 3.2 MS- Excel: Introduction, Starting MS-Excel, Basics of Spreadsheet, MS- Excel Screen and its Components, Elementary Working with MS-Excel. 3.3 MS –Power Point: Introduction, Starting MS-PowerPoint, Basics of PowerPoint, MS-PowerPoint Screen and Its Components, Elementary Working with MS-PowerPoint.	8	12
3.	**Introduction to Internet** 4.1 What is Internet? 4.2 Computer Communication and Internet. 4.3 WWW and Web Browsers. 4.4 Creating own Email Account. 4.5 Networking and types.	4	6
4.	**Introduction to HTML and Software** 5.1 Introduction to HTML. Working of HTML 5.2 Creating and loading HTML pages, tags. 5.3 Structure of on HTML, Document, Stand Alone Tags. 5.4 Formatting text, Adding Images, Creating hyper Links, Tables. 5.6 Cyber security. 5.7 Computer virus.	8	10
5.	**Information Technology** 6.1 Current IT Tools. 6.2 Social networking, mobile computing, cloud computing. 6.3 Introduction of IOT and IOE 6.4 Computer Application in various fields like Data analysis, database management, artificial intelligence.	6	6
	Total	30	40

List of Practical

Exp- 1

Identification of different part of computer system and peripherals

Exp – 2: Operations on operating system

1. Create a new folder and do the following:
    a. Make a new folder in it.
    b. Rename the initial folder.
    c. Opening a new file.
    d. Creating document in note pad.
    e. Move the initial folder.
    f. Copy the initial folder.
    g. Delete the initial folder
2. Implement the various well known features of Windows operating system such as Notepad, WordPad, Calculator, System tools etc. enclosed in Start→Programs→Accessories.
3. Implement various display properties by right clicking on the Windows Desktop.
4. Explore the taskbar of Windows.
5. Set the wall paper and screen saver.
6. Set the date /time.

Exp.3Basic operations on MS Word

1. Create a document and
    a. Put Bullets and Numbers
    b. Apply various Font parameters.
    c. Apply Left, Right, and Centre alignments
    d. Apply Hyperlinks
    e. Insert pictures
    f. Insert ClipArt
    g. Show the use of Word Art
    h. Add Borders and shading
    i. Show the use of Find and Replace.
    j. Apply header/footers

Exp- 4 Advance operations on MS Word

2. Create any document and show the use of File→Versions.
3. Create any document and show the difference between paste and paste special.
4. Create any document and show the use of Washout/Watermark.
5. Implement the concept of mail merge.
6. Implement the concept of macros.
7. Implement the concept of importing a file/document.
8. Implement the concept of merging the documents.
9. Create a student table and do the following :
    a. Insert new row and fill data
    b. Delete any existing row.
    c. Resize rows and columns.
    d. Apply merging/ splitting of cells
    e. Apply sort.
    f. Apply various arithmetic and logical formulas.
    g. Apply various arithmetic and logical formulas.
10. Create your resume using General Templates.

Exp- 5Basic operation on electronic spreadsheet/excel

Computer the division of each and every student of a class.

2. Generation of Electricity Bill
3. Generation of Telephone Bill
4. Generation of Salary statement of an employee
5. Generation of Mark Sheet of a student.
6. To compute mean / median / mode.
7. Generation graph to show the production of goods in a company during the last five years.
8. Compare the cost, overheads and sales figure of a company for last three years through appropriate chart.

Exp – 6 Advance operations on electronic spreadsheet

1. Generation the following worksheet

Roll No.	Marks
2050	67
2051	49
2052	40
2053	74
2054	61
2055	57
2056	45

and do the following:

a. Create chart of the marks.
b. Compute sum of marks using auto sum, auto calculate and sum function.
c. Compute average of marks.
d. Show pass or fail if marks are above 50 or less than 50
e. Put header and footer in the spread sheet.

Importing and exporting data from other files.

Program development in excel using simple commands.

Exp – 7 Power Point Presentation preparation

1. Make a presentation of College Education System using
   a. Blank Presentation
   b. From Design Template
   c. From Auto Content Wizard

Exp – 8 Animation and various effect in Power Point Presentation, exporting and importing contents from word/excel

1. Make a presentation on “Wild Life " and apply the following:
   a. Add audio and video effects
   b. Apply various Color Schemes
   c. Apply various animation schemes.
   d. Apply slide show

Exp – 9 Simple program in HTML

1. Create any webpage using following HTML tags:
    a. Background Colour
    b. Font (Colour, Size, Face)
    c. Bold / Italic / Underline
    d. Big / Small
    e. H 1, H 2, etc.
    f. Marquee
    g. Ordered / Unordered List
    h. Data list
2. Create Employee Table and apply various operations on it using HTML. Also put Border around the table.
3. Create Internal and External Hyperlinks in a Webpage.
4. Implement the concept of Frames in a Webpage.
5. Insert an image in a Webpage.
6. Design Home page of your Institute
7. Design Web page for tourism spots in your area
8. Prepare your CV and link on the web page
9. Use animation of image in a web page
10. Insert a table and perform table handling in web page

Exp – 10 Basics of Internet, surfing, email account opening and transactions through email account

Connect the Internet; open any website of your choice and save the Web Pages.

2. Search any topic related to your syllabus using any search engine and download the relevant material.
3. Create your E-Mail ID on any free E-Mail Server.
4. Login your E-Mail ID and do the following:
    a. Read your mail
    b. Compose a new Mail
    c. Send the Mail to one person
    d. Send the same Mail to various persons
    e. Forward the Mail
    f. Delete the Mail
    g. Send file as attachment
5. Surf Internet using Google to find information about yours state college.
6. Surf Internet using Google to find Tourism information about your state.
7. Surf Internet using Yahoo to find Hotel around your state

Text Books:

i) C.S. French "Data processing and Information Technology ", BPB Publications.
ii) P.K Sinha Computer Fundamentals , BPB Publications
iii) Guy Hart-Davis “The ABCs of Microsoft Office Professional Edition", BPB Publication.
iv) Karl Schwartz, “Microsoft Windows 98 Training Guide"

Course Name : 03 Years Diploma in Engineering

Semester : First

Subject Title : Workshop-I

Subject Code : 112

Teaching and Examination Scheme:

Teaching Scheme			Examination					
L TH	T	P	Full Marks.	External Exam Marks	Internal Exam Marks	External Pas Marks	Total Pass Marks	Duration of External Exams
01		4	50	30	20	--	25	---

Rationale:

Engineering diploma technician is expected to know basic workshop practice. like Wood working, Sheet metal. The students are required to identify, operate, control various machines, select and use various tools and equipments related to Wood working and sheet metal processes together with exposure to fabrication soldering and joint making of various types.

Objectives:

The student will able to

- Know basic workshop processes.
- Read and interpret job drawing.
- Identify, select and use various marking, measuring, holding, striking and cutting tools & equipments.
- Operate, control different machines and equipments.
- Inspect the job for specified dimensions
- Produce jobs as per specified dimensions.
- Adopt safety practices while working on various machines.

CONTENTS:

Sr.No.	Details Of Theory Contents	Jobs	Theory (hr)	Practice(hr)
01	**CARPENTRY SHOP** 1. Introduction. 2. Various types of woods. 3. Different types of tools, machines and accessories. 4. Practice Job a. Preparation of cross lap joints. b. T Lap joints c. Dovetail Joints d. Wood turning	04	04	**14**

02	**FITTING SHOP**: 1. Introduction 2. Various marking, measuring, cutting, holding and striking tools. 3. Different fitting operation like chipping, filing, right angle, marking, drilling, tapping etc. 4. Working Principle of Drilling machine, Tapping dies its use. 5. Safety precautions and safety equipments. 6. Practice 3 Jobs (V groove, Square notch, Fitting of two parts)	03	03	12
03	**SHEET METAL SHOP.** 1. Introduction 2. Various types of tools, equipments and accessories. 3. Different types of operations in sheet metal shop. 4. Soldering and riveting. 5. Safety precautions 6. Practice Jobs (Making funnel, tray, cylinder)	03	03	14
04	**TURNING SHOP** 1. Introduction 2. Various marking, measuring, cutting, holding and striking tools. 3. Working Principle of Drilling machine, Tapping dies its use. 4. Drilling and Tapping 5. Turning: Plain, taper 6. Threading and Knurling 7. Safety precautions and safety equipments.	**03**	**04**	**16**
	Total	13	14	56

Skill to be developed:

Intellectual Skills:

1. Ability to read job drawing
2. Ability to identify and select proper material, tools, equipments and machine.
3. Ability to select proper parameters (like cutting speed, feed, depth cut use of lubricants) in machine.

Motor Skills:

1. Ability to set tools, work piece, and machines for desired operations.
2. Ability to complete job as per job drawing in allotted time.
3. Ability to use safety equipment and follow safety procedures during operations.
4. Ability to inspect the job for confirming desired dimensions and shape.
5. Ability to acquire hands-on experience.

Notes: 1] The Faculty/ Instructor shall give demonstration to the students by preparing a specimen job as per the job drawing.

2] The workshop diary shall be maintained by each student duly signed by Faculty/Instructor of respective shop

Books:

- S.K. Hajara Chaudhary- Workshop Technology-Media Promotors and Publishers, New Delhi
- B.S. Raghuwanshi- Workshop Technology- Dhanpat Rai and sons, New Delhi
- R K Jain- Production Technology- Khanna Publishers, New Delhi
- H.S.Bawa- Workshop Technology- Tata McGraw Hill Publishers,New Delhi
- Kent's Mechanical Engineering Hand book- John Wiley and Sons, New York
- Electronics Trade & technology Development Corporation.(A Govt. of India undertaking) Akbar Hotel Annex, Chanakyapuri, New Delhi- 110 021
- Learning Materials Transparencies, CBT Packages developed by N.I.T.T.E.R. Bhopal.

Scheme of Teaching and Examination for
1st Semester of 3 Years Diploma in Engineering (All Branches except Non Tech

Duration of Semester : **14 Weeks**
Student Contact Hours : **36 Hrs**
Total Marks : **800**

Sl. No.	Name of Subject	Subject Code	Subject	Teaching Scheme			Examination Scheme					
				L	T	P	Hours of Exam	Full Marks of Subject	Final Exam / committee marks	Internal Assessment	Pass Marks Final / Ext. Exam	Pass Marks in Subjects
1.	Communication Skill – I	101	Theory	3	-	-	3	100	80	20	26	40
2.	Engineering Math – I	102	Theory	3	1	-	3	100	80	20	26	40
3.	Engineering Physics - I	103	Theory	3	-	-	3	100	80	20	26	40
4.	Engineering Chemistry – I	104	Theory	3	-	-	3	100	80	20	26	40
5.	Engineering Graphics – I Th	105	Theory	2	-	-	4	50	40	10	13	20
6.	Fundamental of Computer	106	Theory	2	-	-	3	50	40	10	13	20
7.	Engineering Physics Lab – I	107	Practical	-	-	2	4	50	40	10	13	20
8.	Engineering Chemistry Lab- I	108	Practical	-	-	2	4	50	40	10	13	20
9	Engineering Graphics – I SS	109	Sessional	-	-	4	-	50	30	20	-	25
10	Communication Skill I	110	Sessional	-	-	2	-	50	30	20	-	25
11.	Fundamental of Computer - I	111	Sessional	-	-	2	-	50	30	20	-	25
12.	Workshop - I	112	Sessional	-	-	4	-	50	30	20	-	25
Total Hours of Teaching per week :				**16**	**1**	**16**						

Total Marks : Theory : Practical : Sessional :
L : Lecture, T : Tutorial P : Practical

Note:
1. Period of Class hours should be of 1 hrs duration as per AICTE norms.
2. Remaining Hrs every week has been marked for students Library and Student Centered Activities.
3. Drawing / Graphics / Practical / Sessional examinations will be held at parent institution.
4. Board will depute examiner for Practical examination.
5. Regarding sessional examination the parent institution will form a three member committee and this committee will examine the sessional records and hold viva of the examinee for 60 % marks allotted to the subject. Marks for remaining 40 % will be provided by the Faculty concerned on the basis of evaluation of each job / work throughout the semester.

Scheme of Teaching and Examination for

2nd Semester of 3 Years Diploma in Engineering (All Branches except Non Tech)

Duration of Semester : **14 Weeks**
Student Contact Hours : **36 Hrs**
Total Marks : **800**

Sl. No.	Name of Subject	Subject Code	Subject	Teaching Scheme			Examination Scheme					
				L	T	P	Hours of Exam	Full Marks of Subject	Final Exam / committee marks	Internal Assessment	Pass Marks Final / Ext. Exam	Pass Marks in Subjects
1.	Communication Skill – II	201	Theory	3	-	-	3	100	80	20	26	40
2.	Engineering Math – II	202	Theory	3	1	-	3	100	80	20	26	40
3.	Engineering Physics - II	203	Theory	3	-	-	3	100	80	20	26	40
4.	Engineering Chemistry - II	204	Theory	3	-	-	3	100	80	20	26	40
5.	Programming in C	205	Theory	3	-	-	3	100	80	20	26	40
6.	Engineering Physics II	206	Practical	-	-	2	3	50	40	10	13	20
7.	Engineering Chemistry II	207	Practical	-	-	2	3	50	40	10	13	20
8.	Programming in C	208	Sessional	-	-	4	3	50	30	20	-	25
9.	Workshop Practices	209	Sessional	-	-	4	4	100	60	40	-	50
10.	Professional Practice I	210	Sessional	-	-	4	-	50	30	20	-	25
Total Hours of Teaching per week :				**15**	**1**	**16**						

Total Marks : Theory : Practical : Sessional :
L : Lecture, T : Tutorial P : Practical

Note:
1. Period of Class hours should be of 1 hrs duration as per AICTE norms.
2. Remaining Hrs every week has been marked for students for Library and Student Centered Activities.
3. Drawing / Graphics / Practical / Sessional examinations will be held at parent institution.
4. Board will depute examiner for Practical examination.
5. Regarding sessional examination the parent institution will form a three member committee and this committee will examine the sessional records and hold viva of the examinee for 60 % marks allotted to the subject. Marks for remaining 40 % will be provided by the Faculty concerned on the basis of evaluation of each job / work throughout the semester.

Course Name : All Branches of Diploma Engineering

Semester : Second

Subject Title : Communication Skills

Subject Code : 201

Teaching and Examination Scheme:

Teaching Scheme			Examination					
L	T	P	Full Marks.	External Exam Marks	Internal Exam Marks	External Pas Marks	Total Pass Marks	Duration of External Exams
03	1		100	80	20	26	40	3 Hrs

NOTE:

Internal marks will be allotted on the basis of two snap tests and 2 assignment of equal marks to be conducted by the faculty teaching the subject.

Rationale:

The Students have been already been exposed to the Language Skills pertaining to English, leading to a better understanding of English & use of grammar, developing a base for the language. Now with a view to achieve some mastery over the language & to develop Communication Skills, which is the main objective of this subject, the basic concepts of communication, Non-verbal and written skills have been Introduced.

Objectives:

The Students will be able to:

1) Understand and use the basic concepts of communication and principles of effective communication in an organized set up and social context.
2) Give a positive feedback in various situations, to use appropriate body language & to avoid barriers for effective communication.
3) Write the various types of letters, reports and office drafting with the appropriate format.

Contents: Theory

Chapter	Name of the Topic	Hours	Marks
01	**Introduction to communication:** 1.1 Definition, communication cycle., 1.2 The elements of Communication: sender- message – channel- Receiver –Feedback. 1.3 Concept of Communication Process. 1.4 Stages in the process: defining the context, knowing the audience, designing the message, encoding, selecting proper channels, transmitting, receiving, decoding and giving feedback. (Case lets.)	04	08
02	**Types of communication** 2.1 Formal Communication. 2.2 Formal: Types – a) Vertical Communication. b) Horizontal Communication. 2.3 Informal: Types – a) Diagonal Communication. 2.4 Verbal Vs Non-Verbal Communication. 2.5 Verbal: Types-a) Oral Communication. b) Written Communication. 2.6 Non-Verbal: Types- a) Body Language. b) Graphic Language.	06	10
03	**Principles of Effective Communication :** 3.1 Principles of Effective Communication. (One example each.) 3.2 Communication barriers & how to overcome them. 3.3 Developing effective messages: Thinking about purpose, knowing the audience, structuring the message, selecting proper channels, minimizing barriers & facilitating feedback. (Examples: Writing articles for newspapers, magazines.)	04	08
04	**Non verbal- graphic communication**: 4.1 Non- verbal codes: A- Kinesecs , B- Proxemics , C – Haptics D-Vocalics , E- Physical appearance. F -Chronemics , G –Artifacts. (One example each.) 4.2 Aspects of Body Language. Types of Body Language. (One example each.) 4.3 Interpreting visuals & illustrating with visuals like tables, charts & graphs.	06	12
05	**Formal written skills :** 5.1 Office Drafting: Circular, Notice, and Memo. 5.2 Job Application with resume. 5.3 Business correspondence: Enquiry, Order letter, Complaint letter, and Adjustment letter. 5.4 Report writing: Accident report, Fall in production, Progress Report,, Investigation Report. 5.5 Defining, Describing Objects &Giving Instructions. 5.5.1 Defining Objects- Appearance, It's Use. 5.5.2 Describing Objects- Purpose, Components, Functions, Applications. 5.5.3 Giving Instructions- Precise, Directive, Imagistic Statements of a futuristic stance.	10	20

06	**Oral Skills :** 6.1 Phonetics and Phonology - Introduction - Phonetics symbols - Consonants/vowels/Dipthongs - Stress and Intonation 6.2 Discussion Skills - Importance of group discussion - Leadership skills - Team management 6.3 Presentation Skills - Importance of presentation - Planning of presentation - Handling stage fright 6.4 Mock Interview - The Interview process - Pre-Interview preparation - Answering strategies	12	22
	Total	**42**	**80**

Assignments:

1. Communication Cycle (With the Help of Diagram) + Any two communication situations to be represented with the help of Communication Cycle. (Use Pictures)
2. Communication Situations (List of 5 Communication situations stating the type of communication viz; Vertical, Horizontal, Diagonal.
3. Barriers That Hinder a Particular Communication Situation. (State the type of barrier, and how to overcome them). (04 Caselets)
4. Writing articles (two) in keeping with the parameters of developing effective messages. (Collect samples from newspapers, articles, Internet and pate them in the assignment.)
5. Business Letters: a) Job Application with Resume. b) Enquiry Letter.
   c) Order Letter.
   d) Complaint Letter.
6. Non-Verbal Communication:
   a) Body Language: Five Illustrations of appropriate use of Body Language used on the part of student in formal and Informal setups. (Example- formal setup- classroom
   b) Graphic Language: Five Illustrations of the use of Signs, Symbols, Colours, Maps, Graphs, Charts in day to day life.
7. Presentation Skills: Select topic (current issues) and ask students to give a class presentation as per the principles of effective communication and paste these topics as an

assignment in the file.

8. Non-Verbal Codes: Kinesics, Physical Appearance, Haptics. (Collect five pictures per group of five students on the above mentioned non-verbal codes, analyse and discuss them in the class. Ask the students to paste these pictures along with explanation in their individual files.

GUIDELINES: Teachers can make use of group discussions, class presentations, role plays, simulations, caselets, listen and repeat drills with the help of cassettes etc to give a hand on experience for students.

Students should maintain the Institute Files to write all the eight assignments with aprper Index and get it duly certified.

Learning

Resources:

Books:

Sr. No.	Author	Title	Publisher
01	SBTE, Mumbai.	Text book of Communication Skills.	SBTE, Mumbai.
02	M.Ashraf Rizvi	Effective Technical Communication	Tata McGraw Hill Companies.
03	Krushna Mohan, Meera Banerji	Developing Communication Skills	Macmillan
04	Joyeeta Bhattacharya	Communication Skills.	Reliable Series
05	Jayakaran	Every ones guide to effective writing.	Apple Publishing.
06	Website: www.mindtools.com/page8.html-99k		
07	Website: www.khake.com/page66htm/-72k		
08	Website: www.BM Consultant India.Com		
09	Website: www.letstak.co.in		
10	Website: www.inc.com/guides/growth/23032.html-45k		

Course Name : 03 Years Diploma Engineering

Semester : Second

Subject Title : Engineering Chemistry-II

Subject Code : 204 / 207

Teaching and Examination Scheme:

Teaching Scheme			Examination					
L	T	P	Full Marks.	External Exam Marks	Internal Exam Marks	External Pas Marks	Total Pass Marks	Duration of External Exams
03			100	80	20	26	40	3 Hrs
Practical		2	50	40	10	13	20	4 Hrs

NOTE:

Internal marks will be allotted on the basis of two snap tests and 2 assignment of equal marks to be conducted by the faculty teaching the subject.

RATIONALE:

This syllabus of chemistry of 2ND semester for all the branches of Diploma Engineering has been given the name "Engineering Chemistry". In this it is intended to make students learn about the Engineering Materials and their appropriate uses, Lubrication process and protection of machines in different working environments, quality of water and its treatment as per the requirement, corrosion and its control by various methods.

OBEJECTIVE:

The student will be able to:

1. Suggest the appropriate use of metals, alloys and non-metallic material in engineering.
2. Knowledge of corrosion of metal and control methods.
3. Knowledge of choosing suitable lubricants for smooth running machines.
4. Implementing the knowledge and utilization of water and water treatment to serve the requisites of a particular use.

Contents: Theory

Chapter	Name of the Topic	Hours	Marks
1.	**Electrochemistry:** Conductivity of Electrolytes – Concept of Ohms Law, Specific Conductance, Specific Resistance, Equivalent Conductivity & Molar Conductance, Variation of Specific, Molar and Equivalent Conductance with dilution. Concept of: Cell Constant, PH, POH and Buffer solution. Numerical based on PH and POH. Application of PH and Buffer solution.	**04**	**08**
2.	**Metals and Alloys** **2.1 Metals:** Definition of Metallurgy, Brief introduction of the terms involved in metallurgy. Metallurgy of Iron: Resources of Fe, Important Ores of Iron, Extraction process, Smelting in Blast Furnace, Chemical Reactions in Blast Furnace. Composition of Pig Iron. Engineering applications of Pig Iron, Cast Iron, wrought Iron or Malleable Iron. Metallurgy of Copper: Important ores of Copper, Extraction of Copper from chief ore. Engineering properties of Copper and applications. Metallurgy of Aluminium: Important Ores of Aluminium, Extraction of Aluminium from Alumina by Electrolytic Reduction Process, Electrolytic Refining of Aluminium, Engineering Properties of Aluminium & Uses. **2.2 Alloys:** **Ferrous Alloys** Various methods of steel making, Composition, Properties &Applications of Plain Carbon Steel (Low Carbon, medium Carbon, High Carbon & Very Hard Steel) & Effect of Various Alloying Elements (Cr, W, V, Ni, Mn, Mo, Si) etc. on Steel. **Non-Ferrous Alloys:** Copper Alloys–Brass, Bronze, Nickel Silver or German Silver, their Composition, Properties & Applications. Aluminium Alloys – Duralumin, Magnalium, their Composition, Properties & Applications Other Alloys: Definition, Compositions, Properties &Applications of Soft Solder, Tinmann's Solder, Brazing Alloy, Plumber's Solder, Rose Metal.	**12**	**24**
3	**Non-Metallic Engineering Matrerial** **3.1 Ceramics:** Definition, Properties & Engineering Applications, Types – Structural Ceramics, Facing Material, Refractories, Fine Ceramics, Special Ceramics. **3.2 Refractories:**	**06**	**12**

	Definition, Properties, Applications & Uses of Fire Clay Bricks, Silica Bricks and Masonry Bricks. **3.3 Composite Materials:** Definition, Properties, Advantages, Applications & Examples. **3.4 Adhesives:(Marks 4)** Definition, Characteristics, Advantages of adhesives, examples such as phenol-formaldehyde resin, urea formaldehyde resin, epoxy resin- their properties and applications as an adhesives.		
4	**Water:** Characteristics, Sources, Impurities, Hard & Soft Water, Causes of Hardness, Types of Hardness, Degree of Hardness, Boiler and Steam Generation, Scale & Sludge Formation – Causes, Disadvantage, Softening Methods such as Boiling, Clark's, Soda Ash, Lime Soda, Zeolite & Ion Exchange Methods with Principle Chemical Reactions. Plumbo solvency & its Removal. Numerical Problems.	**5**	**10**
5	**Corrosion:** Definition of Corrosion, Types of Corrosion (Dry and Wet chemical Corrosion) and their mechanism. Protection of metal from corrosion (Corrosion Control). Application of Protective Coatings like metal coating such as Galvanising, Tinning, Metal Spraying, Sherardizing, Electroplating and Metal Cladding. **Paints & Varnishes:** **Paints** Definition, Characteristics of Good Paint, Constituents & their functions & Examples, Methods of Applications. Introduction to Chemical Resistant Paints, Heat Resistance Paint, Cellulose Paint, Luminous Paints, Emulsion Paints, Metal Paints, Cement Paints, Water Paint or Distempers. **Varnishes:** Definition, Characteristics, Constituents, Types, Composition, Properties & Application of Japans, Enamels, Lacquers.	**09**	**16**
6	**Lubricant and Lubrication:** Lubricant – Definition, Classification with examples. Functions of lubricant, Lubrication – Mechanism of Lubrication (Fluid Film, Boundary and Extreme Pressure). Physical Characteristics of Lubricants Such as Viscosity, Viscosity Index, Oiliness, Volatility, Flash & Fire Point, and Cloud& Pour Point, Chemical Characteristics such as Acid Value or Neutralization Number, Emulsification, Saponification Value, Selection of Lubricants, Characteristics of Transformer oil.	**06**	**10**
	Total	**42**	**80**

List of Practical:

1	To determine neutralization point of Fatty Acid and ammonium hydroxide. Calculate normality and strength of Fatty Acids.
2	To determine the equivalent conductivity of precipitation of $BaCl_2$ with H_2SO_4 by titrating method. Also find the normality and strength of $BaCl_2$ Solution.
3	To verify Faraday's second law of electrolysis.
4	To determine PH of given solution by universal indicator and PH meter.
5	To determine the strength of given hydrochloric acid solution by titrating it against sodium hydroxide solution by using PH meter.
6	To determine thinner content in Oil paint.
7	To determine the flash and fire point of a given sample of lubricating oil.
8	To prepare Phenol formaldehyde resin (Backelite)
9	To determine viscosity of given lubricating oil.
10	To determine the alkalinity of given sample of water to decide the suitability of water for use in industry, steam generation, etc.
11	To determine degree of hardness of water by EDTA method to find the suitability of water in industrial and domestic use.
12	Study of fire clay bricks and furnaces.

