School of Engineering and Technology
Diploma
Programme Structure &Syllabus

Electrical Engineering

2022-23

K.K. University
Bihar Sharif, Nalanda - 803115

K.K. UNIVERSITY 803115 NALANDA

Pro Vice Chancellor
KK University
Berauti, Nepura, Bihar Sharif
Nalanda - 803115 (Bihar)

Contents

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PREFACE

The vision of the K. K. University, Bihar Sharif, Nalanda, the first private university in the state of Bihar, established in 2017, is to ensure excellence in higher education. As highlighted by Shri(Er.) Ravi Choudhary, the Hon'ble Chancellor of K. K. University, the technical education is the key to the socio–economic development in the current era of knowledge based economy of the country. In this reference, the K. K. University, Bihar Sharif has accepted the responsibility of providing modern engineering education in all branches of relevance to the state of Bihar and India using scientifically planned syllabi which is suitable for faster economic development and is industry relevant, innovation oriented and which promotes the entrepreneurship in its students.

In view of these guidelines and as per the present needs of a upgraded modern syllabus in all branches of engineering, Diploma degrees of which are offered by K. K. University, a scientifically engineered new syllabus has been prepared by young and dynamic team of teachers of this university which is presented in this document. A multi and interdisciplinary approach has been taken in preparation of syllabus to provide a complete package of in-depth theoretical as well as practical knowledge in all branches of engineering in which Diploma degrees are offered by this university.

I am sure that this document, describing all relevant information branch wise at one place will be extremely useful to all stakeholders including teachers and students to have a broad and focused knowledge of K.K. University's sincere efforts in development of quality human recourses in engineering disciplines. I express my gratitude to Hon'ble Chancellor, Er. Ravi Chaudhary and Hon'ble Pro-Chancellor, Er. Richee Ravi, Hon'ble Vice-Chancellor, Prof. (Dr.) B. Narayana, Hon'ble Pro-Vice-Chancellor, Prof. (Dr.) Rumki Bandyopadhyay for their extremely useful suggestions and guidance in preparation of this document. I also express my sincere thanks to all Head of Departments and teachers of K.K. University for their hard work and sincere efforts in shaping the present document. Efforts of Kumar Vikram of Mechanical Engineering, Kriti Raj of Electrical Engineering and Ramsevak Sharma of Civil Engineering Departments are sincerely acknowledged and appreciated from inner core of my heart. I also appreciate the hard work put in by Mr. Gopal Kumar, IT Officer of the university in final printing of the documents of all branches of Engineering.

Dr. Jitendra Kumar
(Principal)
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Nalanda - 803115 (Bihar)

Vision Statement of Electrical Engineering Department:

To produce cutting edge Electrical Engineers, innovators, researchers, and entrepreneurs with high human values to serve society, industry, nation and the world.

Misson Statement of Electrical Engineering Department:

M1. To create state-of-the-art facilities for under-graduate, post- graduate and R&D work.

M2. To cater the needs of society with recent technologies, innovative ideas and inculcate ethical responsibilities.

M3. To develop strong collaborative links with premier industries, institutions and the government agencies.

Program Educational Objectives (PEOs) of Electrical Engineering Department:

PEO 1. Students will be able to engage in life-long learning and research including supportive and responsible roles on multi-disciplinary tasks.

PEO 2. Students will acquire, use and develop skills as required for effective professional and societal practices and leadership quality.

PEO 3. Students will be able to create a new dimension of innovation and entrepreneurship.

Program Outcomes (POs) of Electrical Engineering Department:

Program Outcomes (POs) based on Program Educational Objectives (PEOs) of Electrical Engineering Department:

PO 1. Students will be able to apply knowledge of applied mathematics & science in electrical engineering problems.

PO 2. Students will be able to identify, formulate and solve society and industries related problems.

PO 3. Students will be able to apply knowledge to design a system, component or process to meet desired needs within realistic constraints.

PO 4. Students will be able to conduct laboratory experiments and to critically analyze and interpret experimental data.

PO 5. Students will be able to use the recent techniques, skills, and modern tools necessary for engineering practices.

PO 6. Students will be able to understand the impact of engineering problems, solutions in a global and societal context.

PO 7. Students will be able to demonstrate professional and ethical responsibilities.

PO 8. Students will be able to apply leadership quality to work with team in the area of electrical engineering towards the solution of multi-disciplinary tasks.

PO 9. Students will be able to communicate effectively through verbally, technical writing, reports and presentation.

PO 10. Students will be able to develop confidence for self-education and ability to engage in life-long learning.

K.K. UNIVERSITY 803115 NALANDA

Pro Vice Chancellor
KK University
Berauti, Nepura, Bihar Sharif
Nalanda - 803115 (Bihar)

Semester-wise Detailed Engineering

Diploma in Electrical Engineering

Semester-I

Theory

S. No.	Course Code	Course Title	Hours per week			Credit
			L	T	P	
1	PAS1101	Basic Physics	5	0	0	5
2	PAS1102	Basic Chemistry	3	1	0	4
3	PAS1103	Basic Mathematics	3	1	0	4
4	PAS1104	Communication Skill-I	3	1	0	4
5	PME1101	Engg. Graphics	3	1	0	4
6	PAS1105	Computer Fundamentals	3	1	0	4

Practical

S. No.	Course Code	Course Title	Hours per week			Credit
			L	T	P	
7	PAS1101P	Basic Physics Lab.	0	0	3	2
8	PAS1102P	Basic Chemistry Lab	0	0	2	1
9	PAS1105P	Computer Fundamental	0	0	2	1
10	PME1102P	Basic Workshop Practice	0	0	2	1
Total						**30**

Semester-II

Theory

S. No.	Course Code	Course Title	Hours per week			Credit
			L	T	P	
1	PAS1201	Communication Skills-II	3	1	0	4
2	PAS1202	Engg. Mathematics	4	1	0	5
3	PAS1203	Applied Science	3	1	0	4
4	PME1201	Engg. Mechanics	3	1	0	4
5	PME1202	Engg. Drawing	4	1	0	5

Practical

S. No.	Course Code	Course Title	Hours per week			Credit
			L	T	P	
6	PAS1201P	Communication Skills (Language Lab)	0	0	2	1
7	PAS1203P	Applied Science	0	0	2	1
8	PME1201P	Engineering Mechanics	0	0	2	1
9	PME1203P	Workshop Practice	0	0	3	2
Total						**27**

K.K. UNIVERSITY 803115 NALANDA

Pro Vice Chancellor
KK University
Berauti, Nepura, Bihar Sharif
Nalanda - 803115 (Bihar)

Semester-III

Theory

S. No.	Course Code	Course Title	Hours per week			Credit
			L	T	P	
1	P2M2101	Applied Mathematics	5	0	0	5
2	PEE2101	Electrical Circuit & Network	3	1	0	4
3	PEE2102	Electrical Measurement	3	1	0	4
4	PEE2103	Electrical Power Generation	5	0	0	5
5	PEC2104	Basic Electronics	3	1	0	4

Practical

S. No.	Course Code	Course Title	Hours per week			Credit
			L	T	P	
6	PEE2101P	Electrical Circuit & Network Lab	0	0	2	1
7	PEE2102P	Electrical Measurement Lab	0	0	2	1
8	PEC2104P	Basic Electronics Lab	0	0	2	1
9	PEE2105P	Electrical Workshop Lab	0	0	2	1
Total						**26**

Semester-IV

Theory

S. No.	Course Code	Course Title	Hours per week			Credit
			L	T	P	
1	PEE2201	Transmission & Distribution Of Electrical Power	5	0	0	5
2	PEE2202	DC Machines & Transformers	3	1	0	4
3	PEE2203	Network Theory	5	0	0	5
4	PEE2204	Electrical Estimation & Costing	5	0	0	5
5	PEC2205	Applied Electronics	3	1	0	4

Practical

S. No.	Course Code	Course Title	Hours per week			Credit
			L	T	P	
6	PEC2201P	Electronic Construction And Repair Lab	0	0	2	1
7	PEE2202P	DC Machines & Transformers Lab	0	0	3	2
8	PEE2205P	Electrical Drawing Lab	0	0	3	2
9	PEC2205P	Applied Electronics Lab	0	0	2	1
Total						**29**

Semester-V

Theory

S. No.	Course Code	Course Title	Hours per week			Credit
			L	T	P	
1	PEE3101	Switchgear and Protection	3	1	0	4
2	PEE3102	A.C. Machines	3	1	0	4
3	PEE3103	Utilization of electrical energy	5	0	0	5
4	PEE3104	Electrical Traction-I	3	1	0	4
5	PEE3105	Industrial Automation	3	1	0	4

Practical

S. No.	Course Code	Course Title	Hours per week			Credit
			L	T	P	
6	PEE3101P	Switchgear and Protection Lab	0	0	2	1
7	PEE3102P	A.C. Machines lab	0	0	2	1
8	PEE3104P	Electrical Traction-I Lab	0	0	2	1
9	PEE3105P	Industrial Automation Lab	0	0	2	1
10	PEE3106**S**	In plant training and visit to work	0	0	4	2
Total						**27**

K.K. UNIVERSITY 803115 NALANDA

Pro Vice Chancellor
KK University
Berauti, Nepura, Bihar Sharif
Nalanda - 803115 (Bihar)

Semester-VI

Theory

S. No.	Course Code	Course Title	Hours per week			Credit
			L	T	P	
1	PSH3201	Management(Common)	5	0	0	5
2	PEE3201	Testing &Maintenance of Electrical Machines	3	1	0	4
3	PEE3202	Power Electronics and Drives	3	1	0	4
4	PEE3203	Automatic Control System	3	1	0	4
5	PEE3204	Elective- (Any One)	3	1	0	4
	(i) Electric Traction-II (PEE3204A)	(ii)Maintenance and Repairs of Electrical Equipment(PEE3204B)	(iii) Microprocessors and Microcontrollers(PEC3205C)			

Practical

S. No.	Course Code	Course Title	Hours per week			Credit
			L	T	P	
6	PEE3201P	Testing & Maintenance of Electrical Machines Lab	0	0	2	1
7	PEE3202P	Power Electronics and Drives Lab	0	0	2	1
8	PEE3203P	Automatic Control System Lab	0	0	2	1
9	PEE3204P	Elective- (Any One)	0	0	2	1
	(i) Electric Traction-II Lab (PEE3204PA)	(ii)Maintenance and Repairs of Electrical Equipment Lab (PEE3204PB)	(iii) Microprocessors and Microcontrollers Lab(PEC3205PC)			
10	PEE3205**S**	Industrial Project	0	0	4	2
Total					**27**	

K.K. UNIVERSITY 803115 NALANDA

Pro Vice Chancellor
KK University
Berauti, Nepura, Bihar Sharif
Nalanda - 803115 (Bihar)

Semester-I

Theory

S. No.	Course Code	Course Title	Hours per week			Credit
			L	T	P	
1	PAS1101	Basic Physics	5	0	0	5
2	PAS1102	Basic Chemistry	3	1	0	4
3	PAS1103	Basic Mathematics	3	1	0	4
4	PAS1104	Communication Skill-I	3	1	0	4
5	PME1101	Engg. Graphics	3	1	0	4
6	PAS1105	Computer Fundamentals	3	1	0	4

Practical

S. No.	Course Code	Course Title	Hours per week			Credit
			L	T	P	
7	PAS1101P	Basic Physics Lab.	0	0	3	2
8	PAS1102P	Basic Chemistry Lab	0	0	2	1
9	PAS1105P	Computer Fundamental	0	0	2	1
10	PME1102P	Basic Workshop Practice	0	0	2	1
Total						**30**

Basic Physics

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Nalanda - 803115 (Bihar)

Subject Code PAS1101	Theory			Credits
	No. of Period Per Week			
	L	T	P	5
	5	0	0	
	-	-	-	

Course Objectives:

- Basic Physics aims to give an understanding of this world both by observation and by prediction of the way in which objects behave.
- Concrete use of physical principles and analysis in various fields of engineering and technology are given prominence in the course content.
- The course will help the diploma engineers to apply the basic concepts and principles to solve broad-based engineering problems and to understand different technology based applications.

Contents: Theory

Unit	Name of the topic	Hours
01	**UNITS AND MEASUREMENTS** 1.1 Need of Measurement in engineering and science, unit of a physical quantity, requirements of standard unit, systems of units-CGS, MKS and SI, classification of physical quantities Fundamental and Derived with their units. 1.2 Accuracy, Precision of instruments, Errors in measurement, Estimation of errors Absolute error, Relative error and percentage error, significant figures. (Simple Problems). 1.3 Basic Measuring instruments - Vernier Caliper, Micrometer screw gauge, inner & outer caliper thermometer, speedometer, ammeter, voltmeter with their least count, range, accuracy and precision. Standard reference surfaces used in engineering measurements surface plate, angle plate, V- block, Engineer's square.	3
02	**GENERAL PROPERTIES OF MATTER** 2.1 Elasticity : Deforming force, Restoring force, Elastic and plastic body, Stress and strain with their types, Hooke's law, Stress strain diagram, Young's modulus, Bulk modulus, Modulus of rigidity and relation between them(no derivation), (simple problems). (Simple problems). Stress strain diagrams of H.T. Steel, Cast iron, Aluminum and Concrete, Ultimate and breaking stress, Factor of safety. 2.2 Surface Tension: Forces—cohesive and adhesive, angle of contact, shape of liquid surface in a capillary tube, capillary action with examples, relation between surface tension , capillary rise and radius of capillary (no derivation), (simple problem), effect of impurity and temperature on surface tension. 2.3 Viscosity : Velocity gradient, Newton's law of viscosity, coefficient of viscosity, streamline and turbulent flow, critical velocity, Reynold's number, (simple problems), Stokes law and terminal velocity (no derivation), buoyant (up thrust) force, effect of temperature & adulteration on viscosity of liquid.	7

03	**HEAT** 3.1 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 (simple problems), expansion of solids-linear, aerial and cubical and relation between them. 3.2 Gas laws and specific heats of gases: Boyle's law, Charles's law, Gay Lussac's law, absolute temperature, Kelvin scale of temperature, general gas equation(no derivation) (simple problems), molar or universal gas constant, universal gas equation, standard or normal temperature and pressure (N.T.P.), specific heat of gases, relation between two specific heat (simple problems), thermodynamic variables, first law of thermodynamics (statement & equation only), isothermal, isobaric, isochoric & adiabatic processes (difference among these processes and equations of state).	**6**
04	LIGHT 3.1 Properties of light: Reflection and refraction, Snell's law, physical significance of refractive index (simple problems), Total internal reflection, dispersion, diffraction and polarization of light (only introduction). 3.2 Wave theory of light & Interference: Newton's corpuscles theory of light, Huygens's wave theory, wave front, Types of wave front-spherical, cylindrical and plane Huygens's principle of propagation of wave front, Principle of superposition of waves, Interference of light, constructive and destructive interference, Young's experiment. Analytical treatment of interference, conditions for stationary interference pattern. 3.3 Laser: Light amplification by stimulated emission of radiation, properties of laser, spontaneous and stimulated emission, population inversion, pumping methods, He-Ne laser construction & working, recording and reconstructing of hologram by using He- Ne laser.	**11**
05	MODERN PHYSICS 4.1 Photo electricity : Plank's hypothesis, properties of photons, photo electric effect, laws and characteristics of photoelectric effect, Einstein's photoelectric equation,(simple problems), construction and working of photoelectric cell, applications of photoelectric cell. 4.2 X-rays : Production of X-rays, types of X-ray spectra-continuous and characteristics, X-ray wavelength (simple problems), properties of X-rays, applications of X-rays-engineering, medicine and scientific research work.4.3 Series expansions of even and odd functions.	**6**
	TOTAL	**33**

K.K. UNIVERSITY 803115 NALANDA

Pro Vice Chancellor
KK University
Berauti, Nepura, Bihar Sharif
Nalanda - 803115 (Bihar)

Reference Books:

Titles of the Book	Name of Authors	Name of the Publisher
Physics–I	V. Rajendran	Tata McGraw-Hill raw-Hill publication, New Delhi
Applied Physics	Arthur Beiser.	Tata McGraw-Hill raw-Hill publication, New Delhi
Engineering. Physics	R.K. Gaur & S.L. Gupta. Dhanpat Rai	Dhanpat Rai Publication, New Delhi.
Physic	Resnick and Halliday	
Concept of Physics Part-I & II	H.C. Verma	
Basic Physics	Roshan Kr. Sinha	Foundation Publishing House

Course outcomes:

At the end of the course, the student will be able to:

- Familiarize and analyze the signal accordance accuracy, precision, sensitivity, resolution, errors etc.
- Identify and describe properties of matter Solid, liquid and gas, including: flexibility, strength, transparency, hardness, water resistance, size, color, weight and texture.
- Understand the basic laws of heat transfer and Distinguish between conduction, convection and radiation; identify different methods for reducing heat losses and mode of heat transfer between bodies at different temperatures.
- Apply the knowledge of light related event, illustrate the conditions for light amplification in various LASER and laser based instruments and optical devices.
- Apply the knowledge photo electric effect and x-ray, application of x- ray.

Basic Chemistry

Subject Code PAS1102	Theory			Credits
	No. of Period Per Week			
	L	T	P	4
	3	1	0	
	-	-	-	

Course Objectives:

- To acquire knowledge about desalination of brackish water and treatment of municipal water.
- To gain the knowledge of conducting polymers, bio-degradable polymers and fiber reinforced plastics.
- To learn significance of green chemistry and green synthesis and the synthesis of nano materials.
- To understand mechanism of corrosion and preventive methods.
- To understand concept of semi conductivity, superconductivity and liquid crystal and solar energy.

Contents: Theory

Unit	Name Of The Topic	Hours
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 & Distinction between Orbits & Orbitals, Hund's Rule, Filling Up of the Orbitals by Aufbau's Principles (till Atomic no.30), Pauli's exclusion principle, Valency – Definition, types (Electrovalency & Covalency), Distinction, Octet Rule, Duplet Rule, Formation of Electrovalent & Covalent Compounds e.g. Nacl, CaCl2, MgO, AlCl3, CO2, H2O,Cl2, NH3, C2H4, N2,C2H2.	5
02	**Electrochemistry :** Definition Ionisation & Electrolytic Dissociation, Arrhenius Theory of Ionisation, Significance of the Terms Involved in Electrolysis. Such as Conductors, Insulators or Dielectrics, Electrolyte, Non Electrolyte, Electrolysis, Electrolytic Cell, Electrodes, Current Density, Temperature, Mechanism of Electrolysis – Primary & Secondary Reactions at Cathode & Anode, Electrochemical Series for Cations & Anions, Electrolysis of CuSO4 Solution by using Cu Electrode & Platinum Electrode, Electrolysis of NaOH solution & fused NaCl, Faraday's first & second law of Electrolysis & Numericals, Electrochemical Cells & Batteries, Definition, Types (Primary & Secondary Cells), e.g. Construction, Working & Applications of Dry Cell / Laclanche Cell & Lead – Acid Storage Cell, Applications of Electrolys such as Electroplating & Electro refining, Electrometallurgy & electrotyping Conductivity of Electrolyte – Ohms Law, Definition & Units of Specific Conductivity, Equivalent Conductivity, specific resistance.	6

03	**Metals & Alloys Metals :** Occurrence of Metals, Definition Metallurgy, Mineral, Ore, Gangue, Flux & Slag, Mechanical Properties, Processing of Ore, Stages of Extraction of Metals from its Ores in Detail i.e. Concentration, Reduction, refining. Physical Properties & Applications of some commonly used metals such as Fe, Cu, Al, Cr, Ni, Sn, Pb, Zn, Co, Ag, W. Alloys: Definition of Alloy, Purposes of Making alloy Preparation Methods, Classification of Alloys such as Ferrous & Non Ferrous, examples. Composition, Properties & Applications of Alnico, Duralumin, Dutch Metal, German Silver / Nickel Silver, Gun Metal, Monel metal, Wood's Metal, Babbitt Metal.	**8**
04	**Non Metallic Materials Plastics :** Definition of Plastic, Formation of Plastic by Addition & Condensation Polymerization by giving e.g. of Polyethylene & Bakelite plastic Respectively, Types of Plastic, Thermo softening & Thermosetting Plastic, with Definition, Distinction & e.g., Compounding of Plastics – Resins, Fillers, Plasticizers, Acceleraters, Pigments, Engineering Applications of Plastic based on their Properties. Rubber: Natural Rubber: Its Processing, Drawbacks of Natural Rubber, Vulcanisation of Rubber with Chemical Reaction. Synthetic Rubber: Definition, & e.g., Distinction Between Natural & Synthetic Rubber. Thermal Insulating Materials : Definition, Characteristics & Applications of Glass, Wool, Thermocole, Asbestos, Cork.	**4**
05	**Environmental Effects (Awareness Level) :** Introduction, Definition, Causes of Pollution, Types of Pollution, Such as Air & Water Pollution. Air Pollution : Definition, Types of Air Pollutions their Sources & Effects, Such as Gases, Particulates, Deforestation, Radio Active Gases, Control of Air Pollution, Air Pollution Due to Internal Combustion Engine & Its Control Methods, Causes & Effects of Ozone Depletion & Green House Effects. Water Pollution : Definition, Causes & Methods of Preventing Water Pollution, Types of Waste such as Domestic Waste, Industrial Waste, their Physical & Biological Characteristics, BOD,COD, Biomedical Waste & E–Waste, their Origin, Effects & Control Measures. Preventive Environmental Management (PEM) Activities.	**9**
TOTAL		**32**

K.K. UNIVERSITY 803115 NALANDA

Pro Vice Chancellor
KK University
Berauti, Nepura, Bihar Sharif
Nalanda - 803115 (Bihar)

Reference Books:

Titles of the Book	Name of Authors	Name of the Publisher
Engineering Chemistry	Jain & Jain	Dhanpat Rai and Sons
Engineering Chemistry	S.S. Dara	S. Chand Publication
Industrial Chemistry	B.K. Sharma	Goel Publication
Environmental Chemistry &Pollution Control.	S.S. Dara	S. Chand Publication
Basic Chemistry	Sanjay Kumar, Rahul Kumar	Foundation Publishing House

Course outcomes:

At the end of the course, the student will be able to:

- Develop innovative methods to produce soft water for industrial use and potable water at cheaper cost.
- Substitute metals with conducting polymers and also produce cheaper biodegradable polymers to reduce environmental pollution.
- Design economically and new methods of synthesis Nano materials.
- Apply their knowledge for protection of different metals from corrosion.
- Have the knowledge of converting solar energy into most needy electrical energy efficiently andeconomically to reduce the environmental pollution.