Learning Resources Books:

Sl. No	Authors	Nameofthebook	Publisher
1	Jain&Jain	EngineeringChemistry	DhanpatRaiandSons
2	S.S.Dara	EngineeringChemistry	S. ChandPublication
3	B. K.Sharma	IndustrialChemistry	GoelPublication
4	S.S.Dara	EnvironmentalChemistry &PollutionControl	S. ChandPublication
5	VedprakashMehta	Polytechnicchemistry	JainBrothers

Course Name : 03 Years Diploma in Engineering

Semester : Second

Subject Title : Engineering Mathematics-II

Subject Code : 202

Teaching and Examination Scheme:-

Teaching Scheme			Examination Scheme					
L TH	T	P	Full Marks.	External Exam Marks	Internal Exam Marks	External Pas Marks	Total Pass Marks	Duration of External Exams
03	01		100	80	20	26	40	3 Hrs

NOTE:

Internal marks will be allotted on the basis of two snap tests and 2 assignment of equal marks to be conducted by the faculty teaching the subject.

Rationale:

The subject is extension of Engineering Mathematics - 1 of First Semester and stepping into the prerequisites to learn Applied Mathematics applicable in engineering solutions. Engineering Mathematics lay down the foundation to understand and express principles and laws involved in other technological subjects. The study of Engineering Mathematics will help to develop the skills essential for new emerging avenues.

Objective:

The student will be able to acquire knowledge of mathematical terms, concepts and principles. They can acquire sufficient mathematical techniques and can develop the ability to apply mathematical methods to solve technical and day to day practical problems.

Sub Objective:

This course is divided into five units. After completion of this course one could become able to learn the following.

1. Intuitive meaning of Function, Limit and Continuity for solving the problems
2. Differentiation and its meaning in engineering situations
3. Applications of the Differentiation

3.1 Understand the Geometrical Applications of Derivatives

3.2 Use Derivatives to find extreme values of functions

3.3 The concept of Derivatives as Rate Measure

3.4 Use Derivatives to find Radius of Curvature.

4. Basic terms of Statistics And Prob

5. Complex Number

5.1 Representation of Complex numbers in various forms

5.2 Definition of complex number, its operations and property.

5.3 De-Moivre's theorem (without proof) and simple problems.

Contents: Theory

Chapter	Name of the Topic	Hours	Marks
01	**1. Function, Limit and Continuity** 1.1 Function ▪ Definition of variable, constant, intervals and their type ▪ Definition of Function, value of a function and types of functions, Simple Examples ▪ Definition of sinh x, cosh x and tanh x and some hyperbolic identities 1.2 **Use the concepts of Limit for solving the problems** ▪ Explain the concept of limit and intuitive meaning of $\lim_{x\to a} f(x)=l$ and its properties. ▪ Derive the Standard limits $\lim_{x\to a}\frac{x^n-a^n}{x-a}$, $\lim_{x\to 0}\frac{\sin x}{x}$, $\lim_{x\to 0} Cosx$, $\lim_{x\to 0}\frac{\tan x}{x}$, $\lim_{x\to 0}\frac{a^x-1}{x}$, $\lim_{x\to 0}\frac{e^x-1}{x}$, $\lim_{x\to 0}(1+x)^{\frac{1}{x}}$, $\lim_{x\to\infty}\left(1+\frac{1}{x}\right)^x$ with simple example. ▪ Evaluate the limits of the type $\lim_{x\to\infty}\frac{f(x)}{g(x)}$. ▪ Explain the Concept of continuity of a function at a point and in interval with some examples whether a given function is continuous or not.	06	12

	2. **Differentiation and its meaning in engineering situations** ▪ Concept of derivative of a function y = f(x) from the first principle as $\lim_{h\to 0}\frac{f(x+h)-f(x)}{h}$ and Standard notations to denote the derivative of a function. ▪ Derivatives of elementary functions like x^n, a^x, e^x, log x, sin x, cos x, tanx, secx, cosecx, cot x and Invise Trigonometrical function using the first principles. ▪ Rules for differentiation of sum, difference, scalar multiplication, product and quotient of functions with illustrative and simple examples. ▪ Differentiation of a function of a function (Chain rule) with illustrative examples such as (i) $\sqrt{t^2+\frac{2}{t}}$ (ii) $x^2\sin 2x$ (iii) $\frac{x}{\sqrt{x^2+1}}$ (iv) $\log\left(\sin(\cos x)\right)$.etc ▪ Differentiation of a function with respect to another function and also differentiation of parametric functions with examples. ▪ Derivatives of some simple hyperbolic functions (without Proof). ▪ Differentiation of implicit function with examples. ▪ Logarithmic differentiation of some functions with examples like $[f(x)]^{g(x)}$. ▪ Concept of higher order derivatives (second and third order) with examples. ▪ Concept of functions of several variables, partial derivatives and difference between the ordinary and partial derivatives with simple examples.	**12**	**24**

	3. Applications of the Differentiation 3.1 Geometrical Applications of Derivatives ▪ State the Geometrical meaning of the derivative as the slope of the tangent to the curve y=f(x) at any point on the curve. ▪ Equation of tangent and normal to the curve y=f(x) at any point on it. ▪ The concept of angle between two curves and procedure for finding the Angle between two given curves with illustrative examples. 3.2 Use of Derivatives to find extreme values of functions ▪ The concept and condition of increasing and decreasing functions with illustrative examples. ▪ Find the extreme values (maxima or minima) of a function of single variable - simple problems yielding maxima and minima. 3.3 Concept of Derivatives as Rate Measure with illustraribe examples. 3.4 Concept of Derivatives to find Radius of Curvature with illustraribe examples.	**14**	**24**
	4. Statistics ▪ Measures of Central tendency (mean, median, mode) for ungrouped and grouped frequency distribution. ▪ Graphical representation (Histogram and Ogive Curves) to find mode and median ▪ Measures of Dispersion such as range, mean deviation, Standard Deviation, Variance and coefficient of variation. Comparison of two sets of observations.	**04**	**08**
	5. Complex Number. ▪ Represent the complex number in various forms like modulus-amplitude, polar form, Exponential (Euler) form – illustrate with examples ▪ Modulus, Conjugate and Argument of Complex Number and their properties. ▪ Operations on complex numbers (Equality, Addition, Subtraction, Multiplication and Division) with examples. ▪ Square root of complex number ▪ Cube roots of units and their properties, simple problems based on them. ▪ De-Moivre's theorem (without proof) and simple problems.	**6**	**12**
	Total	**42**	**80**

Tutorial: Tutorials are to be used to get enough practice for solving problems. It is suggested that in each tutorial at least five problems should be solved.

Learning Resources:

Books:

Sr. No	Title	Authors	Publications
1	Mathematics: A Textbook for Class XI Part I & II	National Council of Educational Research and Training	
2	Mathematics: A Textbook for Class XII Part I & II	National Council of Educational Research and Training	
3	Mathematics for Class XI Volume I and II	R. D. Sharma	Dhanpat Rai Publication, New Delhi.
4	Mathematics for Class XII Volume I and II	R. D. Sharma	Dhanpat Rai Publication, New Delhi.
5	Higher Engineering Mathematics	B.S Grewal	Khanna Publication, New Delhi
6	Higher Sr. Secondary School Mathematics for XI & XII	R.S. Agrawal	Bharti Bhawan, Patna

Note:

In board examination, question setter may be advised to select 20% questions of objective, 30% of short type and remaining 50% of long type based on basic concepts, formula and calculations respectively.

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Course Name : 03 Years Diploma Engineering

Semester : Second

Subject Title : Engineering Physics-II

Subject Code : 203/ 206

Teaching and Examination Scheme:

Teaching Scheme			Examination Scheme					
L	T	P	Full Marks.	External Exam Marks	Internal Exam Marks	External Pas Marks	Total Pass Marks	Duration of External Exams
03			100	80	20	26	40	3 Hrs
Practical		2	50	40	10	13	20	4 Hrs

NOTE:

Internal marks will be allotted on the basis of two snap tests and 2 assignment of equal marks to be conducted by the faculty teaching the subject.

RATIONALE:

Basic science forms the foundation of Engineering. In particular Physics provides fundamental facts, principles, l aws, and proper sequence of events to streamline Engineering knowledge.

Objectives : The Student will be able to :

1. Analyze the basic properties of light.
2. Differentiate between field intensity and potential.
3. List the advantages of optical fibre.
4. Describe principal of working of optical fibre.
5. Differentiate between conductor, Insulator and semi conductor on the basis of band theory.
6. Know simple idea of Nano Technology.
7. Know simple idea of non conventional sources of energy.

Contents : Theory

Chapter	Name of the Topic	Hours	Marks
1.	**LIGHT** **Properties of light** Reflection, refraction, Snell's law, physical significance of refractive index, definition of dispersion of light along with ray diagram. **(Numericals on refractive index)**	**03**	**06**
2.	**Electric Field and Potential** **2.1 Electric field** Electric charge, Coulomb's inverse square law, Definition of unit charge, Electric field, Electric lines of force and their properties, Elect field intensity, Electric flux, Electric flux density. **(Numericals on Coulombs law, Electrical Intensity)**	05	08
	2.2 Electric Potential Concept of potential, Definition and unit, Potential due to point charge using integration method, Potential difference between two points, Definition of dielectric strength and breakdown potential. **(Numericals on electric potential)**	05	08
	2.3 Capacity & Condensers Electrostatics capacity & its S.I unit, Capacity of parallel plate condenser, Condensers in series & parallel (Formula only,no derivation), Uses of condensers. **(Simple problems)**	03	06
3	**CURRENT ELECTRICITY** Ohm's law, Resistance and its unit, Specific resistance, Factors affecting resistance, Kirchhoff's law and its application to Wheat stone bridge circuit.	03	08
4	**Fiber Optics** Introduction, Total internal reflection, critical angle, acceptance angle. Structure of optical fiber, Numerical Aperture, Fiber optic materials, Types of optical fibers, Applications in communication systems. **(Numerical on critical angle, numerical aperture)**	05	08
5	**Band Theory of Solids** Energy levels in solids, Valence & conduction bands, forbidden gap, Conductors, Semiconductors and Insulators,	05	08

	Intrinsic and Extrinsic Semiconductors, p-type and n-type semiconductors, P-N junction diode-forward and reversed biased characteristics.		
6	**MODERN PHYSICS.** **7.1 Photo electricity** Concept of photon**,** Plank's hypothesis, properties of photon, photo electric effect, Laws of photoelectric effect, work function, Einstein's photoelectric equation(no derivation), Basic Concept of Solar Energy. **(Numericals on Energy of photon, work function, photoelectric equation)**	03	06
	7.2 LASER Properties of laser, Characteristics and applications of Laser	01	04
	7.3 X-rays Introduction to X-rays, production of X-rays using Coolidge tube, minimum wavelength of X-rays, properties and applications. of X-rays **(Numericals on minimum wavelength of x-rays)**	02	06
7	**Introduction to nanotechnology** Definition of nanoscale, nanometer & nanoparticle, applications of nanotechnology- electronics, automobiles, medical, textile, cosmetics, environmental, space and defence.	03	06
8	**Non- Conventional Sources of energy** Introduction- Non Renewable and renewable (Alternate) energy sources, Examples- Solar Energy, Wind Energy, Tidal Energy, Geo-Thermal Energy and Bio-Mass. Advantages and disadvantages of renewable energy.	04	06
	Total	**42**	**80**

Practical :

Skills to be

Developed :

Intellectual

Skills :

- Proper selection of measuring instruments on the basis of range, least count, precision and accuracy required for measurement.
- To verify the principles, laws, using given instruments under different conditions.
- To read and interpret the graph.

- To interpret the results from observations and calculations.
- To use these results for parallel problems.

Motor Skill :

- Proper handling of instruments.
- Measuring physical quantities accurately.
- To observe the phenomenon and to list the observations in proper tabular form.
- To adopt proper procedure while performing the experiment.

List of Experiment :

1. To represent simple harmonic motion with the help of vertical oscillation of spring to determine spring constant (K) (Stiffness Constant).
2. To determine time period of oscillation of compound bar pendulum and calculate acceleration due to gravity (g).
3. To calculate refractive index of material of prism using spectrometer device.
4. To determine effective capacitance of series and parallel combination of capacitors by calculating its reactance.
5. Verification of Ohm's Law.
6. To convert galvanometer into ammeter of required range using appropriate value of shunt.
7. To verify Total Internal Reflection (TIR) phenomenon for given glass slab and to calculate critical angle of incidence.
8. Determination of Energy Gap (Forbidden Gap) of a semi-conductor.
9. To determine I-V characteristics of P-N junction Diode.
10. To verify inverse square law by using photoelectric cell.

Learning :

Recourses :

Books :

Sr. No.	Author	Title	Publisher
01.	Arthur Beiser	Applied physics	Tata McGraw-Hill
02.	R.K.Gaur and S.L.Gupta	Engineering Physics	Dhanpatrai and Sons.
03.	Rensic and Halliday	Physics	Wiley publication
04.	Dr. S.K. Kulkarni	Nanotechnology-Principles and practices	Capital publishing company
05.	S.K.Gupta	ABC of Physics	Modern Publisher New Delhi
06.	A.S. Vasudeva	Senior Practical Physics	S.K.Kataria & Sons.
07.	Core Physics-II	A. Kumar	Bharti Bhavan
08.	Pradeep's Fundamental Physics-XII	K.L. Gomber & K.L Gogia	Pradeep Publication
09.	S. Chand's Principles of Physics-XII	V.K Mehta & Rohit Mehta	S. Chand Publication
10.	Dinesh New Millennium Physics-XII	S. K Sharma	Dinesh Publication

Course Name : 03 Years Diploma in Engineering

Semester : Second

Subject Title : Professional Practice-I

Subject Code : 210

Teaching and Examination Scheme:

Teaching Scheme			Examination					
L TH	T	P	Full Marks.	External Exam Marks	Internal Exam Marks	External Pas Marks	Total Pass Marks	Duration of External
			50	30	20	---	25	---

Rationale:

Most of the diploma holders are employed in industries. Due to globalization and competition in the industrial and service sectors the selection for the job is based on campus interviews or competitive tests.

While selecting candidates a normal practice adopted is to see general confidence, ability to communicate and attitude, in addition to basic technological concepts.

The purpose of introducing professional practices is to provide opportunity to students to undergo activities which will enable them to develop confidence. Industrial visits, expert lectures, seminars on technical topics and group discussion. These are planned in the semester so that there will be increased participation of students in learning process.

Objectives:

Student will be able to:

1. Acquire information from different sources.
2. Prepare notes for given topic.
3. Present given topic in a seminar.
4. Interact with peers to share thoughts.
5. Prepare a report on industrial visit, expert lecture.

Sr. No.	Activity
1	**Industrial Visits:** Structured industrial visits be arranged and report of the same should be submitted by the individual student, to form part of the term work. Visits to any two of the following : i) Construction site for residential / Public building. ii) Petrol Pump iii) Media Center iv) Small Scale industry. v) Domestic Appliances repair centre vi) Visit public utility place
2	**Lectures by Professional / Industrial Expert to be organized on any three topics of the following suggested areas or any other suitable topics:** i) Pollution control. ii) Fire hazards due to short circuits iii) Fire Fighting / Safety Precautions and First aids. iv) Vedic Mathematics and Abacus. v) Topics related to Social Awareness such as –Traffic Control System, Career opportunities , Communication in Industry, Yoga Meditation, Aids awareness and health awareness
3	**Group Discussion :** The students should discuss in group of six to eight students and write a brief report on the same as part of term work. The topic for group discussions may be selected by the faculty members. Some of the suggested topics are - i) Sports ii) Cultural iii) Discipline and House Keeping iv) Current topic related to Electrical Engineering field.

4	**Literature Survey** **Student will be provided an emerging engineering topic for literature survey from Internet and other media. Based on inputs on the topics students will prepare a report and submit the sample for evaluation after due presentation before the faculty.**
5	**Presentation preparation and demonstration on live sociao economics technical aspects.** **Students in batch of maximum 5 numbers are expected to prepare a power point presentation on a topic with minimum of 20 slides.** **The topics can be from the following:** **a. Rural vs urban divide** **b. Make in India** **c. Gender equality** **d. Satellite launching programs of India** **e. Global Stake in Economics of India** **f. Super power in making: India** **g. Bottom of the pyramid** **h. Social Responsibility of Individual** **i. Swachh Bharat ABhiyan** **j. Namami Gange Project** **k. Digital India**

Course Name : 03 Years Diploma in Engineering

Semester : Second

Subject Title : Programming in C

Subject Code : 205/208

Teaching and Examination Scheme:

Teaching Scheme			Examination Scheme					
L	T	P	Full Marks.	External Exam Marks	Internal Exam Marks	External Pas Marks	Total Pass Marks	Duration of External Exams
03	0		100	80	20	26	40	3 Hrs
Sessional		2	50	30	20		25	3 Hrs

NOTE:

Internal marks will be allotted on the basis of two snap tests and 2 assignment of equal marks to be conducted by the faculty teaching the subject.

Rationale : These days computer knowledge is essential for engineers. Analysis and logical development of basic entities is any engineering field requires software development which in turn requires a programming tool. The best opted tool for program development paving way for software is C language these days. The advancement of C and subsequent program development utilising the concepts of strings arrays decision making in unconditional and conditional manner is required.

Objectives:

1. Development of flowcharts/algorithms for engineering problem solutions.
2. Structural modular program development for software implementation.
3. Working upon a statistical attributes on different aspects of engineering problem for arriving at best suited solutions.
4. Decision making in various atmosphere and conditions.
5. A tool for better learning and grasp of basics.

Chapter	Contents	Hours	Marks
01	**Basics of C** 1.1 Introduction to number system 1.2 Introduction to flowchart and algorithm 1.3 History of C, where C stands 1.4 C character set ,tokens ,constants ,variables, keywords 1.5 C operators (arithmetic, Logical, assignment, relational, increment and decrement, conditional, bit wise, special, operator precedence),C expressions data types. 1.6 Formatted input, formatted output.	**06**	**12**
02	**Decision making** 2.1 Decision making and branching if statement (if, if-else ,else-if ladder, nested if-else) Switch case statement ,break statement. 2.2 Decision making and looping while, do, do-while statements for loop, continue statement**.**	**06**	**10**
03	**Arrays and Strings** 3.1 Arrays Declaration and initialization of one dimensional, two dimensional and character arrays, accessing array elements. 3.2 Declaration and initialization of string variables, string handling functions from standard library (strlen(), strcpy(), strcat(), strcmp()).	**08**	**16**

04	**Functions, Structures** 4.1 Functions Need of functions, scope and life time of variables, defining functions, function call (call by value, call by reference), return values, storage classes. category of function (No argument No return value, No argument with return value, argument with return value), recursion 4.2 Structures Defining structure, declaring and accessing structure members, initialization of structure, arrays of structure.	**08**	**16**
05	**Pointers** 5 Understanding pointers, declaring pointer variable, initialization of pointer variable, accessing address of a variable, pointer expressions, Pointers arithmetic, pointers and arrays, array of pointers	**08**	**16**
06	**File Handling** File System Basics, opening and closing of files, reading and writing in files, File opening modes, string I/O in files.	06	**10**
	Total	42	**80**

Exp. -1: Introduction to C compiler

Exp. -2: Simple basic program in C language using unconditional branching statements.

Exp. -3: Development of C program using conditional branching and subroutines.

Exp.-4 : Development of program for functions.

Exp. – 5 : Development of program in c for operation of one dimensional arrays.

Exp. – 6 : Development of program in c for operation of Multi-dimensional arrays.

Exp.- 7: Development of program in C for display using in different modes.

Exp.-8: Development of program in C for operation on structures.

Exp.-9 : Development of program in C for operation on pointers.

Exp.-10: Development of program in C for file handling.

Course Name : 03 Years Diploma in Engineering

Semester : Second

Subject Title : Workshop- II

Subject Code : 209

Teaching and Examination Scheme:

Teaching Scheme			Examination					
L TH	T	P	Full Marks.	External Exam Marks	Internal Exam Marks	External Pas Marks	Total Pass Marks	Duration of External Exams
		4	50	30	20	--	25	---

Rationale:

Engineering diploma technicians are expected to know basic workshop practice with special reference to Gas and arc Welding, Gas cutting, Drilling, Tapping, Plumbing and Hot Working Processes. The students are required to select and use various tools and equipments for welding, fitting, tapping drilling, plumbing and forging operations.

Objectives:

The student will able to:

- Know basic workshop processes.
- Read and interpret job drawings.
- Identify, select and use various marking, measuring, and holding, striking and cutting tools & equipments wood working and sheet metal shops.
- Operate, control different machines and equipments.
- Select proper welding rods and fluxes.
- Inspect the job for specified dimensions
- Produce jobs as per specified dimensions.
- Adopt safety practices while working on various machines.

Notes: 1] The Faculty/Instructor shall give demonstration to the students by preparing a specimen job as per the job drawing.

2] The workshop diary shall be maintained by each student duly signed by Faculty/Instructor of respective shop.

CONTENTS: Subject practical content as shown in the table below: Skill to be develop.

Intellectual Skills:

1. Ability to read job drawings.
2. Ability to identify and select proper material, tools and equipments and machines.
3. Ability to select proper parameters (like cutting speed, feed, depth cut use of lubricants) in machine.

Motor Skills:

1. Ability to set tools, work piece, and machines for desired operations.
2. Ability to complete job as per job drawing in allotted time.
3. Ability to use safety equipment and follow safety procedures during operations.
4. Ability to inspect the job for confirming desired dimensions and shape.
5. Ability to acquire hands-on experience

Sr. No.	Details of	Job	Theory	Practice
01	**HOUSE WIRIING AND ELECTRICAL FITTING** 1. Introduction 2. Various types of electrical wiring 3. Safety precautions 4. Preparation of different type of joints 5. Wiring of two way switching system 6. Wiring of two bulb, one fan one power point with a fuse connection. 7. Introduction to commonly used equipments, earth resistance measurement 8. Fault finding and repairing of common household appliances	03	02	10
02	**Electronics** 1. Introduction to different types of components 2. Soldering practice 3. Soldering of a pyramid 4. Soldering of a battery eliminator circuit/charger 5. Soldering on PCB 6. Introduction to desoldering and practice 7. Introduction to CRO and other electronic measuring instrument	03	02	10
03	**WELDING SHOP** 1. Introduction to equipments and accessories used in welding 2. Gas, Arc, Spot, welding practice 3. Lap welding practice 4. Butt welding practice 5. Spot welding practice	**03**	**04**	**12**
04	**PLUMBING SHOP** 1. Introduction. 2. Various marking, measuring, cutting, holding and striking tools. 3. Different types of G.I. & PVC pipes, flexible pipes used in practice. 4. Piping layout. 5. G.I. & PVC pipes fittings and accessories, Adhesive solvents- chemical action,	**03**	**03**	**12**

05	**Black Smithy Shop** 1. Introduction to tools and techniques 2. Preparation of commonly used instruments such as flat chisel, ring, screw driver.	**03**	**03**	**12**
	Total	**15**	**14**	**56**

Skill to be developed:

Intellectual Skills:

1. Ability to read job drawing
2. Ability to identify and select proper material, tools, equipments and machine.
3. Ability to select proper parameters (like cutting speed, feed, depth cut use of lubricants) in machine.

Motor Skills:

1. Ability to set tools, work piece, and machines for desired operations.
2. Ability to complete job as per job drawing in allotted time.
3. Ability to use safety equipment and follow safety procedures during operations.
4. Ability to inspect the job for confirming desired dimensions and shape.
5. Ability to acquire hands-on experience.

01	**TURNING SHOP** Note:1] One job related to Plane and Taper turning, threading and knurling 2] One job related to Drilling and tapping 3] Batch size should be selected depending on volume of work. 4] Job allotted should comprise of 6-8 hours of actual working 5] Student shall calculate the cost of material and labor cost for their job from the drawing.
02	**WELDING SHOP** **Note:**1] One job of standard size (Saleable/marketable article shall be preferred) 2] Batch size should be selected depending on volume of work . 3] Job allotted should comprise of 6-8 hours of actual working operations. 4] Student shall calculate the cost of material and labor required for their job from the drawing.
03	**PLUMBING SHOP** • Demonstration of PVC pipe joint with various fittings. • Exercise for students on preparing actual pipeline layout for PVC pipe. Preparing actual drawing and bill of material.

(Note: Utility item are not to be assessed

Learning Resources:

Books:

Sr. No.	Author	Title	Publisher
01	S.K. Hajara Chaudhary	Workshop Technology	Media Promotors and Publishers,New Delhi
02	B.S. Raghuwanshi	Workshop Technology	Dhanpat Rai and Sons, New Delhi
03	R K Jain	Production Technology	Khanna Publishers, New Delhi
04	H.S.Bawa	Workshop Technology	Tata McGraw Hill Publishers,New Delhi
05	--	Kent's Mechanical Engineering Hand book	John Wiley and Sons, New York

Video Cassettes / CDS

- Learning Materials Transparencies, CBT Packages developed by NITTER Bhopal.

RADHA GOVIND UNIVERSITY
RAMGARH, JHARKHAND

ENGINEERING AND TECHNOLOGY

SYLLABUS FOR ELECTRICAL ENGINEERING

CHOICE BASED CREDIT SYSTEM (CBCS)

Scheme of Teaching and Examination for

3rd Semester of 3 Years Diploma in Electrical Engg.

Duration of Semester : **14 Weeks**
Student Contact Hours : **36 Hrs**
Total Marks : **800**
Effective from : **2022 -23 Session**

Sl. No.	*Name of Subject*	*Subject Code*	*Subject*	*Teaching Scheme*			*Examination Scheme*					
				L	*T*	*P*	*Hours of Exam*	*Full Marks of Subject*	*Final Exam / committeemarks*	*Internal Assessment*	*Pass Marks Final/ Ext. Exam*	*Pass Marks in Subjects*
1.	*Math III*	*301*	*Theory*	*4*			*3*	*100*	*80*	*20*	*26*	*40*
2.	*Electrical Engineering*	*ELE303*	*Theory*	*3*			*3*	*100*	*80*	*20*	*26*	*40*
3.	Measurement	*ELE304*	*Theory*	*3*			*3*	*100*	*80*	*20*	*26*	*40*
4.	Basic Engineering(C&M)	*ELE305*	*Theory*	*3*			*3*	*100*	*80*	*20*	*26*	*40*
5.	Electronics Engineering	*ELE306*	*Theory*	*3*			*3*	*100*	*80*	*20*	*26*	*40*
6.	*Electrical Engineering Lab*	*ELE307*	*Practical*			*4*	*4*	*100*	*80*	*20*		*40*
7.	Measurement Lab	*ELE308*	*Practical*			*2*	*4*	*50*	*40*	*10*		*20*
8.	Electronics Lab	*ELE309*	*Practical*			*2*	*4*	*50*	*40*	*10*		*20*
9.	Basic Engineering Lab	*ELE310*	*Sessional*			*2*		*50*	*30*	*20*		*25*
10	*Development of Life Skils*	*302*	*Sessional*			*4*		*50*	*30*	*20*		*25*
Total Hours of Teaching per week :				**16**		**14**						

Total Marks : Theory : Practical : Sessional :
L : Lecture, T : Tutorial P : Practical

Note: 1. Period of Class hours should be of 1 hrs duration as per AICTE norms.
2. Remaining Hrs every week has been marked for students for Library and Student Centered Activities.
3. Drawing / Graphics / Practical / Sessional examinations will be held at parent institution.
4. Board will depute examiner for Practical examination.
5. Regarding sessional examination the parent institution will form a three member committee and this committee will examine the sessional records and hold viva of the examinee for 60 % marks allotted to the subject. Marks for remaining 40 % will be provided by the Faculty concerned on the basis of evaluation of each job / work throughout the semester.