K.K. UNIVERSITY 803115 NALANDA

Pro Vice Chancellor
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Nalanda - 803115 (Bihar)

Basic Mathematics

Subject Code PAS1103	Theory			Credits
	No. of Period Per Week			
	L	T	P	4
	3	1	0	
	-	-	-	

Course Objectives:

The course is aimed to develop the basic Mathematical skills of engineering students that are imperative for effective understanding of engineering subjects. The topics introduced will serve as basic tools for specialized studiesin many fields of engineering and technology.

- Matrices –To provide detailed of matrices which is applied for solving system of linear equations and usefulin various fields of technology.
- Partial Derivatives – This course enables to provide an overview of partial derivatives and its applications which is used for solving optimization problems and concepts is needed in study of wave, heat equation of various orders and also in calculation of errors in various engineering subjects.
- Complex numbers – This course enables the students to learn the concept of imaginary numbers and gives awareness about algebra of complex numbers which helps in understanding of engineering subjects like electrical circuits, Electromagnetic wave theory, and complex analysis etc.
- Indeterminate forms and Taylor series- It helps the students to understand and apply the concept of existence of limits, indeterminate conditions, expansion of standard and non-standard functions in seriesform.
- Successive Differentiation – To provide understanding of existence of n^{th} order derivative.
- Numerical methods and scilab: To build ability to solve numerically system of linear equations, algebraic and transcendental equations. To provide an overview of the experimental aspect of applied mathematics.

Contents: Theory

Unit	Name of the topic	Hour
1	**Algebra** **1.1 Revision:** 1.1.1 Laws of Indices 1.1.2 Formula of factorization and expansion ((a_2-b_2), (a_2+b_2) etc.) Laws of logarithm with definition of Natural and Common logarithm.	1
	1.2 Partial fraction: 1.2.1 Definition of polynomial fraction proper & improper fractions and definition of partial fractions. 1.2.2 To resolve proper fraction into partial fraction with denominator containing non repeated linear factors, repeated linear factors and irreducible non repeated quadratic factors. 1.2.3 To resolve improper fraction into partial fraction.	4

K.K. UNIVERSITY 803115 NALANDA

Pro Vice Chancellor
KK University
Berauti, Nepura, Bihar Sharif
Nalanda - 803115 (Bihar)

	1.3 Determinant and Matrices: **Determinant** 1.3.1 Definitionandexpansionofdeterminantsoforder2and3. 1.3.2 Cramer'sruletosolvesimultaneousequationsin2and3unknowns. **Matrices** 1.3.3 Definition of a matrix of order m x n types of matrices. 1.3.4 Algebra of matrices such as equality, addition, Subtraction, scalar multiplication and multiplication. 1.3.5 Transpose of a matrix. 1.3.6 Minor, cofactor of an element of a matrix, adjoint of matrix and inverse of matrix by adjoint method. 1.3.7 Solutionofsimultaneousequationscontaining2and3unknownsbymatrixinversionmethod.	**12**
	1.4 Binomial Theorem: 1.4.1 Definition of factorial notation, definition of permutation and combinations with formula. 1.4.2 Binomial theorem for positive index. 1.4.3 General term. 1.4.4 Binomial theorem for negative index. 1.4.5 Approximate value (only formula)	**4**
2	**Trigonometry.** **2.1 Revision:** 2.1.1 Measurement of an angle(degree and radian).Relation Between degree and radian. 2.1.2 Trigonometric ratios of 00,300,450etc. 2.1.3 Fundamental identities.	**2**
	2.2 Trigonometric ratios of allied, compound, multiple & Submultiple angles (Questions based on numerical computations, which can also be done by calculators, need not be asked particularly for allied angles).	**8**
	2.3Factorization and de factorization formulae:	**4**
	2.4 Inverse Trigonometric ratios: 2.4.1 Definition of inverse trigonometric ratios, Principal values of Inverse trigonometric ratios. 2.4.2 Relation between inverse trigonometric ratios.	**2**
	2.5 Properties of Triangle 2.5.1 Sine, Cosine, Projection and tangent rules (without proof) 2.5.2 Simple problems.	**2**
3	**Coordinate geometry** **3.1 Point and distances:** 3.1.1 Distance formula, Section formula, midpoint, centroid of triangle. 3.1.2 Area of triangle and condition of collinearity.	**4**

K.K. UNIVERSITY 803115 NALANDA

Pro Vice Chancellor
KK University
Berauti, Nepura, Bihar Sharif
Nalanda - 803115 (Bihar)

	3.2 Straight line: 3.2.1 Slope and intercept of straight line. 3.2.2 Equation of straight line in slope point form, slope-intercept form, two-point form, two-Intercept form, normal form. General equation of line. 3.2.3 Angle between two straight lines condition of parallel and perpendicular lines. 3.2.4 Intersection of two lines. 3.2.5 Lengthofperpendicularfromapointonthelineandperpendiculardistancebetweenparallellines.	**12**
	3.3 Circle : 3.3.1 Equation of circle in standard form, centre – radius form,diameter form, two – intercept form. General equation of circle, its centre and radius.	
4	**Vectors** 4.1 Definition of vector, position vector, Algebra of vectors (Equality,addition, subtraction and scalar multiplication) 4.2 Dot (Scalar) product with properties. 4.3 Vector (Cross) product with properties.	**4**
	4.4 Applications 4.4.1 Work done and moment of force about a point & line.	**4**
TOTAL		**63**

Suggested List of Assignments/Tutorial :	
S. No	**Topic on which tutorial is to be conducted**
1	Partial fractions
2	Determinants
3	Matrices
4	Solution of simultaneous equation by Matrix inversion method.
5	Binomial theorem
6	Trigonometry- fundamental identities-revision only
7	Trigonometry-allied, compound and multiple angles
8	Trigonometry-factorization and de factorization formulae.
9	Trigonometry-inverse trigonometric ratios.
10	Point and distances
11	Straight line
12	Circle.
13	Vectors
14	Vectors' applications

K.K. UNIVERSITY 803115 NALANDA

Pro Vice Chancellor
KK University
Berauti, Nepura, Bihar Sharif
Nalanda - 803115 (Bihar)

Reference Books:

Titles of the Book	Name of Authors	Name of the Publisher
Mathematics for Polytechnic	S.P. Deshpande	Pune Vidyarthi Griha
Trigonometry	S.L. Lonely	S. Chand Publication
Higher Algebra	H.S. Hall & S.R. Knight	Metric edition, Book Palace, New Delhi
College Algebra	Frc. G. Valles	Charotar Publication
Matrices	Aryes.	Schuam series, McGraw Hill
Higher Engineering Mathematics	B.S. Grewal	Khanna Publications New Delhi
Engineering Mathematics	S.S. Sastry	Prentice Hall of India
Basic Mathematics	Sindhu Prasad	Foundation Publishing House

Course outcomes:

At the end of the course, the student will be able to:

- Apply the knowledge of matrices to solve the problems.
- Know and to understand various types of numerical methods
- Ability to interpret the mathematical results in physical or practical terms for complex numbers
- Inculcate the Habit of Mathematical Thinking through Indeterminate forms and Taylor series expansion
- Solve and analyze the Partial derivatives and its application in related field of engineering.

K.K. UNIVERSITY 803115 NALANDA

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Nalanda - 803115 (Bihar)

Communication Skill-I

Subject Code	Theory			Credits
PAS1104	No. of Period Per Week			
	L	T	P	4
	3	1	0	
	-	-	-	

Course Objectives:

Communication skills play an important role in career development. This course aims at introducing basic concepts of communication skills with an emphasis on developing personality of the students. Thus, the main objectives of this course are:

- To develop confidence in speaking English with correct pronunciation;
- To develop communication skills of the students i.e. listening, speaking, reading and writing skills;
- To introduce the need for personality development.
- Focus will be on developing certain qualities which will aid students in handling personal and careerchallenges, leadership skills etc.

Contents: Theory

Unit	Name of the topic	Hours
01	**Part I: Text :** Vocabulary - Understanding meaning of new words from text • Comprehension – Responding to the questions from text • Identifying parts of speech	10
02	**PART II -Application of grammar :** Verb Tenses Do as directed (Active /Passive, Direct/Indirect, Affirmative/Negative/Assertive, Question tag, Remove too, Use ofArticle, Preposition, Conjunctions, Interjections, Punctuation)	6
03	**PART III - Paragraph writing :** Definition – Types of paragraphs How to write a paragraph	2
04	**PART IV - Vocabulary building :-** • Word formation • Technical jargon • Use of Synonyms /Antonyms/Homonyms/Paronyms •One word substitute	4
	TOTAL	22

K.K. UNIVERSITY 803115 NALANDA

Pro Vice Chancellor
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Berauti, Nepura, Bihar Sharif
Nalanda - 803115 (Bihar)

खड	fgUnh	HOURS
1	शब्द रचना उत्पत्ति एवं विकास व्युत्पत्ति एवं नए शब्दों का निर्माण अनेक शब्दों के लिए एक शब्द, विदेशी भाषा के शब्दों का हिंदी में प्रयोग, देशज एवं विदेशी शब्द, समानार्थक शब्द विपरीतार्थक शब्द, युग्म शब्द, संक्षेपन, वाक्य:- प्रकार रूपांतरण, अशुद्ध वाक्यों को शुद्ध करना, हिंदी में प्रयुक्त विराम चिन्ह एवं उनका प्रयोग	3
2	व्याकरण के नियमों का ज्ञान एवं उनका प्रयोग	2
3	अनुच्छेद एवं गद्यांश 1 अनुच्छेद लेखन 2 अपठित गद्यांश एवं प्रश्न उत्तर	2
4	औपचारिक पत्र लेखन:- 1 कार्यालय-पत्र 2 प्रेस सूचना 3 प्रेस विज्ञप्ति 4 प्रतिवेदन 5 व्यावसायिक-पत्र 6 लेखन नौकरी के लिए आवेदन-पत्र 7 बायोडाटा	4
5	fØ;kRed@O;kogkfjd %& 1- शब्दों sa dk lgh mPpkj.k 2- ekSf[kd laizs"k.k@oDrwrk 'kSyh dk fodkl 3- leqfpr 'kkjhfjd Hkk"kk dk iz;ksx 4- laokn dkS'ky	3
	dk;Z Hkkj ([Assignments] %& 1- शब्द ,oa mudk lkFkZd iz;ksx 2- dk;kZy;h शब्द 3- okD;ks a dh v'kqf);kj 4- fojke fpg~uksa dk iz;ksx 5- laokn ys[ku & fLFkfr ds vuqlkj 6- vuqPNsn ys[ku 7- lekpkj i=] fjiksVZ ys[ku 8- शब्दkoyh	
	कुल	14

Reference Books:

Titles of the Book	Name of Authors	Name of the Publisher
Contemporary English	David Green	Macmillan
English Grammar andComposition	R.C. Jain	Macmillan
Thesaurus	Rodgers	Oriental Longman
Dictionary	Oxford	Oxford University
English for Practical Purposes	Z.N. Patil	Macmillan
English at Workplace	Editor Mukti Sanyal	Macmillan
Communication Skill-I	Kajari Guha	Foundation Publishing House
English Grammar Just for you	Rajeevan Karal	Oxford Univ. Press

K.K. UNIVERSITY 803115 NALANDA

Pro Vice Chancellor
KK University
Berauti, Nepura, Bihar Sharif
Nalanda - 803115 (Bihar)

A Practical Guide to EnglishGramma	Dr. K.P. Thakur	Bharti Bhawan

Course outcomes:

At the end of the course, the student will be able to:

- Develop basic speaking and writing skills including proper usage of language and vocabulary sothat they can become highly confident and skilled speakers and writers.
- Be informed of the latest trends in basic verbal activities such as presentations, facing interviews andother forms of oral communication.
- Also develop skills of group presentation and communication in team.
- Develop non-verbal communication such as proper use of body language and gestures.
- Students will heighten their awareness of correct usage of English grammar in writing and speaking.
- Students will improve their speaking ability in English both in terms of fluency and comprehensibility.
- Students will give oral presentations and receive feedback on their performance.
- Students will increase their reading speed and comprehension of academic article.
- Students will improve their reading fluency skills through extensive reading.
- Students will enlarge their vocabulary by keeping a vocabulary journal.
- Students will strengthen their ability to write academic papers, essays and summaries using theprocess approach.

K.K. UNIVERSITY 803115 NALANDA

Pro Vice Chancellor
KK University
Berauti, Nepura, Bihar Sharif
Nalanda - 803115 (Bihar)

Engineering Graphics

Subject Code	Theory			Credits
PME1101	No. of Period Per Week			
	L	T	P	4
	3	1	0	
	-	-	-	

Course Objectives: Get acquainted with the knowledge of various lines, geometrical constructions and constructionof various kinds of scales, and Ellipse. Improve their imagination skills by gaining knowledge about points, lines andplanes.

Contents: Theory

UNIT	Name of the topic	Hours
01	**Drawing Instruments and their uses :** 1.1 Letters and numbers (single stroke vertical) 1.2 Convention of lines and their applications. 1.3 Scale (reduced, enlarged & full size) plain scale and diagonal scale. 1.4 Sheet layout . 1.5 Introduction to CAD (Basic draw and modify Command). 1.6 Geometrical constructions.	5
02	**Engineering curves & Loci of Point:** 1.2 **To draw an ellipse by :** 2.1.1 Directrix and focus method 2.1.2 Arcs of circle method. 2.1.3 Concentric circles method. **2.2 To draw a parabola by :** 2.2.1 Directrix and focus method 2.2.2 Rectangle method **2.3 To draw a hyperbola by :** 2.3.1 Directrix and focus method 2.3.2 Passing through given points with reference toasymptotes. 2.3.3 Transverse Axis and focus method. **2.4 To draw involutes of circle & polygon (up to hexagon) :** **2.5** To draw a cycloid, 21 picycloids, hypocycloid **2.6** To draw Helix & spiral. **2.7** Loci of Points: **2.4** Loci of points with given conditions and examples related to simple mechanisms.	9

K.K. UNIVERSITY 803115 NALANDA

Pro Vice Chancellor
KK University
Berauti, Nepura, Bihar Sharif
Nalanda - 803115 (Bihar)

03	**Orthographic projections :** 3.1 Introduction to Orthographic projections. 3.2 Conversion of pictorial view into Orthographic Views (First Angle ProjectionMethod Only). 3.3 Dimensioning technique as per SP-46.	6
04	**Isometric projection :** 4.1 Isometric scale. 4.2 Conversion of orthographic views into isometric View/projection (Simpleobjects) 4.3 Projection of Straight Lines and Planes. (First Angle Projection Method only).	5
05	5.1 Lines inclined to one reference plane only and limited to both ends in onequadrant. 5.2 Projection of simple planes of circular, square, rectangular, rhombus, pentagonal, and hexagonal, inclined to one reference plane and perpendicular to the other.	7
	TOTAL	**32**

Reference Books:

Titles of the Book	Name of Authors	Name of the Publisher
Engineering Drawing	N.D. Bhatta	Charotar Publishing House
Engineering Drawing & Graphics +Auto CAD	K. Venugopal	New Age Publication
Engineering Drawing	R.K. Dhawan	S. Chand Co.
Engineering Drawing	P.J. Shah	
Engineering Graphics	K.R. Mohan	Dhanpat Rai and Publication Co.
Engineering Graphics	Dharmendra Kumar	Foundation Publishing House

Course outcomes:

At the end of the course, the student will be able to:

- Learning how to draw the shapes, angels and lines and others which is essential for engineer
- Develop student's imagination and ability to represent the shape size and specifications of physical objects.
- Familiarize with different drawing equipment, technical standards and procedures for construction of geometric figures. This will give students ability to draw three dimension objects on the paper and to drawthe pectoral drawings.
- Learning the main idea from assembly and detail drawing.

K.K. UNIVERSITY 803115 NALANDA

Pro Vice Chancellor
KK University
Berauti, Nepura, Bihar Sharif
Nalanda - 803115 (Bihar)

Computer Fundamentals

Subject Code	Theory			Credits
PAS1105	No. of Period Per Week			
	L	T	P	4
	3	1	0	
	-	-	-	

Course Objectives:

The main objective of this course is to introduce the fundamentals of computing devices and reinforce computer vocabulary, particularly with respect to personal use of computer hardware and software, the Internet, networking and mobile computing. It focuses on such computer literacy that prepares students for life-long learning of computer concepts and skills. Students discovers why computers are essential components in education, business and society in this course.

- To understand basics of computer and working with OS.
- To develop working skills with productivity tools, graphics designing and Internet.
- To acquire basic programming skills.
- To apply computing in problem solving.

Contents: Theory

UNIT	Name Of The Topic	HOURS
01	**Fundamentals of computer** Introduction, Components of PC, The system Unit, Front part of system Unit Back part of system Unit CPU, Memory of computer Monitor, Mouse, Keyboard, Disk, Printer, Scanner, Modem, Video, Sound cards, Speakers	3
02	**Introduction to windows 2000/xp** Working with window Desktop Components of window Menu baroption Starting window Getting familiar with desktop Moving from one window to another Reverting windows to its previous size Opening task bar buttons into a windows Creating shortcut of program Quitting windows	3
03	**GUI Based Editing, Spreadsheets, Tables & Presentation :** Application Using MS-Office 2000 & Open Office.Org Menus Opening of menus, Toolbars: standard toolbars, formatting toolbars & closing of menus Quitting Document, Editing & designing your document Spreadsheets Working & Manipulating data with Excel Changing the layout Working with simple graphs & Presentation Working With PowerPoint and Presentation.	3
04	**Introduction To Internet:** What is Internet Equipment Required for Internet connection Sending & receiving Emails Browsing the WWW Creating own Email Account Internet chatting.	2

K.K. UNIVERSITY 803115 NALANDA

Pro Vice Chancellor
KK University
Berauti, Nepura, Bihar Sharif
Nalanda - 803115 (Bihar)

05	**Usage of Computer System in various Domains :** Computer application in Offices, books publication, data analysis, accounting , investment, inventory control, graphics, database management, Instrumentation, Airline and railway ticket reservation, robotics, artificial intelligence, military, banks, design and research work, real-time, point of sale terminals, financial transaction terminals.	2
06	**Information technology for benefits of community :** Impact of computer on society Social responsibilities Applications of IT Impact of IT Ethics and information technology Future with information technology.	3
	TOTAL	16

Reference Books:

Titles of the Book	Name of Authors	Name of the Publisher
Comdex Computer Course kit	Vikas Gupta	Dream tech
Information Technology for Management	Henry Lucas	Tata McGraw Hills
Computer Fundamentals Architecture and Organization	B. Ram	New Age International Publisher
Computer Fundamentals	M. P. Singh	Foundation Publishing House

Course outcomes:

At the end of the course, the student will be able to:

- To acquire knowledge on editor, spread sheet and presentation software.
- Converse in basic computer terminology
- Formulate opinions about the impact of computers on society
- Possess the knowledge of basic hardware peripherals
- Familiarizing with Open Office (Word processing, Spreadsheets and Presentation).
- The students will be able to perform documentation and accounting operations.
- Students can learn how to perform presentation skills.

K.K. UNIVERSITY 803115 NALANDA

Pro Vice Chancellor
KK University
Berauti, Nepura, Bihar Sharif
Nalanda - 803115 (Bihar)

Basic Physics Lab

Subject Code	Theory			Credits
PAS1101P	No. of Period Per Week			
	L	T	P	2
	0	0	3	
	-	-	-	

Contents: Theory

Laboratory Experiments (Any ten experiments to be performed)

1. Use of vernier calipers for the measurement of dimensions of given object.
2. Use of micrometer screw gauge for the measurement of dimensions of given object
3. Determine the Young's modulus of material of wire using Searle's apparatus.
4. To observe rise in water level through capillaries of different bores.
5. Determine coefficient of viscosity of given oil using Stoke's Method.
6. Verification of Boyle's law.
7. Measurement of unknown temperature using thermocouple.
8. Determine the coefficient of linear expansion of given material of rod using Pullinger's apparatus.
9. To observe the divergence of laser light with respect to distance.
10. Plot characteristics of photoelectric cell (Photoelectric current verses intensity of light and voltage (applied).
11. Comparison of Illuminating Power (Luminous intensity) of two light sources using photoelectric cell.
12. Verification of Charles's law.

K.K. UNIVERSITY 803115 NALANDA

Pro Vice Chancellor
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Berauti, Nepura, Bihar Sharif
Nalanda - 803115 (Bihar)

Basic Chemistry Lab

Subject Code	Theory			Credits
PAS1102P	No. of Period Per Week			
	L	T	P	1
	0	0	2	
	-	-	-	

Contents: Theory

Laboratory Experiments (Any ten experiments to be performed)

1 – 7 Qualitative Analysis of **Seven Solutions**, 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+, NH4 +
Acidic Radicals: - Cl–, Br–, I–, CO3–2, SO4–2, NO3–.
8. To Determine E.C.E. of Cu by Using CuSO4 Solution & Copper Electrode.
9. To Determine the % of Fe in the Given Ferrous Alloy by KMnO4 Method.
10. To Prepare a Chart Showing Application of Metals like Fe, Cu, Al, Cr, Ni, Sn, Pb, Co.
11. To Prepare Phenol Formaldehyde Resin (Bakelite).
12. To Determine Carbon Monoxide Content in Emission from Petrol Vehicle.
13. To Determine Dissolved Oxygen in a Water Sample.