Diploma in Engineering (All branch except Mining, Arch & Non Tech)

Semester : Third

Subject Title : Engineering Mathematics-III

Subject Code: 301

Teaching and Examination Scheme:

Teaching Scheme			Examination Scheme					
L TH	T	P	Full Marks.	External Exam Marks	Internal Exam Marks	External Pas Marks	Total Pass Marks	Duration of External Exams
03	01		100	80	20	26	40	3 Hrs

NOTE:Internal marks will be allotted on the basis of two snap tests and 2 assignment of equal marks to be conducted by the faculty teaching the subject.

Rationale:

The subject is extension of Engineering Mathematics – 1 & 2 of First year and stepping into the prerequisites to learn Applied Mathematics applicable in engineering solutions. Engineering Mathematics lay down the foundation to understand and express principles and laws involved in other technological subjects. The study of Engineering Mathematics will help to develop the skills essential for new emerging avenues.

Objective:

The student will be able to acquire knowledge of mathematical terms, concepts and principles. They can acquire sufficient mathematical techniques and can develop the ability to apply mathematical methods to solve technical and day to day practicalproblems and to execute management plans with precision.

Sub Objective:

This course is divided into five units. After completion of this course one could become able to learn the following.

- Intuitive meaning and Methods of finding integration definite integration and its properties.
- Application of Integration in finding Area, volume of irregular shapes.
- Methods of solving differential equation of first order and first degree.
- Methods for finding approximate roots by using bisection, Regula-falsi, Newton-Raphson method, Gauss elimination, Jacobi and Gauss- Seidal methods.
- Use of Binomial, Normal and Poisson distributions for solving different examples.

- Use of Laplace transform for solving problems of Differential Equations.
- Use of Fourier series for expansion of function at the given intervals

Contents: Theory

Chapter	Name of the Topic	Hours	Marks
01	**Integration:** 1.1 Definition of integration as anti-derivative. Integration of standard function. 1.2 Rules of integration (Integrals of sum, difference, scalar multiplication). 1.3 Methods of Integration. 1.3.1 Integration by trigonometrical transformation. 1.3.2 Integration by substitution 1.3.3 Integration by parts. 1.3.4 Integration of rational and irrational functions. 1.3.5 Integration by Partial fractions.	7	16
	1.4 Definite Integration. 1.4.1 Concept of definite integrations with examples. 1.4.2 Properties of definite integral with simple problems.	3	
	1.5 Applications of definite integrals. 1.5.1 Area under the curve. 1.5.2 Area bounded by two curves.	3	
2	**Differential Equation** 2.1 Definition of differential equation, order and degree of differential equation. Formation of differential equation. 2.2 Solution of differential equations of first order and first Degree such as variable separable form, reducible to Variable separable, Homogeneous and Linear Differential Equation.	6	16
	2.3 Applications of Differential equations. 2.3.1 Rectilinear motion (motion under constant and variable acceleration) 2.3.2 Newton's Law of Cooling	3	
3	**Numerical Methods** **3.1 Solution of algebraic equations** Bisection method, Regula falsi method and Newton–Raphson method.	3	16
	3.2 Solution of simultaneous equations containing 3 unknowns		

	3.2.1 Gauss elimination method. 3.2.2 Jacobi's Iterative method. 3.3.3 Gauss Seidal method.	3	
	3.3 Interpolation 3.3.1 Concept of interpolation and extrapolation. 3.3.2 Different operators (Δ, ∇ &),relation between them, someproblems based on operators , formation of Difference Table. 3.3.3 Newton's Forward and Backward difference interpolation formulae. 3.3.4 Lagrange's interpolation formula. 3.3.5 Problems based on above.	6	
	3.4 Numerical Differentiation &Integration. 3.4.1 Newton's forward and backward difference formulae for first and second order differentiation at any point. 3.4.2 Numerical integration Trapezoidal rule and Simpson's 1/3rdrule.	3	
4	**4.1 Probability:** 4.1.1 Definition of random experiment, sample space, event occurrence of event and types of events (impossible, mutually exclusive, exhaustive, equally likely) 4.1.2 Definition of probability, addition and multiplication theorems of probability.	05	16
	4.2 Probability Distribution 4.2.1 Binomial distribution. 4.2.2 Poisson's distribution. 4.2.3 Normal distribution 4.2.4 Simple examples based on above .	05	
5	**Laplace Transform** **5.1** Definition of Laplace transforms Laplace transform of standard functions**.** **5.2** Properties of Laplace transform such as Linearity, first shifting, second shifting, multiplication by t^n, division by t. **5.3** Inverse Laplace transforms. Properties-linearly first shifting, second shifting. Method of partial fractions,	3	16
6	**Fourier Series** 6.1 Definition of Fourier series (Euler's formula). 6.2 Series expansion of continuous functions in the intervals $(0,2l),(-l,l),(0,2\pi),(-\pi,\pi)$	3	

7	**Linear Programming** **7.1 Introduction** **7.2 Solution of Linear Programming problem (LPP) by Graphical Method.**	3	
	TOTAL:	56	80

Tutorial: Tutorials are to be used to get enough practice for solving problems. It is suggested that in each tutorial at least five problems should be solved.

Learning Resources:

Text Book:

Sr. No	Title	Authors	Publications
1	Higher Engg. Mathematics	B. S. Grewal	Dhanpat Rai

Ref. Books:

Sr. No	Title	Authors	Publications
1	Engineering Mathematics	H.K.Das	S.Chand & Company LTD, New Delhi
2	Higher Engineering Mathematics	B.V,Ramana	Mcgraw Hill Education (India) Private limited , New Delhi
3	Practical Mathematics	I.B. Prasad	Khanna
4	Introductory Method of Numerical Analysis	S.S.Shastri	P.H.I
5	Linear Programming	G. Hadley	
6	A text book for class 12, Part- I & II	NCERT	NCERT, Delhi

Electrical Engineering
Subject Code : ELE303

L	T	P	Full Marks 100 (T) + 50(Pr)
3		2	

Objectives:
This is a foundation course to understand the basic principles and behavior of electrical circuits, electrical power apparatus and utilization of electrical energy.

1. Electrical Engg Fundamentals (5 hours)

Introduction to electrical circuits: Electric field, electric current, potential and potential difference, electric power, basic circuit components, ohm's law.
Sources and its types, Ideal and practical sources, Source Conversion, independent and dependent sources, Energy Stored in Inductor and Capacitor, series, parallel and series and parallel circuit.

2. DC Networks & Theorems: (15 hours)

Laws and Theorems applicable to DC networkks (KCL & KVL, Node voltage & Mesh current analysis, Star-Delta and Delta-Star conversion, Superposition theorem, Thevenin & Norton theorem & Maximum power Transfer theorem), Simple problems.

3. AC Fundamentals (6 hours)

Single-Phase AC Circuits: Single-phase EMF Generation, Average and Effective value of periodic ac signals, Peak factor & Form factor, Phasor and Complex representation of sinusoids, Power factor, complex power.
Three-Phase AC Circuits: Comparison between single-phase and three-phase systems, three phase EMF Generation, Line and Phase quantities in star and delta networks,

4. Magnetic circuits (6 hours)

Introduction to Magnetic Circuits: Introduction to Electromagnetism, Faradays laws of Electromagnetic Inductions, B-H curve, Permeability, Reluctance, Solution of magnetic circuits, Hysteresis and Eddy current loss.

5. Single Phase A.C. Circuits (5 hours)

A.C. Circuits containing resistance only, A.C. Circuits containing inductance only, A.C. Circuits containing Capacitance only, R-L Series circuits, R-C series circuits, R-L-C Series circuits, Simple Numerical problems.

6. Parallel A.C. Circuits- (5 hours)

R-L,R-CandR-L-C circuits. Admittance, susceptance, solution by admittance method, phasor diagram, Parallel resonance, quality factor.
Comparison of Series and parallel Circuits

Learning objectives:

1. **Evaluation:** Motivate graduates to become good human beings and responsible citizens for the overall welfare of the society.
2. **Knowledge:** Provide graduates with a strong foundation in mathematics, science and engineering fundamentals to enable them to devise and deliver efficient solutions to challenging problems in electrical, Electronics and allied disciplines.
3. **Core Competence:** Impart analytic and thinking skills to develop initiatives and innovative ideas for R&D, Industry and societal requirements.

Learning outcomes:

1. Diploma engineers will be able to demonstrate knowledge of electrical and electronics engineering.
2. Diploma engineers will demonstrate an ability to identify, formulate and solve Industrial, community & research problems.
3. Diploma engineers will demonstrate an ability to analyze and interpret experiments for mathematical modeling and maintenance of the electrical systems.
4. Diploma engineers to Design & Conduct Experiments, as well as Analyze & Interpret Data.
5. Diploma engineers ability to design a System, Component, or Process to meet desired needs with in realistic constraints such as Economic, Environmental, Social, Ethical, Manufacturability, and Sustainability.
6. Diploma engineers will demonstrate skills to use modern devices, software and equipment to analyse & solve problems.

Electrical Engineering Lab :-
Subject Code : ELE310

List of Experiments:

1. Verification of Ohm's laws
2. Verification Kirchoffs laws
3. Verification of superposition Theorem.
4. Verifications of Thevenin's and Norton's theorem.
5. Verifications of Maximum power transfer theorem.
6. Connection and measurement of power consumption of various lamps.
7. Measurement of resonant frequency of Tank Circuits.
8. V-I Characteristics of incandescent lamps and time fusing current characteristics of a fuse.
9. Calculation of current, voltage and power in series R-L-C circuit excited by single phase AC supply and calculation of power factor.
10. Verifying B-H Curve of an Electromagnet.

Text/reference books:

1. Rizzoni, Principles and Applications of Electrical Engineering., Mc Graw Hill
2. Hughes, "Electrical & Electronic Technology", Ninth Edition Pearson Education.
3. V.D.Toro, "Basic Electrical Engineering", Prentice-Hall of India.
4. B.L.Theraja, A.K.Theraja, "A textbook of Electrical Technology" S.Chand. Ltd.
5. Rajendra Prasad, "Fundamentals of Electrical Engineering", PHI,
6. 6.D P khothari and I J Nagratha "Basic electrical engineering" 2nd ed, TMH.
7. N.N. Parker Smith," Problems in Electrical Engineering", CBS Publisher

Measurement I
Semester- 3rd

L	T	P
3		2

Full marks Theory 80 + 20 (100)
Full marks Practical 40 + 10 (50)

Subject Code : ELE304

01. Fundamentals of Measurement — 4 Hr

1.1 Electrical signals and errors, their types
1.2 Desirable qualities of measuring instruments.
1.3 Various effects of electricity employed in measuring instruments.
1.4 Classification of measuring Instruments.

02. Measurement of Current and Voltage — 9 Hr

2.1 Construction and principle of PMMC, MI, Dynamometer & induction type instruments, Hot wire & electrostatic instruments.
2.2 Voltmeter, Ammeter, Multi-meter : analog and digital types
2.3 Range Extension of Ammeter and Voltmeter.
2.4 Instrument transformers (CT & PT), tongue tester, their use in extension of ranges

03. Measurement of Power — 6 Hr

3.1 Principle and Construction of single phase & three phase dynamometer type wattmeter.
3.2. Errors and their compensation.
3.3 Measurement of single phase power with one wattmeter and 2 wattmeter methods for balanced and unbalanced loads.
3.4 Three phase power measurement by two wattmeter and three wattmeter for balanced and unbalanced loads.
3.5 Effect of power factor variation on wattmeter readings in two wattmeter method.

04. Measurement of Energy — 6 Hr

4.1 Constructional feature & principle of working of single phase induction type energy meter.
4.2 Constructional feature & principle of working of three-phase induction type energy meter.
4.3 Different types of errors and their compensation.
4.4 Concept of Electronic energy meter.

05. Measurement of Resistance — 4 Hr

5.1 Low, medium & high resistance
5.2 Measurement of low resistance by potentiometer & Kelvin's double bridge
5.3 Measurement of earth resistance by megger
5.4 Measurement of medium resistance by Wheatstone bridge method.
5.5 Measurement of high resistance by loss of charge method.

06. Measurement of Inductance & Capacitance **6 Hr**

6.1 Measurement of inductance by Maxwell Bridge, Andersons Bridge. Hays Bridge
6.2 Measurement of capacitance by D-sauty Bridge, Schering Bridge.
6.3 Self & Mutual inductance Measurement,
6.4 Digital multimeter, LCR meter.

07. Transducers **7 Hr**

7.1 Introduction of different types of transducers.
7.2 Primary and Secondary, Active and Passive Transducers.
7.3 LVDT, RVDT, RTD, Thermistor,
7.4 Piezoelectric, photoelectric, ultra-sonic.

Learning objectives:

To understand the basic working principles of electrical and electronic measuring instruments. To receive the skills to managing and operating analogue and digital instruments for a particular application. To learn the ways of presenting and interpreting results. To calculate the uncertainty of the direct and undirect single and multiple measurements.

Learning outcomes:

1. Interprets the results of measurements and presents them in an appropriate form
2. Performs propre measurements of electrical quantities
3. Calculates limiting errors and uncertainties
4. Applies appropriate methods to measure basic electrical quantities
5. Implements and operates appropriate equipment in a measuring experiment
6. Develop the knowledge of theoretical and mathematical principles of electrical measuring instruments.

MEASUREMENT LAB

Subject Code : ELE308

List of Practical's: (Minimum 10 experiments to be performed by students)

Marking will be in the following pattern

Attendance Previous Lab records Experiment performance Observations Viva
(all heads will have equal weight age)

1. Measurement of Current and Voltages by Low range ammeter and voltmeterrespectively with shunt and multiplier.
2. Calibration of Wattmeter at various power factors by standard Wattmeter.
3. Measurement of active power in three phase balanced load by single wattmetermethod.
4. Measurement of active and reactive power in three phase balanced load by twowattmeter method
5. **Measurement of single phase power with 3 ammeters and 3 voltmeters.**
6. **Calibration of Energy meter at various power factors by standard energy meter.**
7. Measurement of energy in single phase & three phase balanced load usingElectronic Energy Meter.
8. Measurement of Low resistance by Kelvin's Double Bridge.
9. Measurement of Medium resistance by Wheatstone bridge.
10. Measurement of Insulation Resistance by Megger.
11. Measurement of Resistance, Voltage, Current, Voltage, Current in A.C & D. C.Circuit by using digital multimeter.
12. Measurement of A.C. Current by tongue tester.
13. Measurement of Circuit Parameters by LCR meter.
14. To measure linear displacement by LVDT and plot characteristics.
15. Measurement of inductance by Maxwell Bridge.
16. Measurement of Capacitance by Schering Bridge.
17. Measurement of inductance by Hay's Bridge.

Books Recommended:-

1. Electrical & Electronics Measuring Instrument- Dhanpat Rai & Sons.--- A.K Sawhney
2. Electrical Measurement & Measuring Instrument-Khanna Publisher—Rejendra Prasad
3. Electrical Measurement & Measuring Instrument --- E.W.Golding
4. Electrical & Electronic Measurement by J B Gupta
5. Electrical & Electronic Measurement by Ryder
6. Electronic Instrumentation and Measurement by W D Cooper

Semester-III
Paper- Basic Engineering (Civil & Mechanical)
Full Marks-100 (80+20)
Total Hours : 42
Subject Code : ELE305

L T P **Full Marks 100 (T) + 50(Pr)**
3 2

Chapter	Name of Topics	Number of hrs
01	*Basic Civil Engineering Materials:* *1.1 Basic Knowledge of Civil Engineering Materials like sand, Cement, Stove eves Bricks, Tiles, Terra Coat, Lime, Mortar Concrete, Paints & Varnishes.*	*05*
02	*Timber:* *Type & Structure of Timber tree, Defects in timber, characteristics of good timber, seasoning of timber.*	*03*
03	*Surveying & Levelling:* *Surveying Instruments, Measurements of horizontal distance by chair or table. Measurement of horizontal & Vertical angle. Basic Knowledge of levelling and total station.*	*08*
04	*Foundations for Machines:* *5.1 Fundamental of Mechanical Vibration* *5.2 Need for Foundation* *5.3 Martial Required for Foundation* *5.4 Foundation battz & Sizes.* *5.5 Crilina for design*	*03*
05	*Joints and Fabrications* *Types of joints, necessary precautions for workingwith metals, fabrication process concept.*	*02*
06	*I. C Engine:* *5.1 Construction & Working of two strokes and four stroke petrol & Diesel Engine.* *5.2 Reasons of Mal functioning & remedial measurement for IC Engine*	*04*
07	*6.1 Construction & Working of Cochran, Babcock & Wilcox Boilers.* *6.2 Construction & Working Principle with velocity diagram of Pelton, impulse & Reaction turbine.* *6.3 Construction & Working principle of steamturbine.*	*02* *05* *02*
08	*Introduction of Thermodynamics. 1st and 2nd Lawsof thermodynamics. Basic Knowledge of Enthalpy, Entropy etc.*	*04*
09	*Pumps & Air Compressors:* *9.1 Types of Pumps- Centrifugal Pump, Reciprocating Pump, Their Function.* *9.2 Air Compressors, Classification of compressors, construction & working of single & Two Stage reciprocating compressors.*	*02* *02*
	Total	**42**

Semester-III
Paper- Basic Engineering Lab (Civil & Mechanical)
Subject Code : ELE310

List of Experiments :-

1. *Field visit for identification & Physical Properties of sand, Brick, Cement, Lime Title and Point.*
2. *Field Survey of Distance measurement by chain and tape with correction.*
3. *Angle measurement by prismatic and surveyor compass.*
4. *Practice of making various types of joints*
5. *Practice of fabrication with metal flats.*
6. *Demonstration of Total Station.*
7. *Field visit of Machine Foundation.*

Reference Books :

1. *Constructions materials*	*Sushil Kumar'*
2. *Surveying and levelling*	*B C Poonamia*
3. *Mechanical Engg.*	*Rai Choudhary*
4. *Workshop Technology*	*Hazra Choudhary*
5. *Automobile Engg.*	*Kripal Singh Vol II*
6. *Thermal Engg.*	*R K Rajput*
7. *Hydrulics and Hydraulic Machine*	*R K Bansal*

Learning objectives:

1. Become competent and engaged engineering professionals, applying their technical and managerial skills in the planning, design, construction, operation or maintenance of the built environment and global infrastructure, and utilizing their skills to analyze and design systems, specify project methods and materials, perform cost estimates and analyses, and manage technical activities in support of civil engineering projects.
2. Initiated an active program of life-long learning, including studies leading to professional licensure or an advanced degree in engineering, that provides for continued development of their technical abilities and management skills, and attainment of professional expertise.

Learning outcomes:

1. an ability to identify, formulate, and solve complex engineering problems by applying principles of engineering, science, and mathematics;
2. an ability to apply engineering design to produce solutions that meet specified needs with consideration of public health, safety, and welfare, as well as global, cultural, social, environmental, and economic factors;
3. an ability to communicate effectively with a range of audiences;
4. an ability to recognize ethical and professional responsibilities in engineering situations and make informed judgments, which must consider the impact of engineering solutions in global, economic, environmental, and societal contexts;
5. an ability to function effectively on a team whose members together provide leadership, create a collaborative and inclusive environment, establish goals, plan tasks, and meet objectives;
6. an ability to develop and conduct appropriate experimentation, analyze and interpret data, and use engineering judgment to draw conclusions.

Semester-III
Branch-Electrical Engineering & EEE
Paper- Electronics Engineering
Subject Code : ELE306
Total Hours : 42
Full Marks-100 (80+20)

Chapter	Topics	Hours
01.	*Semiconductor Diode:* *1.1 Semiconductor Theory* • *Review of Semiconductor theory (No Question to be setin theory paper)* • *Intrinsic semiconductor, Extrinsic semiconductor, doping, dopant* • *trivalent & pentavalent impurities, P-Type and N-Type Semiconductor.* *1.2 Semiconductor Diode* • *PN Junction* • *Junction theory: Barrier voltage, Depletion region, Junction capacitance, Forward and reverse biased junction.* • *V-I characteristics of P-N Junction diode.* • *Circuit diagram for characteristics (Forward & Reverse)* *1.3 Specification of diode* • *Forward Voltage Drop, Reverse Saturation Current, Maximum Forward Current, Power Dissipation.* • *Ideal Diode Model.* *1.4 Zener Diode* • *Construction & Symbol* • *Circuit diagram for characteristics (Forward & Reverse)* • *Specification of zener diode: zener voltage (VZ), Maximum Power dissipation (PD max), Break over current, zener resistance.* • *Special Purpose diodes: Schott key diode, Point-contact diode, Varacter Diode (Construction, Symbol, Characteristics and application).* • *Optical diodes: LED, IRLED, Photodiode and Lased diode (Symbol, Operating Principle and application ofeach)*	*04*
02	*Rectifiers and Filters* *2.1 Rectifiers* • *Need of rectifier* • *Types of rectifier: Half wave rectifier, Full wave*	*06*

	rectifier (Bridge and centre tapped). • *working with waveform (IP/OP) waveforms for voltage and current, Average (DC) value of current and voltage (No derivation).* • *Ripple, ripple factor, ripple frequency, PIV of diode used, transformer utilization factor, efficiency of rectifier.* • *Comparison of three types of rectifiers (HWR, FWR (Bridge & Centre Tapped)).* *2.2 Filters* • *Need of Filters* • *Types of Filters: Shunt capacitor, series inductor, LC* filter, π filter (circuit diagram, operation, DC O/P *voltage, ripple factor (Formula), ripple frequency, dependence of ripple factor on load.* • *I/P and O/P waveforms, Limitations and Advantages of all types of filters.*	
03	*Bipolar Junction Transistor* *3.1 transistor* • *Transistor definition* • *Types: NPN, PNP Junction transistors (Symbols, operating principle)* • *Transistor configuration: Common emitter (CE), Common Collector (CC), Common base (CB).* • *Characteristics in CE configuration (Circuit diagram, I/P and O/P characteristics, different points of characteristics (Cut-off, Active and Saturation), input* resistance, Output resistance, current gain (α and β) *Transistor Biasing).* • *Need of biasing, DC load line, Operating Point.* • *Types of Biasing Circuits: Fixed bias circuit, Base biased with emitter feedback, Base biased with collector feedback, voltage divider bias, emitter biased.* • *Transistor Model of h-parameters.* *3.2 Transistor as an amplifier (CE configuration only)* • *Graphical representation, Current gain, Voltage gain, Power gain (No derivation), Input Output resistance, Phase Shift between input and output.* • *AC Load Line.* • *Single Stage CE amplifier: Circuit diagram, Function of each component. Frequency response and bandwidth.* *3.3 Need of Cascaded amplifier* • *Types of coupling: RC couple, Transformer couple, Direct Couple (Circuit diagram and function of each component).* • *Application of each amplifier* • *Transistor as a switch-(Circuit diagram, Operation,*	*12*

	Application). *UJT* • *Symbol, characteristics and working principle of UJT.*	
04	*Field Effect Transistor (Unipolar Transistor)* *4.1 FET* • *Types, Symbols and working principle.* • *Characteristics of FET, Circuit diagram for drain characteristics, Operating regions of characteristics.* • *Drain resistance, Mutual capacitance, amplification factor and their relation, Pinch off voltage of FET.* • *Comparison of BJT and FET. (Type of carriers, switching speed, Thermal stability, space in case of IC fabrication, control parameter, input impedance, offset voltage, power gain at audio frequencies)* *4.2 MOSFET* • *Types, Symbol, working principle.* • *Application of FET and MOSFET.*	*08*
05	*Regulated Power Supply* *5.1* • *Definition of regulator, Need of regulator, Voltage regulation factor* • *Concept of load regulation and line regulation.* • *Zener diode as a voltage regulator.* • *Basic block diagram of DC Power supply* • *Transistorized Series voltage regulator, Transistorized Shunt Voltage regulator, (Circuit diagram and operation).* *5.2 Regulator IC's* • *IC's 78XX, 79XX (Functional Pin diagram)* • *IC 723 as fixed, variable and Dual regulator.*	*04*
06	*OP Amp* • *Block diagram, Basic definition of Terms* • *Equivalent Circuit* • *Open Loop & closed Loop, OP Amp* • *Inverting & Non inverting OP Amp* • *Adder and Subtractor* • *Integrator, differentiator & Comparator circuit usingOP Amp.*	*08*
	Total	*42*

Reference Books :

01	*Principles of Electronics by Malvino*
02	*Electronics device & circuits by Neselski & Boylsted*
03	*Electronics device & circuits by Grove*
04	*Electronics device & circuits by by Milliman & Holkias*
05	*Electronics device & circuits by V.K. Mehta*
06	*Op Amp by Gaikwad*

Electronics Lab :-
Subject Code :-ELE309

Practical :-

Skills to be developed

Intellectual Skills :

1. *Identification & selection of Components*
2. *Interpretation of Circuits*
3. *Understand working of rectifier, filter, amplifier and Oscillator circuits*

Motor Skills :

1. *Ability to drow the circuits*
2. *Ability to measure various parameters*
3. *Ability to test the components using Multimeter*
4. *Ability to read data sheets of components*
5. *Follow standard test procedures*

List of Practicals

1. *Forward & Reverse characteristics of diode*
2. *Characteristics of Zener diode*
3. *Study of Rectifiers (Half wave & Full wave) & Filters (Capacitor & Inductor filter)*
4. *Input & Output Characteristics of transistor in CE mode*
5. *Characteristics of FET*
6. *Characteristics of UJT*
7. *Load & Line regulation Characteristics of Regulator*
8. *Frequency response of single stage RC coupled amplifier.*
9. *To Study the V-I Characteristics of PN Junction diode.*
10. Determination of h parameter.

Learning objectives:

1. This course provides the student with the fundamental skills to understand the basic of semiconductor and components like diode, transistor, FET, MOSFET and operational amplifier It will build mathematical and numerical background for design of electronics circuit & component value.