K.K. UNIVERSITY 803115 NALANDA

Pro Vice Chancellor
KK University
Berauti, Nepura, Bihar Sharif
Nalanda - 803115 (Bihar)

Computer Fundamental Lab

Subject Code	Theory			Credits
PAS1105P	No. of Period Per Week			
	L	T	P	1
	0	0	2	
	-	-	-	

Contents: Theory

Laboratory Experiments (Any ten experiments to be performed)

1. Working with Windows 2000 desktop, start icon, taskbar, Recycle Bin, My Computer iconThe Recycle Bin and deleted files creating shortcuts on the desktop.
2. The Windows 2000 accessories WordPad – editing an existing document Use of Paint – drawing toolsThe Calculator, Clock
3. The Windows Explorer window, concept of drives, folders and files? Folder selection techniques, Switching drives, Folder creation Moving or copying files,Renaming, Deleting files and folders
4. Printing**,** Installing a printer driver, Setting up a printer, Default and installed printers, Controlling print queues, Viewing installed fonts**,** The clipboard and 'drag and drop'**,** Basic clipboard concepts**,** Linking vs.embedding
5. Moving through a Word document menu bar and drop down menus toolbars
6. Entering text into a Word 2000 document, selection techniques Deleting text
7. Font formatting keyboard shortcuts
8. Paragraph formattingBullets and numbering
9. Page formatting: What is page formatting? Page margins, Page size and orientation Page breaks, Headers and footers.
10. Introducing tables and columns
11. Printing within Word 2000 Print setup Printing options Print preview
12. Development of application using mail merge Mail merging addresses for envelopes Printing anaddressed envelope and letter.
13. Creating and using macros in a document
14. Creating and opening workbooks Entering data
15. Navigating in the worksheet, Selecting items within Excel 2000, Inserting and deleting cells, rows and column, Moving between worksheets, saving worksheet, workbook.
16. Formatting and customizing data
17. Formulas, functions and named ranges
18. Creating, manipulating & changing the chart type
19. Printing, Page setup, Margins Sheet printing options, Printing a worksheet
20. Preparing presentations with Microsoft Power Point. Slides and presentations, Opening an existing presentation , Saving a presentation
21. Using the Auto Content wizard, Starting the Auto Content wizard Selecting a presentation type withinthe Auto Content wizard Presentation type Presentation titles, footers and slide number.

K.K. UNIVERSITY 803115 NALANDA

Pro Vice Chancellor
KK University
Berauti, Nepura, Bihar Sharif
Nalanda - 803115 (Bihar)

22. Creating a simple text slide, Selecting a slide layout, Manipulating slide information within normal and outline view, Formatting and proofing text, Pictures and backgrounds, drawing toolbar, AutoShapes, Using clipart, Selecting objects, Grouping and un-grouping objects, The format painter
23. Creating and running a slide show, Navigating through a slide show, Slide show transitions, Slideshow timings, Animation effects
24. Microsoft Internet Explorer 5 & the Internet, Connecting to the Internet, The Internet Explorer program window, The on-line web tutorial Using hyper links, Responding to an email link on a web page
25. Searching the Internet, Searching the web via Microsoft Internet Explorer, Searching the Internet usingWeb Crawler, Searching the Internet using Yahoo, Commonly used search engines
26. Favorites, security & customizing Explorer, Organizing Favorite web sites, Customizing options – general, security, contents, connection, programs, advanced
27. Using the Address Book, Adding a new contact, Creating a mailing group, Addressing a message,Finding an e-mail address
28. Using electronic mail, Starting Outlook Express, Using the Outlook Express window, Changing the window layout, Reading file attachment, Taking action on message-deleting, forwarding, replying
29. Email & newsgroups, Creating and sending emails, Attached files, Receiving emails, Locating andsubscribing to newsgroups, Posting a message to a newsgroup
30. Chatting on internet, Understating Microsoft chat environment, Chat toolbar

K.K. UNIVERSITY 803115 NALANDA

Pro Vice Chancellor
KK University
Berauti, Nepura, Bihar Sharif
Nalanda - 803115 (Bihar)

Basic workshop practice

Subject Code	Theory			Credits
PME1102P	No. of Period Per Week			
	L	T	P	1
	0	0	2	
	-	-	-	

Contents: Theory

S. No.	List Of Practical's
1	**Wood working shop:** • Demonstration of different wood working tools / machines. • Demonstration of different wood working processes, like plaining, marking, chiseling,grooving, turning of wood etc. • One simple job involving any one joint like mortise and tenon dovetail, bridle, half lapetc.
2	**Welding shop** : • Demonstration of different welding tools / machines. • Demonstration on Arc Welding, Gas Welding, gas cutting and rebuilding of broken Parts with welding. • One simple job involving butt and lap joint.
3	**Fitting shop**: • Demonstration of different fitting tools and drilling machines and power tools • Demonstration of different operations like chipping, filing, drilling, tapping, cutting etc. • One simple fitting job involving practice of chipping, filing, drilling, tapping, cutting etc.
4	**Plumbing shop** : • Demonstration of different plumbing tools • Demonstration of different operations in plumbing, observing different pipe joints andpipe accessories. Different samples of PVC pipes and PVC pipe fittings. • One job on simple pipe joint with nipple coupling for standard pipe. Pipe threadingusing standard die sets.
5	**Sheet metal shop :** • Demonstration of different sheet metal tools / machines. • Demonstration of different sheet metal operations like sheet cutting, bending, edging,End curling, lancing, soldering and riveting. • One simple job involving sheet metal operations and soldering and riveting.

Text /Reference Books:

Titles of the Book	Name of Authors	Name of the Publisher
Workshop Technology	S.K. Hajara Chaudhary	Media Promotors & Publishers, New Delhi
Workshop Technology	B.S. Raghuwanshi	Workshop Technology B.S.Raghuwanshi Dhanpat Rai and Sons, New Delhi

K.K. UNIVERSITY 803115 NALANDA

Pro Vice Chancellor
KK University
Berauti, Nepura, Bihar Sharif
Nalanda - 803115 (Bihar)

Semester-II

Theory

S. No.	Course Code	Course Title	Hours per week			Credit
			L	T	P	
1	PAS1201	Communication Skills-II	3	1	0	4
2	PAS1202	Engg. Mathematics	4	1	0	5
3	PAS1203	Applied Science	3	1	0	4
4	PME1201	Engg. Mechanics	3	1	0	4
5	PME1202	Engg. Drawing	4	1	0	5

Practical

S. No.	Course Code	Course Title	Hours per week			Credit
			L	T	P	
6	PAS1201P	Communication Skills (Language Lab)	0	0	2	1
7	PAS1203P	Applied Science	0	0	2	1
8	PME1201P	Engineering Mechanics	0	0	2	1
9	PME1203P	Workshop Practice	0	0	3	2
Total						**27**

K.K. UNIVERSITY 803115 NALANDA

Pro Vice Chancellor
KK University
Berauti, Nepura, Bihar Sharif
Nalanda - 803115 (Bihar)

Communication Skill -II

Subject Code	Theory			Credits
PAS1201	No. of Period Per Week			
	L	T	P	4
	3	1	0	
	-	-	-	

Course Objectives:

Communication skills play an important role in career development. This course aims at introducing basic concepts of communication skills with an emphasis on developing personality of the students. Thus, the main objectives of this course are:

- To develop confidence in speaking English with correct pronunciation;
- To develop communication skills of the students i.e. listening, speaking, reading and writing skills.
- To introduce the need for personality development. Focus will be on developing certain qualities which will aid students in handling personal and career challenges, leadership skills etc.

Contents: Theory

Unit	Name of the topic	Hours
01	**Introduction to communication :** 1.1 Definition , Communication Cycle/Process, 1.2 The elements of communication: sender- message – channel-Receiver – Feedback & Context. 1.3 Definition 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.	2
02	**Types of communication :** 2.1 Formal- Informal, Verbal- Nonverbal, Vertical- Horizontal- Diagonal	2
03	**Principals of effective communication :** 3.1 Definition of Effective Communication.. 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.	2
04	**Non-verbal- graphic communication**: 4.1 Non- verbal codes: A- Kinesics , B- Proxemics , C – Haptics D-Vocalics , EP physical appearance. F –Chronemics ,G –Artifacts Aspects of Body Language Interpreting Visuals &illustrating with Visuals like Tables, Charts & graphs.	4
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 /Investigative. 5.5 Defining & describing objects & giving Instructions.	6
	Total	16

[kaM	हिन्दी	Hours
1	परिचय एवं प्रक्रिया, संप्रेषण के तत्व, प्रेषक, संदेश, चैनल, ग्राहक, फीडबैक एवं संदर्भ संप्रेषण प्रक्रिया की परिभाषा, संप्रेषण, प्रक्रिया के सोपान, संदर्भ,	2
2	श्रोता समुदाय, संदर्भ का स्वरूप, माध्यम का चयन प्रस्तुति में दृश्य चार्ट, टेबल आदि का प्रयोग। संप्रेषण के प्रकार, औपचारिक, अनौपचारिक, भाषिक एवं गैर भाषिक, प्रभावशाली संप्रेषण की परिभाषा, प्रकार,	2
3	संप्रेषण, प्रभावशाली संदेश की तैयारी एवं स्वरूप फीडबैक, मौखिक संप्रेषण एवं शारीरिक भाषा प्रकार, तौर तरीके एवं आधारभूत शिष्टाचार, शारीरिक भाषा द्वारा संप्रेषण, मुखाकृति द्वारा संप्रेषण,	2
4	सामूहिक परिचर्चा विवाद, वक्तृत्व शैली का विकास, कार्यभार संप्रेषण प्रक्रिया से संबंधित डायग्राम, संप्रेषण के प्रकार एवं स्थिति, विषय के अनुसार कहानी लेखन एवं अनुच्छेद लेखन,तकनीकी एवं वैज्ञानिक शब्दावली, बैंक से संबंधित शब्दावली, व्यवसायिक पत्र	2
	Total	8

Text /Reference Books:

Titles of the Book	Name of Authors	Name of the Publisher
Developing Communication Skills	Krushna Mohan, Meera Banerji	Macmillan
Communication Skills	Joyeeta Bhattacharya.	Reliable Series
Every ones guide to effective writing	Jayakaran	Apple Publishing
Communication Skills-II	Kajari Guha	Foundation Publishing House
The Functional Aspects of Communication Skills	Dr. P. Prasad	S.K. Kataria & Sons.
Communication Skills	Leena Sen	Prentice Hall of India Pvt. Ltd.
Professional Communication	Dr. Raavee Tripathi	S.K. Kataria & Sons.
Technical Communication for Engineers	Shalini Verma	Vikas Publishing Home Pvt. Ltd.
Effectual Communication Skills	Bhupender Kour	S.K. Kataria & Sons.

Course outcomes:

At the end of this course, the participants will:

- Develop basic speaking and writing skills including proper usage of language and vocabulary so that they can become highly confident and skilled speakers and writers.
- Be informed of the latest trends in basic verbal activities such as presentations, facing interviews and other forms of oral communication.
- Also develop skills of group presentation and communication in team.
- Develop non-verbal communication such as proper use of body language and gestures.

Engineering Mathematics

Subject Code PAS1202	Theory			Credits
	No. of Period Per Week			
	L	T	P	5
	4	1	0	
	-	-	-	

Course Objectives:

- To visualize and conceptualize the engineering problems.
- To model the engineering problem mathematically using theory of calculus and matrices.
- To determine the solution of the studied engineering problem from application point of view.

Contents: Theory

Unit	Name of the topic	Hours
01	**Function and Limit :** **1.1 Function** 1.1.1 Definitions of variable, constant, intervals such as open, closed, semi-open etc. 1.1.2 Definition of Function, value of a function and types of functions, Simple Examples. **1.2 Limits** 1.2.1 Definition of neighbourhood, concept and definition limit. 1.2.2 Limits of algebraic, trigonometric, exponential and logarithmic functions with simple examples.	**9**
02	**Derivatives :** 2.1 Definition of Derivatives, notations. 2.2 Derivatives of Standard Functions 2.3 Rules of Differentiation. (Without proof). Such as Derivatives of Sum or difference, scalar multiplication, Product and quotient. 2.4 Derivatives of composite function (Chain rule) 2.5 Derivatives of inverse and inverse trigonometric functions. 2.6 Derivatives of Implicit Function 2.7 Logarithmic differentiation 2.8 Derivatives of parametric Functions. 2.9 Derivatives of one function w.r.t another function 2.10 Second order Differentiation.	**12**
03	**Statistics and Probability :** **3.1 Statistics** 3.1.1 Measures of Central tendency (mean, median, and mode) for ungrouped and grouped frequency distribution. 3.1.2 Graphical representation (Histogram and Ogive Curves) to find mode and median. 3.1.3 Measures of Dispersion such as range, mean deviation, Standard Deviation, Variance and coefficient of variation. Comparison of two sets of observations. **3.2 Probability** 3.2.1 Definition of random experiment, sample space, event, Occurrence of event and types of events (impossible, mutually exclusive, exhaustive, equally likely).	**12**

	3.2.2 Definition of Probability, addition and multiplication theorems of Probability.	
04	**4.1 Applications of derivative** 4.1.1 Geometrical meaning of Derivative, Equation of tangent and Normal. 4.1.2 Rates and Motion 4.1.3 Maxima and minima 4.1.4 Radius of Curvature **4.2 Complex number** 4.2.1 Definition of Complex number. Cartesian, polar, Exponential forms of Complex number. 4.2.2 Algebra of Complex number(Equality, addition, Subtraction, Multiplication and Division) 4.2.3 De-Moivre's theorem (without proof) and simple problems. Euler's form of Circular functions, hyperbolic functions and relations between circular & hyperbolic Functions.	**9**
05	**5.1 Numerical Solution of Algebraic Equations** 5.1.1 Bisection method, Regula- Falsi method and Newton- Raphson method. **5.2 Numerical Solution of Simultaneous Equations** 5.2.1 Gauss elimination method 5.2.2 Iterative methods-Gauss Seidal and Jacobi's method.	**6**
	Total	**48**

Text /Reference Books:

Titles of the Book	Name of Authors	Name of the Publisher
Mathematics for Polytechnic	S.P. Deshpande	Pune Vidyarthi Griha Prakashan Pune.
Advanced Engineering Mathematics	Dass H.K.	S. Chand Publication, New Delhi
Calculus single Variable	Robert T Smith	Tata McGraw Hill
Fundamentals of Mathematical Statistics	S.C. Gupta and Kapoor	S. Chand Publication New Delhi
Higher Engineering Mathematics	B.S. Grewal	Khanna Publication, New Delhi
Applied Mathematics	P.N. Wartikar	Pune Vidyarthi Griha Prakashan, Pune.
Engineering Mathematics	Sindhu Prasad	Foundation Publishing House

Course outcomes:

At the end of this course, the students will be able:

- To visualize and conceptualize the engineering problems.
- To model the engineering problem mathematically using theory of calculus and matrices.
- To determine the solution of the studied engineering problem from application point of view.
- To validate the solution.
- To implement the solution for engineering problem.

Course Code	PAS 1203
Course Title	Applied Science
Number of Credits	4(L: 3, T: 1, P: 0)
Prerequisites	NIL
Course Category	PAS

Course Objectives:-

- Applied Physics aims to give an understanding of this world both by observation and by prediction of the way in which objects behave.
- Concrete use of physical principles and analysis in various fields of engineering and technology are given prominence in the course content.
- The course will help the diploma engineers to apply the basic concepts and principles to solve broad-based engineering problems and to understand different technology based applications.

CONTENTS: THEORY

Unit	PHYSICS(A)	
01	**1. Kinematics** **1.1 Rectilinear Motion** Equations of Motions- v = u+at, S = ut+1/2at2, V2 = u2+2as (only equation), Distance traveled by particle in nth second, Velocity Time Diagrams-uniform velocity, uniform acceleration and uniform retardation, equations of motion for motion under gravity. **1.2 Angular Motion** Definition of angular displacement, angular velocity, angular acceleration, Relation between angular velocity and linear velocity, Three equations of circular motion (no derivation) angular distance traveled by particle in nth second (only equation), Definition of S.H.M. and S.H.M. as projection of uniform circular motion on any one diameter, Equation of S.H.M. and Graphical representation of displacement, velocity, acceleration of particle in S.H.M. for S.H.M. starting from mean position and from extreme position.	**7**
02	**2. Kinetics** **2.1** Definitions of momentum, impulse, impulsive force, and Statements of Newton's laws of motion and with equations, Applications of laws of motion—Recoil of gun, Motion of two connected bodies by light inextensible string passing over smooth pulley, Motion of lift. **2.2 Work, Power, Energy** Definition of work, power and energy, equations for P.E. K.E., Work energy principle, Representation of work by using graph, Work done by a torque(no derivation).	**7**
03	**3. Non –destructive testing of Materials.** **3.1 T**esting methods of materials -Destructive and Non-destructive, Advantages and Limitations of N.D.T., Names of N.D.T. Methods used in industries, Factors on Which selection of N.D.T. dependents, Study of Principle, Set up, Procedure. **3.2** Working, Advantages, limitations, Applications and Application code of following N.D.T. methods -Penetrant method, Magnetic particle method,	**5**

	Radiography, Ultrasonic, Thermography.	
04	**Acoustics and Indoor Lighting of Buildings** **4.1 Acoustics** Weber and Fetcher's law, limit of intensity and loudness, echo, Reverberation and reverberation time (Sabine's formula) **,**Timbre(quality of sound), Pitch or Frequency of sound. Factors affecting Acoustical planning of auditorium-- echo, reverberation, creep, focusing, standing wave, coefficient of absorption, sound insulation, noise pollution and the different ways of controlling these factors. **4.2 Indoor lighting** Definition of luminous intensity, intensity of illumination with their SI units, Inverse square law and Photometric equation, Bunsen's photometer— ray diagram, working and applications, Need of indoor lighting, Indoor lighting schemes and Factors Affecting Indoor Lighting.	**5**
	Total	**24**

Text /Reference Books:		
Titles of the Book	**Name of Authors**	**Name of the Publisher**
Physics –I	V. Rajendran	Tata McGraw - Hill
Applied Physics	Arthur Beiser	Tata McGraw - Hill
Engineering Physics	R.K. Gaurand and S.L. Gupta	Dhanpatrai
Phyiscs	Resrie and Holliday	-
Concept of Physics Part-I, II	H.C. Verma	-
Applied science	Roshan Kr. Sinha	Foundation Publishing House

(B) **CHEMISTRY**		
Unit	**Name Of The Topic**	**Hours**
01	**Electrochemistry** Definition of Electrolyte & Conductor, Difference between Metallic &Electrolytic Conduction, Ionisation, Degree of Ionisation & Factors Affecting Degree of Ionisation, Conductivity of Electrolytes. Definition of Electrochemical Cell, Battery, Charge, Discharge, Closed Circuit Voltage, Open Circuit Voltage, EMF, Internal Resistance, Separator, Classification of Batteries such as Primary, Secondary &Reserve with Examples. Industrial Application of Electrolysis – Metallic or Protective Factors for Selection of Method of Coating, Process of Electroplating, Electrorefining, Electrometallurgy (Applications of Electroplating), Impregnated Coating or Cementation on Base Metal Steel – Coating Metal Zn (Sheradizing),Cr (Chomozing), Al (Colorizing), Applications, Advantages & Disadvantages.	5

02	**Non Metallic Engineering Materials** (Plastic, Rubber, Insulators, Refractories, Composite Material, Ceramics) **1. Engineering Plastic:** Special Characteristics & Engineering Applications of Polyamides or Nylons, Polycarbonates (Like Lexan, Merlan), Polyurethanes(Like Perlon – U), Silicons, Polyacetals, Teflon, Laminated Plastic, Thermocole, Reinforced Plastic. **2. Ceramics:** Definition, Properties & Engineering Applications, Types – Structural Ceramics, Facing Material, Refractories, Fine Ceramics, Special Ceramics. **3. Refractories:** Definition, Properties, Applications & Uses of Fire Clay, Bricks, Silica Bricks. **4. Composite Materials:** Definition, Properties, Advantages, Applications & Examples.	5
03	**Metals & Alloys** **Metals** – Metallurgy of Iron, Terms Involved in Metallurgy, Indian Resources of Fe, Imp Ores, Extraction, Smelting in Blast Furnace, Chemical Reactions in Blast Furnace, Products of Blast Furnace, their Composition, Application, Commercial Forms of Iron, (Pig Iron /Cast Iron, Wrought or Malleable Steel), their Composition, Properties & Applications, Types of Casting (Chilled Casting, Centrifugal Casting & Malleable Casting), Heat Treatment, Heat Treatment of Cast Iron & Steel. **Alloys** – Definition, Types, Ferrous Alloys – Steel, Composition, Properties & Applications of Plain Carbon Steel (Low Carbon, Medium Carbon, High Carbon & Very Hard Steel) & Alloy Steels, (Heat Resisting, Shock Resisting, Magnetic, Stainless, Tool Steel & HSS), Effect of Various Alloying Elements (Cr, W, V, Ni, Mn, Mo, Si) etc. on Steel. Non-Ferrous Alloys – Copper Alloy – Brass, Bronze, Nickel Silver or German Silver, their Composition, Properties & Applications, Aluminium Alloy – Duralumin, Bearing Alloy – Babbitt Metal, Solders –Soft Solder, Brazing Alloy, Tinamann's Solder, Nickel Alloy – Monel Metal, Low Melting Alloys – Woods Metal.	8
04	**Corrosion** Definition, Types, Atmospheric or Chemical Corrosion, Mechanism, Factors Affecting Atmospheric, Corrosion & Immersed Corrosion or Electrochemical Corrosion, Mechanism, Protection of Metals by Purification of Metals, Alloy Formation, Cathode Protection, Controlling the External Conditions & Application of Protective Coatings i.e. Galvanising, Tinning, Metal Spraying, Sherardizing, Electroplating, Metal Clodding, Cementation or Diffusion Method, their Definition, Procedure, Uses, Advantages & Disadvantages, Examples of Non Corrosive Materials, Protection of Corrosion by the Use of Organic Coating Like Paint, Lacquer, Enamels, Emulsion Paints, Special Paints,their Properties & Uses. Special Paints – Heat Resistant, Cellulose Paint, Coaltar Paint, Antifouling Paint their constituents & applications.	6
05	**Lubricant** Lubricant, Types, Lubrication Mechanism by Fluid Film, Baundary, Extreme Pressure, Physical Characteristics of Lubricants Such as Viscosity, Viscosity Index, Oilness, Volatility, Flash & Fire Point, Cloud &Pour Point, Chemical Characteristics such as Acid Value or Neutralization Number, Emulsification, Saponification Value, Selection of Lubricants for Various Types of Machineries.	3

	Total	27

Text /Reference Books:		
Titles of the Book	**Name of Authors**	**Name of the Publisher**
Engineering Chemistry	Jain & Jain	Dhanpat Rai and Sons
Engineering Chemistry	S.S. Dara	S. Chand Publication
Industrial Chemistry	B.K. Sharma	Goel Publication
Environmental Chemistry & Pollution Control	S.S. Dara	S. Chand Publication
Applied science	Sanjay Kumar, Rahul Kumar	Foundation Publishing House

Course outcomes:

• Represent physical quantities as scalar and vectors and solve real life relevant problems.