2. To impart **quality engineering education** *as per the industry need*
3. To motivate students to undertake **research** *on next generation technologies*
4. To create an **environment** *that shall foster growth of professionals capable of effectively using*

Learning outcomes:

1. Maintain digital and analog devices and circuits.
2. Analyze components associated with digital and analog electronic systems.
3. Demonstrate proficiency in the use of electronic equipment and devices.
4. Assist in the design, operation, and troubleshooting of electronic systems.
5. Analyzing electronics devices and circuits using computer simulations.
6. Solve electronic devices and systems using mathematical concepts.

3rd Semester Diploma in Engineering (Common)

Subject Title : Development of Life Skills- I

Subject Code : 302

Rationale:

In today's competitive world, the nature of organizations is changing at very rapid speed. In this situation the responsibility of diploma holder is not unique. He will be a part of a team in the organization. As such the individual skills are not sufficient to work at his best.

This subject will develop the student as an effective member of the team. It will develop the abilities and skills to perform at highest degree of quality as an individual as well as a member of core group or team. Such skills will enhance his capabilities in the field of searching, assimilating information, managing the given task, handling people effectively, solving challenging problems.

THE SUBJECT IS CLASSIFIED UNDER HUMAN SCIENCE. Objectives: The

students will be able to:

1. Develop team spirit i.e. concept of working in teams
2. Apply problem solving skills for a given situation
3. Use effective presentation techniques
4. Apply techniques of effective time management
5. Apply task management techniques for given projects
6. Enhance leadership traits
7. Resolve conflict by appropriate method
8. Survive self in today's competitive world
9. Face interview without fear
10. Follow moral and ethics
11. Convince people to avoid frustration

CONTENTS: Interaction by faculty / professional

Chapter	Name of the Topic	Suggested HOURS
1	**SOCIAL SKILLS** Society, Social Structure, Develop Sympathy And Empathy.	01
2	Swot Analysis – Concept, How to make use of SWOT.	01
3	**Inter personal Relation** Sources of conflict, Resolution of conflict , Ways to enhance interpersonal relations.	02

4	**Problem Solving** **I) STEPS IN PROBLEM SOLVING,** 1) Identify and clarify the problem, 2)Information gathering related to problem, 3) Evaluate the evidence, 4) Consider alternative solutions and their implications, 5) Choose and implement the best alternative, 6)Review **II) Problem solving technique**.(any one technique may be considered) 1) Trial and error, 2) Brain storming, 3) Lateral thinking	**02**
5	**Presentation Skills** Body language -- Dress like the audience Posture, Gestures, Eye contact and facial expression. STAGE FRIGHT, Voice and language – Volume, Pitch, Inflection, Speed, Pause Pronunciation, Articulation, Language, Practice of speech. Use of aids –OHP,LCD projector, white board	**03**
6	**Group discussion and Interview technique** – Introduction to group discussion, Ways to carry out group discussion, Parameters— Contact, body language, analytical and logical thinking, decision making **INTERVIEW TECHNIQUE** Necessity, Tips for handling common questions.	**03**
7	**Working in Teams** Understand and work within the dynamics of a groups. Tips to work effectively in teams, Establish good rapport, interest with others and work effectively with them to meet common objectives, Tips to provide and accept feedback in a constructive and considerate way , Leadership in teams, Handling frustrations in group.	**02**
8	**Task Management** Introduction, Task identification, Task planning ,organizing and execution, Closing the task	**02**
	TOTAL	**16**

CONTENTS: PRACTICAL -

List of Assignment: (Any Eight Assignment)

1. SWOT analysis:- Analyse yourself with respect to your strength and weaknesses, opportunities and threats. Following points will be useful for doing SWOT.
    a) Your past experiences,
    b) Achievements,
    c) Failures,
    d) Feedback from others etc.
2. Undergo a test on reading skill/memory skill administered by your teacher.
3. Solve the true life problem.
4. Form a group of 5-10 students and do a work for social cause e.g. tree plantation, blooddonation, environment protection, camps on awareness like importance of cleanliness in slump area, social activities like giving cloths to poor etc.(One activity per group)
5. Deliver a seminar for 10-12 minutes using presentation aids on the topic given by your teacher.
6. Watch/listen an informative session on social activities. Make a report on topic of your interest using audio/visual aids. Make a report on the programme. ####
7. Conduct an interview of a personality and write a report on it.
8. Discuss a topic in a group and prepare minutes of discussion. Write thorough description of the topic discussed
9. Arrange an exhibition, displaying flow-charts, posters, paper cutting, photographs etc on the topic given by your teacher.

Note: - Please note that these are the suggested assignments on given contents/topic. These assignments are the guide lines to the subject teachers. However the subject teachers are free to design any assignment relevant to the topic. The **term work** will consist of any eight assignments.
Mini Project on Task Management: Decide any task to be completed in a stipulated time with the help of teacher. Write a report considering various steps in task management.

LEARNING RESOURCES:

BOOKS:

Sr. No	Title of the book	Author	Publisher
1	Adams Time management	Marshall Cooks	Viva Books
2	Basic Managerial Skills for All	E.H. Mc Grath , S.J.	Pretice Hall of India
3	Body Language	Allen Pease	Sudha Publications Pvt. Ltd.
4	Creativity and problem solving	Lowe and Phil	Kogan Page (I) P Ltd
5	Decision making & Problem Solving	by Adair, J	Orient Longman
6	Develop Your Assertiveness	Bishop , Sue	Kogan Page India
7	Make Every Minute Count	Marion E Haynes	Kogan page India
8	Organizational Behavior	Steven L McShane and Mary Ann Glinow	Tata McGraw Hill
9	Organizational Behavior	Stephen P. Robbins	Pretice Hall of India, Pvt Ltd
10	Presentation Skills	Michael Hatton (Canada – India Project)	ISTE New Delhi

11	Stress Management Through Yoga and Meditation	--	Sterling Publisher Pvt Ltd
12	Target setting and Goal Achievement	Richard Hale ,Peter Whilom	Kogan page India
13	Time management	Chakravarty, Ajanta	Rupa and Company
14	Working in Teams	Harding ham .A	Orient Longman

Learning objectives:

1. To enhance one's ability to be fully self aware by helping oneself to overcome all fears and insecurities and to grow fully from inside out and outside in.
2. To increase one's knowledge and awareness of emotional competency and emotional intelligence at place of study/work.
3. To provide opportunity for realising one's potential through practical experience.
4. To develop interpersonal skills and adopt good leadership behaviour for empowerment of self and others.
5. To set appropriate goals, manage stress and time effectively.
6. To manage competency- mix at all levels for achieving excellence with ethics.

Learning outcomes:

1. Gain Self Competency and Confidence
2. Practice Emotional Competency
3. Gain Intellectual Competency
4. Gain an edge through Professional Competency
5. Aim for high sense of Social Competency
6. Be an integral Human Being

RADHA GOVIND UNIVERSITY
RAMGARH, JHARKHAND

ENGINEERING AND TECHNOLOGY

SYLLABUS FOR ELECTRICAL ENGINEERING

CHOICE BASED CREDIT SYSTEM (CBCS)

Scheme of Teaching and Examination for

4th Semester of 3 Years Diploma in Electrical Engineering

Duration of Semester : 14 Weeks
Student Contact Hours : 36 Hrs
Total Marks : 800
Effective from : 2022 - 23 Session

Sl. No.	*Name of Subject*	*Subject Code*	*Subject*	*Teaching Scheme*			*Examination Scheme*					
				L	*T*	*P*	*Hours of Exam*	*Full Marks of Subject*	*Final Exam / committee marks*	*Internal Assessment*	*Pass Marks Final/ Ext. Exam*	*Pass Marks in Subjects*
1.	Network Theory	*ELE402*	*Theory*	*3*	-	-	*3*	*100*	*80*	*20*	*26*	*40*
2.	Electrical Machine I	*ELE403*	*Theory*	*3*	-	-	*3*	*100*	*80*	*20*	*26*	*40*
3.	Digital Circuits & Microprocessor	*ELE404*	*Theory*	*3*	-	-	*3*	*100*	*80*	*20*	*26*	*40*
4.	Elect Estimation & Costing	*ELE405*	*Theory*	*3*	-	-	*3*	*100*	*80*	*20*	*26*	*40*
5.	Power System I	*ELE406*	*Theory*	*3*	-	-	*3*	*100*	*80*	*20*	*26*	*40*
6.	Network Theory Lab	*ELE407*	*Practical*	-	-	*2*	*4*	*50*	*80*	*20*	-	*40*
7.	Electrical Machine I Lab	*ELE408*	*Practical*	-	-	*2*	*4*	*50*	*40*	*10*	-	*20*
8.	Digital Circuits & Microprocessor Lab	*ELE409*	*Practical*	-	-	*2*	*4*	*50*	*40*	*10*	-	*20*
9.	Electrical Workshop	*ELE410*	*Sessional*	-	-	*4*	-	*100*	*60*	*40*	-	*50*
10	Professional Practices II	*401*	*Sessional*	-	-	*4*	-	*50*	*30*	*20*	-	*25*
Total Hours of Teaching per week :				**15**		**14**						

Total Marks: Theory : Practical : Sessional :
L : Lecture, T : Tutorial P : Practical

Note: 1. Period of Class hours should be of 1 hrs duration as per AICTE norms.
2. Remaining Hrs every week has been marked for students for Library and Student Centered Activities.
3. Drawing / Graphics / Practical / Sessional examinations will be held at parent institution.
4. Boardwill depute examiner for Practical examination.
5. Regarding sessional examination the parent institution will form a three member committee and this committee will examine the sessional records and hold viva of the examinee for 60 % marks allotted to the subject. Marks for remaining 40 % will be provided by the Faculty concerned on the basis of evaluation of each job / work throughout the semester

Network Theory

Subject Code : ELE402

Full Marks – 100 (80 + 20)

L T P

3 2

Chapter	Name of the Topic	Hours
01	**Introduction :** State and explain Network elements — passive and active elements State and explain types of network Laplace transform fundamentals Concept of s parameters	**6**
02	**4. Network Theorems (DC & AC, Statement, procedure, applications and areas of applications, Simple Numerical on Circuits)** 4.1 Superposition Theorem 4.2 Thevenin's Theorem 4.3 Norton's Theorem 4.4 Maximum power transfer Theorem 4.5 Reciprocity Theorem 4.6 Compensation Theorem	**08**
03	**5. TRANSIENTS (DC & AC):** 5.1 Steady state & transient response 5.2 Response to R-L, R-C & RLC circuit 5.3 Application of Laplace transform for solution of transient circuits.	04
04	**6. TWO-PORT NETWORK:** 6.1 Open circuit impedance (z) parameters 6.2 Short circuit admittance (y) parameters 6.3 Transmission (ABCD) parameters 6.4 Hybrid (h) parameters 6.5 Inter relationships at different parameters 6.6 Inter connection of two port networks 6.7 T and π representation	06

05	Network Synthesis Network Functions, Poles and zeros. Positive real function Driving point synthesis with LC elements Two terminal pair synthesis by ladder development	8
06	**7. FILTERS:** 7.1 Classification of filters 7.2 Filter networks 7.3 Equations of filter networks 7.4 Classification of pass Band and stop Band 7.5 Characteristic impedance in the pass and stop bands 7.6 Constant – K low pass filter 7.7 Constant – K high pass filter 7.8 M- derived T section 7.9 Band pass filter 7.10 Band elimination filter	08
	Total	**42**

Course Objectives:

1. To analyze the Circuits in time and frequency domain
2. To study network Topology, network Functions, two port network.
3. To synthesize passive network by various methods.

Course Outcomes (CO's) After successful completion of the course student will be able to:

1. Apply their knowledge in analyzing Circuits by using network theorems.
2. Apply the time and frequency method of analysis.
3. Find the various parameters of two port network.
4. Apply network topology for analyzing the circuit

Network Theory Lab

Subject Code : ELE407

List of Experiments :

1) To observe A.C. wave form on C.R.O. and calculates average & R.M.S. Values, frequency, and observe the response of 'Resistance' to AC
2) To observe response of 'Inductor' and 'Capacitor' to AC
3) To determine impedance & Plot the phasor diagram of R-L series circuit.
4) To determine the current and P.F. of R.C. series circuit.
5) To determine the current and P.F. in R.L.C. series circuit.
6) To obtain resonance in R-L-C series circuit.
7) To determine the current and P.F. in R.L. Parallel circuit.
8) To determine the current and P.F. in R.C. Parallel circuit.
9) To determine the current and P.F. in R.L.C. Parallel circuit.
10) To obtain resonance in R-L-C parallel circuit.
11) To verify the line and phase values for star connected balanced load.
12) To verify the line and phase values for delta connected balanced load.
13) To verify the Superposition theorem.
14) To verify Thevenins theorem and Norton's theorem.
15) To verify the maximum power transfer Theorem.

Reference Books

1. Network analysis — Van Velcanburg
2. Network Synthesis — Van Velcanburg
3. Network Analysis — Gupta & Dhar
4. Network Analysis and Synthesis — Chang
5. Network Analysis — Mittal
6. Network Analysis and Synthesis — C L Wadhwa
7. Network Analysis and Synthesis — Bhattacrya
8. Network Analysis and Synthesis — F Kuo
9. Problems in Electrical Engg — Siskind

Electrical Machine I

Subject Code : ELE408

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3 0

Total Contact Hours : 42

Total Marks : 100 (80+20)

RATIONALE:

Electrical machines are in wide use in industries and other services. In this course DC generator, DC motors, single phase transformer, auto transformer and three phase transformer is covered in details.

AIM:

1. To acquire knowledge of construction, and control of the DC machines.

2. To acquire knowledge of performance of DC machines and transformers of all types.

CONTENTS:

1. D.C. GENERATORS 12 Hrs

1.1 Principles of operation

1.2 Constructional feature.

1.3 Armature winding, Back pitch, Front pitch, Resultant pitch and commentator pitch.

1.4 Simple Lap and wave winding (problems on winding diagram)

1.5 Different types of D.C. Machines, Shunt, Series and Compound machines

1.6 Armature reaction in D.C. machine and Commutation.

1.7 Methods of improving commutation (Resistance and emf commutation)

1.8 Inter poles and compensating winding Characteristics of D.C. Generators and uses of Different types of D.C. Generators. Concept of critical resistance, causes of failure of Development of emf.

1.9 Losses and efficiency of D.C. Machines, condition for maximum efficiency.

1.10 Parallel operation of D.C. Generators.

2. D.C. MOTORS 10 Hrs

2.1 D.C. Motor principles

2.2 Signification of back emf in D.C. Motor

2.3 Voltage equation of Motor

2.4 Torque (equation of armature torque and shaft torque)

2.5 Performance characteristics of shunt, series and compound motors and their application.

2.6 Methods of starting shunt, series and compound Motors, study of starters (3-point, 4-point starters and Drum controller type, problems in starter.

2.7 Speed control of D.C. shunt motors

2.7.1 Flux control Method

2.7.2 Armature voltage (rheostatic) control method.

2.8 Ward Leonard method

2.9 Speed control of series motors — Flux control method and series parallel control method.

2.10 Efficiency of DC machine by brake test

2.11 Efficiency of DC machine by Swinburne's test.

2.12 Losses & efficiency and condition for maximum power.

3. SINGLE PHASE TRANSFORMER 12 Hrs

3.1 Working principles

3.2 Transformer construction — Arrangement of core & winding in different types of transformer - Brief ideas about transformer accessories such as conservator, tank, breather, and explosion vent etc.

3.3 Types of cooling methods

3.4 Care and maintenance

3.5 EMF equation

3.6 Voltage transformation ratio

3.7 Transformer on no load and on load Phasor diagrams.

3.8 Equivalent resistance, reactance and impedance.

3.9 Phasor diagram of transformer with winding resistance and magnetic leakage

3.10 Equivalent circuit

3.11 Approximate & exact voltage drop of a Transformer

3.12 Regulation at various loads and power factor

3.13 Different types of losses in a Transformer

3 .14 Open circuit test

3.15 Short circuit test

3.16 Efficiency, efficiency at different loads and power factors, condition for maximum efficiency.

3.17 All day efficiency

3.18 etermination of load corresponding to maximum efficiency.

3.19 Parallel operation of single phase transformer.

3.20 Introduction to Autotransformer, its advantages and applications

4. INTRODUCTION TO THREE—PHASE TRANSFORMER 8 Hrs

Construction, principle of operation, parallel operation, connections, applications. Various connections and groups, choice of connection star-delta connections, Scott connection, three phase to two phase conversion and vice versa, Applications.

Parallel operation of three phase transformer its conditions.

COURSE OBJECTIVES:

1 To study and understand different types of DC generators, Motors and Transformers, their construction, operation and applications.
2 To analyze performance aspects of various testing methods.

COURSE OUTCOMES:

1 Students will be able to identify different parts of a DC machine & understand its operation.
2 Students will be able to carry out different testing methods to predetermine the efficiency of DC machines.
3 Students will be able Understand different excitation and starting methods of DC machines.
4 Students will be able to develop the speed control of a DC machines.
5 Students will be able to understand and classify different parts of a transformer & understand its operation.
6 Students will be able to analyze 1-Ph and 3-Ph transformers circuits.

Electrical Machine I Lab

Subject Code : ELE408

LIST OF EXPERIMENTS:

l. Study of different part, identification terminals and testing of insulation resistance of a D.C. machine

2. Determination OCC and external characteristic of shunt generator.

3. Speed variation of D.C. motor by field control armature resistance variation and ward Leonard method.

4. Determination of efficiency of a DC motor by brake test.

5. Determination of efficiency of a Single phase transformer by direct loading.

6. Parallel operation of a Single phase transformers

7. Parallel operation of 3 phase transformers

8. Identification of terminals, OC test, SC test and measurement of iron loss, No load current and no load P.F. and measurement of copper loss and computation of Zeq, Req and Xeq of a 1 phase transformer and determination of regulation.

9. Study of a 3-point/ 4-point starter for connecting and running a shunt motor.

10. Study of drum controller for connecting and running of DC series motor.

REFERENCE BOOKS:

1. Electrical Technology by B.L. Thareja and A.K. Thareja
2. Electrical Technology by J .B. Gupta.
3. Electrical Machine by P S Bhimbra
4. Electrical Machine by Fitzarald
5. Electrical Machines by M G Say
6. Electrical Machine by Nagrath & Kothari

Digital Circuits and Microprocessor

Subject Code : ELE404
Contact Hours : 42
Full Marks : 100 (80+20)

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1. **NUMBER SYSTEM & CODES-** **04 hrs**
   Binary, Octal, Hexadecimal number systems and their inter- conversion, Binary Arithmetic (Addition, Subtraction, Multiplication and Division), Diminished radix and radix compliments, BCD code , Gray code, Excess-3 code.

2. **LOGIC GATES, BOOLEAN ALGEBRA-** **04 hrs**
   Axiomatic definition of Boolean algebra, Basic Theorems & properties of Boolean algebra, Boolean function Canonical and Standard forms, Digital logic Gate.
3. **COMBINATIONAL LOGIC DESIGN:-** **04 hrs**
   The K-map method, Two, Three, Four variable K-map, Sum of product and product of sums Simplification, Binary Adder and Subtractor ,Multiplexers, De multiplexers, Decoder.

4. **INTRODUCTION TO SEQUENTIAL LOGIC: -** **6 hrs**
   Introduction, S-R Flip-flops, JK flip-flop, D flip-flops, T flip-flop, master slave flip-flop, Flip-flop excitation table. Classification of sequential circuits, Registers and A to D and D to A converter circuits, counters, detector and sequence generator.
5. **SEMICONDUCTOR MEMORIES:-** **04 hrs**
   Introduction, Memory organization, Classification and characteristics of memories, Sequential memories, ROMs, R/W memories charged-coupled memories**.**
6. **MICROPROCESSOR -8085:-** **08 hrs**
   Evolution of microprocessors, Terminology used in microprocessor- Hardware, software Firmware, Bus, Address Bus, Data Bus, control Bus, Comparison of machine language, assembly language and high-level language. Architecture & Features of 8085 microprocessor, Schematic diagram of microcomputer and microprocessor based system, Pin definition of 8085 microprocessor. Control signals, de multiplexing of address & Data Bus.
7. **8085 INSTRUCTIONS AND PROGRAMMING: -** **08 hrs**
   Instruction Format (one byte, two byte and three byte instruction), addressing modes of 8085, 8085 Instruction set. Definition of machine cycle, T state and instruction cycle. Different operations of 8085 with respect to the status of IO/M, S1, S0, RD, WR signals. Instructions related with interrupt. Timing diagram of opcode fetch cycle or memory read cycle, Memory write, I/O read and I/O write cycle, MVI A, 8 bit data; LXI rp, 16 bit data; STA, 16 bit address. Concept of stack, subroutine and interrupts. Hardware and software interrupts, mask able and non-mask able interrupt vectored interrupts.

8. **Introduction to 8086 microprocessor:** Paging concept, max and min mode concept**. 04 hrs**

Digital Circuits & Microprocessor Lab

Subject Code : ELE409

List of Practical's:

1. To verify the truth table of logic gates realize AND, OR, NOT gates.
2. To realize AND, OR gates using diodes and resistors.
3. To verify the Boolean algebra function using digital IC gates (consensus theorem).
4. To realize the function F (A, B, C, D) =(C+D) (A+B) (B+D) neither using NOR gates.
5. Design a half/full adder circuit using FF for 2 bits.
6. Design a half/full sub tractor circuit using FF for 2 bits.
7. Design a binary to gray code converter.
8. Design a function using K-map and verify its performance using SOP & POS.
9. Design BCD to seven segment display using 7447 IC.
10. Implement F (A, B, C) = E (1, 3, 4, 5, 6) with a multiplexer.
11. To study 8085 based microprocessor system
12. To load content in one register and shift it to another.
13. To move the content of one memory location to another.
14. To develop and run a program for finding out the largest/ smallest number from a given set of numbers.
15. To develop and run a program for arranging in ascending/descending order of a set of number
16. To perform multiplication/division of given numbers.
17. To perform floating point mathematical operations (addition, subtraction, multiplication, and division).
18. To perform computation of square root of a given number.

Books Recommended:-

1. Digital Principles-- Tata McGrew Hill (TMH)—Malvino & Leach
2. Modern Digital Electronics—TMH--- R. P. Jain
3. Digital Logic and Computer- PHI-- M. Morris Mano
4. Fundamentals of Microprocessors and Microcomputers- Dhanpat Rai Publications ------ B. Ram
5. Microprocessor Architecture, Programming and Applications with 8085-- Penram International-- Ramesh S. Gaonkar

Learning objectives:

1 logic circuit design concepts.
2 semiconductor memories and their functioning.

Learning outcomes:

1 Gains knowledge of various digital circuits that play an important role in data processing.
2 Develops knowledge of how to interface I/O peripherals with 8085 microprocessor and microcontroller.
3 Learns the assembly language programming skills and applications of microprocessors.
4 Learns the basic and advanced concepts of C++ programming.
5 Develops knowledge of semiconductor memories and their functioning as they form important part modern lifestyle.
6 To develop skill to build, and troubleshoot digital circuits.

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Electrical Estimation & Costing

Subject Code : ELE405
Theory Hrs : 42
Full marks - 100 (80 + 20)

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Chapter	Topics	Hours
01	**Electrical Installation and IE rules** 1.1 Classification of Electrical Installation. 1.2 General requirement of Electrical Installation. 1.3 Reading and Interpretation of Electrical Engineering Drawings. 1.3.1. Various diagrams, plans and layout 1.3.2. Important definitions related to Installation 1.4 IE rules related to Electrical Installation & Testing.	**04**
02	**Service Connection** 2.1 Concept of service connection. 2.2 Types of service connection & their features. 2.3 Methods of Installation of service connection. 2.4 Estimates of under ground & overhead service connections.	**04**

03	**Domestic Building Electrification** 3.1 General rules guidelines for wiring of Residential Installation and positioning of equipments. 3.2 Principles of circuit design in lighting and power circuits. 3.3 Procedures for designing the circuits and deciding the number of circuits. 3.4 Method of drawing single line diagram. 3.5 Selection of type of wiring and rating of wires & cables. 3.6 Load calculations and selection of size of conductor. 3.7 Selection of rating of main switch, distributions board, protective switchgear ELCB and MCB and wiring accessories. 3.8 Earthing of Residential Installation. 3.9 Sequence to be followed for preparing Estimate 3.10 Preparation of detailed estimates and costing of Residential Installation.	**08**

04	**Electrification of commercial Installation** 4.1 Concept of commercial Installation. 4.2 Differentiate between electrification of Residential and commercial Installation. 4.3 Fundamental considerations for planning of an electrical Installation system for commercial building. 4.4 Design considerations of electrical Installation system for commercial building. **4.4.1** Load calculations & selection of size of service connection and nature of supply. 4.4.2 Deciding the size of cables, busbar and busbar chambers. 4.4.3 Mounting arrangements and positioning of switchboards, distribution boards main switch etc. 4.4.4 Earthing of the electrical Installation 4.5 Selection of type wire, wiring system & layout. 4.6 Sequence to be followed to prepare estimate. 4.7 Preparation of detailed estimate and costing of commercial Installation.	**08**
05	**Electrification of factory unit Installation** 5.1 Concept of Industrial load. 5.2 Concept of Motor wiring circuit and single line diagram. 5.3 Important guidelines about power wiring and Motor wiring. 5.4 Design consideration of Electrical Installation in small Industry/Factory/workshop. 5.4.1. Motor current calculations. 5.4.2. Selection and rating of wire, cable size & conduct. 5.4.3 Deciding fuse rating, starter, distribution boards main switch etc. 5.4.4. Deciding the cable route, determination of length of wire, cable, conduit, earth wire, and earthing. 5.5 Sequence to be followed to prepare estimate. 5.6 Preparations of detailed estimate and costing of small	**08**
06	**Testing of Installation** Testing of wiring Installation for verification of current; earthing, insulation resistance and continuity as per IS	**04**
07	**Contracts, Tenders and Execution:** 7.1 Concept of contracts and Tenders 7.1.1 Contracts, types of contracts, contractors. 7.1.2 Valid Contracts, Contract documents. 7.1.3 Tender and tender notice. 7.1.4 Procedure for submission and opening tenders. 7.1.5 Comparative statements, criteria for selecting contractors, General conditions in order form. 7.2 Principles of Execution of works 7.3.1 Administrative approval, Technical sanctions. 7.3.2. Billing of executed work.	**06**
		Total 42

Sr. No.	Author	Title	Publisher & Address
1.	K.B. Raina	Electrical Design, Estimating and costing	New Age International (p) Limited, New Delhi
2.	Surjit Singh	Electrical Estimating and costing	Dhanpat Rai and company, New Delhi
3.	N. Alagappan, S. Ekambaram	Electrical Estimating and costing	Tata Mc Graw Hill Publication, New Delhi

COURSE OBJECTIVES:

Emphasize the estimating and costing aspects of all electrical equipment, installation and designs to analyze the cost aviability**.** Exposure to design and estimation of wiring, design of overhead and underground distribution lines, substations and illuminations design.

LEARNING OUTCOME:

1 After undergoing the subject, student will be able to:
2 Determine various types of wiring systems and how they are being used
3 Practice and execute any type of wiring
4 Estimate and determine the cost of wiring Installation Estimate the material required for HT and LT lines
5 Prepare a tender document for a particular job
6 Estimate the material required for pole-mounted sub-stations

POWER SYSTEM – I

Subject Code : ELE406
Total Contact Hours : 42
Full Marks : 100 (80+20)

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01 Basics of Power Generation (02 hrs)

1.1 Importance of electrical power in day today life
1.2 Different forms of energy
1.3 Comparison of sources of energy
1.4 Power crisis in India and Future Trend
1.5 Overview of method of electrical power generation

02 Thermal Power Stations (08 Hrs)

2.1 List of thermal power stations in the state with their capacities
2.2 Selection of site for thermal power stations.
2.3 Layout and working of thermal power station with block diagram.
2.4 Operation of following components: Boiler, Economizer, Air pre heater, Super-heaters & re-heaters, Steam prime movers, Condensers and Spray ponds & cooling towers.
2.5 Quality of fuel and its effect on quality of power generation.
2.6 Merits and demerits of Thermal Power Plants.
2.7 Simple Problems.

03 Nuclear Power Stations (05 Hrs)

3.1 Selection of site for Nuclear Power plants.
3.2 Nuclear fission process
3.3 Block diagram and working of Nuclear Power station.
3.4 Construction and working of nuclear reactor.
3.5 Fuels used in Nuclear Power Station
3.6 Merits and demerits of Nuclear Power Plants
3.7 List of Nuclear power stations in state & county with their capacities.

04 Hydro Power Stations (06 Hrs)

4.1 Selection of site and classification of Hydroelectric Power Plants
4.2 Layout and working of Hydro Power Station.
4.3 Types of Turbines & generators used
4.4 Pumped storage Power Plant
4.5 Merits and demerits of Hydro Power Station
4.6 List of Hydro Power stations with their capacities & number of units in the state.
4.7 Simple Problem.

05 Diesel & Other Electric Power Stations (06 Hrs)

5.1 Selection of site for Diesel Electric Power Station.
5.2 Elements of diesel Electric power plants and their working.
5.3 Operation, maintenance & trouble shooting chart of diesel Electric plant.
5.4 Merits, demerits and applications of diesel electric power stations

5.5 Performance and thermal efficiency of Diesel Electric Power Plant.
5.6 Solar, Wind, Tidal, and Geo thermal power stations concept only

06 Economics of Power Generation (08 Hrs)

6.1 Terms commonly used in system operation: connected load, firm power, cold reserve, hot reserve, spinning reserve.
6.2 Terms used in system operation such as Load curve, load duration curve, integrated duration curve. (Simple numerical based on plotting above curves.)
6.3 Factors affecting the cost of Generation: Average demand, Maximum demand, plant capacity factor & plant use factor, Diversity factor & load factor.
(Simple numerical based on above)

07 Interconnected Power Systems (02 Hrs)

7.1 Advantages of Interconnection.
7.2 Base load & peak loads, load allocation among various types of power stations
7.3 Load sharing and transfer of load between power stations.
7.4 Inter connection of power stations at state and national level

8. Substations (05 Hrs)

8.1 Introduction.
8.2 Classification of indoor & outdoor sub-stations.
8.3 Advantages & Disadvantages.
8.4 Selection & location of site.
8.5 Main connection schemes.
8.6 Equipment's circuit element of substations.
8.6.1 In coming & outgoing lines, Transformers, CT&PT, Relays, CB's, fuses, Isolators, batteries, lightning arresters. Insulators.
8.6.2 Bus bar's material, types in detail.
8.7 Connection diagram and layout of sub-stations.

Sl. No.	Author	Title
1	Dr. S. L. Uppal	Electrical Power
2	Soni – Gupta – Bhatnagar	A course in Electrical Power
3	Prof. G. D. Rai	Non conventional Energy sources
4	Prof. Arrora and Dr. V. M. Domkundwar	A course in Power Plant Engineering
5	J B Gupta	Power System
6	C L Wadwah	Power System
7	Asfaque Hussain	Power System

Course Objective:

• To introduce the students to the general structure of the network for transferring power from generating stations to the consumers.

• To expose the students to the different electrical & mechanical aspects of the power network along with its environmental and safety constraints.

• To familiarize the students with the price structure of Indian power market.

Course Outcomes:

1. Ability to design and analyze the real time electrical transmission system with respect to various electrical parameters considering environmental and economic obligations

2. Develop the ability to implement the appropriate safety equipments for design of electrical power system with enhancing the efficiency of the transmission and distribution system with environment friendly technology.

3. Ability to implement the knowledge of basic mathematical ,physical and electrical principles to formulate significant electrical hazards

4. Judge the suitability of installing overhead and underground power transmission strategies considering electrical, mechanical, environmental, performance, safety and economic constraints

5. Chose the appropriate type of power generating station following norms and guidelines related to cost, environment, societal and ethical issues. Also review the different tariff systems available and determine the one most appropriate for a given scenario to optimize the revenue earned.

6. Recognize the need to continuously follow the advancements in technology and incorporating them in the present system to improve efficiency.

Electrical Workshop (Sessional)

Subject Code- ELE410
Full Marks- 100, No. Of classes per week-04

1. Identify the different electrical tolls & Accessories used in electrical Installation, Concept of gauge & switches.
2. Different types of Joints used in overhead levis/underground cable/electrical wiring.
3. Different types of wiring like casing, conduct beat, concealed conduct.
4. Fluorescent tube wiring.
5. wire up a call bell/buzzer.
6. Identify this mantle, sketch and assemble different electrical appliances.
7. Preparation of distribution board having 3 pin socket, tube controlled by independently switch.
8. Wiring circuits for staircase.
9. Wiring of Main Board with ICDP (main switch) and distribution fuse Box with MCB.
10. Prepare and wire, amount single phase energy meets.
11. Study and install house hold earthling.

Professional Practices-II

Subject Code : 401

Rationale:

Most of the diploma holders join industries. Due to globalization and competition in the industrial and service sectors the selection for the job is based on campus interviews or competitive tests.

While selecting candidates a normal practice adopted is to see general confidence, ability to communicate and their attitude, in addition to basic technological concepts.

The purpose of introducing professional practices is to provide opportunity to students to undergo activities which will enable them to develop confidence. Industrial visits, expert lectures, seminars on technical topics and group discussion are planned in a semester so that there will be increased participation of students in learning process.

Objectives:

Student will be able to:

1. Acquire information from different sources
2. Prepare notes for given topic
3. Present given topic in a seminar
4. Interact with peers to share thoughts
5. Prepare a report on industrial visit, expert lecture

Sl. No.	Activity Heads	Activities	Suggested Hrs
1.	Acquire information from different sources	Topic related to the branch and current area of interest i.e. articles in internet on which research or review is undergoing may be decided for the students group. The group may be restricted to maximum 5 students. Literature survey from Internet , print media and nearby practices may be undertaken. Minimum of 10 to 15 papers may be suggested for reading to get an overview and idea of matters.	12
2.	Prepare notes for given topic	Making review or concept to be penned down in form of a article .(the article or review may be of 8 – 10 pages length in digital form of 12 font size in Times New Roman font)	4
3.	Present given topic in a seminar	A seminar or conference or work shop on branch related topic is to be decided and all students in group of 5-6 students may be asked to present their views.	4
4.	Interact with peers to	A power point presentation of the article prepared in stage 2	4

	share thoughts	may be presented before the classmates and faculty members.	
5.	Prepare a report on industrial visit, expert lecture	A topic on best practices and product / software development may be assigned to the student group. The group may be asked to prepare a survey, come to opinion making and list out the activities to develop the activities with SWOT analysis.	12

RADHA GOVIND UNIVERSITY

RAMGARH, JHARKHAND

ENGINEERING AND TECHNOLOGY

SYLLABUS FOR ELECTRICAL ENGINEERING

CHOICE BASED CREDIT SYSTEM (CBCS)

Scheme of Teaching and Examination for

5th Semester of 3 Years Diploma in Electrical Engineering

Duration of Semester : **14 Weeks**

Student Contact Hours : **36 Hrs**

Total Marks : **800**

Effective from : **2022 -23 Session**

Sl. No.	*Name of Subject*	*Subject Code*	*Subject*	*Teaching Scheme*			*Examination Scheme*					
				L	*T*	*P*	*Hours of Exam*	*Full Marks of Subject*	*Final Exam / committee marks*	*Internal Assessment*	*Pass Marks Final / Ext. Exam*	*Pass Marks in Subjects*
1.	Power System II	ELE 503	Theory	3	-	-	3	100	80	20	26	40
2.	Electrical Machines II	ELE 504	Theory	3	-	-	3	100	80	20	26	40
3.	Traction	ELE 505	Theory	3	-	-	3	100	80	20	26	40
4.	Elective I	ELE 506/CSE503/ECE505	Theory	3	-	-	3	100	80	20	26	40
5.	Elective II	ELE 507/ECE406/ECE503/ELE508	Theory	3	-	-	3	100	80	20	26	40
6.	Electrical Machines II Lab	ELE 509	Practical	-	-	2	4	50	40	10	-	20
7.	Power System Lab	ELE 510	Practical	-	-	2	4	50	40	10	-	20
8.	Elective I lab	ELE 511/ELE 512/ELE 513	Sessional			2	-	50	30	20	-	25
9	Elective II Lab	ELE 514/ECE409/ECE512/ELE515	Sessional	-	-	2	-	50	30	20	-	25
10.	In Plant Training	502	sessional	-	-	-	-	50	30	20	-	25
11.	DLS	501	Sessional	-	-	4	-	50	30	20	-	25
Total Hours of Teaching per week :				**15**		**12**						

*Elective I (Illumination Engineering- ELE 506/ Micro. Processor & Micro. Controller- CSE*503*/ Programmable Logic Controller - ECE 505) Elective II (Maintenance of Electrical Machines ELE507/Control System ECE406/Instrumentation ECE503/ Robotics & Smart System ELE508)*

Total Marks : Theory : Practical : Sessional :

L : Lecture, T : Tutorial P : Practical

Note: 1. Period of Class hours should be of 1 hrs duration as per AICTE norms.

2. Remaining Hrs every week has been marked for students for Library and Student Centered Activities.

3. Drawing / Graphics / Practical / Sessional examinations will be held at parent institution.

4. Board will depute examiner for Practical examination.

5. Regarding sessional examination the parent institution will form a three member committee and this committee will examine the sessional records andhold viva of the examinee for 60 % marks allotted to the subject. Marks for remaining 40 % will be provided by the Faculty concerned on the basis of evaluation of each job / work throughout the semester.

6. Inplant Training of 04 weeks duration to be undertaken after 4th semester Exam and before start of 5th semester classes.

Subject : Power System -II
Subject Code : ELE 503
Total Hours : 42
Full Marks : 80 + 20 = 100

Content:

1. Transients in Power System and protection against them. Elements of Power System dynamics, Computer methods in Power System Analyses, load Flow Studies. 06 Hrs

2. Power transmission systems – Electrical characteristics of overhead lines and cables, Sag & Tension, Proximity, Corona, Skin effect, Bundled conductors, Transposition of conductors, Per unit representation of system quantities. Steady state performance of transmission network – ABCD parameters of short, medium and long lines. 12 Hrs

3. Methods of active and reactive power control – use of VAR compensators Elements of economic operations. Electricity tariffs. Distribution systems – feeders and distributors radial and mesh system – distribution sub-station – earthing, Important I.E. rules Indian Electricity Acts. 07 Hrs

4. Nature of faults in electrical systems, fault calculations, symmetric and asymmetric faults – method of sequence components – sequence networks. 05 Hrs

5. Study of Protective Devices- Isolators, disconnecting switch, lightening arrester, Horn gap, CT, PT, Protective relays and their applications to power apparatus and systems. Principles of circuit breakers – different types, oil circuit breakers, air circuit breakers, vacuum circuit breakers, SF_6 – circuit breakers, their uses and comparison. 12 Hrs

BOOKS :

1. Stevenson W.D. : Elements of Power System Analysis; McGraw Hill International Edn.

2. Grainger J J & Stevenson W.D. Power System Analysis ; McGraw Hill Intl. Edn.

3. Nagrah I J & Kothari D.P. : Power System Engg. TMH Pub. Co. Ltd.

4. Saadat: Power System Analysis, TMH

5. Pabla A.S. : Electric Power Distributors System TMH Pub.

6. K.C.Pal: Heat Power, Orient Longman

7. Wadhwa: Electrical Power Systems, New Age International

8. Wadhwa: High Voltage Engineering, New Age International

9. Protection & Switch gear – S.S. Rao

Course Objectives:

• To introduce the students to the general structure of the network for transferring power from generating stations to the consumers.
• To expose the students to the different electrical & mechanical aspects of the power network along with its environmental and safety constraints.
• To familiarize the students with the price structure of Indian power market.

Course Outcomes:

1. Ability to design and analyze the real time electrical transmission system with respect to various electrical parameters considering environmental and economic obligations
2. Develop the ability to implement the appropriate safety equipments for design of electrical power system with enhancing the efficiency of the transmission and distribution system with environment friendly technology.
3. Ability to implement the knowledge of basic mathematical , physical and electrical principles to formulate significant electrical hazards
4. Judge the suitability of installing overhead and underground power transmission strategies considering electrical, mechanical, environmental, performance, safety and economic constraints
5. Chose the appropriate type of power generating station following norms and guidelines related to cost, environment, societal and ethical issues. Also review the different tariff systems available and determine the one most appropriate for a given scenario to optimize the revenue earned.
6. Recognize the need to continuously follow the advancements in technology and incorporating them in the present system to improve efficiency.

Subject: Power System -Lab
Subject Code ELE510 Full marks 50

List of Experiments

1. Determination of Transient response of I st and II nd order systems
2. Experiment on circuit protection
3. Experiment on Power System dynamics
4. Study of different types of load Flows
5. Determination of losses in cables,
6. Determination of Sag & Tension in experimental setup
7. Study of Corona and Skin effects in transmission lines
8. Study of Steady state performance of transmission network
9. Determination of active and reactive power and study of control using VAR compensators.
10. Study of feeders and distributors
11. Measurement of earth resistance and earthing for electrical establishment
12. Determination / diagnosis of faults in electrical systems and fault rectification.
13. Study of , symmetric and asymmetric faults
14. Study of Protective Devices- Isolators, disconnecting switch, lightening arrester
15. Study of different circuit breaker

(Note : Minimum 10 experiments from the above list has to performed by students)

Subject : Electrical Machine -II
Subject Code : ELE504
Total Hours 42
Full Marks : 80 + 20 = 100

Contents: Theory

Chapter	Name of the Topic	Hours
01	**Three phase induction motor** 1.1 Construction of three phase induction motor 1.2 Production of rotating magnetic field 1.3 Principle of working/operation 1.4 Concept of slip 1.5 Equation of rotor induced emf, current, frequency, reactance, and impedance under steady and running condition 1.6 Torque equation of three phase induction motor 1.7 Starting and running torque of squirrel cage and slip ring induction motor 1.8 Condition for maximum and starting torque 1.9 Torque slip characteristics of three phase induction motor 1.10 Effect of change in rotor circuit resistance on torque-slip characteristics 1.11 Effect of change in supply voltage on torque-slip characteristics	08
	1.12 measurement of slip by a) Tachometer method b) Comparing rotor frequency and stator frequency 1.13 Speed control of three phase induction motor by a) Pole changing method b) Frequency control method c) By stator voltage control d) Rotor resistance control 1.14 Comparison between squirrel-cage and slip-ring induction motor. **1.15 Applications of three phase induction motor.** 1.16 Power stages of three phase induction motor. (Numerical on all above) 1.17 Double cage IM a) Construction b) Characteristic of outer, inner cage & combined characteristic c) Industrial Applications 1.18 I.M. as a generalized transformer 1.19 Vector diagram of IM	08
	1.20 Equivalent circuit of 3-phase IM (No numerical) 1.21 Starting of 3-phase IM (No numerical) a) Stator resistance starter b) Star-Delta starter c) Auto transformer starter d) Rotor resistance starter	02
02	**Three Phase Alternator** 2.1 Definition and construction of three phase Alternator a) Armature b) Rotor- smooth cylindrical & projecting type 2.2 Derivation of e.m.f. equation of Alternator which includes a) Chording factor b) Distribution factor	04

	2.3 Factors affecting the terminal voltage of Alternator a) Armature resistive drop b) Leakage reactance drop c) Armature reaction at various power factors & concept of Synchronous impedance 2.4 Regulation of three phase Alternator by a) Synchronous impedance method b) mmf method	04
03	**Synchronous Motor** 3.1 Principle of working/operation 3.2 Synchronous Motor on load with constant excitation 3.3 Effect of excitation at constant load 3.4 V curve & inverted V curve 3.5 Hunting & phase swinging 3.6 Applications 3.7 Starting of Synchronous Motor 3.8 Comparison between IM & Synchronous Motor (Numerical on all above)	06
04	**Single phase Motors** 4.1 Double field revolving theory 4.2 Types of Single phase IM 4.3 Split phasing principle of starting a) Resistance start induction run b) Capacitor start induction run c) Capacitor start Capacitor run d) Double value Capacitor applications motor 4.4 Shaded pole IM 4.5 Applications	06
05	**Special machines** 5.1 Induction Generator: Principle of operation, Construction and Applications 5.2 Linear Induction Motor Principle of operation, Construction and Applications 5.3 AC series motor Principle of operation, Construction and Applications	04
	Total	**42**

Learning objectives:

1. Describe the structure of Electric Drive systems and their role in various applications such as flexible production systems, energy conservation, renewable energy, transportation etc., making Electric Drives an enabling technology.
2. Understand basic requirements placed by mechanical systems on electric drives.
3. Review phasors and three-phase electric circuits.

Learning outcomes:

1.) Explain how electromagnetism can transfer electric energy to mechanical energy. 2.) Use the basic principles of physics to describe simple linear and rotational motion. 3.) Determine the torque-speed relationships for typical mechanical loads.
4.) Explain the key parts of magnetic circuits and perform basic magnetic circuit calculations. 5.) List the sources of power loss in magnetic circuits.
6.) Explain how electromagnetic forces produce motor action.

Subject : Electrical Machine -II Lab

Subject Code : ELE509

Practical:

Intellectual Skills: 1. Analytical Skills
2. Identification Skills

Motor Skills : 1. Measuring Skills
2. Connecting instruments

List of Practical:

1) a) To measure the slip of 3 phase IM by i) Tachometer
ii) Comparing rotor & stator frequency
iii) Stroboscopic method.

b) To reverse the direction of rotation of 3-phase IM.

2) To measure the performance of 3-phase IM by direct loading

3) To list different types of starters used for 3-phase IM .Identify & use the same to start & run 3-phase IM

4) Using an MG set (DC motor-Alternator) observe the effect of excitation & speed on induced e.m.f. & plot O.C.C. of the given alternator.

5) To find the percentage regulation of 3-phase alternator by synchronous impedance method at various power factors.

6) To find the percentage regulation of 3-phase alternator by direct loading Method at various power factors.

7) To list & explain various starting methods of synchronous motor & applying one of them to start the synchronous motor. Plot V & inverted V curve of the same.

8) To list the various types of 1-phase IM, Collect the literature for them from dealers/manufacturers of local places & compare on the following pts.
i) Method of starting ii) Cost iii) Performance iv) Starting torque etc. Prepare a report

Books:

Sr.No.	Author	Title	Publisher
01	S. K. Bhattacharya	Electrical Machines	TTTI, Chandigarh
02	B. L. Theraja	Electrical Technology Vol. II	S Chand & Co.
03	C. L. Dawes	Electrical Technology	--
04	P. S Bhimbra	Electrical Machines	
05	D.P. Khothari	Electrical Machines	
06	J. B. Gupta	Electrical Machines	
07	Ashfaq Hussain	Electrical Machines	
08	G. K Dubey	Electrical Drives	
09	A. Chakraborty	Electrical Machines	
10	M. G. Say	Electrical Machines & Design	

Subject : Traction
Subject Code : ELE 505
Full Marks : 80+20=100
Hours 42

Content-

Chapter	Chapter Name & Content	Hours
1	**Traction Systems and Latest Trends** **1.1** Explain the present scenario of Indian Railways – High speed traction, Metro **1.2** Detail the latest trends in traction- Metro, monorail, Magnetic levitation Vehicle **1.3** Explain types of traction systems and their significance – Steam, diesel, diesel-electric, Battery and electric traction systems **1.4** Explain the general arrangement of different types of Electric traction systems and their significance – General arrangement of D.C.,A.C. single-phase, 3phase, Composite systems **1.5** Choice of traction system – Diesel - Electric or Electric	**04**
2	**Mechanics of Train Movement** **2.1** Draw the speed time curve related to different traction system- Analysis of speed time curves for main line, suburban and urban services **2.2** Solve numerical based on speed time curve - Simplified speed time curves , Relationship between principal quantities in speed time curves **2.3** Calculate specific energy consumption- Requirement of tractive effort **2.4** State the factors affecting Specific energy consumption -Specific energy consumption and factors affecting it.	**07**
3	**Traction Motors and Their Control** **3.1** State the desirable features of traction motors. **3.2** Explain Significance of D.C. series motor over D.C. Shunt motor - Significance of D.C. series motor as traction motor **3.3** Explain working of various A.C. motors as traction motors - A.C. Traction motors – single phase, Three phase, Linear Induction Motor **3.4**Comparison between different traction motors **3.5 Apply various control methods applied to traction motors - Series –parallel control, Open circuit, Shunt and bridge transition, Pulse Width Modulation control of induction motors** **3.6** Explain different types of electric braking system	**15**
4	**Electric Locomotives and Auxiliary Equipment** **4.1** Classify electric locomotive -Important features of electric locomotives **4.2** Describe the function of auxiliaries in traction system -Different types of locomotives **4.3** Describe the different current collecting methods in locomotives- Current collecting equipment **4.4** Explain different control and auxiliary equipment used in the locomotive **4.5** Describe the power conversion and transmission systems - Power conversion and transmission systems **4.6** Explain Coach wiring and lighting devices-Coach wiring and lighting devices	**12**

5	**Feeding and Distribution System.** **5.1** Explain the distribution & feeder system pertaining to traction-distributions and feeders **5.2** Classify traction substations - Requirements and selection **5.3** Describe different methods of feeding the traction sub- station - Method of feeding the traction sub-station	**04**
	Total	**42 hours**

Book :-

SI.NO.	Title Name	Author's Name	Publication
1	Modem Electric traction	H. Partab	DhanpatRai and Sons, New Delhi
2	Electric traction	J. Upadhyay S.N. Mahendra	Allied Publishers Ltd., DhanpatRai and Sons, New Delhi
3	Electric traction	A.T. Dover	Mac Millan, DhanpatRai and Sons, New Delhi
4	Electric traction Hand Book	R.B. Brooks.	Sir Isaac Pitman and sons Ltd. London.

Learning Objectives:

1. Become familiar with railway terminology.
2. Identify the characteristics and the features of the various DC and AC traction systems.
3. Name catenary types and the main parameters affecting the railway system design.
4. Interpret the overall traction single line diagram for DC and AC systems.
5. Describe how the catenary is powered by the substations.

Learning Outcomes:

1. Identify different traction systems.
2. Differentiate speed time curve of different services of traction system.
3. Use traction system auxiliaries.
4. Calculate energy consumption of traction system.
5. Use various speed control methods applicable to traction motors.
6. Get exposure with modern trends in traction.

Subject : Illumination Engineering
Subject Code : ELE506
Total Hours 42
Full Marks : 80 + 20 = 100

Contents: Theory

Chapter	Name of the Topic	Hours
1	**Fundamentals of Illumination** 1.1 Illumination Terminology 1.2 Laws of Illumination 1.3 Featuring of good Illumination scheme 1.4 Advantages of good Illumination scheme 1.5 Measurement of level of Illumination (simple illumination)	06
2	**Lamps & Lighting Accessories** 2.1 Types of lamps: ARC lamps, HPMV lamps, Sodium Lamps, CFL Lamps, Metal halides, LED lamps 2.2 Neon Sign Tubes. 2.3 Neon Lamps. 2.4 Halogen Lamps. 2.5 Construction, working principle, advantages, disadvantages & Application of incandescent & Flurocent 2.6 Lighting accessories. (All fittings, switches, enclosers) 2.7 Illumination Auditing	08
3	**Illumination Control & Control Circuits** 3.1 Purpose of lighting control 3.2 Dimmer & Dimmer Transformer & their types 3.3 Electronic Dimmer 3.4 Enhancing Lighting control. 3.5 Control circuits for lamps (refer) : ON/OFF control & Illumination control.	06
4	**Illumination for Interior Applications** 4.1 Standard for various situations of Interior Illumination 4.2 Design Techniques 4.3 Design considerations for Interior location of Residential, Commercial, Industrial premises 4.4 Design Illumination scheme for different Interior locations of Residential, Commercial, Industrial unit.	08
5	**Illumination for Outdoor Applications** 5.1 Factory Lighting 5.2 Street Lighting (Latest Technology) 5.3 Flood Lighting 5.4 Railway Lighting 5.5 Lighting for Advertisement/Hoardings 5.6 Sports Lighting	08
6	**Lighting for Special Applications** 6.1 Agriculture & Horticulture 6.2 Health Care Centers / Hospitals 6.3 Decorating Purposes 6.4 Stage Lighting 6.5 Aquariums & Shipyards 6.6 Special purpose lamps used in photography video films.	06
	Total	**42**

Learning Objectives:

To make student understand the importance of illumination engineering in energy conservation and to guide them towards acquiring the knowledge regarding the fundamentals and elementary design aspects of artificial lighting.

Learning outcomes:

1. Apply an appropriate measurement and analysis technique of artificial lighting for different specific purposes.
2. Investigate on various types of electric bulbs as well as can evaluate their performance in terms of their colour rendering and luminous efficacy.
3. Develop a clear idea on various illumination techniques and hence can design lighting schemes for specific applications.
4. Select as well as apply an appropriate light fitting method for any specific application.
5. Identify, formulate, and figure out the need of research and development activities required for developing efficient artificial illumination.
6. Identify, formulate, and solve problems using advanced engineering principles, methodologies, and tools.

Subject : Illumination Engineering Lab
Subject Code : ELE511

Practical:

Skill to be developed:

Intellectual

Skills**:**

1. Apply different Designing Skills.
2. Select proper

equipment. Motor Skills**:**

1. Measurement of Illumination.
2. Drawing skills.

List of Practicals:

1. To Measure Illumination by luxmeter.
2. Visit to nearby lamp manufacturing industry.
3. **Prepare a report of different luminaries available in the market & collect the technicaldata**

   (Visit local market / Use internet for data collection).
4. Study the different lighting accessories required for varies types of lamps.
5. Design an Illumination scheme for a garden of medium size.
6. Design an Illumination scheme for a conference room of medium size.
7. Design an Illumination scheme for a workshop for fine work of medium size.
8. Design an Illumination scheme for a medium size Hotel / Hospital /Shopping complex.