• Analyse type of motions and apply the formulation to understand banking of roads/railway tracks and conservation of momentum principle to describe rocket propulsion, recoil of gun etc.

• Define scientific work, energy and power and their units. Derive relationships for work, energy and power and solve related problems.

Course Code	**PME 1201**
Course Title	**Engineering Mechanics**
Number of Credits	**4(L: 3, T: 1, P: 0)**
Prerequisites	**NIL**
Course Category	**PME**

Course Objectives:-

- To familiarize students with the key concepts and principles of digital marketing.
- To develop students' ability to create effective digital marketing strategies.
- To enhance students'skills in using digital marketing tools such as Google Analytics and socia l media platforms.

CONTENTS: THEORY

Unit	**Name Of The Topic**	**Hours**
	Force a. **Fundamentals: - Definitions of** mechanics, statics, dynamics. Engineering Mechanics, body, rigid body, mass, weight, length, time, scalar and vector, fundamental units, derived units, S.I. units.	

01	b. **Force**: - Definition of a force, unit force, Newton, S.I. unit of a force, representation of a force by vector and by Bow's notation method. Characteristics of a force, effects of a force, principle of transmissibility. c. **Resolution of a force:** Definition, Method of resolution, Types of component forces, Perpendicular components and Non perpendicular components. d. **Moment of a force: -** Definition, measurement of moment of a force, S. I. unit, geometrical meaning of moment of a force, classification of moments according to direction of rotation, sign convention, law of moments Varignon's theorem of moment andit's use, couple – definition, S.I. unit, measurement of a couple, properties of couple. e. **Force system: -** Definition, classification of force system according to plane and line of action f. **Composition of Forces**: - Definition, Resultant force, methods of composition of forces, I – Analytical method:– (i) Trigonometric method (law of parallelogram of forces) (ii) Algebraic method (method of resolution),II – Graphical method: - Introduction, space diagram, vector diagram, polar diagram, and funicular polygon. Resultant of concurrent, non-concurrent and parallel force system by analytical and graphical method.	12
02	**Equilibrium:** 2.1 Definition, conditions of equilibrium, analytical and graphical conditions of equilibrium for concurrent, non-concurrent and parallel force system, free body and free body diagram. 2.2 Lami's Theorem – statement and explanation, Application of Lami's theorem for solving various engineering problems. 2.3 Equilibrant – Definition, relation between resultant and equilibrant, equilibrant of concurrent and non-concurrent force system. 2.4 Beams – Definition, Types of beams (cantilever, simply supported, overhanging, fixed, continuous), Types of end supports (simple support, hinged, roller), classification of loads, point load, uniformly distributed load. Reactions of a simply supported and over.	6
03	**Friction:** 3.1 Definition of friction, force of friction, limiting frictional force, coefficient of friction, angle of friction, angle of repose, relation between angle of friction angle of repose and coeff. Of friction. Cone of friction, types of friction, laws of friction, advantages and disadvantages of friction. 3.2 Equilibrium of bodies on level plane –external force applied horizontal and inclined up and down. 3.3 Equilibrium of bodies on inclined plane – external forces is applied parallel to the plane, horizontal and incline to inclined plane. 3.4 Ladder friction, Wedge and block.	8
04	**Centroid and Centre Of Gravity:** 4.1 **Centroid:** Definition of centroid. Moment of an area about an axis. Centroid of basic geometrical figures such as square, rectangle, triangle, circle, semicircle and quarter circle. Centroid of composite figure. 4.2 **Center of gravity:** Definition, center of gravity. Of simple solids such as cylinder, sphere, hemisphere, cone, cube, and rectangular block. Centre of gravity of composite solids.	8
	Simple Machines: 5.1 Definitions of simple machine, compound machine , load , effort ,	

05	mechanical advantage , velocity ratio , input on a machine ,out put of a machine ,efficiency of a machine , expression for mechanical advantage , velocity ratio and efficiency of a machine. Ideal machine, ideal effort and ideal load, friction in machines, effort lost in friction and frictional load. 5.2 Law of machine, maximum mechanical advantage and maximum efficiency of a machine, reversibility of a machine, condition for reversibility of a machine, self locking machine. 5.3 Study of simple machines : Simple axle and wheel, differential axle and wheel, Weston's differential pulley block, single purchase crab, double purchase crab, worm and worm wheel, geared pulley block, screw jack, pulleys : First, second and third system of pulleys, gear train, hoist mechanism.	10
	Total	48

Text /Reference Books:		
Titles of the Book	**Name of Authors**	**Name of the Publisher**
Engineering Mechanics	Beer-Johnson	Tata McGraw Hill, Delhi
Engineering Mechanics	Basu	Tata McGraw Hill, Delhi
Vector Mechanics for Engineers Vol. - I & II	Joslph F. Shelley	Tata McGraw Hill, Delhi
Engg. Mechanics	Ram Manohar Pandey	Foundation Publishing House

Course Outcomes:

- Students will be able to explain the fundamental concepts and principles of digital marketing.
- Students will be able to design and implement a comprehensive digital marketing strategy.
- Students will be able to analyze digital marketing metrics and generate performance reports using Google Analytics.

Course Code	PME 1202
Course Title	**Engineering Drawing**
Number of Credits	4(L: 3, T: 1, P: 0)
Prerequisites	NIL
Course Category	PME

Course Objectives :-

To introduce the students, the techniques of constructing the various types of polygons, curves and scales.

Unit	Name Of The Topic	Hours
01	**Sectional Views.** 1.1 Types of sections 1.2 Conversion of pictorial view into sectional orthographic views (First Angle Projection Method only)	3
02	**Missing Views.** 2.1 Draw missing view from the given Orthographic views – simple components (First Angle Projection Method only)	1
03	**Isometric Projection** 3.1 Conversion of Orthographic Views into Isometric view/projection (Including rectangular, cylindrical objects, representation of slots on sloping as well as plane surfaces).	3
04	**Projections of Solids.** 4.1 Projections of Prism, Pyramid, Cone, Cylinder, Tetrahedron, Cube with their axes inclined to one reference plane and parallel to other.	2
05	**Sections of Solids.** 5.1 Solids: -Prism, Pyramid, Cone, Cylinder, Tetrahedron, Cube. 5.2 Cone, Pyramid and Tetrahedron resting on their base on Horizontal Plane. 5.3 Prism, Cylinder: -a)Axis parallel to both the reference plane b) Resting on their base on HP. 5.4 Section plane inclined to one reference plane and perpendicular to other.	3
06	**Developments of Surfaces.** Developments of Lateral surfaces of cube, prisms, cylinder, pyramids, cone and their applications such as tray, funnel, Chimney, pipe bends etc.	2
07	**Free Hand Sketches** 7.1 Free hand sketches of nuts, bolts, rivets, threads, split pin, foundation bolts,	2
	Total	16

Text /Reference Books:		
Titles of the Book	**Name of Authors**	**Name of the Publisher**
Engineering Drawing	N.D. Bhatta	Charotkar Publishing House
Engineering Drawing	R.K. Dhawan	S. Chand Co.

Engineering Drawing P.J. Shah	Engineering Drawing P.J. Shah	-
Machine Drawing	N.D. Bhatta	Charotkar Publishing House
Engineering Drawing and Graphics + Auto CAD	K. Venugopal	New Age Publication
Engineering Graphics	K.R. Mohan	Dhanpat Rai and Publication Co.
Machine Drawing	R.K. Dhawan	S. Chand Co.
Engineering Drawing	Dharmendra Kumar	Foundation Publishing House

Course Outcomes:

• To enable the students with various concepts like dimensioning, conventions and standards related to Engineering Drawing
• To impart knowledge on the projection of points, lines and plane surfaces
• To improve the visualization skills for better understanding of projection of solids
• To develop the imaginative skills of the students required to understand Section of solids and Developments of surfaces
• To make the students understand the viewing perception of a solid object in Isometric and Perspective projections

Course Code	**PAS 1201P**
Course Title	**Communication Skills(Language Lab)**
Number of Credits	**1(L: 0, T: 0, P: 1)**
Prerequisites	**NIL**
Course Category	**PASP**

CONTENTS: PRACTICAL

Assignments:

1. Communication Cycle (With The Help Of Diagram)
2. Communication Situations (List Of 5 Communication situations stating the types of Communication
3. Barriers That Hinder A Particular Communication Situation. (State the type of barrier, and how to overcome them)
4. Developing A Story Or A Paragraph For The Given Topic Sentence.(in a group of 5 – 6 students)
5. Describing Various Equipment's.
6. Identifying The Various Sentences With Their Type Of Writing. (e.g. Scientific, Legal, Colloquial etc.)
7. Business Letters

8. Letters Of Suggestion
9. Comparative Time Table Of 2 Students
10. Description Of Two Different Persons.(seeing the picture)
11. Letter To The Librarian, Principal
12. Report Writing

NOTE: The above assignments are suggested to be completed in the prescribed work-book.

Course Code	**PAS 1201P**
Course Title	**Applied Science Lab**
Number of Credits	**1(L: 0, T: 0, P: 2)**
Prerequisites	**NIL**
Course Category	**PASP**

CONTENTS: PRACTICAL

List of Experiments (PHYSICS):

1. To represent simple harmonic motion with the help of vertical oscillation of spring and to determine spring constant (K) (Stiffness Constant)
2. To determine time period of oscillation of compound bar pendulum and calculate acceleration due to gravity.
3. To determine the velocity of sound by using resonance tube
4. To compare luminous intensities of two luminous bodies by using Bunsen's photometer.
5. To calculate coefficient of absorption for acoustical materials
6. To determine Joule's constant (J) by electric method
7. To determine wavelength of Sodium light by using Newton's rings

List of Experiments (CHEMISTRY):

1. To determine neutralization point of weak acid and weak base by conductivity meter.
2. To determine end point of titration between dil. H_2SO_4 and $BaCl_2$ using conductivity meter.
3. To verify Faraday's second law of electrolysis.
4. To determine pH of given solution by using pH paper, universal indicator and pH meter.
5. To determine the strength of given hydrochloric acid solution by titrating it against sodium hydroxide solution using pH meter.
6. To determine percentage of copper from brass iodometrically.
7. To find the rate of corrosion of Al strip in acidic and basic medium graphically.

8. To determine thinner content in paint.
9. To determine acid value of given lubricant.
10. To determine viscosity of given oil by using Ostwald's viscometer.
11. To determine saponification value of given lubricant

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Course Code	PME 1201P
Course Title	Engineering Mechanics
Number of Credits	1(L: 0, T: 0, P: 2)
Prerequisites	NIL
Course Category	PMEP

CONTENTS: PRACTICA

Skills to be developed:
1.Intellectual Skill: A. Calculate the forces on given structure
B. Interpret the results
2. Motor Skills: A. Handle the equipment carefully
B. Draw graph
Any five experiments from Group A,B and graphical solution in Group C :
Group A:
1) Verify law of polygon of forces
2) Verify law of moments
3) Verification of Lami's theorem
4) Forces in members of a jib crane.
5) Comparison of coefficient of friction of various pair of surfaces and
6) determination of angle of repose
7) Equilibrium of parallel forces – simply supported beam reactions.
8) Experimental location of centre of gravity of plane plate of uniform thickness.
Group B:
To find MA, VR, Efficiency, Ideal Effort, Effort lost in friction for various loads and establish
law of machine and calculate maximum efficiency.
Also check the reversibility of a machine (Any five):
1) Differential axle and wheel
2) Weston's differential pulley block
3) Geared pulley block
4) Single purchase crab
5) Double purchase crab
6) Worm and worm wheel
7) Two sheave and three sheave pulley block
8) Screw jack.
Group C:
A 2 Size drawing sheets containing graphical solutions for –
1) Concurrent force system : Two problems
2) Parallel force system : Two problems
3) Reactions of a beam : Two problems

Course Code	PME 1203P
Course Title	Workshop Practice
Number of Credits	2(L: 0, T: 0, P: 3)
Prerequisites	NIL
Course Category	PMEP

CONTENTS:PRACTICAL

S.No.	List Of Practical's
1	**CARPENTERY SHOP:** • Any one composite job from the following involving different joint, turning and planning, surface finishing by emery paper, varnishing etc. like square stool, tea table, center table, chaurang, table lamp bed sofaset, book rack. Cabinet, notice board, shows cases, tables chairs etc. Note: 1] One job of standard size (Saleable 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 4] Student shall calculate the cost of material and labor cost for their job from the drawing.
2	**WELDING SHOP** • Any one composite job from involving butt joint lap joint welding process, from the following like Grill, door, window frame, waste paper basket, Chappel stand, Corner flower stand chair , table frame (squarepipe 25 mm) cooler frame (folding type) **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.
3	**SMITHY SHOP** • Demonstration of different forging tools and Power Hammer. • Demonstration of different forging processes, likes shaping, caulking fullering, setting down operations etc. • One job like hook peg, flat chisel or any hardware item. • **Note**: 1]One job of standard size (Saleable/marketable article shall be preferred) 2] Job allotted should comprise of 4-6 hours of actual working operations. 3] Student shall calculate the cost of material and labor required for their job from the drawing.
	PLUMBING SHOP :

4	• Demonstration of PVC pipe joint with various fittings. • Exercise for students on preparing actual pipeline layout for G.I. Pipe or PVC pipe. Preparing actual drawing and bill of material. 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 4] Student shall calculate the cost of material and labor cost for their job from the drawing.
5	***SHEET METAL SHOP*** • One composite job from the following: Letter box, Trunk, Grain Container, Water-heater Container, Bucket, Waste Paper Basket, Cooler Tray, Water-draining Channel, etc.(including soldering and riveting) Note: 1] One job of standard size (Saleable/marketable article shall be preferred) K.K.U-DIPLOMA(E.E) Page 39 2] Batch size should be selected depending on volume of work. 3] Job allotted should comprise of 4-6 hours of actual working ions. 4] Student shall calculate the cost of material and labor cost required for their job from the drawing.
6	**Demonstration of power tools and practice of utility items.** • Demonstration of advance power tools, pneumatic tools, electrical wiring tools and accessories. • Making of electrical switchboard with 2 sockets and piano buttons and with electrical wiring. • Any other item as per the requirement of college/Deptt./

Course Objectives:

Communication skills play an important role in career development. This course aims at introducing basic concepts of communication skills with an emphasis on developing personality of the students. Thus, the main objectives of this course are:

To develop confidence in speaking English with correct pronunciation;

To develop communication skills of the students i.e. listening, speaking, reading and writing skills.

To introduce the need for personality development. Focus will be on developing certain qualities which will aid students in handling personal and career challenges, leadership skills etc.

CONTENTS: THEORY

UNIT	Name Of The Topic	Hours
01	**Introduction to communication :** 1.1 Definition , Communication Cycle/Process, 1.2 The elements of communication : sender- message – channel- Receiver –Feedback & Context. 1.3 Definition 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.	2
02	**Types of communication :** 2.1 Formal- Informal, Verbal- Nonverbal, Vertical- Horizontal- Diagonal	2
03	**Principals of effective communication :** 3.1 Definition of Effective Communication.. 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.	2
04	**Non verbal- graphic communication**: 4.1 Non- verbal codes: A- Kinesics , B- Proxemics , C – Haptics D-Vocalics , EP hysical appearance. F –Chronemics ,G –Artifacts Aspects of Body Language Interpreting Visuals &illustrating with Visuals like Tables, Charts & graphs.	4
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 /Investigative. 5.5 Defining & describing objects & giving Instructions.	6
	Total	16
	हिन्दी	Hour

		s
	परिचयएवंप्रक्रिया,संप्रेषणकेतत्व,प्रेषक,संदेश,चैनल,ग्राहक,फीडबैकएवंसंदर्भसंप्रेषणप्रक्रियाकीपरिभाषा,संप्रेषण,प्रक्रियाकेसोपान,संदर्भ,	2
	श्रोतासमुदाय,संदर्भकास्वरूप,माध्यमकाचयनप्रस्तुतिमेंदृश्यचार्ट,टेबलआदिकाप्रयोग ।संप्रेषणकेप्रकार,औपचारिक,अनौपचारिक,भाषिकएवंगैरभाषिक,प्रभावशालीसंप्रेषणकीपरिभाषा,प्रकार,	2
	संप्रेषण,प्रभावशालीसंदेशकीतैयारीएवंस्वरूपफीडबैक,मौखिकसंप्रेषणएवंशारीरिकभाषाप्रकार,तौरतरीकेएवंआधारभूतशिष्टाचार,शारीरिकभाषाद्वारासंप्रेषण,मुखाकृतिद्वारासंप्रेषण,	2
	सामूहिकपरिचर्चाविवाद,वक्तृत्वशैलीकाविकास,कार्यभारसंप्रेषणप्रक्रियासेसंबंधितडायग्राम,संप्रेषणकेप्रकारएवंस्थिति,विषयकेअनुसारकहानीलेखनएवंअनुच्छेदलेखन,तकनीकीएवंवैज्ञानिकशब्दावली,बैंकसेसंबंधितशब्दावली,व्यवसायिकपत्र	2

Text /Reference Books:		
Titles of the Book	**Name of Authors**	**Name of the Publisher**
Developing Communication Skills	Krushna Mohan, Meera Banerji	Macmillan
Communication Skills	Joyeeta Bhattacharya.	Reliable Series
Every ones guide to effective writing	Jayakaran	Apple Publishing
Communication Skills-II	Kajari Guha	Foundation Publishing House
The Functional Aspects of Communication Skills	Dr. P. Prasad	S.K. Kataria & Sons.
Communication Skills	Leena Sen	Prentice Hall of India Pvt. Ltd.
Professional Communication	Dr. Raavee Tripathi	S.K. Kataria & Sons.
Technical Communication for Engineers	Shalini Verma	Vikas Publishing Home Pvt. Ltd.
Effectual Communication Skills	Bhupender Kour	S.K. Kataria & Sons.

Course outcomes:

At the end of this course, the participants will:

- Develop basic speaking and writing skills including proper usage of language and vocabulary so that they can become highly confident and skilled speakers and writers.
- Be informed of the latest trends in basic verbal activities such as presentations, facing interviews and other forms of oral communication.
- Also develop skills of group presentation and communication in team.
- Develop non-verbal communication such as proper use of body language and gestures.

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CourseCode		**PAS1202**
CourseTitle		**Engineering Mathematics**
NumberofCredits		**5(L:4,T:1,P:0)**
Prerequisites		**NIL**
CourseCategory		**PAS**

CONTENTS: THEORY

Course Objectives:

- To visualize and conceptualize the engineering problems.
- To model the engineering problem mathematically using theory of calculus and matrices.
- To determine the solution of the studied engineering problem from application point of view.

Unit	Name Of The Topic	
	Function and Limit : **1.1 Function**	

01	1.1.1 Definitions of variable, constant, intervals such as open, closed, semi-open etc. 1.1.2 Definition of Function, value of a function and types of functions, Simple Examples. **1.2 Limits** 1.2.1 Definition of neighborhood, concept and definition limit. 1.2.2 Limits of algebraic, trigonometric, exponential and logarithmic functions with simple examples.	9
02	**Derivatives :** 2.1 Definition of Derivatives, notations. 2.2 Derivatives of Standard Functions 2.3 Rules of Differentiation. (Without proof). Such as Derivatives of Sum or difference, scalar multiplication, Product and quotient. 2.4 Derivatives of composite function (Chain rule) 2.5 Derivatives of inverse and inverse trigonometric functions. 2.6 Derivatives of Implicit Function 2.7 Logarithmic differentiation 2.8 Derivatives of parametric Functions. 2.9 Derivatives of one function w.r.t another function 2.10 Second order Differentiation.	12
03	**Statistics and Probability :** **3.1 Statistics** 3.1.1 Measures of Central tendency (mean, median, mode) for ungrouped and grouped frequency distribution. 3.1.2 Graphical representation (Histogram and Ogive Curves) to find mode and median. 3.1.3 Measures of Dispersion such as range, mean deviation, Standard Deviation, Variance and coefficient of variation. Comparison of two sets of observations. **3.2 Probability** 3.2.1 Definition of random experiment, sample space, event, Occurrence of event and types of events (impossible, mutually exclusive, exhaustive, equally likely). 3.2.2 Definition of Probability, addition and multiplication theorems of Probability.	12
04	**4.1 Applications of derivative** 4.1.1 Geometrical meaning of Derivative, Equation of tangent and Normal. 4.1.2 Rates and Motion 4.1.3 Maxima and minima 4.1.4 Radius of Curvature **4.2 Complex number** 4.2.1 Definition of Complex number. Cartesian, polar, Exponential forms of Complex number. 4.2.2 Algebra of Complex number(Equality, addition, Subtraction, Multiplication and Division) 4.2.3 De-Moivre's theorem (without proof) and simple problems. Euler's form of Circular functions, hyperbolic functions and relations between circular &hyperbolic	9

	Functions.	
05	**5.1 Numerical Solution of Algebraic Equations** 5.1.1 Bisection method, Regula- Falsi method and Newton- Raphson method. **5.2 Numerical Solution of Simultaneous Equations** 5.2.1 Gauss elimination method 5.2.2 Iterative methods-Gauss Seidal and Jacobi's method.	6
	Total	48

Text /Reference Books:

Titles of the Book	**Name of Authors**	**Name of the Publisher**
Mathematics for Polytechnic	S.P. Deshpande	Pune Vidyarthi Griha Prakashan Pune.
Advanced Engineering Mathematics	Dass H.K.	S. Chand Publication, New Delhi
Calculus single Variable	Robert T Smith	Tata McGraw Hill
Fundamentals of Mathematical Statistics	S.C. Gupta and Kapoor	S. Chand Publication New Delhi
Higher Engineering Mathematics	B.S. Grewal	Khanna Publication, New Delhi
Applied Mathematics	P.N. Wartikar	Pune Vidyarthi Griha Prakashan, Pune.
Engineering Mathematics	Sindhu Prasad	Foundation Publishing House

Course outcomes:

At the end of this course, the students will be able:

- To visualize and conceptualize the engineering problems.
- To model the engineering problem mathematically using theory of calculus and matrices.
- To determine the solution of the studied engineering problem from application point of view.
- To validate the solution.
- To implement the solution for engineering problem.

CourseCode		**PAS1203**
CourseTitle		**Applied Science**
NumberofCredits		**4(L:3,T:1,P:0)**
Prerequisites		**NIL**
CourseCategory		**PAS**

Course Objectives :-

- Applied Physics aims to give an understanding of this world both by observation and by prediction of the way in which objects behave.
- Concrete use of physical principles and analysis in various fields of engineering and technology are given prominence in the course content.