Learning Resources:

Books:

Sr. No.	Author	Name of Book	Publisher & Address
1.	Jack L. Lindsey	Applied Illumination Engineering	The Fairmont Press Inc.
2.	R. H. Simons, Robert Bean	Lighting Engineering: Applied Calculations	Architectural Press (ISBN 0750650516)
3.	Casimer M Decusatis	Handbook of Applied Photometry	Springer (ISBN 1563964163)

Subject : Microprocessor & Microcontroller
Subject Code : CSE 503
Total Hour 42
Full Marks : 80 + 20 = 100

Study the Architecture of 8051 microcontroller.

UNIT I THE 8085 MICROPROCESSOR 4 Hrs

Introduction to 8085 – Microprocessor architecture , pin out diagram, – Addressing modes - Instruction set, Interrupts and interrupt service routines.

UNIT II THE 8086 MICROPROCESSOR 8 Hrs

Introduction to 8086 – Microprocessor architecture – Addressing modes - Instruction set and assembler directives – concept of pipelining, Assembly language programming – Modular Programming - Linking and Relocation - Stacks - Procedures – Macros – Interrupts and interrupt service routines – Byte and String Manipulation.

UNIT III 8086 SYSTEM BUS STRUCTURE 6 Hrs

8086 signals – Basic configurations – System bus timing –System design using 8086 – IO programming – Introduction to Multiprogramming – System Bus Structure - Multiprocessor configurations – Coprocessor, Closely coupled and loosely Coupled configurations.

UNIT IV I/O INTERFACING 6 Hrs

Memory Interfacing and I/O interfacing - Parallel communication interface – Serial communication interface – D/A and A/D Interface - Timer – Keyboard /display controller – Interrupt controller – DMA controller – Programming and applications Case studies: Traffic Light control, LED display , LCD display, Keyboard display interface and Alarm Controller.

UNIT V MICROCONTROLLER 6 Hrs

Architecture of 8051 – Special Function Registers(SFRs) - I/O Pins Ports and Circuits - Instruction set - Addressing modes - Assembly language programming.

UNIT VI INTERFACING MICROCONTROLLER 9 Hrs

Programming 8051 Timers - Serial Port Programming - Interrupts Programming – LCD & Keyboard Interfacing - ADC, DAC & Sensor Interfacing - External Memory Interface- Stepper Motor and Waveform generation.

Learning Objectives:

The student should be made to:

Study the Architecture of 8085 and 8086 microprocessor.

- Learn the design aspects of I/O and Memory Interfacing

- circuits. Study about communication and bus interfacing.

Learning Outcomes:

1. Understand the fundamentals of Microprocessors.
2. Understand the internal design of 8051 microcontroller along with the features and their programming.
3. Competent with the on chip peripherals of microcontrollers.
4. Design different interfacing applications using microcontrollers and peripherals.
5. Demonstrate the limitations and strengths of different types of microcontrollers and their comparison.
6. Build systems using microcontrollers for real time applications.

TEXT BOOKS:

1 Microprocessor Architechture, Programming and Applications with 8085 by Ramesh K Goankar, Galgotia Pub

2 Digital Computer System by Malvino (2nd Ed) TMH

Subject : Microprocessor & Microcontroller Lab
Subject Code : ELE512

LIST OF EXPERIMENTS:

8086 Programs using kits and MASM

1. Basic arithmetic and Logical operations

2. Move a data block without overlap

3. Code conversion, decimal arithmetic and Matrix operations.

4. Floating point operations, string manipulations, sorting and searching

5. Password checking, Print RAM size and system date

6. Counters and Time Delay

7. Traffic light control

8. Stepper motor control

9. Digital clock

Key board and Display

11. Printer status

12. Serial interface and Parallel interface

13. A/D and D/A interface and Waveform Generation using 8051

14. Basic arithmetic and Logical operations

15. Square and Cube program, Find 2"s complement of a number

16. Unpacked BCD to ASCII

Subject : Programmable Logic Controller
Subject Code : ECE505
Total Hours 42
Full Marks : 80 + 20 = 100

1. PLC Basics : 6 hrs
   An Overall Look at Programmable Logic Controllers - Introduction, definition & history of the PLC, manufacturing & assembly process, PLC advantage & disadvantage, overall PLC system, CPU & programmer/monitors, PLC input & output modules, printing PLC information. The PLC: A Look Inside - Introduction, the PLCas a computer, the central processing unit, solid state memory, the processor, I/O modules, power supplies. General PLC Programming Procedures - Introduction, programming equipment, programming formats, proper construction of PLC ladder diagrams, process scanning consideration, PLC operational faults. Devices to Which PLC Input and Output Modules Are Connected - Introduction, input ON/OFF switching device, input analog device, output ON/OFF device, output analog devices
2. PLC Programming : 6 hrs
   Programming On/Off Inputs to Produce On-Off Outputs - Introduction, PLC input instruction, output: coils, inductors & others, operational procedures, contact & coil input/output programming examples, a look at fail safe circuit, industrial process examples. Relation of Digital Gate Logic to Contact/Coil Logic - Digital logic gates, Boolean algebra PLC programming, conversion examples. Creating Ladder Diagrams from Process Control Descriptions - Ladder diagram & sequence listing, large process ladder diagram construction, flow charting as programming method
3. PLC Functions : 6 hrs
   Register - Introduction, general characteristics of registers, module addressing, holding registers, input registers: single & group, output registers: single & group. PLC Timer Functions - Introduction, PLC timer functions, examples of timer function industrial application, industrial process timing application. PLC Counter Functions - Introduction, PLC counters examples of counter function industrial application
4. Intermediate Functions : 6 hrs
   PLC Arithmetic Functions - Introduction, PLC addition & subtraction, the PLC repetitive clock, PLC multiplication, division & square-root: PLC trigonometric & log function, other PLC arithmetic functions. PLC Number Comparison Functions - Introduction, PLC basic comparison function, PLC basic comparison function application, PLC advanced comparison function. Numbering Systems and PLC Number Conversion Functions - Introduction, numbering system: decimal, binary & BCD, PLC conversion between decimal & BCD, OCTAL & HEX DECIMAL numbering system, other numbering & code system
5. **Data Handling Functions** 6 hrs
   The PLC SKIP and MASTER CONTROL RELAY Functions - Introduction, the SKIP function & application, the MASTER CNTROL RELAY function & application. Jump Functions - Introduction, jump with non-return, jump with return. PLC Data Move Systems - Introduction, PLC MOVE function & application, moving large blocks of PLC data, PLC table & registers moves, other PLC MOVE functions.

Other PLC Data Handling Functions - Introduction, PLC FIFO functions, the FAL function, the one shot (ONS), clear (CLR) & SWEEP functions

6. Working with Bits 8 hrs

PLC Digital Bit Functions and Applications - Introduction, bit pattern in a register, changing a register bit status, shift register function, shift register application. PLC Sequencer Functions - Introduction, electromechanical sequencing, the basic PLC sequencer function, a basic PLC sequencer application with timing, other PLC sequencer function, cascading sequencer. Controlling a Robot with a PLC - Introduction, basic two axis ROBOT with PLC sequencer control, industrial three axis ROBOT with PLC control. PLC Matrix Functions - Introduction, applying matrix functions to reduce program length, the PLC AND & OR matrix function, the PLC COMPLEMENT & OMPARE matrix function, combination PLC matrix operation

7. Advanced PLC Functions : 4 hrs

Analog PLC Operation - Introduction, types of PLC, analog modules & systems, PLC analog signal processing, BCD or multi-bit data processing, PLC analog output application examples.

Subject : Programmable Logic Controller Lab
Subject Code : ELE513

List of Experiments:

1 Study of PLC
2 Input instruction of PLC
3 Output operation of PLC
4 Conditional Control statement
5 Unconditional control statement
6 Creating and realizing logic gates
7 Data handling
8 Working with bits
9 Developing Robot functions
10 Multi bit data processing

Books :

1. Programmable Logic Controllers : Principles & Applications, John W. Webb and Ronald A.Reis, Prentice Hall India
2. Programmable Logic Controllers by Bolton, Elsever N Publication
3. Programmable Logic Controllers by FD Prestrusela, TMH
4. Programmable Logic Controllers: Programming Methods and Applications by John R. Hackworth and Frederick D. Hackworth Jr, Pearson

Learning Objectives:

1. Describe the four basic parts of any programmable logic controller (PLC).

2. Explain how a PLC program is different from a BASIC or Fortran program.

3. Explain the four things that occur when the PLC processor scans its program.

4. Compare how a PLC controls a conveyor sorting system to the way a typical solid-state logic circuit would control it.

Learning Outcomes:

1. Students will be able to describe typical components of a Programmable Logic Controller.
2. Students will be able to explain the basic concepts of a Programmable Logic Controller.
3. Students will be able to state basic PLC terminology and their meanings.
4. Students will be able to explain and apply the concept of electrical ladder logic, its history, and its relationship to programmed PLC instruction.
5. Students will be able to explain the concept of basic digital electronics and data manipulation.
6. Students will be able to use timer, counter, and other intermediate programming functions.

Subject : Maintenance of Electrical Machines (Elective-II)
Subject Code : ELE507
Full Marks : 80+20=100
Hours 42

1. **Safety and Accidents - 6 Hrs**
   Definition of terminology used in safety: Safety, hazard, accident, major accident hazard, responsibility, authority, accountability, monitoring.
   I.E. Act & statutory regulations for safety of persons and equipment working with electrical installation, causes of electrical accidents, preventive measures, electrical shocks, precaution to be taken against electrical shock, treatment for electrical shock. Causes of electrical fires, precaution to be taken to avoid fire, action to be taken in case of fire, fire fighting equipments.
2. **General Introduction - 7 Hrs**
   Concept of routine, preventive and breakdown maintenance, Advantages of preventive maintenance, procedure for developing preventive maintenance schedule, factors affecting preventive maintenance schedule. Introductionto total productive maintenance.
3. **Maintenance of Rotating machines 7 Hrs**
   Routine, preventive and breakdown maintenance of 1& 3 phase induction motors, Synchronous machines and D.C machines
4. **Maintenance of transformer 6 Hrs**
   Preventive and routine maintenance of distribution transformers, Periodic checks for replacement of oil, Silica gel, properties of a good transformer oil.
5. **Maintenance of insulation 6 Hrs**
   Classification of insulating, factors affecting life of insulating materials, measurement of insulation resistance, interpretation of conditions, agents that contaminate insulating oil, tests on insulating oil (a) Acidity test (b) Sludge test (c) Crackle test (d) flash point test
   Filtration of insulating oil for protection of electrical equipments (insulation) during period of inactivity.
   Procedure for cleaning, washing and drying insulation and revarnishing
   Methods of internal heating & vaccum impregnation.
6. **Troubleshooting of electrical machine & switchgear. 10 Hrs**
   Significance of trouble shooting of various electrical machines and describes the procedure for the same. Internal and external causes of failure of equipment, various types of faults (mechanical, electrical of magnetic) in electrical machines, Reason for their occurrences, use of following tools: Bearing puller, Filler gauge, dial indicator, spirit level, megger, earth tester, growler,
   Trouble shooting charts for 1 & 3 phase induction motor, 1 & 3 Phase transformer.
   List the common trouble in electrical installation and cables.

Maintenance and trouble shooting of LVS switchgear like MCCB, ELCB, Contactors & Batteries.

Subject : Maintenance of Electrical Machines Lab (Elective-II)
Subject Code : ELE514

List of Practical's

1. Safety precautions in lab while doing electrical work
2. **Safety equipments study**
3. Winding of Fan coil
4. Winding of single motor
5. Winding of three phase motor
6. Repairing of single phase transformer
7. Repairing of wiring system
8. Installation of machine
9. Repairing of starter
10. Repairing of mains
11. Study of various types of MCB and other circuit breakers

Books :-

1. Electricals Protection & Switchgear by S.S. Rao
2. Maintenance of Electrical Machine by J.B. Gupta
3. Testing Commisioning Operation & Maintenance Of Electrical Equipment by S. Rao
4. Installation Maintenance And Repair Of Electrical Machines And Equipments by Madhvi Gupta
5. Testing And Maintenance Of Electrical Machines by B.P. Patil

Subject : Control System (Elective-II)
Subject Code : ECE 406
Full Marks : 80+20=100
Hours 42

PART A

CONTROL SYATEM 4 Hrs

1. **Introduction:** Elements of control systems, concept of open loop and closed loop systems, Examples and application of open loop and closed loop systems, brief idea of multivariable control systems.

2. **Mathematical Modeling of Physical Systems**: 6 Hrs
Representation of physical system (Electro Mechanical) by differential equations, Determination of transfer function by block diagram reduction techniques and signal flow method, Laplace transformation function, inverse Laplace transformation

3. **Time Response Analysis of First Order and Second Order System**: 8 Hrs
Characteristic Equations, response to step, ramp and parabolic inputs. Transient response analysis, steady state errors and error constants, Transient & steady state analysis of LTI systems

4. **Control System Components:** 4 Hrs
Constructional and working concept of ac servomotor, synchronous and stepper motor

5. **Stability and Algebraic Criteria:** 4 Hrs
Concept of stability and necessary conditions,
Routh-Hurwitz criteria and limitations. Root Locus Technique: The root locus concepts, construction of root loci.

6. **Frequency Response Analysis**: 6 Hrs
Frequency response, correlation between time and frequency responses, polar and inverse polar plots, Bode plots

7. **Stability in Frequency Domain:** 4 Hrs
Nyquist stability criterion, assessment of relative stability: gain margin and phase margin, M and N Loci, Nichols chart.

8. Study of preliminary considerations of lead, lag and lead-lag networks, closed loop systems using compensation techniques in time domain and frequency domain. 4 Hrs

Controllers : Brief idea of proportional, derivative and integral controllers. 2 Hrs

BOOKS:

1. I. J.Nagrath and M.Gopal, "Control System Engineering", New Age International Publishers, 5th Edition, 2007.
2. Benjamin.C.Kuo, "Automatic control systems", Prentice Hall of India, 7th Edition,1995.
3. M.Gopal, "Control System – Principles and Design", Tata McGraw Hill, 2nd Edition, 2002.
4. Schaum's Outline Series, "Feed back and Control Systems" Tata Mc Graw-Hill, 2007.
5. John J.D'Azzo & Constantine H.Houpis, "Linear Control System Analysis and Design'", Tata Mc Graw-Hill, Inc., 1995.
6. Richard C. Dorf and Robert H. Bishop, "Modern Control Systems", Addison – Wesley, 1999.

Subject : Control System Lab (Elective-II)
Subject Code : ECE 409

List of Practical-

1. Transfer function of first and second order system
2. Syncros system control system study
3. AC position servo system study
4. DC position servo system study
5. Control through magnetic amplifier
6. Measurement of passive elements using Bridge Networks
7. Study of transducers and characterization
8. **Digital simulation of linear systems**
9. **Stability Analysis of Linear system using MATLAB or equivalent Software**
10. Study the effect of P, PI, PID controllers using MATLAB or equivalent Software
11. Design of Lead and Lag compensator

Learning Objectives:

1. To provide the fundamental knowledge of control system engineering and the concept of mathematical modeling of the physical system.
2. The subject gives various classical analysis tools for design and stability of system in time and frequency domain.

Learning outcomes:

1. Understand the concept of LTI control systems, Importance of feedback in CS and stability concept.
2. Able to Design a Stable Control System
3. Understand the difference between Linear and Digital Control Systems.
4. Interpret different physical and mechanical systems in terms of electrical system to construct equivalent electrical models for analysis.
5. Employ time domain analysis to predict and diagnose transient performance parameters of the system for standard input functions.
6. Formulate different types of analysis in frequency domain to explain the nature of stability of the system.

Subject - Instrumentation System
Subject Code – ECE503
Total Hours 42
Full Marks - 80 + 20 = 100

Unit I

Electronic Meters: 6 hrs

Electronic Analog voltmeter: DC voltmeters-Choppers type-DC amplifier, solid state voltmeter, Differential voltmeter, peak responding voltmeter, True RMS voltmeter, calibration of DC voltmeters. Digital Voltmeter:- Introduction, Ramp Techniques, dual slope, integrating type DVM, Successive approximation type DVM, Resolution and sensitivity of digital meters, general specification of a DVM. CRO's study of various stages in brief, measurement of voltage, current phase and frequency, special purpose oscilloscope.

Unit II

Instrumentation for Generation and Analysis of Waveforms: 6 hrs

Signal generators: Fixed and variable AF oscillators, AF sine and square wave generator, Function generator: Square and pulse generator, Sweep generator, wave analyzer, harmonic distortion analyzer, spectrum analyzer, spectrum analysis.

Unit III

Storage and Display Devices: 4 hrs

Necessity of recorders, recording requirements, graphic recorders, strip chart recorders, magnetic tape recorders, digital tape recorders. Electronic indicating instruments, seven segment display, fourteen segmental display Nixie tube.

Unit IV

Transducers and DATA Acquisition Systems: 6 hrs

Strain gauge, LVDT, thermocouple, piezoelectric, crystal and photoelectric transducers and their applications. Data acquisition systems. Unit VII Telemetry: Introduction, method of data transmission, types of telemetry systems and applications.

UNIT V

Instrumentation: 6 hrs

Types of Instrumentation systems, Data acquisition system (DAS) and its uses in intelligent Instrumentation system, Detailed study of each block involved in making of DAS, Signal Conditioners: as DA, IA, Signal Converters (ADC & DAC), Sample and hold, Designing of Pressure, Temperature measuring instrumentation system using DAS, Data logger.

UNIT VI

Automation 4 hrs

Introduction about Automation system, Concepts of Control Schemes, Types of Controllers, Components involved in implementation of Automation system i.e., DAS, DOS, Converter (I to P) and Actuators: Pneumatic cylinder, Relay, Solenoid (Final Control Element), Computer Supervisory Control System (SCADA), Direct Digital Control's Structure and Software.

UNIT VII

Plc & Intelligent Controller: 10 Hrs

Introduction of Programmable logic controller, Principles of operation, Architecture of Programmable controllers, Programming the Programmable controller. Introduction to Intelligent Controllers, Model based controllers, Predictive control, Artificial Intelligent Based Systems, Experts Controller, Fuzzy Logic System and Controller, Artificial Neural Networks, Neuro-Fuzzy Controller system.

Subject - Instrumentation Lab
Subject Code: ECE512
Full marks 50

List of Experiments:-

1. To determine output characteristic of a LVDT and determine its sensitivity.
2. Study characteristics of temperature transducer like Thermocouple, Thermistor and RTD with implementation of small project using signal conditioning circuit.
3. Study characteristics of Light transducer like Photovoltaic cell, Phototransistor and Pin Photodiode with implementation of small project using signal conditioning circuit.
4. To study input- output characteristics of a potentiometer and to use two potentiometers as an error detector.
5. To study transmitter- receiver characteristics of a synchro set to use the set as control component.
6. To study the operation of a d-c positional servo system and to investigate the effect of damping and supply voltage on its response.
7. To study the operation of an a.c. position servo-system and to obtain effects of supply voltage and system parameter on its transient response.
8. To study a stepper motor and control its direction speed and number of steps with the help of a microprocessor
9. **ADC Converter**
10. **DAC converters**
11. Study of Automation system
12. Intelligent controllers

Suggested Readings / Books:

1 Electrical and Electronic Measurements and Instrumentation, by K. SAWHNEY.
2 Electronic Instrumentation and Measurement Techniques, by D Cooper.
3 Electronic Instrumentation, by H.S. Kalsi, Tata McGraw Hill
4 Applied Electronics Instrumentation and measurement, David Buchla, Wayne Melachlan:
5 Electronics Measurement and Instrumentation, Oliver by B.H and Cag J.M. McGrawHill.
6 Element of Electronic Instrumentation & Measurement, by Carr, Pearson Education.
7 Electronic Measurements & Instrumentation, by Kishore, Pearson Education.
8 Process Control Systems and Instrumentation, Bartelt, Cengage Learning
9 Process Control Instrumentation Technology‖ 6/e, by Curtis D Johnson, Pearson Ed.
10 Computer-Based Industrial Control‖, by Krishna Kant, PHI.

Learning Objectives:

- Graduates will have a sound knowledge base and skill sets to develop and expand professional careers in fields related to instrumentation technologies, process control, and industrial processes automation.
- Graduates will be well-rounded individuals with strong personal skills, competent in all forms of communication, able to work in team environments, and possess a strong sense of professionalism.
- Graduates will meet industry expectations in managing ethical, societal, and environmental issues in the practice of Instrumentation Engineering Technology.
- Graduates will be capable of career advancement, professional development, and an understanding of the importance of life-long learning.
- Graduates will have a sound knowledge base in safety and safe practices, industry standards available through associated professional organizations, and regulating agencies for compliance.

Learning Outcomes:

- Apply the concepts of automatic control, including measurement, feedback and feed forward regulation for the operation of continuous and discrete systems.
- Design and implement systems utilizing analog/digital control devices.
- Apply the concepts of chemistry, physics & electric/electronics to measurement & control systems.
- Apply the concepts of digital and microprocessor systems and functionality of system components/devices for the automation of processes.
- Apply the concepts of measurements and sensor selection.
- Communicate the technical details of control systems using current techniques and graphical standards.

Subject : **Robotics & Smart System (Elective-II)**
Subject Code : **ELE508**
Full Marks : **80+20=100**
Hours : **42**

Module-I **[4Hrs]**

Fundamentals: Define Robot, Classification of Robots, Define Robotics, History of Robotics, Advantage and Disadvantages of Robots, Robot Components, Robot Sensing, Robot Degree of Freedom, Robot Joints, Robot Coordinates, Robot Reference Frames, Programming Modes, Robot Programming Language, Robot Applications.

Module-II **[4 Hrs]**

Robot Arm Kinematics: Robots as Mechanisms, Conventions, Matrix Representation: Representation of a Point in Space; Representation of a Vector in Space, Representation of Rigid Body, The Direct Kinematics Problem, The Inverse Kinematics Solution

Module-III **[3 Hrs]**

Robot Arm Dynamics: Lagrange-Euler Formulation, Newton-Euler Formation, Effective Moments of Inertia, Generalized D'Alembert Equation of Motion.

Module-IV **[4 Hrs]**

Panning of Manipulator Trajectories: Path versus Trajectory, Basics of Trajectory Planning, General Consideration on Trajectory Planning, Joint-interpolated Trajectories, Planning of Manipulator Cartesian Path Trajectories.

Module-V **[8 Hrs]**

Control of Robot Manipulators: Characteristics of Actuating Systems, Comparison of Actuating Systems, Hydraulic Actuators, Pneumatic Devices, Electric Motors: AC Motors; DC Motors; Servomotors; Stepper Motors, Microprocessor Control of Electric Motors, Magneto strictive Actuators, Speed Reduction.

Module-VI **[8 Hrs]**

Sensors: Sensor Characteristics, Sensor Utilization, Position Sensors: Potentiometers; Encoders; LVDT; Resolves; LMDT; Hall-effect Sensors, Velocity Sensors: Encoders; Tachometers; Differentiation of Position Signals, Acceleration Sensors, Force and Pressure Sensors: Piezoelectric; Force Sensing Resistor; Strain Gauge, Torque Sensors, Micro switches, Visible Light and Infrared Sensors, Touch Sensors, Proximity Sensors, Range Finder, Sniff Sensors,.

Module-VII **[5 Hrs]**

Robot Programming Languages: Characteristics of Robot Level Languages, A brief about AL and AML robot programming languages, Position Specification, Motion Specification, Sensing and Flow of Control, Programming Support, Characteristics of Task Level Languages, World Modelling, Task Specification, Robot Program Synthesis, Concluding Remarks.

Subject : Robotics & Smart System Lab (Elective-II)
Subject Code : ELE515

List of Experiments:

1. Configure the working of robots
2. Demonstrate the different types of sensor in robotics
3. Interface sensors using Microprocessor or Microcontroller
4. Measure various parameters of Electro-Mechanical Instruments Pressure, Flow, Speed and Moisture
5. Interface Actuators using Microprocessor or Microcontroller
6. Interface Drives using Microprocessor or Microcontroller
7. Interface Stepper Motor using Microprocessor or Microcontroller
8. **Use robot trainer to perform different tasks**
9. Develop a Program for Line Follower Configuration.
10. Develop a Program for coffee maker configuration

Reference Books:

1. K.S. Fu, R.C. Gonzalez, C.S.G. Lee, "Robotics: Control, Sensing, Vision and Intelligence", McGraw Hill Education (India Ed.)
2. Saeed B. Niku, "Introduction to Robotics: Analysis, Control, Application 2/E", Wiley India Edition
3. S.K. Saha, "Introduction to Robotics 2/E", McGraw Hill Education (India Ed.)
4. R.K. Mittle, I.J. Nagrath, "Robotics and Control", McGraw Hill Education (India Ed.)
5. Thomas R. Kurfess, "Robotics and Automation Handbook", CRC Press
6. Ashitava Ghosal, "Robotics: Fundamental Concepts and Analysis 1/E", Oxford University Press

Learning Objectives:

1. learn the leading trends and systems in natural language processing
2. obtain knowledge on significance of pragmatics for natural language understanding.
3. gain application based knowledge on natural language processing and to show the points of syntactic, semantic and pragmatic processing.

Learning Outcomes:

1. describe the real-world applications of NLP
2. summarize the approaches to syntax and semantics in NLP.
3. explain the concepts of discourse, generation, dialogue and summarization within NLP.
4. discuss the fundamentals of Robotic Natural Language Understanding
5. compare the machine learning techniques used in NLP
6. build text based dialogue systems

Subject Title : Development of Life Skills (Common Paper)
Subject Code: 502
Full Marks 50

Rationale:

In today's competitive world, the nature of individual and organizations is changing at very rapid speed. In this situation the responsibility of diploma holder is not unique. After completing his course work he has to face the world and seek meaningful employment also. Merely having knowledge is not sufficient these days. He has to show his communicative skill also. As such the individual skills with capability to show his strength and communicate his willingness new skills for further advancement with to impart his ability and acquiring has to be displayed and learned.

This subject will develop the student as an effective individual to grab the available situation and be member of the unseen team in which he may be put in . It will develop the abilities and skills to perform at highest degree of quality as an individual as well as a member of core group or team. Such skills will enhance his capabilities in the field of searching, assimilating information, managing the given task, handling people effectively, solving challenging problems.

Learning Objectives: The students will be able to:

1. Develop acumen to face interview.
2. Lead in the group discussion and set goals and targets for others
3. Develop team spirit i.e. concept of working in teams
4. Apply problem solving skills for a given situation
5. Use effective presentation techniques
6. Apply techniques of effective time management

Learning Outcomes:

1. Gain Self Competency and Confidence.
2. Practice Emotional Competency.
3. Gain Intellectual Competency.
4. Gain an edge through Professional Competency.
5. Aim for high sense of Social Competency.
6. Be an integral Human Being.