- The course will help the diploma engineers to apply the basic concepts and principles to solve broad-based engineering problems and to understand different technology based applications.

CONTENTS:THEORY

Unit	PHYSICS(A)	
01	**1. Kinematics** **1.1 Rectilinear Motion** Equations of Motions- $v = u+at$, $S = ut+1/2at^2$, $V^2 = u^2+2as$ (only equation), Distance traveled by particle in nth second, Velocity Time Diagrams-uniform velocity, uniform acceleration and uniform retardation, equations of motion for motion under gravity. **1.2 Angular Motion** Definition of angular displacement, angular velocity, angular acceleration, Relation between angular velocity and linear velocity, Three equations of circular motion (no derivation) angular distance traveled by particle in nth second (only equation), Definition of S.H.M. and S.H.M. as projection of uniform circular motion on any one diameter, Equation of S.H.M. and Graphical representation of displacement ,velocity, acceleration of particle in S.H.M. for S.H.M. starting from mean position and from extreme position.	7
02	**2. Kinetics** **2.1** Definitions of momentum, impulse, impulsive force, Statements of Newton's laws of motion and with equations, Applications of laws of motion—Recoil of gun, Motion of two connected bodies by light inextensible string passing over smooth pulley, Motion of lift. **2.2 Work, Power, Energy** Definition of work, power and energy, equations for P.E. K.E., Work energy principle, Representation of work by using graph, Work done by a torque(no derivation).	7
03	**3. Non –destructive testing of Materials.** **3.1 T**esting methods of materials -Destructive and Nondestructive, Advantages and Limitations of N.D.T., Names of N.D.T. Methods used in industries, Factors on Which selection of N.D.T. dependents, Study of Principle, Set up, Procedure. **3.2** Working, Advantages, limitations, Applications and Application code of following N.D.T. methods -Penetrant method, Magnetic particle method, Radiography, Ultrasonic, Thermography.	5
04	**Acoustics and Indoor Lighting of Buildings** **4.1 Acoustics** Weber and Fetcher's law, limit of intensity and loudness, echo, Reverberation and reverberation time (Sabine's formula) **,**Timbre(quality of sound), Pitch or Frequency of sound. Factors affecting Acoustical planning of auditorium-- echo, reverberation, creep, focusing, standing wave, coefficient of absorption, sound insulation, noise pollution and the different ways of controlling these factors. **4.2 Indoor lighting**	5

	Definition of luminous intensity, intensity of illumination with their SI units, Inverse square law and Photometric equation, Bunsen's photometer— ray diagram, working and applications, Need of indoor lighting, Indoor lighting schemes and Factors Affecting Indoor Lighting.	
	Total	24

Text /Reference Books:

Titles of the Book	**Name of Authors**	**Name of the Publisher**
Physics –I	V. Rajendran	Tata McGraw - Hill
Applied Physics	Arthur Beiser	Tata McGraw - Hill
Engineering Physics	R.K. Gaurand and S.L. Gupta	Dhanpatrai
Phyiscs	Resrie and Holliday	-
Concept of Physics Part-I, II	H.C. Verma	-
Applied science	Roshan Kr. Sinha	Foundation Publishing House

(B)	**CHEMISTRY**	
Unit	Name Of The Topic	Hours

01	**Electrochemistry** Definition of Electrolyte & Conductor, Difference between Metallic &Electrolytic Conduction, Ionisation, Degree of Ionisation & FactorsAffecting Degree of Ionisation, Conductivity of Electrolytes.Definition of Electrochemical Cell, Battery, Charge, Discharge, ClosedCircuit Voltage, Open Circuit Voltage, EMF, Internal Resistance, Separator, Classification of Batteries such as Primary, Secondary &Reserve with Examples.Industrial Application of Electrolysis – Metallic or Protective Factors for Selection of Method of Coating, Process of Electroplating, Electrorefining, Electrometallurgy (Applications of Electroplating),Impregnated Coating or Cementation on Base Metal Steel - CoatingMetal Zn (Sheradizing),Cr (Chomozing), Al (Colorizing), Applications,Advantages& Disadvantages.	5
02	**Non Metallic Engineering Materials** (Plastic, Rubber, Insulators, Refractories, Composite Material, Ceramics) **1. Engineering Plastic:** Special Characteristics & Engineering Applications of Polyamides orNylons, Polycarbonates (Like Lexan, Merlan), Polyurethanes(Like Perlon – U), Silicons, Polyacetals, Teflon, Laminated Plastic, Thermocole, Reinforced Plastic. **2. Ceramics:** Definition, Properties & Engineering Applications, Types – Structural Ceramics, Facing Material, Refractories, Fine Ceramics, Special Ceramics. **3. Refractories:** Definition, Properties, Applications & Uses of Fire Clay, Bricks, Silica Bricks.	5

	4. Composite Materials: Definition, Properties, Advantages, Applications & Examples.	
03	**Metals & Alloys** **Metals** – Metallurgy of Iron, Terms Involved in Metallurgy, Indian Resources of Fe, Imp Ores, Extraction, Smelting in Blast Furnace, Chemical Reactions in Blast Furnace, Products of Blast Furnace,their Composition, Application, Commercial Forms of Iron, (Pig Iron /Cast Iron, Wrought or Malleable Steel), their Composition, Properties & Applications, Types of Casting (Chilled Casting, Centrifugal Casting & Malleable Casting), Heat Treatment, Heat Treatment of Cast Iron & Steel. **Alloys** – Definition, Types, Ferrous Alloys – Steel, Composition,Properties & Applications of Plain Carbon Steel (Low Carbon,Medium Carbon, High Carbon & Very Hard Steel) & Alloy Steels, (HeatResisting, Shock Resisting, Magnetic, Stainless, Tool Steel & HSS), Effectof Various Alloying Elements (Cr, W, V, Ni, Mn, Mo, Si) etc. on Steel.Non-Ferrous Alloys – Copper Alloy – Brass, Bronze, Nickel Silver or German Silver, their Composition, Properties & Applications,Aluminium Alloy – Duralumin, Bearing Alloy – Babbitt Metal, Solders –Soft Solder, Brazing Alloy, Tinamann's Solder, Nickel Alloy – MonelMetal, Low Melting Alloys – Woods Metal.	8
04	**Corrosion** Definition, Types, Atmospheric or Chemical Corrosion, Mechanism, Factors Affecting Atmospheric, Corrosion & Immersed Corrosion or Electrochemical Corrosion, Mechanism, Protection of Metals by Purification of Metals, Alloy Formation, Cathode Protection, Controlling the External Conditions & Application of Protective Coatings i.e. Galvanising, Tinning, Metal Spraying, Sherardizing, Electroplating, Metal Clodding, Cementation or Diffusion Method, their Definition, Procedure, Uses, Advantages & Disadvantages, Examples of Non Corrosive Materials, Protection of Corrosion by the Use of Organic Coating Like Paint, Lacquer, Enamels, Emulsion Paints, Special Paints,their Properties & Uses. Special Paints – Heat Resistant, Cellulose Paint, Coaltar Paint, Antifouling Paint their constituents& applications.	6
05	**Lubricant** Lubricant, Types, Lubrication Mechanism by Fluid Film, Baundary, Extreme Pressure, Physical Characteristics of Lubricants Such as Viscosity, Viscosity Index, Oilness, Volatility, Flash & Fire Point, Cloud &Pour Point, Chemical Characteristics such as Acid Value or Neutralization Number, Emulsification, Saponification Value, Selection	3

	of Lubricants for Various Types of Machineries.	
	Total	27

Text /Reference Books:		
Titles of the Book	**Name of Authors**	**Name of the Publisher**
Engineering Chemistry	Jain & Jain	Dhanpat Rai and Sons
Engineering Chemistry	S.S. Dara	S. Chand Publication
Industrial Chemistry	B.K. Sharma	Goel Publication
Environmental Chemistry & Pollution Control	S.S. Dara	S. Chand Publication
Applied science	Sanjay Kumar, Rahul Kumar	Foundation Publishing House

Course outcomes:

- Represent physical quantities as scalar and vectors and solve real life relevant problems.
- Analyse type of motions and apply the formulation to understand banking of roads/railway tracks and conservation of momentum principle to describe rocket propulsion, recoil of gun etc.
- Define scientific work, energy and power and their units. Derive relationships for work, energy and power and solve related problems.

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CourseCode		**PME1201**
CourseTitle		**Engineering Mechanics**
NumberofCredits		**4(L:3,T:1,P:0)**
Prerequisites		**NIL**
CourseCategory		**PME**

Course Objectives :-

- To familiarize students with the key concepts and principles of digital marketing.
- To develop students' ability to create effective digital marketing strategies.
- To enhance students'skills in using digital marketing tools such as Google Analytics and socia l media platforms.

CONTENTS: THEORY

Unit	Name Of The Topic	Hours
01	**Force** a. **Fundamentals: - Definitions of** mechanics, statics, dynamics. Engineering Mechanics, body, rigid body, mass, weight, length, time, scalar and vector, fundamental units, derived units, S.I. units. b. **Force**: - Definition of a force, unit force, Newton, S.I. unit of a force, representation of a force by vector and by Bow's notation method. Characteristics of a force, effects of a force, principle of transmissibility. c. **Resolution of a force:** Definition, Method of resolution, Types of component forces, Perpendicular components and Non perpendicular components. d. **Moment of a force: -** Definition, measurement of moment of a force, S. I. unit, geometrical meaning of moment of a force, classification of moments according to direction of rotation, sign convention, law of moments Varignon's theorem of moment andit's use, couple – definition, S.I. unit, measurement of a couple, properties of couple. e. **Force system: -** Definition, classification of force system according to plane and line of action f. **Composition of Forces**: - Definition, Resultant force, methods of composition of forces, I – Analytical method:– (i) Trigonometric method (law of parallelogram of forces) (ii) Algebraic method (method of resolution),II – Graphical method: - Introduction, space diagram, vector diagram, polar diagram, and funicular polygon. Resultant of concurrent, non-concurrent and parallel force system by analytical and	12

	graphical method.	
02	**Equilibrium:** 2.1 Definition, conditions of equilibrium, analytical and graphical conditions of equilibrium for concurrent, non-concurrent and parallel force system, free body and free body diagram. 2.2 Lami's Theorem – statement and explanation, Application of Lami's theorem for solving various engineering problems. 2.3 Equilibrant – Definition, relation between resultant and equilibrant, equilibrant of concurrent and non-concurrent force system. 2.4 Beams – Definition, Types of beams (cantilever, simply supported, overhanging, fixed, continuous), Types of end supports (simple support, hinged, roller), classification of loads, point load, uniformly distributed load. Reactions of a simply supported and over.	6
03	**Friction:** 3.1 Definition of friction, force of friction, limiting frictional force, coefficient of friction, angle of friction, angle of repose, relation between angle of friction angle of repose and coeff. Of friction. Cone of friction, types of friction, laws of friction, advantages and disadvantages of friction. 3.2 Equilibrium of bodies on level plane –external force applied horizontal and inclined up and down. 3.3 Equilibrium of bodies on inclined plane – external forces is applied parallel to the plane, horizontal and incline to inclined plane. 3.4 Ladder friction, Wedge and block.	8
04	**Centroid and Centre Of Gravity:** 4.1 **Centroid:** Definition of centroid. Moment of an area about an axis. Centroid of basic geometrical figures such as square, rectangle, triangle, circle, semicircle and quarter circle. Centroid of composite figure. 4.2 **Center of gravity:** Definition, center of gravity. Of simple solids such as cylinder, sphere, hemisphere, cone, cube, and rectangular block. Centre of gravity of composite solids.	8
05	**Simple Machines:** 5.1 Definitions of simple machine, compound machine , load , effort ,mechanical advantage , velocity ratio , input on a machine ,out put of a machine ,efficiency of a machine , expression for mechanical advantage , velocity ratio and efficiency of a machine. Ideal machine, ideal effort and ideal load, friction in machines, effort	

	lost in friction and frictional load. 5.2 Law of machine, maximum mechanical advantage and maximum efficiency of a machine, reversibility of a machine, condition for reversibility of a machine, self locking machine. 5.3 Study of simple machines : Simple axle and wheel, differential axle and wheel, Weston's differential pulley block, single purchase crab, double purchase crab, worm and worm wheel, geared pulley block, screw jack, pulleys : First, second and third system of pulleys, gear train, hoist mechanism.	10
	Total	48

Text /Reference Books:		
Titles of the Book	**Name of Authors**	**Name of the Publisher**
Engineering Mechanics	Beer-Johnson	Tata McGraw Hill, Delhi
Engineering Mechanics	Basu	Tata McGraw Hill, Delhi
Vector Mechanics for Engineers Vol. - I & II	Joslph F. Shelley	Tata McGraw Hill, Delhi
Engg. Mechanics	Ram Manohar Pandey	Foundation Publishing House

- **Course Outcomes:**
- Students will be able to explain the fundamental concepts and principles of digital marketin g.
- Students will be able to design and implement a comprehensive digital marketing strategy.
- Students will be able to analyze digital marketing metrics and generate performance reports using Google Analytics.

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CourseCode		**PME1202**
CourseTitle		**Engineering Drawing**
NumberofCredits		**4(L:3,T:1,P:0)**
Prerequisites		**NIL**
CourseCategory		**PME**

Course Objectives :-

To introduce the students, the techniques of constructing the various types of polygons, curves and scales.

Unit	Name Of The Topic	Hours
01	**Sectional Views.** 1.1 Types of sections 1.2 Conversion of pictorial view into sectional orthographic views (First Angle Projection Method only)	3
02	**Missing Views.** 2.1 Draw missing view from the given Orthographic views - simple components (First Angle Projection Method only)	1
03	**Isometric Projection** 3.1 Conversion of Orthographic Views into Isometric view/projection (Including rectangular, cylindrical objects, representation of slots on	3

	sloping as well as plane surfaces).	
04	**Projections of Solids.** 4.1 Projections of Prism, Pyramid, Cone, Cylinder, Tetrahedron, Cube with their axes inclined to one reference plane and parallel to other.	2
05	**Sections of Solids.** 5.1 Solids: -Prism, Pyramid, Cone, Cylinder, Tetrahedron, Cube. 5.2 Cone, Pyramid and Tetrahedron resting on their base on Horizontal Plane. 5.3 Prism, Cylinder: -a)Axis parallel to both the reference plane b) Resting on their base on HP. 5.4 Section plane inclined to one reference plane and perpendicular to other.	3
06	**Developments of Surfaces.** Developments of Lateral surfaces of cube, prisms, cylinder, pyramids, cone and their applications such as tray, funnel, Chimney, pipe bends etc.	2
07	**Free Hand Sketches** 7.1 Free hand sketches of nuts, bolts, rivets, threads, split pin, foundation bolts,	2
	Total	16

Text /Reference Books:		
Titles of the Book	**Name of Authors**	**Name of the Publisher**
Engineering Drawing	N.D. Bhatta	Charotkar Publishing House
Engineering Drawing	R.K. Dhawan	S. Chand Co.
Engineering Drawing P.J. Shah	Engineering Drawing P.J. Shah	-
Machine Drawing	N.D. Bhatta	Charotkar Publishing House
Engineering Drawing and Graphics + Auto CAD	K. Venugopal	New Age Publication
Engineering Graphics	K.R. Mohan	Dhanpat Rai and Publication Co.
Machine Drawing	R.K. Dhawan	S. Chand Co.
Engineering Drawing	Dharmendra Kumar	Foundation Publishing House

Course Outcomes:

• To enable the students with various concepts like dimensioning, conventions and standards related to Engineering Drawing
• To impart knowledge on the projection of points, lines and plane surfaces
• To improve the visualization skills for better understanding of projection of solids
• To develop the imaginative skills of the students required to understand Section of solids and Developments of surfaces
• To make the students understand the viewing perception of a solid object in Isometric and

Perspective projections

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CourseCode		**PAS1201P**
CourseTitle		**Communication Skills(Language Lab)**
NumberofCredits		**1(L:0,T:0,P:1)**
Prerequisites		**NIL**
CourseCategory		**PASP**

CONTENTS : PRACTICAL

Assignments:

1. Communication Cycle (With The Help Of Diagram)
2. Communication Situations (List Of 5 Communication situations stating the types of Communication
3. Barriers That Hinder A Particular Communication Situation. (State the type of barrier, and how to
overcome them)
4. Developing A Story Or A Paragraph For The Given Topic Sentence.(in a group of 5 – 6 students)

5. Describing Various Equipments.
6. Identifying The Various Sentences With Their Type Of Writing. (e.g. Scientific, Legal, Colloquial etc.)
7. Business Letters
8. Letters Of Suggestion
9. Comparative Time Table Of 2 Students
10. Description Of Two Different Persons.(seeing the picture)
11. Letter To The Librarian, Principal
12. Report Writing

NOTE: The above assignments are suggested to be completed in the prescribed work-book.

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CourseCode		**PAS1201P**
CourseTitle		**Applied Science Lab**
NumberofCredits		**1(L:0,T:0,P:2)**
Prerequisites		**NIL**
CourseCategory		**PASP**

CONTENTS:PRACTICAL

List of Experiments (PHYSICS):

1. To represent simple harmonic motion with the help of vertical oscillation of spring and to
determine spring constant (K) (Stiffness Constant)
2. To determine time period of oscillation of compound bar pendulum and calculate acceleration due
to gravity.
3. To determine the velocity of sound by using resonance tube
4. To compare luminous intensities of two luminous bodies by using Bunsen’s photometer.

5. To calculate coefficient of absorption for acoustical materials
6. To determine Joule's constant (J) by electric method
7. To determine wavelength of Sodium light by using Newton's rings

List of Experiments (CHEMISTRY):

1. To determine neutralization point of weak acid and weak base by conductivity meter.
2. To determine end point of titration between dil. H2SO4 and BaCl2 using conductivitymeter.
3. To verify Faraday's second law of electrolysis.
4. To determine pH of given solution by using pH paper, universal indicator and pH meter.
5. To determine the strength of given hydrochloric acid solution by titrating it against
sodium hydroxide solution using pH meter.
6. To determine percentage of copper from brass iodometrically.
7. To find the rate of corrosion of Al strip in acidic and basic medium graphically.
8. To determine thinner content in paint.
9. To determine acid value of given lubricant.
10. To determine viscosity of given oil by using Ostwald's viscometer.
11. To determine saponification value of given lubricant

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CourseCode		**PME1201P**
CourseTitle		**Engineering Mechanics**
NumberofCredits		**1(L:0,T:0,P:2)**
Prerequisites		**NIL**
CourseCategory		**PMEP**

CONTENTS:PRACTICAL

Skills to be developed:
1.Intellectual Skill: A. Calculate the forces on given structure
B. Interpret the results
2. Motor Skills: A. Handle the equipment carefully
B. Draw graph
Any five experiments from Group A,B and graphical solution in Group C :
Group A:
1) Verify law of polygon of forces
2) Verify law of moments

3) Verification of Lami's theorem
4) Forces in members of a jib crane.
5) Comparison of coefficient of friction of various pair of surfaces and
6) determination of angle of repose
7) Equilibrium of parallel forces – simply supported beam reactions.
8) Experimental location of center of gravity of plane plate of uniform thickness.
Group B:
To find MA, VR, Efficiency, Ideal Effort, Effort lost in friction for various loads and establish
law of machine and calculate maximum efficiency.
Also check the reversibility of a machine (Any five):
1) Differential axle and wheel
2) Weston's differential pulley block
3) Geared pulley block
4) Single purchase crab
5) Double purchase crab
6) Worm and worm wheel
7) Two sheave and three sheave pulley block
8) Screw jack.
Group C:
A 2 Size drawing sheets containing graphical solutions for –
1) Concurrent force system : Two problems
2) Parallel force system : Two problems
3) Reactions of a beam : Two problems

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CourseCode		**PME1203P**
CourseTitle		**Workshop Practice**
NumberofCredits		**2(L:0,T:0,P:3)**
Prerequisites		**NIL**
CourseCategory		**PMEP**

CONTENTS:PRACTICAL

S.No.	List Of Practical's
	CARPENTERY SHOP: Any one composite job from the following involving different joint, turning and planning, surface finishing by emery paper, varnishing etc. like square stool, tea table, center table, chaurang, table lamp bed sofaset, book rack. Cabinet, notice board, shows cases, tables chairs etc.

1	Note: 1] One job of standard size (Saleable 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 4] Student shall calculate the cost of material and labor cost for their job from the drawing.
2	**WELDING SHOP** Any one composite job from involving butt joint lap joint welding process, from the following like Grill, door, window frame, waste paper basket, Chappel stand, Corner flower stand chair , table frame (squarepipe 25 mm) cooler frame (folding type) **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.
3	**SMITHY SHOP** Demonstration of different forging tools and Power Hammer. Demonstration of different forging processes, likes shaping, caulking fullering, setting down operations etc. One job like hook peg, flat chisel or any hardware item. **Note**: 1]One job of standard size (Saleable/marketable article shall be preferred) 2] Job allotted should comprise of 4-6 hours of actual working operations. 3] Student shall calculate the cost of material and labor required for their job from the drawing.
4	**PLUMBING SHOP :** Demonstration of PVC pipe joint with various fittings. Exercise for students on preparing actual pipeline layout for G.I. Pipe or PVC pipe. Preparing actual drawing and bill of material. 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 4] Student shall calculate the cost of material and labor cost for their job from the drawing.
5	***SHEET METAL SHOP*** One composite job from the following: Letter box, Trunk, Grain Container, Water-heater Container, Bucket, Waste Paper Basket, Cooler Tray, Water-draining Channel, etc.(including soldering and riveting) Note: 1] One job of standard size (Saleable/marketable article shall be preferred) K.K.U-DIPLOMA(E.E) Page 39 2] Batch size should be selected depending on volume of work. 3] Job allotted should comprise of 4-6 hours of actual working ions. 4] Student shall calculate the cost of material and labor cost required for their job from the drawing.

6	**Demonstration of power tools and practice of utility items.** Demonstration of advance power tools, pneumatic tools, electrical wiring tools and accessories. Making of electrical switchboard with 2 sockets and piano buttons and with electrical wiring. Any other item as per the requirement of college/Deptt./

IIIRD SEMESTER DIPLOMA IN ELECTRICAL ENGINEERING

(Effective from Session 2023-24 Batch)

THEORY

S. No.	Course Code	Course Title	Teaching Scheme			Credit
			Contact Hours per week			
			L	T	P	
1	BS2101	Applied Mathematics	3	0	0	3
2	EEPC2103	Electrical Circuit & Network	2	1	0	3
3	EEPC2105	Electrical Measurement	3	1	0	4
4	EEPC2107	Electrical Power Generation	3	0	0	3

5	ECPC2101	Basic Electronics	3	0	0	3

PRACTICAL

S. No.	Course Code	Course Title	Teaching Scheme			Credit
			Contact Hours per week			
			L	T	P	
1	EEPC2109P	Electrical Circuit & Network Lab	0	0	2	1
2	EEPC2111P	Electrical Measurement Lab	0	0	2	1
3	ECPC2113P	Basic Electronics Lab	0	0	2	1
4	EEPC2115P	Electrical Workshop Lab	0	0	2	1
			Total			**20**

APPLIED MATHEMATICS

Subject Code P2M2101	Theory			Credits
	No. of Period Per Week			
	L	T	P	5
	5	0	0	
	-	-	-	

Course Objectives: To make the students

- Discuss definition and properties of Laplace, Fourier and Z transform.
- Apply Numerical methods to solve first order ordinary differential equations and Algebraic and

Transcendental equation.

- Demonstrate the ability of solving ordinary differential equations and partial differential equations by
  Laplacetransform and Fourier transform.
- Determine the solution of difference equations by use of z transform.
- To learn about some advanced numerical techniques e.g. solving a nonlinear equation, linear system of

equations, Interpolation and Approximation techniques.

CONTENTS: THEORY

Unit	Name Of The Topic	Hours
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 substitution 1.3.2 Integration of rational functions. 1.3.3 Integration by partial fractions. 1.3.4 Integration by trigonometric transformation. 1.3.5 Integration by parts. 1.4 Definite Integration. 1.4.1 Definition of definite integral. 1.4.2 Properties of definite integral with simple problems. 1.5 Applications of definite integrals. 1.5.1 Area under the curve. 1.5.2 Area between two curves. 1.5.3 Mean and RMS values	12
02	**Differential Equation** 2.1 Definition of differential equation, order and degree ofdifferential equation. Formation of differential equation for functioncontaining single constant. 2.2 Solution of differential equations of first order and first degree such asvariable separable type, reducible to Variable separable,Homogeneous, Non-homogeneous, Exact, Linear and Bernoulli Equations. 2.3 Applications of Differential equations. 2.3.1 Laws of voltage and current related to LC, RC, and LRC Circuits.	08
03	**Laplace Transform** 3.1 Definition of Laplace transform, Laplace transform of standard functions. 3.2 Properties of Laplace transform such as Linearity, first shifting,second shifting, multiplication by t_n, division by t. 3.3 Inverse Laplace transforms. Properties- linearly first shifting, secondshifting. Method of partial fractions, 3.4 Convolution theorem. 3.5 Laplace transform of derivatives, 3.6 Solution of differential equation	10
04	**Fourier Series** 4.1 Definition of Fourier series (Euler's formula). 4.2 Series expansion of continuous functions in the intervals(0, 2*l*) , (−*l*, *l*) , (0, 2p) ,(−p ,p) 4.3 Series expansions of even and odd functions. 4.4 Half range series.	10

05	**Numerical Methods** 5.1 Solution of algebraic equationsBisectionmethod, Regular-Falsimethod. Newton – Raphson method. 5.2 Solution of simultaneous equations containing 2 and 3 unknowns Gauss elimination method.Iterative methods- Gauss seidal and Jacobi's methods.	08
	TOTAL	**42**

Text /Reference Books:		
Titles of the Book	**Name of Authors**	**Name of the Publisher**
Mathematics for polytechnic	S. P. Deshpande	Pune Vidyarthi Griha Prakashan, Pune
Calculus: single variable	Robert T. Smith	Tata McGraw Hill
Laplace Transform	Lipschutz	Schaum outline series.
Fourier series and boundary value problems	Brown	Tata McGraw Hill
Higher Engineering Mathematics	B. S. Grewal	Khanna Publication, New Dehli
Introductory Methods of Numerical analysis	S. S. Sastry	Prentice Hall Of India, New Dehli
Numerical methods for scientific & engineering computations	M. K. Jain & others	Wiley Eastern Publication.

Course outcomes:

At the end of the course, the student will be able to:

- Solve non-linear equations in one variable and system of linear equations using iteration methods.
- Choose appropriate interpolation formulae based on the given data.
- Compute the value of a definite integral using numerical integration techniques.

- Predict the numerical solution of the derivative at a point from the given initial value problem using appropriate numerical method.
- Transform line integrals to surface and surface to volume integrals and evaluate them.

ELECTRICAL CIRCUIT & NETWORK

Subject Code	Theory			Credits
PEE2101	No. of Period Per Week			
	L	T	P	4
	3	1	0	
	-	-	-	

Course Objectives:To make the students

- Understand basic Laws in circuits, circuit elements and sources and their characteristics.
- Understand fundamental concepts of alternating current and voltages, power triangle and powerfactor.
- Analyze circuits with network topology.
- Analyze circuits with different DC and AC sources.
- Gain knowledge about statement and application of various theorems.
- Understand concept of resonance in series and parallel circuits.

CONTENTS: THEORY

Unit	Name Of The Topic	Hours
01	**Review of Basic concepts of electrical Circuit** 1.1 Electric Circuit Elements R,L,C 1.2 Energy Sources 1.3 A.C. waveform and definition of various terms associated with it 1.4 Response of pure R, L, and C to AC supplies. Vector Representation of alternating quantity.	08

02	**Single phase AC Circuits** 2.1 Series AC circuits R-L, R-C and R-L-C circuits. Impedance, reactance, phasor diagram, impedance triangle, power factor, Average power, Apparent power, Reactive power, Power triangle (Numerical) 2.2 Series Resonance, quality factor (Numerical) 2.3 Parallel AC circuits R-L, R-C and R-L-C circuits. Admittance,Susceptance, Solution by admittance method, phasor diagram andcomplex Algebra method. (Numerical) Parallel resonance, qualityfactor. 2.4 Comparison of series and Parallel circuits.	10
03	**Poly phase AC Circuits** 3.1 Generation of three phase e. m. f. 3.2 Phase sequence, polarity marking 3.3 Types of three-phase connections. 3.4 Concept of unbalanced load and balanced load. 3.5 Line, phase quantities and power in three phase system withbalanced star and Delta connected load & their interrelationship 3.6 Advantages of polyphase circuits over single phase circuits	10
04	**Principles of circuit Analysis (AC and DC circuits)** 1.1 Mesh analysis.(Numerical) 1.2 Node analysis with voltage current source .(Numericals) 1.3 Star/delta & Delta/star transformations.(Simple Numericals)	08
05	**Network Theorems (Statement, procedure, applications andSimple Numerical)** 5.1 Superposition Theorem 5.2 Thevenin's Theorem 5.3 Norton's Theorem 5.4 Source conversion /ideal voltage and current source 5.5 Maximum power transfer Theorem	10
	TOTAL	**46**

Text /Reference Books:

Titles of the Book	**Name of Authors**	**Name of the Publisher**
Introductory circuit Analysis.	Boylested R.L.	Pune Vidyarthi Griha Prakashan, Pune
Schaum online series Theory and problems of Electric circuits	Edminister	Tata McGraw Hill
Circuit and network	A. Sudhakar	Schaum outline series.
Basic Electrical Engineering.	V.N. Mittle	Tata McGraw Hill
Electrical Technology Volume-I	B. L. Theraja	Khanna Publication, New Dehli
Electrical Circuits and Network	Umesh Kumar	Prentice Hall Of India, New Dehli

Course outcomes: At the end of the course, the student will be able to:

- Gain knowledge about basic Laws, circuit elements and sources and their characteristics.
- Draw Phasor diagrams, phase relations in elements and power triangle.
- Analyze circuits with network topology.
- Solve problems involving with different AC and DC sources in electrical circuits.
- Synthesis the circuits with various theorems.
- Demonstrate the series and parallel resonance circuits.

ELECTRICAL MEASUREMENTS

Subject Code PEE2102	Theory			Credits
	No. of Period Per Week			
	L	T	P	4
	3	1	0	
	-	-	-	

Course Objectives:To make the students

- The basic understanding of various electrical instruments like ammeter, voltmeter, wattmeter etc.
- The basic understanding of various electronic instruments like CRO, frequency generator, signal generator
- Basic bridges used for the measurement of resistance, inductance, capacitance.
- Employ appropriate instruments to measure given sets of parameters.
- Practice the construction of testing and measuring set up for electrical systems.
- Use relevant measuring instrument in different electrical applications.

CONTENTS:THEORY

Unit	Name Of The Topic	Hours
01	**Fundamentals of Measurement** 1.1 Purpose of measurement and significance of measurement 1.2 Various effects of electricity employed in measuring instruments. 1.3 Desirable qualities of measuring instruments. 1.4 Classification of Instruments. 1.5 Types of errors 1.6 Different types of torque in Analog Instruments.	05

02	**Measurement of Current and Voltage** 2.1 Construction and principle of PMMC, MI & Dynamometer typeInstrument. 2.2 Production of torque: methods. 2.3 Principles of Voltage and Current measurement. 2.4 Range Extension of Ammeter and Voltmeter 2.5 Different Methods of range extension of Ammeter and Voltmeter. 2.6 Calibration of Ammeter and Voltmeter. 2.7 Instrument transformers (CT & PT)	10
03	**Measurement of Power** 3.1 Concept of power in A.C. Circuit 3.2 Principle and Construction of dynamometer type wattmeter. 3.3 Errors and their compensation. 3.4 Multiplying factor of wattmeter. 3.5 Measurements of power in 3 phase circuit for balanced and unbalancedload by one wattmeter method, two wattmeter method. 3.6Effect of power factor variation on wattmeter readings in twowattmeter method. 3.7 Measurement of reactive power in three phase balance load by onewattmeter method and two wattmeter method. 3.8 Digital Wattmeter, Polyphase wattmeter.	10
04	**Measurement of Electrical Energy** 4.1. Concept of electrical energy. 4.2 Constructional feature & principle of working of 1-ϕ&3-ϕ induction type energy meter. 4.3 Different types of errors and their compensation. 4.4 Calibration of energy meter. 4.5 Electronic energy meter.	07
05	**Constructional features and working principles of other Meters** 5.1 Single phase and three phase Power Factor Meter(only dynamometertype). 5.2 Frequency meter (Weston and Ferro dynamic type). 5.3 Sychronoscope. 5.4 Phase sequence Indicator.(Rotating type only) 5.5 Clip-on-meter. 5.6 Q-meter.	08
06	**Measurement of Circuit Parameters** 6.1 Classification of Resistance, Low, Medium and High. 6.2 Methods of Measurements of Low, Medium and High. Resistance (Kelvin Double bridge, Wheatstone bridge and Megger) 6.3 Measurement of Earth resistance- Earth tester (Analog & Digital) 6.4 Digital Multimeter. 6.5 Introduction to A.C. Bridges. 6.6 L.C.R. Meter.	08
	TOTAL	**48**

Text /Reference Books:

Titles of the Book	Name of Authors	Name of the Publisher
Electric & Electronic Measurement and Instrumentation	A.K. Sawhney	Dhanpatrai & Sons
Instrumentation Devices and System	Rangan Mani & Sarma	Tata McGraw Hill
Electronic Instrumentation	Kalsi	Tata McGraw Hill
Industrial Instrumentation & control	S.K.Singh	Tata McGraw Hill
Electrical Measurement & measuring Instrument, Delhi.	N.V.Suryanaryan	S. Chand & Co.
Electrical Measurements	S.N. Bhargava	Foundation Publishing

Course outcomes: At the end of the course, the student will be able to:

- Check the working of the electrical measuring instrument.
- Use different types of measuring instruments for measuring voltage and current.
- Use different types of measuring instruments for measuring electric power.
- Use different types of measuring instruments for measuring electric energy.
- Use different types of electrical instruments for measuring various ranges of electrical parameters.
- Choose the proper type and specification of measuring procedure and measuring instruments for different industrial/commercial/domestic applications.

ELECTRICAL POWER GENERATION

Subject Code	Theory			Credits
PEE2103	No. of Period Per Week			5
	L	T	P	
	5	0	0	
	-	-	-	

Course Objectives:To make the students

- An understanding of basic abstractions of electrical power generations from conventional and non-conventional sources of energy.
- The basic understanding of various power plant e.g.- Thermal Power Plant, Hydro Power Plant,

Wind Power Plant etc

- The capability to use abstractions to comprehend and analyze the impact of various system on environments and economics aspects of energy generation.
- Maintain the efficient operation of various electric power generating plants.
- The capability to incorporate the knowledge of electrical power generation in other field of science, engineeringand economics

CONTENTS:THEORY

Unit	Name Of The Topic	Hours

01	**Basics of Power Generation** 1.1 Importance of electrical power in day today life 1.2 Various sources of energy 1.3 Overview of method of electrical power generation 1.4 Comparison of Sources of power.	03
02	**Thermal Power Stations** 2.1 List of thermal power stations in the state with their capacities 2.2 Selection of site for thermal power stations. 2.3 Main parts block diagram of thermal power stations. 2.4 Quality of fuel and its effect on quality of power generation 2.5 Operation of following components: 2.5.1 Boiler 2.5.2 Economizer. 2.5.3 Air pre heater 2.5.4 Super-heaters & re-heaters. 2.5.5 Steam prime movers. 2.5.6 Condensers. 2.5.7 Spray ponds & cooling towers. (Block diagrams & description in brief)	08
03	**Nuclear Power Stations** 3.1 Block diagram and working of Nuclear Power Station 3.2 Construction and working of Nuclear Reactor 3. 3 Fuels used in Nuclear Power Station 3. 4 Economics of Nuclear Power Station 3. 5 List of Nuclear power stations in state & county with their capacities.	05
04	**Hydro Power Stations** 4.1 List of Hydro Power stations with their capacities & number of units in the state. 4.2 Selection of site and Classification 4.3 Layout of hydro Power stations 4.4 Types of Turbines & generators used 4.5 Selection of turbine and alternator according to water head and capacity	04

05	**Non-Conventional Energy Sources** 5.1 Types of non-conventional energy sources. 5.2 Solar Energy 5.2.1 Potential of solar energy. 5.2.2 Photovoltaic effect – for solar energy. 5.2.3 Construction & materials used in solar photo-voltaic cells. 5.2.4 Working & applications of solar energy. 5.3 Wind Energy. 5.3.1 Selection of site for wind mills 5.3.2 Principle of electricity generation with the help of wind energy 5.3.3 Block diagram and working of Wind energy plant and its applications 5.3.4 List of major wind farms in the state with their approximate capacities 5.4 Bio-mass & Bio-gas energy. 5.4.1 Composition of Bio-gas & its calorific value. 5.4.2 Traditional; non-traditional Biogas plants 5.4.3 Bio-mass based power generation plants & their capacities. 5.5 Geo-thermal Energy and its Applications. 5.6 Ocean energy. 5.6.1 Ocean thermal Electric conversion. 5.6.2 Energy from tides 5.6.3 Site requirements 5.6.4 Advantages and Limitations of Tidal power generation. 5.7 Fuel Cells: Construction, working and applications	08
06	**Interconnected Power Systems** 6.1 Combined operation of power stations. 6.2 Comparison of various types of power stations 6.3 Advantages of Interconnection. 6.4 Base load & peak loads, load allocation among various types of power stations 6.5 Economic loading of interconnected stations. 6.6 Load sharing and transfer of load between power stations. 6.7 Inter connection of power stations at state and national level	06
	TOTAL	**48**

Text /Reference Books:		
Titles of the Book	**Name of Authors**	**Name of the Publisher**
Electrical Power	Dr. S. L. Uppal	Khanna Publishers.
A course in Electrical Power	Soni – Gupta - Bhatnagar	Dhanpatrai & Sons
Non conventional Energy sources	Prof. G. D. Rai	Khanna, New Delhi

A course in Power Plant Engineering	Prof. Arrora and Dr. V. M. Domkundwar	Dhanpatrai & Sons

Course outcomes: At the end of the course, the student will be able to:

- Maintain the optimized working of the thermal power plant.
- Maintain the optimized working of large and micro hydro power plants.
- Maintain the optimized working of solar and biomass-based power plants.
- Maintain the optimized working of wind power plants.
- Select the adequate mix of power generation based on economic operation.
- Demonstrate the load regulation & line regulation.

BASIC ELECTRONICS

Subject Code	Theory			Credits
PEC2104	No. of Period Per Week			
	L	T	P	4
	3	1	0	
	-	-	-	

Course Objectives:To make the students

- Examine the concept of Semi-Conductor diode, Zener Diode,
- Examine the concept of Special Diodes: Point contact diode , Schottky diode.
- Examine the concept of Rectifiers & Filters.
- Examine the concept of Transistors: BJT, Unipolar Transistor (JFET), Uni-junction Transistor(UJT).
- Examine the concept of regulator

CONTENTS:THEORY

Unit	Name Of The Topic	Hours
01	**1.1 Semiconductor diode** 1.1.1 Rectifying diode Review of P-type and N-type semiconductor Junction of P-type & N-type i.e. PN junction Barrier voltage, depletion region, JunctionCapacitance. 1.1.2 Forward biased & reversed biased junctionDiode symbol , circuit diagram for characteristics (forward &reversed) Characteristics of PN junction diode 1.1.3 Specifications:-Forward voltage drop , Reversed saturation current, Maximumforward current , power dissipation Package view of diodes of different power ratings (to be shown during practical hours) 1.2 Zener Diode:Construction (reference to doping level) 1.2.1 Symbol , circuit diagram for characteristics (forward & reversed) 1.2.1 Avalanche & zener breakdown 1.2.3 Specifications:-Zener voltage, power dissipation, break over current, Dynamicresistance & maximum reverse current. 1.3 Special Diodes:Point contact diode , Schottky diode 1.4 Optical Diodes:LED, IRLED, photo diode, laser diode. Symbol, operating principle & applications of each.	12
02	**2.1Rectifiers & Filters** 2.1.1 Need of rectifier, definitionTypes of rectifier- Half wave rectifier, Full waverectifier(Bridge &centre tapped) 2.1.2 Circuit operation: Input/output waveforms for voltage & Current,Average (dc) value of current & voltage (no derivation), Ripple ,ripple factor , ripple frequency , PIV of diode used, transformerutilization factor,efficiency of rectifier. 2.1.3 Comparison of three types of rectifier 2.1.4 Need of filters, Types of filters [A] shunt capacitor,[B] Series inductor, [C] LC filter, [D] π filter 2.1.5 Circuit operation, dc output voltage , ripple factor, ripplefrequency , Dependence of ripple factor on load. Input/outputwaveforms , limitations & Advantages	10
03	**Transistors** 3.1 Bipolar Junction Transistor(BJT):- Introduction , Basic concept 3.1.1 Types of transistors , structure & symbols Transistor operation Conventional current flow , relation between different currents intransistor 3.1.2 Transistor amplifying action Transistor configurations:- CB , CE & CC Circuit diagram to find the characteristics Input / outputcharacteristics 3.1.3 Transistor parameters- input resistance, output resistance, α, β &relation between	12

	them. Comparison between three configurations 3.1.4 Transistor specifications:- VCE Sat ,IC Max , VCEO , ICEO, α , β VCE Breakdown , Power dissipation (to beexplained during practical using data sheets) 3.1.5 Testing of transistor using multi-meter (To be shown during practical) 3.1.6 Construction, working principle, characteristics of Photo Transistor Introduction to opto-coupler 3.2 Uni-polar Transistor (JFET):- Construction, working principle & characteristics. 3.3 Uni-junction Transistor(UJT):- Construction, working principle& characteristics.	
04	**Biasing of BJT** 4.1 Introduction , need of biasing , concept of dc load line, selection ofoperating point (Q point) , need of stabilization of Q point, (thermalrun away concept) 4.2 Types of biasing circuits [A] Fixed biased circuit [B] Base biased with emitter feed back [C] Base biased with collector feed back [D] Voltage divider [E] Emitter biased 4.3 Circuit operation of each circuit. 4.4 Introduction to two port network Hybrid model for CE	08
05	**Regulated Power Supply** 5.1 What is a regulator? 5.1.1 Need of regulators , voltage regulation factor 5.1.2 Concept of load regulation & line regulation 5.1.3 Basic zener diode voltage regulator 5.2 Linear Regulators 5.2.1 Basic block diagram of dc power supply 5.2.2 Transistorisedseries & shuntregulator –circuit diagram	06
	TOTAL	**48**

Text /Reference Books:		
Titles of the Book	**Name of Authors**	**Name of the Publisher**
Basic Electronics & Linear Circuits	N.N.Bhargava, D.C. Kulashreshtha, S.C. Gupta – TTTI	Tata McGraw Hill

	Chandigharh	
Electronic Principles	Alberrt Malvino David J.Bates	Tata McGraw Hill
Electronic Devices & Components'	Allen. Mottershead	Prentice Hall of India
Basic Electronics &Devices	NIIT	Prentice Hall of India
Basic Electronics	Grob Bernard	Tata McGraw Hill
Electronics Devices & Circuits	David J. Bell	Prentice Hall of India
Basic Electronics	Amit Kumar, D.P. Verma	Foundation Publishing

Course outcomes: At the end of the course, the student will be able to:

- Maintain the optimized working of Semi-Conductor diode, Zener Diode
- Maintain the optimized working of Point contact diode , Schottky diode.
- Maintain the optimized working of Rectifiers & Filters.
- Maintain the optimized working of BJT
- Maintain the optimized working of Uni-polar Transistor (JFET), Uni-junction Transistor (UJT).