CONTENTS:

SOCIAL SKILLS

1. Social understanding for group discussion, imaginative thinking and develop free ideas .
2. SWOT Analysis – Concept, and know himself in details. Learn how to make use of SWOT.
3. **Inter personal Relation:-** How to effectively counter arguments of others without hearting their feeling Sources of conflict and conflict resolution, Ways to enhance interpersonal dependence and relations.
4. **Problem Solving**

I) STEPS IN PROBLEM SOLVING,

1) Identify and clarify the problem,
2) Information gathering related to problem,
3) Evaluate the evidence,
4) Consider alternative solutions and their implications,
5) Choose and implement the best alternative,
6) Review

II) Problem solving technique.(any one technique may be considered)

1) Trial and error
2) 2) Brain storming
3) 3) Lateral thinking

5. Presentation Skills

Body language --
Dress like the audience, Posture, Gestures, Eye contact and facial expression. STAGE FRIGHT,
Voice and language – Volume, Pitch, Inflection, Speed, Pause, Pronunciation, Articulation, Language, Practice of speech. Use of presentation aids, Summarizing the facts

6. Group discussion –

Introduction to group discussion, Ways to carry out group discussion, Parameters— Contact, body language, analytical and logical thinking, decision making

7. INTERVIEW TECHNIQUE

Necessity, Techniques to influence interviews and giving directions, Tips for handling common questions.

8. Working in Teams

Understand and work within the dynamics of a groups.
Tips to work effectively in teams,
Establish good rapport, interest with others and work effectively with them to meet common objectives,
Tips to provide and accept feedback in a constructive and considerate way ,
Leadership in teams, Handling frustrations in group.

9. Task Management

Introduction, Task identification, Task planning ,organizing and execution, Closing the task

BOOKS:

Sr. No	Title of the book	Author	Publisher
1	Adams Time management	Marshall Cooks	Viva Books
2	Basic Managerial Skills for All	E.H. Mc Grath , S.J.	Pretice Hall of India
3	Body Language	Allen Pease	Sudha Publications Pvt.
4	Creativity and problem solving	Lowe and Phil	Kogan Page (I) P Ltd
5	Decision making & Problem Solving	by Adair, J	Orient Longman
6	Develop Your Assertiveness	Bishop , Sue	Kogan Page India
7	Make Every Minute Count	Marion E Haynes	Kogan page India
8	Organizational Behavior	Steven L McShane and Mary Ann Glinow	Tata McGraw Hill
9	Organizational Behavior	Stephen P. Robbins	Pretice Hall of India, Pvt Ltd
10	Presentation Skills	Michael Hatton (Canada – India Project)	ISTE New Delhi
11	Stress Management Through Yoga and Meditation	--	Sterling Publisher Pvt Ltd
12	Target setting and Goal Achievement	Richard Hale ,Peter Whilom	Kogan page India
13	Time management	Chakravarty, Ajanta	Rupa and Company
14	Working in Teams	Harding ham .A	Orient Longman

RADHA GOVIND UNIVERSITY

RAMGARH, JHARKHAND

ENGINEERING AND TECHNOLOGY

SYLLABUS FOR ELECTRICAL ENGINEERING

CHOICE BASED CREDIT SYSTEM (CBCS)

Scheme of Teaching and Examination for

6th Semester of 3 Years Diploma in Electrical Engineering

Duration of Semester : **14 Weeks**

Student Contact Hours : **36 Hrs**

Total Marks : **800**

Effective from : **2022 -23 Session**

Sl. No.	Name of Subject	Subject Code	Subject	Teaching Scheme			Examination Scheme					
				L	T	P	Hours of Exam	Full Marks of Subject	Final Exam / committee marks	Internal Assessment	Pass Marks Final / Ext. Exam	Pass Marks in Subjects
1.	Industrial Engineering & Management	601	Theory	3	-	-	3	100	80	20	26	40
2.	Utilization of Electrical Energy	ELE 604	Theory	3	-	-	3	100	80	20	26	40
3.	Power Electronics	ECE 504	Theory	3	-	-	3	100	80	20	26	40
4.	Elective III	ELE 605/606/607	Theory	3	-	-	3	100	80	20	26	40
5.	Elective IV	ELE608/ECE507/ ECE511/ELE609	Theory	3	-	-	3	100	80	20	26	40
6.	Power Electronics Lab	ECE513	Sessional	-	-	2	-	50	30	20	-	25
7.	Utilization of Electrical Energy Lab	ELE 610	Sessional	-	-	2	-	50	30	20	-	25
8.	Elective III lab	ELE611/612/613	Sessional	-		2	-	50	30	20	-	25
9.	Elective IV Lab	ELE614/ECE515/ ECE519/ELE615	Sessional	-		2	-	50	30	20	-	25
10	Project Work	603	Sessional	-	-	4	-	50	30	20	-	25
11	Professional Practices	602	Sessional	-	-	4	-	50	30	20	-	25
Total Hours of Teaching per week :				**15**		**16**						

Elective III (Energy Conservation & Audit- ELE605/ Renewable Energy Sources-ELE606/Bye laws for Electrical Enginers-ELE607)

Elective IV (Smart Grid-ELE608/VLSI-ECE507 /DSP-ECE511/ Communication System-ELE609)

Total Marks: Theory : Practical : Sessional :

L : Lecture, T : Tutorial P : Practical

Note: 1. Period of Class hours should be of 1 hrs duration as per AICTE norms.

2. Remaining Hrs every week has been marked for students for Library and Student Centered Activities.

3. Drawing / Graphics / Practical / Sessional examinations will be held at parent institution.

4. Board will depute examiner for Practical examination.

5. Regarding sessional examination the parent institution will form a three member committee and this committee will examine the sessional records and hold viva of the examinee for 60 % marks allotted to the subject. Marks for remaining 40 % will be provided by the Faculty concerned on the basis of evaluation of each job / work throughout the semester.

Subject : Industrial Engineering & Management (Common Paper)

Subject Code 601

Full Marks : 80+20 = 100

L	T	P
3	0	0

Rationale:

After completion of three years of technical training, Polytechnic students are expected to enter in to the World of Work. The business environment is altogether different and new to the students. A proper introduction and understanding of Business Processes is therefore essential for all Polytechnic students. Management is a subject which deals with basics of Management science required to understand the processes the in Industrial & Commercial environment. This will enable the students of Polytechnic to become familiar and to understand various Business Organizational structures, their functioning and the Role these technicians will have to play in these setups with responsibilities.

Industrial Engineering is concerned with the design, improvement and installation of integrated systems of people, materials, equipment and energy. Polytechnic students must be able to analyze the use and cost of the resources of the organization in order to achieve the objective, i.e. to increase productivity, profits etc. and carryout the policies efficiently and effectively.

Detailed Syllabus

1. **Productivity :** **02 Hrs**

   Production and productivity, importance of productivity, factors affecting productivity, means of increasing productivity.

2. **Plant Layout and Material Handling :** **02 Hrs**

   Definition of plant layout, objectives of good plant layout, principles of plant layout, types of plant layout, flow pattern, steps in planning the layout for a new enterprise, definition of material handling, functions and principles of material handling, material handling devices.

3. **Work Study :** **04 Hrs**

   Definition, concept and need for work study, objectives of method study and work measurement, basic procedure/steps in method study, recording technique, critical examination, principles of motion economy, stop watch procedure for collecting time study data, including performance rating and allowances, work sampling.

4. Production Planning and Control (PPC) : 04 Hrs

Definition and objectives of PPC, functions of PPC, routing, scheduling, loading, dispatching, production control definition and objectives, principle of sound production control system.

5. Material, Purchase and Stores Management : 04 Hrs

Definition, functions& objectives of materials management, inventory control, economic order quantity (EOQ), ABC analysis. Objectives of purchasing department, buying techniques, purchasing procedure (steps involved in one complete purchasing cycle); functions of stores department, location and layout of stores, receipt and issue of materials.

6. Quality Control and TQM : 04 Hrs

Meaning of quality and quality control, dimensions of quality, quality circle, concept and definition of TQM, elements of TQM, Kaizen, 5 'S' and six sigma.

7. Management : 04 Hrs

Various definition, concept of management, levels of management, administration and management, scientific management by F. W. Taylor. Principles of management (14 principles of Henry Fayol). Functions of management - planning, organizing, coordinating, directing, controlling, decision making.

8. Organizational Management : 04 Hrs

Organization - definition, steps in forming organization. Types of organization. Types of organization - line, line and staff, functions, project type. Departmentation- Organized and decentralized, authority and responsibility, span of control (management). Forms of ownership - proprietorship, partnership, joint stock company, co-operative society, govt. sector.

9. Human Resource Management : 06 Hrs

Personnel Management – Introduction, definition, function. Staffing – Introduction to HR, Introduction to HR Planning, Recruitment procedure. Personnel- Training & Development – Types of training, Induction, Skill enhancement. Leadership & Motivation – Leadership- Styles & types, Motivation- Definition, Intrinsic, &Extrinsic, Moslow's theory of Motivation and its significance. Safety Management – Causes of accident, Safety Procedures. Introduction, Objectives & feature of Industrial Legislation such as – Factory act, ESI act, Workman compensation act, Industrial dispute act and salary & wages.

10. Financial Management : 04 Hrs

Financial Management- Objectives & Functions. Capital Generation & Management- Types of capitals, Sources of finance. Budgets and accounts- Types of budgets, Production budget (including varience report), Labour budget, Introduction to Profit & Loss Accounts (Only concept), Balance sheet etc.

11. Entrepreneurship : 04 Hrs

Concept and definition of entrepreneur and entrepreneurship, factors influencing entrepreneurship, entrepreneurial characteristics, need for promotion of entrepreneurship and small scale industries, steps in setting up a small scale industrial enterprise.

References Books :

1. Industrial Engineering and Management by O. P. Khanna
2. Industrial Engineering and Production Management by M. Mahajan.
   Publisher :Dhanpat Rai Publication (P) Ltd. New Delhi

3. Business Administration and Management by Dr. S. C. Saksena
   Publisher :Sahitya Bhawan, Agra.

Learning Objectives:

1. Familiarize environment in the world of work.
2. Explain the importance of management process in Business.
3. Identify various components of management.
4. Describe Role & Responsibilities of a Technician in an Organizational Structure.
5. Apply various rules and regulations concerned with Business & Social responsibilities of the technician.

Learning Outcomes:

1. an ability to apply engineering design to produce solutions that meet specified needs with consideration of public health, safety, and welfare, as well as global, cultural, social, environmental, and economic factors
2. an ability to communicate effectively with a range of audiences
3. an ability to recognize ethical and professional responsibilities in engineering situations and make informed judgments, which must consider the impact of engineering solutions in global, economic, environmental, and societal contexts
4. an ability to function effectively on a team whose members together provide leadership, create a collaborative and inclusive environment, establish goals, plan tasks, and meet objectives
6. an ability to acquire and apply new knowledge as needed, using appropriate learning strategies.

Subject : Utilization of Electrical Energy
Subject Code : ELE604
Full Marks : 80+20=100
Hours 42

Contents: Theory

Chapter	Name of the Topic	Hours
01	**Illumination:** 1.1 Definitions of Terms Used in Illumination: Light, Luminous Flux, Luminous Intensity, Lumen, Candle Power, Illumination, Lux or Meter Candle, Mean Horizontal Candle Power (MHCP), Mean Spherical Candle Power (MSCP), Mean Hemi-spherical Candle Power (MHSCP), Reduction Factor, Lamp Efficiency, Specific Consumption, Glare, Space-Height Ratio, Utilisation Factor, Maintenance Factor, Depreciation Factor, Waste Light Factor, Absorption Factor, Reflection Factor, Solid Angle. 1.2 Laws of Illumination: - Law of Inverse Squares - Lambert's Cosine Law. (No Numerical) 1.3 Sources of Light: Construction, Working and Applications of Following Lamps: - Incandescent Lamps. - Halogen Lamps. - Low Pressure Mercury Vapour Lamps (Fluorescent Tube). - High Pressure Mercury Vapour Lamps. - Sodium Vapour Lamps. - Compact Fluorescent Lamps (C.F.L.) - Metal Halide Lamps - LED Lamps - Neon Signs. 1.4 – Basic Principles of Light Control. 1.5 – Types of Lighting Schemes. Direct, Semi-direct, Semi-indirect, Indirect, General Lighting. 1.6 – Design of Lighting Scheme: Objectives of Lighting Scheme. Factors to be considered While Designing the Lighting Scheme. (Simple Numericals) 1.7 - Factory Lighting: - General Requirements - Types of Installations: General Lighting, Local Lighting, Emergency Lighting. 1.8 – Lumen or Light Flux Method of Lighting Calculations. (Simple Numericals) 1.9 – Flood Lighting - Flood Lighting Purposes. - Classification of Projectors. - Location and Mounting of Projectors. (Simple Numericals) [no numerical]	05

02	**Electric Heating and Welding: Electric Heating:** 2.1.1 – Advantages of Electric Heating. 2.1.2 – Modes of Transfer of Heat: - Conduction, Convection and Radiation. 2.1.3 – Classification of Electric Heating Methods: 2.1.4 – Resistance Heating:(Construction & Operation) - Direct Resistance Heating: Salt Bath Furnace. - Indirect Resistance Heating: Resistance Ovens, Requirements of Heating Element Material, Causes of Failure of Heating Elements, Methods of Temperature Control. - Applications of Resistance Heating. 2.1.5 – Arc Heating: (Construction & Operation) - Direct Arc Furnace: - Indirect Arc Furnace. - Applications of Arc Heating. 2.1.6 –Induction Heating: (Construction & Operation) - Core Type Induction Furnaces: Ajax Wyatt Furnace. - Coreless Induction Furnace. - Applications of Induction Heating. (Simple Numericals on Melting Furnaces) 2.1.7 – Dielectric Heating: - Principle of Dielectric Heating. - Advantages of Dielectric Heating - Limitations of Dielectric Heating. - Applications of Dielectric Heating. (Simple Numericals on Dielectric Heating) 2.1.8 Eddy current heating Principle, advantages and applications	05
	Electric Welding: 2.2.1 – Methods of Electric Welding: Electric Arc Welding, Resistance Welding. 2.2.2 – Resistance Welding: - Principle of Resistance Welding. - Advantages of Resistance Welding. - Types of Resistance Welding - (Only List) 2.2.3 – Spot Welding Machine. 2.2.4 – Electric Arc Welding: - Formation and Characteristics of Electric Arc. - Effect of Arc Length. - Arc Blow. 2.2.5 – Polarity in DC Welding: 2.2.6 – Electrodes for Metal Arc Welding: 2.2.7 – V-I Characteristics of Arc Welding . 2.2.8 – Arc Welding Machines:[only list] - DC Welding Machines – MG Set, AC Rectified Welding Unit. - AC Welding Machines – Welding Transformer.	05
03	**Elevators:** 3.1 Types of electric elevators 3.2 Size and shape of elevator car 3.3 Speed of elevators 3.4 Location of elevator machine 3.5 Types of elevator machines, elevator motors 3.6 Power transmission gears braking 3.7 Safety in elevators	04

04	**Electric Drives:** 4.1 – Introduction: - What is drive? - Drives – Mechanical Drive and Electric Drive. 4.2 – Advantages and Disadvantages of Electric Drive. 4.3 – Factors Governing Selection of Electric Motors. 4.4 - Nature of Electric Supply: 3 φ & 1φ AC and DC. 4.5 - Type of Drive: Group Drive & Individual Drive. 4.6 - Nature of Load: Nature of the Mechanical Load, Matching of the Speed Torque Characteristics of the Motor with that of the Load, and Starting Conditions of the Load. 4.7 - Electrical Characteristics: (Only DC Series, Three Phase and Single Phase Induction Motors are to be dealt) - Running Characteristics: Three Typical Speed Torque Characteristics – Inverse, Constant Speed and Drooping. - Starting Characteristics: Starting Torque only. (No Starters). - Speed Control: Suitability to Economic and Efficient Speed Control Methods (Above and Below Normal Speed). - Braking Characteristics: Plugging, Rheostatic Braking and Regenerative Braking, as Applied to DC Series and Three Phase Induction Motor.Only characteristics and applications of following motors D.C. Series ,1phase A.C. Series, 1phase I.M., 3phase I.M., Universal motor, Stepper motor. Requirements of Motors used in following applications, stone crushing, textile industry, paper manufacturing industry, rolling mill, chemical industry. 4.8 - Mechanical Features: - Type of Enclosure as per IS - Type of Bearings - Type of Transmission for Drive - Noise Level. 4.9 - Size and Rating of Motor: - Load Cycles for – Continuous Loads, Short Time Loads, Intermittent Loads, Continuous Operation with Short Time Loads and Continuous Operation with Intermittent Loads. - Duty Cycles. - Standard Ratings for Motors as per ISS.	07
	- Estimation of Rating of a Motor. (Simple Numericals on Estimating Size of Continuously Rated Motor) - Load Equalisation. (No Calculations) 4.10 - Cost: - Capital Cost - Running Cost (Losses, p.f., Maintenance).	

05	**Electric Traction:** 5.1 – Requirements of an Ideal Traction System. 5.2 – Traction Systems: - Non-electric Traction Systems. - Electric Traction Systems: Straight Electric Traction, Its advantages and Disadvantages. Diesel Electric Traction, Its advantages and Disadvantages. 5.3 - Systems of Track Electrification: DC System, Composite System – Single Phase to Three Phase System and Single Phase AC to DC System (Kando System). Advantages and Disadvantages of Single Phase 25 KV AC System Over DC System. 5.4 – Traction Mechanics: - Units Used in Traction Mechanics. - Types of Services. - Speed Time Curve. - Simplified Speed Time Curve (No Derivation) - Average Speed and Schedule Speed. - Factors Affecting The Schedule Speed. - Tractive Effort [No Derivation] - Specific Energy Consumption [No Derivation] - Factors Affecting Specific Energy Consumption. - Coefficient of Adhesion. (Simple Numerical on Simplified Speed Time Curves and Specific Energy Consumption) 5.5 – Traction Motors: - Desirable Characteristics of Traction Motors, Special features of traction motor.only advantages ,disadvantages and applications of following motors - Suitability of DC Series Motor for Traction. - Suitability of Three Phase Induction Motor for Traction. , LIM, 1phase ac series motor. 5.6 - Traction Motor Control: - Requirements. - Traction Control of DC Locomotives and EMUs: Series Parallel Control Combined with Rheostatic Control, Transition from Series to Parallel Combination (Open Circuit Transition, Shunt Transition and Bridge Transition), Energy Efficiency and Limitations of Series Parallel cum Rheostatic Control, Chopper Control of Motors in DC Traction Systems. - Traction Control System of AC Locomotives: Tap Changer, Step less Voltage Control through Use of Thyristors, PWM	10
	5.7 – Braking: - Requirements of a Braking System. - Mechanical Braking: Vacuum Braking, Com- pressed Air Braking, Hand Brake for Parking. - Electric Braking: Rheostatic Braking and Regenerative Braking. (No Derivation and No Numericals). - Sequence of Braking - Dead Man's Handle	

06	Economic Aspects of Utilising Electrical Energy: 6.1 – Economic Aspects of Utilising Electrical Energy. 6.2 – Costing of Electrical Energy: Fixed Charges, Semi Fixed Charges and Running Charges. 6.3 – Formulation of Electrical Tariffs. 6.4 – Various Types of Tariffs: Tariffs in force for Domestic, Commercial and Industrial Consumers.Simple,Block rate,Two part,Three part, KVA, MD, P.F. Tarriffs. 6.5 – Power Factor Improvement: Causes of Low Power Factor, Disadvantages of Low Power Factor, Power Factor Improvement by using Static Capacitors, Location of Capacitors for Power Factor Improvement, Most Economical Power Factor. Automatic Power Factor Controller (Derivation and Simple Numericals) 6.6 – Energy Conservation: Importance and need of Energy Conservation, Measures for Energy Conservation in (i) Electric Drives (ii) Electric Traction (iii) Electric Heating (iv) Refrigeration and Air Conditioning (v) Illumination.	06
	Total	**42**

Subject : Utilization of Electrical Energy Lab
Subject Code : ELE610

List of Experiments

1. Study of different types of Lamps (Incandescent Lamps. Halogen Lamps. - Low Pressure Mercury Vapour Lamps (Fluorescent Tube,- High Pressure Mercury Vapour Lamps. - Sodium Vapour Lamps. - Compact Fluorescent Lamps (C.F.L.), - Metal Halide Lamps, - LED Lamps, - Neon Signs)
2. Calculation of loads in terms of provision of lighting
3. V-I Characteristics of Arc Welding .
4. Study of Types of elevator motors and elevator system.
5. Study of Power transmission gears braking
6. Speed Control: Suitability to Economic and Efficient Speed Control Methods.
7. Experiment on Braking Characteristics in reference to Plugging and Rheostatic Braking
8. Study of Traction systems
9. Experiment on Power factor improvement.
10. Study of Refrigeration and Air Conditioning.

Books:

Sr. No.	Author	Title	Publisher
01	H. Partab	Art & Science of Utilisation of Electrical Energy	Dhanpat Rai & Sons
02	J. B. Gupta	Utilisation of Electric Power & Electric Traction.	S. K. Kataria & Sons
03	G. C. Garg	Utilisation of Electric Power & Electric Traction.	Khanna Publishers
04	J. Upadhyay S. N. Mahendra	Electric Traction	Allied Publisher Ltd.
05	G. K. Dubey	Fundamentals of Electrical Drives	Narosa Publishing House.

Learning Objectives:

This subject gives a comprehensive idea in utilization of electrical power such as drives, electric heating, electric welding and illumination, electric traction, electrolysis, refrigeration airconditioning and automobile electric system.

Learning Outcomes:

1. Able to maintain electric drives used in an industries
2. Able to identify a heating/ welding scheme for a given application
3. Able to maintain/ Trouble shoot various lamps and fittings in use
4. Able to figure-out the different schemes of traction schemes and its main components
5. Able to design a suitable scheme of speed control for the traction systems
6. Able to identify the job/higher education / research opportunities in Electric Utilization industry.

Subject : Power Electronics
Subject Code : ECE504
Total Hours 42
Full Marks : 80 + 20 = 100

Content:

1. Power semiconductor devices PNPN diodes, DIACS Thyristors, TRIACS, G.T.O. devices. Power Transistors, Power MOSFET, Rating, Losses and Cooling. Triggering circuits for SCR's, UJT, Blocking Oscillators, Schmitt trigger circuits – Power MOS gate drive circuits.

10 hrs

2. Uncontrolled and controlled Rectifiers : Single phase and poly phase Bridge rectifiers. Transformer ratings. Inductive load, free wheeling diodes. Converter operation: Overlap, power factor, inversion, regulation, P-pulse converters, power factor control via PWM converters

6 hrs

3. D.C. line commutation : Series and parallel capacitor turn off, resonant turn off, impulse commutation. D.C. Choppers : Principles, classification, use.

6 hrs

4. Frequency conversion : Cycloconverter single and three phase circuits, blocked group operation, circulating current mode. Single phase and three phase inverters, constant voltage source andconstant current source inverters, HF inverters for heating.

12 hrs

5 **Application: D.C. and A.C. drives, S.M.P.S., Resonant converters, A.C. Line Filters, ratio, interference suppression. HDVC transmission.**

8 hrs

BOOKS :

1. Ramamurthy M – An Introduction to Thysistors and their applications
2. Lauder C W - Power Electronics, 3rd Edn. MHI 1993
3. Sen P C – Power Electronics, TMH
4. Rashid M H – Power Electronics, PHI Pub.
5. Dubey S K – Thysistorised Power Controller; John Wiley & Sons
6. Singh M D & Khanchandni : Power Electronics ; TMH Pub.
7. Dewan S B & Stranghen A – Power Semiconductors circuit
8. Mohan N, Underland T M & Robbins W P : Power Electronics, John Wiley & Sons.
9. Bose B K : Modern Power Electronic ; Jaico Pub. House
10. Dubey G.K.: Thyristorised Power Controllers, New Age International
11. Subramanyam: Power Electronics, New Age International
12. Sugandhi: Thyristors: Theory & Applications, New Age International

Subject : Power Electronics Lab
Subject Code : ECE513

1. study of v-i characteristics of an scr.
2. study of v-i characteristics of a triac.
3. study of different trigerring circuits for thyristor.
4. study of uni- junction transistor (ujt) trigerring circuit.
5. study of a firing circuit suitable for single phase half controlled convertor.
6. simulation on the single phase ac-dc uncontrolled convertor with & without the source inductance.
7. Simulation of a single phase ac to controlled dc convertor with & without the source inductance.
8. single phase half controlled bridge convertor with two thyristors & two diodes.
9. single phase fully controlled bridge convertor using four thyristors.
10. pspice simulation of dc to dc step down chopper.
11. pspice simulation of single phase controller with r-l load.
12. pspice simulation of pwm bridge invertor of r-l load using mosfet.

Learning Objectives:

1. Examine the characteristics of various devices and application of firing circuits used in power electronics.
2. Outline the performance characteristics of AC voltage regulators, choppers, inverters, rectifiers and cycloconverters.
3 Demonstrate the working principle of various power electronic devices and circuits using simulation.
4. Design the simple power electronic circuits through digital simulation.

Learning Outcomes:

1. Understand the operation of power electronic devices and its applications.
2. Analyze the I-V characteristics of SCR, DIAC and TRIAC.
3. Analyze the characteristics of MOSFET, IGBT and UJT.
4. Illustrate the functioning of rectifiers and firing circuits.
5. Distinguish the speed control of DC motor using converters.
6. Design the different power electronic circuits using MATLAB/Simulation.

Subject : Energy Conservation & Audit (Elective III)
Subject Code : ELE605
Full Marks : 80+20=100
Hours 42

1. Energy Audit Methodology and recent trends. 11 Hrs

General Philosophy, need of Energy Audit and Management, EC Act, Definition and Objective of Energy Management, General Principles of Energy management. Energy Management Skills, Energy Management Strategy. Economics of *implementation* of energy optimization projects, its constraints, barriers and limitations, Financial Analysis: Simple Payback, IRR, NPV,

Discounted Cash flow;

Report-writing, preparations and presentations of energy audit reports, Post monitoring of energy conservation projects, MIS, Case-studies / Report studies of Energy Audits. Guidelines for writing energy audit report, data presentation in report, findings recommendations, impact of renewable energy on energy audit recommendations. Instruments for Audit and Monitoring Energy and Energy Savings, Types and Accuracy. Case studies of implemented energy cost optimization projects in electrical utilities as well as thermal utilities.