ELECTRICAL CIRCUIT & NETWORK LAB

Subject Code	Theory			Credits
PEE2101P	No. of Period Per Week			1
	L	T	P	

	0	0	2	
	-	-	-	

Course Objectives:To make the students

- Understand the concept of r.m.s value, average value, time period and frequency of signal
- Understand the concept of current and p.f of R-L series and parallel, R-C series and parallel, RLC series and parallel circuits
- Line and Phase quantities in star load and delta load
- Understand various theorems such as Superposition theorem, Thevenin's theorem, Norton theorem, Maximum Power Transfer theorem through electronic kit
- Understand the concept of series and parallel resonance in series and parallel RLC circuit

CONTENTS:PRACTICAL

Skills to be developed:

Intellectual Skills:

1. Interpret results
2. Calculate values of various components for given circuits
3. Select instruments

Motor Skills:

1. Connect the instruments properly.
2. Take accurate readings.
3. Draw phasor diagrams and graphs.

List of Practical:

1) To observe A.C. waveform on C.R.O.and calculates average & R.M.S. Values, frequency, Time Periods.
2) To determine impedance & Plot the phasor diagram of R-L series circuit.
3) To determine the current and P.F. of R.C. series circuit.
4) To determine the current and P.F. of R.L.C. series circuit.
5) To determine the current and P.F. in R.L. Parallel circuit.
6) To determine the current and P.F. in R.C. Parallel circuit.
7) To determine the current and P.F. in R.L.C. Parallel circuit.
8) To verify the line and phase values of voltage & current in star connected balanced load & Compare
with practical situation.
9) To verify the line and phase values of voltage & Current in delta connected balanced load & Compare with
practical situation.
10) To verify the superposition theorem applicable to D.C.& A.C. circuit.
11) To verify Thevenin's theorem applicable to D.C.& A.C. circuit
12) To verify Norton's theorem applicable to D.C.& A.C. circuit
13) To verify the maximum power transfer Theorem applicable to D.C. & A.C. circuit.
14) To verify conditions for Series and Parallel Resonance

LIST OF PRACTICE ORIENTED PROJECTS:

1) To observe Response of R; L; and C to A.C. supply. Observe the current and voltage wave forms on
C.R.O. and determine magnitude and phase angle of voltage and current.
2) To obtain Resonance in R-L-C series circuit and study the quality factor and bandwidth. Give

applications
of series resonance circuit and Draw the curve showing variation of R,XL,XC,I with F.
3) To verify KCL, KVL, Superposition theorem, Thevenin's theorem and maximum power transfer theorem
applicable to A.C. circuits.

Course outcomes: At the end of the course, the student will be able to:

- Find out r.m.s value, average value, time period and frequency of a signal using CRO
- Calculate the current and Power factor in series and parallel R,L,C combinational circuits.
- Establish a relationship between phase and line voltage and current in star and delta load
- Verify various theorems such as Superposition theorem, Thevenin's theorem, Norton theorem, Maximum Power Transfer theorem through electronics kit
- Find the various parameters in series and parallel resonance in series and parallel RLC circuit

ELECTRICAL MEASUREMENT LAB

Subject Code	Theory			Credits
PEE2102P	No. of Period Per Week			1
	L	T	P	

	0	0	2	
	-	-	-	

Course Objectives: To make the students

- To know the procedures for measuring values and errors of circuit elements of different ranges by various bridges.
- To perform experiments to measure three phase power by two wattmeter method.
- To design experiments for calibration of energy meter.
- To measure insulation resistance of cables, winding and insulators through megger.
- To understand the use of various digital instruments like Clip-on meter, Earth Tester, LCR meter, PF meter etc.

CONTENTS:PRACTICAL

Skills to be developed:

Intellectual Skills:

1. Identification of instruments
2. Selection of instruments and equipment for measurement

Motor Skills:

1. Accuracy in measurement
2. Making proper connections

List of Practicals:

1. Measurement of Current & Voltages by Low range ammeter & voltmeter respectively withshunt & multiplier.
2. Measurement of Current and Voltages by Low range ammeter and voltmeter respectively by Using
current transformer and potential transformer.
3. Measurement of active and reactive power in three phase balanced load by single wattmetermethod.
4. Measurement of active and reactive power in three phase balanced load by two wattmeter method and observe the effect of Power Factor variation on Wattmeter reading.
5. Calibration of Energy meter at various power factor by standard energy meter.
6. Measurement of energy in single phase & three phase balanced load using ElectronicEnergy Meter.
7. Measurement of Low resistance by Kelvin's Double Bridge.
8. Measurement of Medium resistance by Wheatstone bridge.
9. Measurement of Insulation Resistance by Megger.
10. a) Measurement of Resistance, Voltage, Current, Voltage, Current in A.C & D. C. Circuit byusing digital multi-meter.
b) Measurement of A.C. Current by Clip-on ammeter

11. Measurement of Earth Resistance by Earth Tester.

12. Measurement of Circuit Parameters by LCR meter.
13. Measurement of power factor of 1-ϕ &3-ϕ load by PF meter & verifyingthrough I, V &P measurement.
14. Observe the phase sequence of three phase circuit Using Rotating type phase sequence Indicator.
15. Measurement of Frequency of A.C. Supply Using Weston or Ferro dynamic type Frequency meter.

Course outcomes: At the end of the course, the student will be able to:

- Examine various methods to measure resistance
- Examine methods to measure 3-Φ active power and reactive power.
- Analyse the performance of various meters and to calibrate and test single phase energy meter
- Use of various digital meters like Clip-on meter, Earth Tester, LCR meter, PF meter etc.

BASIC ELECTRONICS LAB

Subject Code PEC2104P	Theory			Credits
	No. of Period Per Week			
	L	T	P	1
	0	0	2	
	-	-	-	

Course Objectives: To make the students

- Able to get basic knowledge of the characteristics of diodes, clippers, rectifiers.
- To get basic knowledge of transistor biasing and characteristics of BJT.
- Able to get basic knowledge on characteristics of JFET and MOSFET
- Able to learn characteristics of Multistage and Feedback amplifiers
- To familiarize on LC and RC oscillators
- Able to learn various Applications using OP-amp.

CONTENTS:PRACTICAL

Skills to be developed:

Intellectual Skills:

1. Identification and selection of components.
2. Interpretation of circuits.
3. Understand working of Regulated dc power supply.

Motor skills:

1. Ability to draw the circuits.
2. Ability to measure various parameters.
3. Ability to test the components using multimeter.
4. Follow standard test procedures.

List of Practical:

1] To plot Forward & Reverse biased characteristics of diode.
2] To plot Forward & Reverse biased characteristics of Zener diode.
3] To Study the Rectifiers a] Half wave b] Full wave & draw i/p & o/p wave forms.
4] To Study the filter circuits. a] Capacitor Filter b] Inductor filter & draw wave forms.
5] To Plot Input & output characteristics of transistor in CE mode.
6] To Plot Input & output characteristics of transistor in CB mode.
7] To Plot Characteristics of FET.
8] To Plot Characteristics of UJT.
9] To study the Zener Diode as Regulator& calculate load regulation.
10] To study Transistor series and shunt regulator.
11] To study Single stage common emitter amplifier & plot its frequency response.
12] To study two stage RC coupled amplifier & plot its Frequency response.

Course outcomes: At the end of the course, the student will be able to:

- Analyse the different applications of Diodes.
- Analyse BJT as an amplifier
- Apply JFET and MOSFET in different switching operations
- Design different types of multistage and feedback amplifiers
- Design different types of Oscillator circuits.
- Able to generate different basic waveforms using OP-amp.

ELECTRICAL WORKSHOP LAB

Subject Code	Theory			Credits
PEE2105P	No. of Period Per Week			1
	L	T	P	

	0	0	2	
	-	-	-	

Course Objectives: To make the students

- Identify, dismantle and repair different types of electrical accessories
- Wire up lamps using SPT switch/one way and two way switch
- Wire up power sockets and test boards
- Wire up consumer's main board with ICDP & distribution fuse box
- Connection and testing of energy meter, ceiling fan, fluorescent lamp and automatic iron
- Connection for single staircase wiring and double staircase wiring

CONTENTS:PRACTICAL

Note: All the experiments will be performed by using casing capping or conduit wiring, prepare schedule of
material for each wiring work.

1. Identify, dismantle, sketch & assemble differentElectrical accessories 10 Hrs.
2. Wire up one lamp controlled by one SPT switch 06 Hrs.
3. Wire up two lamps controlled by two independent SPT switches 06 Hrs.
4. Wire up a call bell/ buzzer 06 Hrs.
5. Wire up four power sockets controlled independently 06 Hrs.
6. Wire up a test board 06 Hrs.
7. Wire lighting circuit for a go down wiring 08 Hrs.
8. Prepare & mount the energy meter board 08 Hrs.
9. Wire up consumer's main board with ICDP & distribution fuse box & 08 Hrs. With LCB / MCB
10. Testing of automatic electric iron
11. Testing& study of electric ceiling fan
12. study& connection of fluorescent(tube light) lamp
13. Prepare a connection for single staircase wiring and double staircase wiring and perform the same
14. Make a house wiring for a lamp ceiling fan and a three pin socket controlled by their individual switches.

Course outcomes: At the end of the course, the student will be able to:

- Repair different electrical accessories
- Use single way and two way switch/SPT switch
- Set up distribution board connection
- Use ICDP switch/DPIC switch
- Design different types of Oscillator circuits.
- Able to generate different basic waveforms using OP-amp

IVTH SEMESTER DIPLOMA IN ELECTRICAL ENGINEERING

(Effective from Session 2019-20 Batch)

THEORY

S. No.	Course Code	Course Title	Teaching Scheme	Credit

			Contact Hours per week			
			L	**T**	**P**	
1	PEE2201	Transmission & Distribution Of Electrical Power	5	0	0	5
2	PEE2202	DC Machines & Transformers	3	1	0	4
3	PEE2203	Network Theory	5	0	0	5
4	PEE2204	Electrical Estimation & Costing	5	0	0	5
5	PEC2205	Applied Electronics	3	1	0	4

PRACTICAL

S. No.	Course Code	Course Title	Teaching Scheme			Credit
			Contact Hours per week			
			L	**T**	**P**	
1	PEC2201P	Electronic Construction And Repair Lab	0	0	2	1
2	PEE2202P	DC Machines & Transformers Lab	0	0	3	2
3	PEE2205P	Electrical Drawing Lab	0	0	3	2
4	PEC2205P	Applied Electronics Lab	0	0	2	1
			Total			**29**

TRANSMISSION & DISTRIBUTION OF ELECTRICAL POWER

Subject Code	Theory			Credits
PEE2201	No. of Period Per Week			
	L	T	P	5
	5	0	0	

	-	-	-	

Course Objectives:

The main objective of this subject is to understand and to know the following concepts:

- To introduce the students to the general structure of the network for transmitting 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
- Maintain the proper functioning of the electrical transmission and distribution systems.

CONTENTS:THEORY

Unit	Name Of The Topic	Hours
01	**Basics Of Transmission.** 1.1 Introduction to transmission. 1.2 Necessity of transmission of electricity. 1.3 Classification & comparison of different transmission systems.	03
02	**Transmission Line Components.** 2.1 Introduction to line components. 2.2 types of conductors-Copper, Aluminum & state their trade names. 2.3 Solid, Stranded & bundled conductors. 2.4 Line supports – requirements, types, and field of applications. 2.5 Line insulators – requirements, types, and field of applications. 2.6 Failure of insulator & reasons of Failure. 2.7 Distribution of potential over a string of suspension insulators. 2.8 Concept of string efficiency, Methods of improving string efficiency. 2.9 Corona – corona formation, advantages & disadvantages, factors affecting corona, important terms related to corona. 2.10 Spacing between Conductors. 2.11 Calculation of Span length & sag Calculation (Numerical based on 2.7 , 2.8&2.11)	10
03	**Transmission Line Parameters** 3.1 R,L & C of 1-ph & 3-ph transmission line & their effects on line. 3.2 Skin effect, proximity effect & Ferranti effect. 3.3 Concept of transposition of conductors & necessity.	03
04	**Performance Of Transmission Line.** 4.1 Classification of transmission lines. 4.2 Losses, Efficiency & Regulation of line. 4.3 Performance of single phase short transmission line(Numerical based on it) 4.4 Effect of load power factor on performance. 4.5 Medium transmission lines-End condenser, Nominal T &	10

	Nominalπ Network with vector diagram. 4.6 General circuit & Generalised Circuit Constants (A, B, C, D)	
05	**Extra High Voltage Transmission.** 5.1 Introduction & Requirement. 5.2 EHVAC Transmission, Reasons for adoption & limitations. 5.3 HVDC Transmission – Advantages, Limitations.	03
06	**Components Of Distribution System.** 6.1 Introduction. 6.2 Classification of distribution system. 6.3 A.C distribution. 6.4 Connection schemes of distribution system. 6.5 Requirements of Distribution systems. 6.6 Design consideration. 6.7 A.C. distribution calculations. 6.8 Methods of solving A.C.-1 phase &3 Ø -phase connected (balanced) distribution System. (Numerical based on 1-ph & 3-ph balanced distribution system)	10
07	**Underground Cables.** 7.1 Introduction & requirements. 7.2 Classification of cables. 7.3 Cable conductors. 7.4 Cable construction. 7.5 Cable insulation, Metallic sheathing & mechanical protection. a. Comparison with overhead lines 7.6 Cable laying	02
08	**Substations.** 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. Connection diagram and layout of substations.	05
	TOTAL	**46**

Text /Reference Books:

Titles of the Book	**Name of Authors**	**Name of the Publisher**
A Course in electrical power	Soni-Gupta- Bhatnagar	Dhanpat Rai

Principals of power system	V. K. Mehta	S. Chand & Company
A Course in electrical power	S. L. Uppal.	S. K. Khanna
Transmission & distribution of electrical energy	J. B. Gupta	S. K. Khanna
Generation & transmission of electrical energy	A. T. Star	Pitman
Transmission & Distribution of Electric Power	Savinder Singh	Foundation Publishing

Course Outcomes:

At the end of the course, the student will be able to:

- Interpret the normal operation of the electric transmission and distribution systems.
- Maintain the functioning of the medium and high voltage transmission system.
- Interpret the parameters of the extra high voltage transmission system.
- Maintain the components of the transmission and distribution lines.

D.C MACHINES & TRANSFORMERS

Subject Code	Theory			Credits
PEE2202	No. of Period Per Week			4
	L	T	P	
	3	1	0	
	-	-	-	

Course Objectives:

The main objective of this subject is to understand and to know the following concepts:

- Provide the basic concept of DC machines and Transformers.
- Develop the skills of the students in the areas of machines and transformers by identifying the current problem in the industries and bring solutions through research.
- Diagnose the condition of DC machines and Transformers.
- Maintain electric motors and transformers.

CONTENTS:THEORY

Unit	Name Of The Topic	Hours
01	**DC Machine General** 1.1 definition 1.2 construction & types of DC machines 1.3 armature winding types : lap & wave. 1.4 emf equation 1.5 armature reaction 1.6 commutation – concept of reactance voltage 1.7 methods of improving commutation – emf commutation Numericals on e.m.f. equation	10
02	**DC Motors** 2.1 working, principle, back emf, torque equation 2.2 characteristics & application of series, shunt & compound motors 2.3 speed control of dc motor & numerical based on 2.1 to 2.3 2.4 starting of dc motor – 3 point starter 2.5 applications of above motors	10
03	**Single phase transformer** 3.1 introduction 3.2 principle of operation 3.3 emf equation, transformation ratio, KVA rating 3.4 types & construction of transformer 3.5 concept of ideal transformer 3.6 transformer on no load – vector diagram & numerical 3.7 transformer on load – phasor diagram of loaded transformer 3.8 equivalent circuit 3.9 direct method of finding performance of transformer, 3.10 finding the performance of 1 phase transformer by indirect method using OC& SC Test. 3.11 all day efficiency– numerical based on 3.10 & 3.11 3.12 polarity of transformer & polarity test 3.13 application 3.14 1 phase auto transformer – principle , advantages & disadvantages	20

04	**Special purpose transformer** 4.1 current transformer 4.2 potential transformer 4.3 isolation transformer 4.4 welding transformer	06
	TOTAL	**46**

Text /Reference Books:		
Titles of the Book	**Name of Authors**	**Name of the Publisher**
Electrical Technology	E. Hughes	Logmans, London
Electrical Technology	H. Cotton	C. B. S. Publisher New Delhi
Electrical Technology Vol. II	B. L. Theraja	S. Chand & C0 Delhi
Electrical Machine Design Dhanpatrai & Sons, New Delhi	A. K. Sohawney	Dhanpatrai & Sons, New Delhi
Electrical Technology	E. Hughes	Logmans, London

Course Outcomes:

At the end of the course, the student will be able to:-

- Explain the concepts of magnetic circuits.
- Describe the operation of dc generators and its characteristics.
- Analyze the speed control techniques and testing methods of dc motors.
- Analyze construction and operation of single and three phase Transformers.

NETWORK THEORY

Subject Code	**Theory**			**Credits**
PEE2203	**No. of Period Per Week**			
	L	**T**	**P**	**5**
	5	**0**	**0**	
	-	**-**	**-**	

Course Objectives:

The main objective of this subject is to understand and to know the following concepts:

- To equip the students with the knowledge and techniques of analyzing three phase electrical circuits.
- Students learn to characterize and analyse networks in both the time and complex frequency domain.
- Students learn the concepts of Two-port Network parameters.
- With this the students will have the knowledge of how to evaluate and analyze any complex network.

CONTENTS:THEORY

Unit	Name Of The Topic	Hours
01	**BASIC CIRCUIT ELEMENTS & WAVEFORMS:** 01.01 Circuit Components 01.02 Standard Input Signals 01.03 Sinusoidal Signals	08
02	**MESH AND NODE ANALYSIS**: 02.01 Kirchhoff's Laws. 02.02 Source Transformation. 02.03 Mesh & Node analysis. 02.04 Magnetic coupling.	08
03	**FOURIER SIERIES**: 03.01 All forms of Fourier Series including trigonometry, Exponential etc. 03.02 Fourier Transform.	05
04	**LAPLACE TRANSFORM & THEIR APPLICATION:** 04.01 Introduction. 04.02 Laplace Transformation. 04.03 Application of Laplace Transform in the solution of Linear Differential Equation. 04.04 Inverse Laplace Transform.	06
05	**RESONANCE:** 05.01 Series Resonance. 05.02 Parallel Resonance	05
06	**TWO-PORT NETWORK:** 06.01 Introduction. 06.02 Open Circuit Impedance Parameters. 06.03 Short Circuit Admittance.	08
	TOTAL	**40**

Text /Reference Books:		
Titles of the Book	**Name of Authors**	**Name of the Publisher**
Network & system	D. Roy Choudhury	
Network & system	G.K. Mittal	
Network & system	Vulkenberg	

Network & system	Dacsur & Kuo	
Network Theory	R.N. Pathak	

Course Outcomes:

At the end of the course, the student will be able to:

- Gain knowledge about basic Laws, circuit elements and sources, waveforms and their characteristics.
- Analyze the circuit using various techniques like Nodal and Mess Analysis.
- Analyze waveform using Fourier series & Fourier transform.
- Analyze a signal using Laplace Transform.
- Solve problems on series and parallel resonance.
- Analyze two port network with the help of various parameters.
- Analyze simple First order and second order circuit.

ELECTRICAL ESTIMATION & COSTING

Subject Code	Theory			Credits
PEE2204	No. of Period Per Week			
	L	T	P	5
	5	0	0	
	-	-	-	

Course Objectives:

The main objective of this subject is to understand and to know the following concepts:

- To know the necessary material and the cost to be incurred before starting the project.
- Recognize the different conductor systems used in residential and light commercial wiring in accordance with the codes and authorities for installation.
- Design electrical installation systems in building complexes.

CONTENTS:THEORY

Unit	Name Of The Topic	Hours
01	**Drawing 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 underground& overhead service connections.	**06**
03	**Residential 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 ofcircuits. 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, protectiveswitchgear 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.	**14**
04	**Electrification of factory unit Installation** 4.1 Concept of Industrial load. 4.2 Concept of Motor wiring circuit and single line diagram. 4.3 Important guidelines about power wiring and Motor wiring. 4.4 Design consideration of Electrical Installation in small Industry/Factory/workshop. 4.4.1. Motor current calculations. 4.4.2. Selection and rating of wire, cable size & conduct.	**14**

	4.4.3 Deciding fuse rating, starter, distribution boards main switch etc. 4.4.4. Deciding the cable route, determination of length of wire, cable, conduit, Earthwire, and earthing. 4.5 Sequence to be followed to prepare estimate. 4.6 Preparations of detailed estimate and costing of small factory unit/workshop.	
05	**Testing of Installation** Testing of wiring Installation for verification of current; earthing, insulation resistance and continuity as per IS	04
	TOTAL	**42**

Text /Reference Books:		
Titles of the Book	**Name of Authors**	**Name of the Publisher**
Electrical Design; Estimating and costing	K.B. Raina S.K.Bhattacharya	New Age International (p) Limited, NewDelhi
Electrical Estimating and costing	Surjit Singh	Dhanpat Rai and company, New Delhi
Electrical Estimating and costing	N. Alagappan S. Ekambaram	TMH Publication, New Delhi
Electrical Estimating &costing	S.L. Uappal	Khanna Publication.
Electrical wiring, Estimating and costing	B.D.Arora	R.B. Publication, New Delhi
Electrical Estimation & Costing	Savinder Singh	Foundation Publishing

Course Outcomes:

At the end of the course, the student will be able to:

- Select accessories, wires, cables, and wiring systems for electrification.
- Design electrical wiring installation system for a residential unit.
- Prepare wiring layouts on the wiring board
- Do proper earthing for residential building electrification.
- Locate and diagnose faults in electrical wiring installation.