2. Electrical Distribution and Utilization: 11 Hrs

Electrical Systems, Transformers loss reductions, parallel operations, T & D losses, P.F. improvements, Demand Side management (DSM), Load Management, Harmonics & its improvements Energy efficient motors and Soft starters, Automatic power factor Controllers, Variable speed drivers, Electronic Lighting ballasts for Lighting, LED Lighting, Trends and Approaches. Study of 4 to 6 cases of Electrical Energy audit and management (Power factor improvement, Electric motors, Fans and blowers, Cooling Towers, Industrial/Commercial Lighting system,

3. Thermal Systems: 10 Hrs

Boilers- performance evaluation, Loss analysis, Water treatment and its impact on boiler losses, integration of different systems in boiler operation. Advances in boiler technologies, FBC and PFBC boilers, Heat recovery Boilers- it's limitations and constraints. Furnaces- Types and classifications, applications, economics and quality aspects, heat distributions, draft controls, waste heat recovering options, Furnaces refractory- types and sections. Thermic Fluid heaters, need and applications, Heat recovery and its limitations. Insulators- Hot and Cold applications, Economic thickness of insulation, Heat saving and application criteria. Steam Utilization Properties, steam distribution and losses, steam trapping, Condensate, Flash steam recovery.

4. System Audit of Mechanical Utilities: 10 Hrs

Pumps, types and application, unit's assessment, improvement option, parallel and series operating pump performance. Energy Saving in Pumps & Pumping Systems. Bloomers (Blowers) types & application, its performance assessment, series & parallel operation applications & advantages. Energy Saving in Blowers Compressors types & applications, specific power consumption, compressed air system & economic of system

changes. Energy Saving in Compressors & Compressed Air Systems Cooling towers, its types and

performance assessment & limitations, water loss in cooling tower. Energy Saving in Cooling Towers .Study of 4 to 6 cases of Energy Audit & Management in Industries (Boilers, Steam System, Furnaces, Insulation and Refractory, Refrigeration and Air conditioning, Cogeneration, Waste Heat recovery etc.)Study of Energy Audit reports for various Industries and Organizations.

Subject : Energy Conservation & Audit Lab (Elective III)
Subject Code : ELE611

List of Experiments

1. Calculation of energy units based on points
2. Selection of points based on illumination required in any room of installation
3. Report writing about faults and excessive billing
4. Impact of solar system installation for 10 % load in any establishment
5. Power Factor improvement.
6. Study of FBC & PFBC.
7. Study of Boilers and Properties of fittings on them.
8. Study of Pumps
9. Study of Pumps in series operation.
10. Study of Pumps in parallel operation

Reference Books:

1. Energy Audit and Management, Volume-I, IECC Press
2. Energy Efficiency in Electrical Systems, Volume-II, IECC Press
3. Energy Management: W.R.Murphy, G.Mckay, Butterworths Scientific
4. Energy Management Principles, C.B.Smith, Pergamon Press
5. Industrial Energy Conservation, D.A. Reay, Pergammon Press
6. Energy Management Handbook, W.C. Turner, John Wiley and Sons, A Wiley Interscience
7. Industrial Energy Management and Utilization, L.C. Witte, P.S. Schmidt, D.R. Brown, Hemisphere Publication, Washington, 1988

Learning Objective:

1. The knowledge of existing and upcoming industrial utility and energy management theory that allows the student to have a solid theoretical knowledge and be able in the future to design and development of various energy management technologies.

2. The skill to identify, formulate and solve fields problem in a multi-disciplinary frame individually or as a member of a group.

Learning Outcomes:

1. Understand energy scenario and policy
2. Understand the significance and procedure for energy conservation and audit.
3. Understand causes and remedies for global energy issues.
4. Analyze, calculate and improve the energy efficiency and performance of electrical utilities.
5. Analyze, calculate and improve the energy efficiency and performance of mechanical utilities.
6. Understand the applications of Internet of Things (IoT) in the energy sector.

Subject : **Renewable Energy Sources (Elective III)**
Subject Code : **ELE606**
Full Marks : **80+20=100**
Hours : **42**

Content:

INTRODUCTION [8 hours]
World Energy Use – Reserves of Energy Resources – Environmental Aspects of Energy Utilisation – Renewable Energy Scenario in Jharkhand, India and around the World – Potentials – Achievements / Applications – Economics of renewable energy systems.

SOLAR ENERGY [8 hours]
Solar Radiation – Measurements of Solar Radiation – Flat Plate and Concentrating Collectors – Solar direct Thermal Applications – Solar thermal Power Generation – Fundamentals of Solar Photo Voltaic Conversion – Solar Cells – Solar PV Power Generation – Solar PV Applications.

WIND ENERGY [8 hours]
Wind Data and Energy Estimation – Types of Wind Energy Systems – Performance – Site Selection – Details of Wind Turbine Generator – Safety and Environmental Aspects

BIO–ENERGY [9 hours]
Biomass direct combustion – Biomass gasifiers – Biogas plants – Digesters – Ethanol production – Bio diesel – Cogeneration – Biomass Applications

OTHER RENEWABLE ENERGY SOURCES [9 hours]
Tidal energy – Wave Energy – Open and Closed OTEC Cycles – Small Hydro-Geothermal Energy – MSD, Hydrogen and Storage – Fuel Cell Systems – Hybrid Systems.

Subject : **Renewable Energy Sources Lab (Elective III)**

Subject Code : **ELE612**

List of Experiments:

1. Study of Solar Unit
2. Study of Solar Dryer
3. Study of Solar Panels and Storage System.
4. Study of Wind Mills
5. Study of Wind turbine generator
6. Impact of Wind Speed on Turbine Generator
7. Visit to Biogas Plant
8. Generation of Bio diesel from Biomass
9. Study of Wave Energy Generator
10. Study of Hybrid Energy Generation System

TEXT BOOKS:

- Rai. G.D., “Non Conventional Energy Sources”, Khanna Publishers, New Delhi, 2011.
- Twidell, J.W. & Weir, A., “Renewable Energy Sources”, EFN Spon Ltd., UK, 2006.

REFERENCES:

- Sukhatme. S.P., “Solar Energy”, Tata McGraw Hill Publishing Company Ltd., New Delhi, 1997.
- Godfrey Boyle, “Renewable Energy, Power for a Sustainable Future”, Oxford University Press, U.K., 1996.
- Tiwari. G.N., Solar Energy – “Fundamentals Design, Modelling & Applications”, Narosa Publishing House, New Delhi, 2002.
- Freris. L.L., “Wind Energy Conversion Systems”, Prentice Hall, UK, 1990.
- Johnson Gary, L. “Wind Energy Systems”, Prentice Hall, New York, 1985
- David M. Mousdale – “Introduction to Biofuels”, CRC Press, Taylor & Francis Group, USA 2010
- Chetan Singh Solanki, Solar Photovoltaics, “Fundamentals, Technologies and Applications”, PHI Learning Private Limited, New Delhi, 2009.

Learning Outcomes:

1. Understand the various forms of conventional energy resources.
2. Learn the present energy scenario and the need for energy conservation
3. Explain the concept of various forms of renewable energy
4. Outline division aspects and utilization of renewable energy sources for both domestics and industrial application
5. Analyse the environmental aspects of renewable energy resources.

Learning Outcomes:

1. Describe the environmental aspects of non-conventional energy resources. In Comparison with various conventional energy systems, their prospects and limitations.
2. Know the need of renewable energy resources, historical and latest developments.
3. Describe the use of solar energy and the various components used in the energy production with respect to applications like - heating, cooling, desalination, power generation, drying, cooking etc.
4. Appreciate the need of Wind Energy and the various components used in energy generation and know the classifications. 5. Understand the concept of Biomass energy resources and their classification, types of biogas Plants- applications
6. Compare Solar, Wind and bio energy systems, their prospects, Advantages and limitations.

Subject : Bye Laws for Electrical Engineers (Elective III)
Subject Code : ELE 607
Full Marks : 80+20=100
Hours 42

Content-

1.	Energy Consumption Rules & Laws	04 Hrs
2.	Power point and power calculation in domestic and industrial, commercial establishment Rules	06 Hrs
3.	Energy Audit and Billing/Tariff Rules	06 Hrs
4.	Different Consumers supply Voltage Regulation and Limitations Rules.	05 Hrs
5.	Different BS & ISO Standards for electrical appliances	05 Hrs
6.	Compensation Rules related to Electrical Accidents	04 Hrs
7.	Electrical cables and wires Rules	04 Hrs
8.	Rules Related to High Power Units locations in Domestic areas.	04 Hrs
9.	Workman eligibility and compensation rules for Electricians	04 Hrs

Subject : Bye Laws for Electrical Engineers Lab (Elective III)
Subject Code : ELE 613

List of Experiments

Report Writing based on the following topics

1 Energy Consumption Rules & Laws
2. Power point and power calculation in domestic and industrial Rules.
3. Electrical commercial establishment Rules
4. Energy Audit and Billing/Tariff Rules
5. Different Consumers supply Voltage Regulation and Limitations Rules.
6. Different BS & ISO Standards for electrical appliances
7. Compensation Rules related to Electrical Accidents
8. Electrical cables and wires Rules
9. Rules Related to High Power Units locations in Domestic areas.
10. Workman eligibility and compensation rules for Electricians.

Books:

1. Different Act & Laws Promulgated by GoI
2. Different Rules Adopted by Jharkhand Govt related to Electrical supply and Transmission

Subject : Smart Grid (Elective IV)
Subject Code : ELE608
Full Marks : 80+20=100
Hours 42

Content

1. Introduction to Smart Grid, Architecture of Smart Grid System, Standards for Smart Grid System, Elements and Technologies of Smart Grid System 6 Hrs

2. Communication Technologies for Power System:

   Fiber Optical Networks, WAN based on Fiber Optical Networks, IP based Real Time data Transmission, Substation communication network, Zigbee.Information System for Control Centers (ICCS): ICCS Configuration, ICCS communication Network, ICCS Time Synchronization.
   E-Commerce of Electricity, GIS, GPS 8 Hrs

3. **Integration, Control and Operation of Distributed Generation:**
   Distributed Generation Technologies and its benefits, Distributed Generation Utilization Barriers, Distributed Generation integration to power grid. 10 Hrs

4. Monitoring the smart grid: 10 Hrs
   Load dispatch centers, wide-area monitoring control and protection of Micro

5. Micro grid: 8 Hrs
   Integration of distributed energy sources; concept, operation, control and protection of Micro

Subject : Smart Grid Lab (Elective IV)
Subject Code : ELE614

List of Experiments"

1. Study of Architecture of Smart Grid
2. Fiber Optical Network Study
3. Study of Smart Control Panel at sub station
4. Study of Smart metering of Consumers
5. Optimization of Energy Consumption through Smart Grid
6. Study of Load Dispatch through Smart Grid
7. **Study of Phasor Measurement Unit**
8. Study of Concept of Islanding
9. Study of communication infrastructure for Smart Grid
10. Study of Smart Billing System

Reference Books:

1. Smart power grids by A Keyhani, M Marwali.
2. Computer Relaying for Power Systems by ArunPhadke
3. Microgrids Architecture and control by Nikos Hatziargyriou
4. Renewable Energy Systems by Fang Lin Luo, Hong Ye
5. Voltage-sourced converters in power systems_ modeling, control, and applications by Amirnaser Yazdani, Reza Iravani" grid. Hybrid Power Systems: Integration of conventional and non- conventional energy sources.

Course Objectives:

1. Smart electric power grids, including definition, design criteria, technology and IoT.
2. Information processing and communications to the power grid.
3. Understanding the development of the smart grid,
4. Smart grid design, implementation, evaluation and management of smart electricity infrastructure.

Course Outcomes:

1. Identify the key elements of Smart Grids and visualise the roadmap towards next-Gen electricity networks.
2. Evaluate technology options pertaining to renewable energy generation, energy storage, data handling and communications for Smart Grids.
3. Justify technological and economical choices in the context of existing commercial Smart Grids projects and suggest improvements and expansions.
4. Determine the relevance of Smart Grids projects, develop ways to evaluate their impacts and implications
5. Analyse the new roles of utilities and consumers in Smart Grids and pinpoint business and market opportunities and potential gains.
6. Understand the operation and importance of data acquisition devices and their location in Voltage and Frequency control.

Subject : VLSI (Elective-IV)
Subject Code : ECE507
Total Hours 42
Full Marks : 80 + 20 = 100

Content-

1. Introduction: 8 hrs
   Introduction to Computer-aided design tools for digital systems. Hardware description languages, Introduction to VHDL, Data objects, Classes and data types, Operators, Overloading, and Logical operators. Types of delays, Entity and Architecture declaration Introduction to behavioral, dataflow and structural models
2. VHDL Statements: 6 hrs
   Assignment statements, Sequential Statements and Process, Conditional Statements, Case Statements, Array and Loops, Resolution Functions, Packages & Libraries, Concurrent Statements.
3. Applications of VHDL: 8 hrs
   Combinational Circuit Design such as such as Multiplexers, Encoders, Decoders, Code Converters, Comparators, and Implementation of Boolean functions etc., Sequential Circuit Design such as Shift registers, Counters etc.
4. Review of MOS Devices: 6 hrs
   MOS Structure, Enhancement & Depletion Transistor, Threshold Voltage, MOS device design equations MOS Transistor Models. NMOS, PMOS, CMOS.
5. Basic Electrical Properties and Circuit Concepts: 8 hrs
   The NMOS Inverter and Transfer Characteristics pull up and pull down ratios of NMOS, alternative forms of pull up the CMOS Inverter and transfer characteristics. CMOS Inverter Delays. Driving large Capacitive loads, Propagation delays and effect of wiring capacitance.
6. **Circuit Characterization and Performance Estimation: 6 hrs**
   Estimation of R, C, L, Switching Characteristics-delay models. Power dissipation. Scaling of MOS circuits. Effect of device scaling on circuit performance.

Subject : VLSI Lab (Elective-IV)
Subject Code : ECE515

List of Experiments: Combinational Design Exercises

1. Design of basic Gates: AND, OR, NOT.
2. Design of universal gates
3. Design of 2:1 Mux using other basic gates
4. Design of 2 to 4 Decoder
5. Design of Half-Adder, Full Adder, Half Substractor, Full Substractor
6. Design of 3:8 Decoder
7. Design of 8:3 Priority Encoder
8. Design of 4 Bit Binary to Grey code Converter

9. Design of 4 Bit Binary to BCD Converter using sequential statement

10. Design an 8 Bit parity generator (with for loop and Generic statements)

11. Design of 2,s Complementary for 8-bit Binary number using Generate statements Sequential Design Exercises

12. Design of all type of Flip-Flops using (if-then-else) Sequential Constructs

13. Design of 8-Bit Shift Register with shift Right, Rhisft Left, Load and Synchronous reset.

14. Design of Synchronous 8-bit Johnson Counter.

15. Design of Synchronous 8-Bit universal shift register (parallel-in, parallel-out) with 3- state output (IC 74299)

16. Design of 4 Bit Binary to BCD Converter using sequential statement.

17. Design counters (MOD 3, MOD 5, MOD 8, MOD 16)

18. Design a decimal up/down counter that counts up from 00 to 99 or down from 99 to 00.

19. Design 3-line to 8-line decoder with address latch

Recommended Text Books:

1. ―A VHDL Primmer‖: Bhasker; Prentice Hall 1995.

2. Weste and Eshrighian, ―Principle of CMOS VLSI Design‖ Pearson Education, 2001.

3. Pucknell D A and Eshraghian K, ―Basic VLSI Design‖, Prentice Hall India, New Delhi (2003).

4. Fundamentals of Digital Logic with VHDL Design: Brown and Vranesic; TMH(2000)

5. S. M. Kang, Y. Lebiebici, ―CMOS digital integrated circuits analysis & design‖ TMH, 3rd Edition.

Learning Objectives:

- To study HDL based design approach.
- To learn digital CMOS logic design.
- To nurture students with CMOS analog circuit designs.
- To realize importance of testability in logic circuit design.
- To overview SoC issues and understand PLD architectures with advanced features.

Learning Outcomes:

- Model digital circuit with HDL, simulate, synthesis and prototype in PLDs.
- Understand chip level issues and need of testability.
- Design analog & digital CMOS circuits for specified applications.
- Identify the various IC fabrication methods.
- Express the Layout of simple MOS circuit using Lambda based design rules.
- Apply the Lambda based design rules for subsystem design

Subject : Digital Signal Processing (Elective-IV)
Subject Code : ECE511
Total Hours 42
Full Marks : 80 + 20 = 100

Content-

UNIT I Introduction: 14

Limitations of analog signal processing, Advantages of digital signal processing and its applications; Some elementary discrete time sequences and systems; Basic elements of digital signal processing such as convolution, correlation and autocorrelation, Concepts of stability, causality, linearity, difference equations. DFT and its properties; Linear Periodic and Circular convolution; Linear Filtering Methods based on DFT; Fast Fourier Transform algorithm using decimation in time and decimation frequency techniques; Goertzel algorithm.

UNIT II The Z Transform: 8 hrs

Introduction, Z-Transform, Region of convergence; Inverse Z Transform methods, properties of Z transform.

UNIT III Design of Digital Filters: 14 hrs

Structures of realization of discrete time system, direct form, Cascade form, parallel form and lattice structure of FIR and IIR systems. Linear Phase FIR filters; **Design methods for FIR filters**; IIR filter design by Impulse Invariance, Bilinear Transformation, Matched Z-Transformation, Analog and Digital Transformation in the Frequency Domain. Finite Precision Effects: Fixed point and Floating point representations, Effects of coefficient unitization, Effect of round off noise in digital filters, Limit cycles.

UNIT IV DSP Processors: 6 hrs

Architectures of ADSP and TMS series of processor.

RECOMMENDED TEXT BOOK

1. Digital Signal Processing Principles, Algorithms and Application John G Proakis, Dimtris G Manolakis 4th 2009.

Books Recommended

1. Discrete-Time Signal Processing Alan V Oppenheim, Ronald W Schafer, John R Back 2nd 2008, Prentice Hall.
2. Digital Signal Processing S. Salivahan, A Vallavaraj, Gnanpiya 1st 2008 Tata McGraw Hill.
3. Digital Signal Processing-A computer based approach S. K. Mitra 1st 2006 Tata McGraw Hill
4. Jervis, ―Digital Signal Processing‖, Pearson Education India.
5. Introduction to Digital Signal Processing Johny R. Johnson 1st 2006, Prentice Hall.

Subject : Digital Signal Processing Lab (Elective-IV)
Subject Code : ECE519

List of Experiments:

Perform the following exercises using MATLAB

To develop elementary signal function modules (m-files) for unit sample, unit step, exponential and unit ramp sequences.

2. Write a program in MATLAB to generate standard sequences.

3. Write a program in MATLAB to compute power density spectrum of a sequence.

4. To develop program modules based on operation on sequences like signal Shifting, signal folding, signal addition and signal multiplication.

5. Write a program in MATLAB to verify linear convolution.

6. Write a program in MATLAB to verify the circular convolution.

7. To develop program for finding magnitude and phase response of LTI system Described by system function H(z).

8. To develop program for finding response of the LTI system described by the difference equation.

9. To develop program for computing inverse Z-transform.

10. To develop program for computing DFT and IDFT.

11. To develop program for conversion of direct form realization to cascade form realization.

12. To develop program for cascade realization of IIR and FIR filters.

13. To develop program for designing FIR filter.

14. To develop program for designing IIR filter.

15. To write a MATLAB program for noise reduction using correlation and autocorrelation methods.

Learning Objectives:

This course is designed to give students the required knowledge for DFT, FFT, Z Transforms and its computation and understand the design techniques for digital filters.

Learning Outcomes:

1. Understand the analytical tools such as Fourier transforms, Discrete Fourier transforms, Fast Fourier Transforms and Z-Transforms required for digital signal processing.
2. Get familiarized with various structures of IIR and FIR systems.
3. Design and realize various digital filters for digital signal processing.
4. Understand the applications of DSP in speech processing and spectrum analysis.
5. Illustrate digital signals, systems and their significance.
6. Analys e the digital signals using various digital transforms DFT, FFT etc.

Subject : Communication System (Elective-IV)
Subject Code : ELE609
Full Marks : 80+20=100
Hours 42

Content -

Chapter	Chapter Name & Content	Hours
1	**Introduction to electronic communication** 1.1 Importance 1.2 Block diagram of communication system 1.3 Modulation 1.3.1 Need for modulation 1.4 Types of Electronics communications 1.4.1 Simplex 1.4.2 Duplex – Full & Half 1.4.3 Digital 1.4.4 Analog 1.5 Applications of communication 1.6 The electromagnetic spectrum (different bands &their frequencies) 1.7 Concept of Transmission band width.	04
2	**Amplitude modulation & Frequency modulation** 2.1 Definition 2.2 Modulation index – definition, its effect on modulated signal, simple numerical. 2.3 Mathematical representation of amplitude modulated wave & its meaning (concept of sidebands) 2.4 Bandwidth requirement 2.5 Representation of AM signal in time & frequency domain. 2.6 Power relation in AM wave, simple numerical. 2.7 Frequency modulation (definition) 2.8 Definition – Deviation ratio, max. Deviation ratio. 2.8 Mathematical representation of frequency modulation and its meaning. 2.9 Representation of frequency modulated signal in time domain and frequency domain. 2.10 Bandwidth representation – simple numerical 2.11 FM signal generation using reactance modulator circuit (transistorized) 2.12 Concept with graph – pre emphasis and de-emphasis. 2.13 Block diagram of FM transmitter explanation with waveform (Armstrong frequency modulation system)	09
3	**Wave Propagation** 3.1 Fundamental of electromagnetic wave. 3.2 Transverse electromagnetic wave, Polarization. 3.3 Ground wave 3.4 Ionosphere 3.5 Sky wave propagation 3.6 Concept of actual height and virtual height. 3.7 Definition – critical frequency, max. useable frequency, skip distance, fading	06

	3.8 Space wave propagation. **3.9** Duct propagation **3.10** Troposphere scatter propagation	
4	**Introduction of Digital communication** 4.1 Basic digital communication system, block diagram 4.2 Channel capacity – definition, Hartley's law, Shannon – Hartley theorem, Channel capacity equation, channel noise and its effect, entropy 4.3 Advantages and disadvantages of digital communication	**04**
5	**Pulse Communication** 5.1 Introduction, comparison with Continuous Wave Modulation, advantages 5.2 Sampling theorem, Nyquist rate, aliasing, natural & Flat top sampling. 5.3 PAM, PWM, PPM definition, generation, block diagram, waveform analysis, and their comparison. 5.4 Pulse code modulation- block diagram of PCM transmitter & receiver, sampling quantization, quantization error, compading, inter symbol interference 5.5 Delta modulation – block diagram of DM, slope overload, granular noise. 5.6 ADM, DPCM, block diagram and its working.	**14**
6	**Multiplexing and Multiple Access** 6.1 Need of Multiplexing, TDM, FDM definition block diagram and their comparison. 6.2 Introduction to WDM. 6.3 Access technique TDMA, FDMA, CDMA (only concept), advantages of TDMA over FDMA.	**05**
	Total	**42 hours**

Subject : Communication System Lab (Elective-IV)
Subject Code : ELE615

Based on the theoretical paper, faculty will be decide minimum 10 Experiments to be performed by the Students.

Books:

SI. No.	Subject Name	Author's Name	Publication
1	Electronic Communication System	George Kennedy	TMH
2	Electronic Communication	Dennish Roddy& John Colen	PHI
3	Communication Electronics - Principles& Applications	Louis E Frenzel -3rd edition	TMH
4	Communication System	Sanjay Sharma	S.K. Kateria & sons
5	Digital Communication	Siman Haykin	John wiley& sons
6	Analog & Digital Communication	HSU & Mitra	TMH

Learning Objectives:

- Understand and apply communication theory
- Critically think about communication processes and messages
- Write effectively for a variety of contexts and audiences
- Interact skillfully and ethically

Learning Outcomes:

- Basic working of communication system
- Analog Modulation Techniques and their comparative analysis and applications suitability.
- Process of Modulation and Demodulation.
- Types, characterization and performance parameters of transmission channels.
- Analog to digital conversion and Digital data transmission.
- Multiplexing Techniques.

Subject : Professional Practices (Common Paper)
Subject Code : 602

Rationale:

Most of the diploma holders join industries. Due to globalization and competition in the industrial and service sectors the selection for the job is based on campus interviews or competitive tests.

While selecting candidates a normal practice adopted is to see general confidence, ability to communicate and attitude, in addition to basic technological concepts.

The purpose of introducing professional practices is to provide opportunity to students to undergo activities which will enable them to develop confidence. Industrial visits, expert lectures, seminars on technical topics and group discussion are planned in a semester so that there will be increased participation of students in learning process.

Activities to be undertaken:

Students are expected to undertake these activities:

1. Acquire information from different sources (Print and electronic) on the topics of specialization and related to the subjects of II and final year. The class is to be divided in groups of not more than five to six students in a group and all groups are to be allotted topic of their choice. The topic should not be repeated to other group for originality of work to be performed by the group. This activity will develop interdependence and leadership among the students.

2. Prepare notes for given topic at point no 1. The notes will be in form of a project report, having all the sections of report. The report should not be of 30 – 50 pages.

3. Prepare presentation and Present the learning and finding on given topic in a seminar. The presentation should be prepared in Power Point module having more than 25 slides. All students should be asked to deal with suitable parts decided by the group itself.

4. Interact with peers to share thoughts. After the final presentation the students should be encouraged to interact with the faculty members, students' fellows and other experts for suggestions and advanced and structured learning.

5. Undertake industrial visit of their area and choice. Prepare a report on industrial visit. Expert lectures on the topic selected may be invited for the students and these expert lectures also the students should be asked to prepare a report and present the same in seminar or have a group discussion before the expert and faculty members.

6. Develop entrepreneurial traits. Students group may be asked to have a field survey and product assessment and analysis for a product of their choice. Prepare a report for all the inputs of their requirement and submit it for evaluation.

7. To prepare for start ups. Expert lectures for exploring this option may be arranged as this is also a viable option and much talked about option for self employment and avail the encouragement by the government.

Based on the above rationales students will advised to develop traits under guidance of dedicated faculty members / mentors.

Learning Objectives:

- Cognitive: having to do with knowledge and mental skills.
- Psychomotor: having to do with physical motor skills.
- Affective: having to do with feelings and attitudes.
- Interpersonal/Social: having to do with interactions with others and social skills.

Learning Outcomes:

1. Communicate effectively in written and spoken English to transfer complex knowledge and ideas to technical and non-technical audiences.
2. Identify and use appropriate sources of information when developing professional documents.
3. Maintain and develop appropriate, effective and professional forms of documentation.
4. Demonstrate effective team membership skills and contribute collaboratively within diverse team environments.
5. Articulate and reflect on the industry expectations of competence and conduct in engineering and computing professions.
6. Learning outcomes are measurable statements that concretely formally state what students are expected to learn in a course.