APPLIED ELECTRONICS

Subject Code	Theory	Credits

PEC2205	No. of Period Per Week			4
	L	T	P	
	3	1	0	
	-	-	-	

Course Objectives:

The main objective of this subject is to understand and to know the following concepts:

- about the operation and applications of analog electronic circuits and devices.
- the principles behind designing amplifiers and how to design an operational amplifier.
- how to analyze amplifiers and their configurations at low and high frequencies.
- learn about different feedback topologies and oscillators.
- learn about power amplifiers and tuned amplifiers.
- the behavior of noise in an amplifier

CONTENTS:THEORY

Unit	Name Of The Topic	Hours
01	**Amplifiers** 1.1 Power Amplifiers 1.1.1 Introduction, Classification – Class A, Class B,Class AB & Class C, efficiency of each. 1.1.2 Single stage class A power amplifier: Circuit operation, input & output waveforms , graphical Analysis and efficiency of 1.1.2.i] Transformer couple resistive load single stage power amplifier 1.1.2. ii] Class A push pull amplifier 1.1.2.iii] Class B push pull amplifier 1.1.2.iv] Class AB push pull amplifier 1.1.3 Concept of cross over distortion 1.1.4. Advantages of push pull amplifier, collector power dissipation requirement& specifications of power transistor, need of heat sink. 1.2 FET Amplifier 1.2.1 Biasing of FET: Source Self Bias, Drain to source Bias Application of FET as V V R 1.2.2 Common Source Amplifier: Working & Applications 1.2.3 Introduction to MOSFET:Types, Construction, Working & Applications 1.3 Tuned Amplifiers 1.3.1 Introduction & necessity of tuned amplifier. Basic tuned circuits, series & parallel resonance in tuned circuits. 1.3.2 Operating principle, circuit working,	**16**
02	**2.1 Feedback Amplifiers & oscillators** 2.1.1 General theory of feedback: Types of feedback – negative & positive	**10**

	feedback. 2.1.2 Types of negative feedback – voltage shunt, voltage series, current shunt & current series. 2.1.3 Advantages of negative feedback on voltage gain , bandwidth , input impedance output impedance, stability , noise , distortion in amplifiers. 2.2 Introduction to oscillator , block diagram of sine wave oscillator , requirement of oscillation – 2.2.1 Barkhausen criterion , operating principles of RC & LC oscillators 2.2.2 RC oscillators – RC phase shift , Wien bridge 2.2.3 LC oscillators – Colpitts , Hartley , Crystal oscillators Circuit diagram, equation for frequency of oscillation & frequency stability.	
03	**3.1 Wave shaping circuits** 3.1.1 Necessity of wave shaping circuits. 3.1.2 Linear circuits – RC integrator & differentiator – input / outputwaveforms & frequency response. 3.1.3 Non-linear circuits - Clipper , diode series & shunt ,positive & negative biased& unbiased & combinational clipper. 3.1.4 Clampers – positive & negative clampers	**06**
04	**4.1 Multivbrator** 4.2 Transistor as switch. Definition & graphical representation of different time periods . 4.3 Multivbrator classification , circuit working & frequency with specific application . MMV , AMV,BMV & Schmitt trigger	**06**
05	**5.1 Time base generator –** 5.2 Voltage time base generator, exponential sweep generator UJT Relaxation Oscillator, negative resistance generator. working principle & operation . 5.3 Current time base generator , bootstrap & miller sweep generator, applications in TV & CRO	**06**
06	**Trouble shooting & Testing** 6.1 Need for trouble shooting , Important steps for testing 6.2 Visible testing – Observing circuits for visible faults like broken component, open contacts etc. 6.3 Active testing – Voltage analysis, Resistance analysis, signal analysis. 6.4 Trouble shootings of multivibrators, phase shift oscillators, transistorized sweep generator, clipping & clamping circuits.	**04**
	TOTAL	**48**

Text /Reference Books:		
Titles of the Book	**Name of Authors**	**Name of the Publisher**
Electronic Principles	Paul Malvino	Tata McGraw-Hill
Applied Electronics	R.S.Sedha	Dhanpat Rai and company, New Delhi
Electronics Devices & Circuits	Allen ottershed	Tata Mc Graw Hill Publication, New Delhi
Pulse Digital & Switching Waveforms	J.Millman and H.Taub	Khanna Publication.
Pulse & Digital Electronics	G.K.Mittal and R.Vanvasai	R.B. Publication, New Delhi
Applied Electronics	R.S. Sharma	Foundation Publishing

Course Outcomes:

At the end of the course, the student will be able to:

- analyse the different types of power amplifier and tuned amplifier.
- design and analysis of feedback and oscillator.
- knowledge of clipper and clamper circuit, RC integrator, and RC differentiator.
- Knowledgeof different types of Multivbrator.
- Introduction of CRO.
- Tracing fault in analog and digital circuit.

ELECTRONIC CONSTRUCTION & REPAIR LAB

Subject Code PEC2201P	Theory			Credits
	No. of Period Per Week			
	L	T	P	1
	0	0	2	
	-	-	-	

Course Objectives:

The main objective of this subject is to understand and to know the following concepts:

- Practical experience with electronic components, instruments, and semiconductor devices.
- How to design basic electronic circuits and analyze their characteristics.
- Verify the theoretical concepts of electronic devices and circuits.
- By using hardware kits to analyze analog electronic circuits.
- By using a simulator like MULTISIM or ORCAD spice to analyze analog electronic circuits.
- By learning electronics hardware and production skills as per current industrial practices.

CONTENTS: PRACTICAL

UNIT	NAME OF THE TOPIC
01	Construction of a Battery Eliminator Box, Stabilizer Box, Radio and TV Cabinets.
02	Soldering Practice: Connecting circuit components.
03	Assembling Battery-Stabilizer, Radio Receiver, Intercoil Circuit.
04	Assembling Inverter.
05	- Location of faults and repair of:- - Battery Eliminator - Voltage stabilizer - Inverter - Radio Receiver
06	Location of faults in different types of Electronics Circuits.
07	Tracing fault in a C.H.O and its repair.
08	Handling of different types of multimeter: VTVM, Frequency meters, Calculators.
09	Fault Location and repair of instruments – Multimeter VTVM, Frequency meters, Calculators.
10	Repair of faulty study panels of your laboratory.

Course Outcomes:

At the end of the course, the student will be able to:

- Design basic electronic circuits and analyze their characteristics.
- Verify the theoretical concepts of electronic devices and circuits.
- Simulator like MULTISIM or ORCAD spice to analyze analog electronic circuits.
- Learn electronics hardware and production skills as per current industrial practices.

DC MACHINES & TRANSFORMER LAB

Subject Code	Theory			Credits
PEE2202P	No .of Period Per Week			2
	L	T	P	
	0	0	3	
	-	-	-	

Course objectives:

The aim of this course is to help the student to attain the following industry identified competency through
various teaching learning experiences:

• Provide the basic concept of DC machines and Transformers.
• Develop the skills of the students in the areas of machines and transformers by identifying the current problem
in theindustries and bring solutions through research.
• Diagnose the condition of DC machines and Transformers.
• Maintain electric motors and transformers.

CONTENTS: PRACTICAL

List of Practical's:-

1) To identify the constructional parts of D. C. machine.

2) To find the performance of d. c. series & shunt motor by conducting load test

3) a) To control the speed of d. c. shunt motor above and below normal speed.
b) To reverse the direction of rotation of d. c. motor.

4) a) To identify the constructional details of 1-phase and 3-phase transformer.
b) Visit to maintenance and repair workshop of a transformer and prepare a report.

5) To measure the performance of single phase transformer by direct loading and tofind transformation ratio.

6) To measure the performance of single phase transformer by conducting O.C. and S.C. test.

7) To identify terminal polarity of corresponding phases of 3-phase transformer & to calculate transformation ratio.

8) To compare 1-phase auto transformer with two winding transformer by collecting literaturefrom local
dealer/manufacturer& compare the data on following points.
Weight of iron, weight of copper, turns ratio, efficiency & percentage regulation.

9) To observe the phase difference between primary & secondary voltage of 3-phase transformer for various vector groups.

Course outcomes:

At the end of the course, the student will be able to:

- Maintain different types of DC generators.
- Maintain different types of DC motors.

- Maintain single phase transformer.
- Maintain three phase transformers.
- Maintain different types of special purpose transformers used in different applications.

ELECTRICAL DRAWING LAB

Subject Code	Theory			Credits
PEE2205P	No. of Period Per Week			
	L	T	P	2
	0	0	3	
	-	-	-	

Course objectives:

The aim of this course is to help the student to attain the following industry identified competency through
various teaching learning experiences:

- Provide the basic concept of machines and electrical accessories..
- Develop the skills of the students to represent circuits/systems, block diagrams & wiring diagram.
- Develop wiring Diagrams of substations
- Draw Layout diagram & single line diagram.

CONTENTS: PRACTICAL

UNIT	NAME OF THE TOPIC
01	Study of symbols for representation of machines, Electrical Accessories Equipment switching and protection units as per IS 2032, 8270, 3722
02	Study of various methods of representing circuits/systems through layouts, Block Diagrams, wiring diagrams.
03	Study any Engineering Graphic package (preferably CAD)for preparing layout, Block Diagrams, wiring Diagrams of substations, Machine shop, Illumination systems etc.
04	How to read and interpret, various types of electrical drawings based on the knowledge& Information given while studying the above 3 chapters.

Drawing Sheets: (HALF IMPERIAL)

1. (A) Draw a sheet for symbolic representation of various electrical equipment's/machines
   (B) Read the given circuits identify the components & trace the path of flow of current.
2. Draw a sheet of wires & wiring accessories
3. Prepare a drawing sheet showing details of domestic appliances such as Electric iron, electric Geyser,
   Electric Bell, Hot plate.
4. Draw a sheet of electrical symbols for various electrical devices using CAD.
5. Draw circuit diagrams for Staircase & Godown wiring using CAD.
6. Draw (a) circuit diagram
(b)vector diagram for conducting direct loading test on transformer usingCAD
7. Draw control and power circuit diagrams for DOL and Star/Delta Starter

Mini Project:

1. Visit electrical Machine lab/workshop & trace the electrical installation. Draw Layout diagram & single
line diagram.

Course outcomes:

At the end of the course, the student will be able to:

- Maintain different types of machines and electrical accessories..
- Maintain different types of circuits/systems, block diagrams & wiring diagram.
- Maintain wiring Diagrams of substations
- Maintain Layout diagram & single line diagram.

APPLIED ELECTRONICS LAB

Subject Code	Theory			Credits
PEC2205P	No. of Period Per Week			1
	L	T	P	
	0	0	2	
	-	-	-	

Course objectives:

The aim of this course is to help the student to attain the following industry identified competency through

various teaching learning experiences:

- Understanding analog circuits-Students learn about the basic principles, operation, and applications of analog electronic circuits and devices.
- Designing analog circuits-Students learn how to design and analyze analog electronic circuits using discrete components.
- Comparing theory and experiment-Students design, construct, and measure analog circuits, and compare the experimental results with theoretical analysis.
- Understanding transistor characteristics-Students learn about the characteristics of diodes and transistors.
- Designing amplifiers-Students learn how to design various amplifiers, such as CE, CC, and common source amplifiers.
- Understanding small signal amplifiers-Students learn how to design small signal amplifiers using linear transistor models.
- Understanding oscillators and wave shaping circuits-Students learn how to analyze and design oscillators and wave

CONTENTS: PRACTICAL

Intellectual Skills

1 To locate faults in circuits.

2. Interpret the waveforms.

Motor Skill:

1. Ability to Sketch circuit/block diagram.
2. Ability to interpret the circuit.

List of Practical's:

1. To Plot Frequency response of FET amplifier.
2. To Plot Frequency response & bandwidth of negative feedback amplifier.
3. To Study the Colpitt's oscillator.
4. To Study RC Phase shift oscillator.
5. To Study RC integrator and differentiator & draw i/p & o/p waveforms.
6. To Study Clipping and clamping circuits.
7. To Study function of Astable Multivbrator.
8. To Study Monostable Multivbrator.
9. To Study Bistable Multivbrator.
10. To Study UJT relaxation oscillator.

. Course Outcomes:

At the end of the course, the student will be able to:

- Design and analyze analog electronic circuits using discrete components.
- Design, construct, and measure analog circuits, and compare the experimental results with theoretical analysis.
- Describe characteristics of diodes and transistors.
- Design small signal amplifiers using linear transistor models.
- Analyze and design oscillators and wave

VTH SEMESTER DIPLOMA IN ELECTRICAL ENGINEERING

(Effective from Session 2019-20 Batch)

THEORY

S. No.	Course Code	Course Title	Teaching Scheme			Credit
			Contact Hours per week			
			L	T	P	
1	PEE3101	Switchgear and Protection	3	1	0	4

2	PEE3102	A.C. Machines	3	1	0	4
3	PEE3103	Utilization of electrical energy	5	0	0	5
4	PEE3104	Electrical Traction-I	3	1	0	4
5	PEE3105	Industrial Automation	3	1	0	4

PRACTICAL

S. No.	Course Code	Course Title	Teaching Scheme			Credit
			Contact Hours per week			
			L	T	P	
1	PEE3101P	Switchgear and Protection Lab	0	0	2	1
2	PEE3102P	A.C. Machines lab	0	0	2	1
3	PEE3104P	Electrical Traction-I Lab	0	0	2	1
4	PEE3105P	Industrial Automation Lab	0	0	2	1
5	PEE3106**S**	In plant training and visit to work	0	0	4	2
			Total			**27**

SWITCHGEAR AND PROTECTION

Subject Code	Theory			Credits
PEE3101	No. of Period Per Week			4
	L	T	P	
	3	1	0	
	-	-	-	

Course Objectives:

The main objective of this subject is to understand and to know the following concepts:

- To understand the need of protection of electric equipment and their protection schemes.
- To understand the operations of various types of circuit breakers and their ratings.

- To understand the types of Circuit breakers and relays for protection of Generators, Transformers and feeder bus bar from Over voltages.
- To describe the important of neutral grounding for overall protection.
- To understand the unit protection and over voltage protection of different apparatus in power system.
- To analyses the phenomenon of over Voltage and its classification.

CONTENTS:THEORY

Unit	Name Of The Topic	Hours
01	**Fundamental:** 1.1 Necessity & functions of protective system. 1.2 Normal & abnormal conditions. 1.3 Types of faults & their causes. 1.4 Short circuit calculations(Symmetrical faults only) 1.5 Use of current limiting reactors & their arrangements.	04
02	**Circuit interrupting devices** 2.1 HRC fuses – construction, types, working, characteristics, selection and applications 2.2 Isolators- vertical break, horizontal break & pentograph type 2.3 Arc formation process, methods of arc extinction, related terms. 2.4 Circuit breakers- Concept, Classification, Working principle,Construction, Specification & Applications of 2.4.1 H.T – Bulk oil circuit breaker, Minimum oil circuit breakers(M.O.C.B.), Sulpher Hexa Fluoride circuit breaker (SF6), Vacuum circuit breaker. 2.4.2 L.T.- Air circuit breakers (ACB),miniature circuit breakers (M C B), Moulded case circuit breakers (M C C B) , Earth leakagecircuit breaker (E L C B or R L C B), Comparison of fuse &MCCB 2.5 Selection of MCCB for motor. 2.6 Selection and rating of circuit breakers.	12
03	**Protective Relaying** 3.1 Requirements- relay time, related terms. 3.2 Classification – Electromagnetic attraction, induction static, µPbased relays. 3.3 Protective transformers. (No numerical on above topic) 3.4 Over current relay-Time current characteristics. 3.5 Static over current relays 3.6 µP based over current relays. 3.7 Distance relaying- Principle, static, µP based 3.8 Directional relay. 3.9 Differential Relay. (Simple numerical on relay setting)	12

04	**Protection of Alternator** 4.1 Abnormalities & Faults 4.2 Differential protection 4.3 Overcurrent, earth fault, interturn fault, negative phase sequence,over heating protection. 4.4 Reverse power protections. (Simple numerical on differential protection)	08
05	**Protection of Transformer** 5.1 Abnormalities & faults. 5.2 Differential, over current, earth fault, interturn, restricted earthfault, Over heating protection. 5.3 Buchholtz relay (Simple numerical on differential protection)	08
06	**Protection of Motor** 6.1 Abnormalities & faults. 6.2 Short circuit protection, Overload protection, Single phasepreventor	02
07	**Protection of Busbar & transmission line** 7.1 Abnormalities & faults. 7.2 Bus bar protection. 7.3 Transmission line, over current, distance protection. Pilot wireprotection	04
08	**Neutral Earthing** 8.1 Introduction & importance. 8.2 Types of earthing 8.3 substation earthing	02
09	**Over voltage Protection** 9.1 Causes of over voltages. 9.2 Lighting phenomena & over voltage due to lightning. 9.3 Protection of transmission line & substation from direct stroke. 9.4 Types of lightning arresters & surge absorbers &their Construction & principle of operation. 9.5 Protection against traveling waves. 9.6 Insulation co-ordination.	06
	TOTAL	**60**

Text /Reference Books:		
Titles of the Book	**Name of Authors**	**Name of the Publisher**
Switch gear & protection	S.Rao	Khanna Publications, New
A text book on electrical power system	Soni,Gupta &Bhatnagar	Dhnapat Rai & Sons, New
A text book of Electrical power	S.L.Uppal.	Khanna Publisher, Delhi.
Power System Protection & Switchgear	Badriram & Vishwakarma P.N.	TMH, New Delhi

Switchgear & Power system Protection	Ravindra P. Singh	PHI Publication
Handbook of Switchgears	BHEL	Tata McGraw Hill

Course Outcomes:

At the end of the course, the student will be able to:

- Identify various types of faults in Power system.
- Explain working of different types of circuit breakers in power system.
- Explain working of different types of relays in power system.
- Maintain the protection of transmission line and feeder from various faults.
- Protect transformer, alternator, motor and bus bar.
- Protect power system against over voltages.

A.C MACHINES

Subject Code	Theory			Credits
PEE3102	No. of Period Per Week			4
	L	T	P	
	3	1	0	
	-	-	-	

Course Objectives:

The aim of this course is to help the student to attain the following industry identified competency through various teaching learning experience.

- To expose the concepts of energy conversion theory between electrical and mechanical systems by

introducing electromechanical energy conversion principles.

- Understand the construction, operation and performance of three phase induction machines.

- Gain knowledge about construction, operation and application of single phase induction machines.
- Understand the construction, operation and performance of Alternators
- Gain knowledge about construction, operation and performance of synchronous motors.

CONTENTS:THEORY

Unit	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 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. 1.17 Double cage IM (a) Construction (b) Characteristic of outer, inner cage & combined characteristic (c) Industrial Applications (Numerical on all above) 1.18 I.M. as a generalized transformer 1.19 Vector diagram of IM 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	33
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	12

	(a) Chording factor (b) Distribution factor 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 Synchronousimpedance 2.4 Regulation of three phase Alternator by (a) Synchronous impedance method (b) mmf method (Numerical on all)	
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 & SynchronousMotor (Numerical on all above)	12
04	**Single phase Motors** 4.1 Types of Single phase IM 4.2 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 4.3 Shaded pole IM 4.4 Applications	07
	TOTAL	**64**

Text /Reference Books:		
Titles of the Book	**Name of Authors**	**Name of the Publisher**
Electrical Machines	S. K. Bhattacharya	TTTI, Chandigarh
Electrical Technology Vol. II	B. L. Theraja	S chand & Co.
Electrical engineering	C.L.Dawes	T. M. G. H.
Electrical Machinery	Dr.P.S.Bimbra	Khanna Publishers,New Delhi

Course Outcomes:

At the end of the course, the student will be able to:

- Demonstrate construction, operation and performance of three phase induction machines.
- Explain construction, operation and application of single phase induction machines.
- Analyze operation and performance of Alternators
- Analyze operation and performance of synchronous motors.

UTILIZATION OF ELECTRICAL ENERGY

Subject Code	Theory			Credits
PEE3103	No. of Period Per Week			5
	L	T	P	
	5	0	0	
	-	-	-	

Course Objectives:

The main objective of this subject is to understand and to know the following concepts:

- This course deals with the fundamentals of illumination and its classification.
- This course deals with various methods used for electrical heating and welding.
- This course deals with the working principle of elevators.
- This course provides an introduction to the principles of electrical drives and their applications

in daily life.

CONTENTS:THEORY

Unit	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-HeightRatio, Utilization Factor, Maintenance Factor, Depreciation Factor, Waste LightFactor, Absorption Factor, Reflection Factor, Solid Angle. 1.2 Laws of Illumination: (a) Law of Inverse Squares (b) 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 Numerical) 1.7 Factory Lighting:General Requirements, Types of Installations: General Lighting, Local Lighting, EmergencyLighting. 1.8 Lumen or Light Flux Method of Lighting, Calculations. (Simple Numerical) 1.9 Flood Lighting, Flood Lighting Purposes, Classification of Projectors.	14
02	**Electric Heating and Welding:** **2.1 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, Requirementsof Heating -Element Material, Causes of Failure of Heating Elements, Methods of Temperature Control. - Applications of Resistance Heating.	16

	2.1.5 Arc Heating: (Construction & Operation) (a) Direct Arc Furnace (b) Indirect Arc Furnace. - Applications of Arc Heating. 2.1.6 Induction Heating: (Construction & Operation) - Core Type Induction Furnaces: Ajax WyattFurnace. - Coreless Induction Furnace. - Applications of Induction Heating. (Simple Numerical on MeltingFurnaces) 2.1.7 Dielectric Heating: - Principle of Dielectric Heating. - Advantages of Dielectric Heating - Limitations of Dielectric Heating. - Applications of Dielectric Heating. (Simple Numerical on DielectricHeating) **2.2 Electric Welding:** 2.2.1 Methods of Electric Welding: Electric Arc Welding, ResistanceWelding. 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 DC Machines. 2.2.8 Arc Welding Machines: - DC Welding Machines – MG Set, AC Rectified Welding Unit. - AC Welding Machines – Welding Transformer.	

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 3.8 Bombay lift act.	08
04	**Electric Drives:** 4.1 Introduction: - What is drive?	16

	- 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 f & 1f 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 motor with that of the Load & Starting Conditions ofthe Load. 4.7 Electrical Characteristics: (Only DC Series, Three Phase and Single Phase Induction Motors are to bedealt) 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 ControlMethods (Above and Below Normal Speed). Braking Characteristics: Plugging, Rheostatic Braking and RegenerativeBraking, as Applied to DC Series and Three Phase Induction Motor. 4.8 Mechanical Features: Type of Enclosure as per IS Type of Bearings Type of Transmission for Drive Noise Level. 4.9 Size of Motor: Load Conditions – 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. Estimation of Rating of a Motor. (Simple Numerical on Estimating Size of Continuously Rated Motor), Load Equalisation. (No Calculations) 4.10 Cost: Capital CostRunning Cost (Losses, p.f., Maintenance).	
05	**Economic Aspects of Utilizing Electrical Energy:** 5.1 Economic Aspects of Utilizing Electrical Energy. 5.2 Costing of Electrical Energy: Fixed Charges, Semi Fixed Charges and RunningCharges. 5.3 Formulation of Electrical Tariffs. 5.4 Various Types of Tariffs: Tariffs in force for Domestic, Commercial andIndustrial Consumers. 5.5 Power Factor Improvement: Causes of Low Power Factor, Disadvantages of Low PowerFactor, Power Factor Improvement by using Static Capacitors, Location ofCapacitors for Power Factor Improvement, Most Economical	10

	Power Factor.Automatic Power Factor Controller (Derivation and Simple Numerical) 5.6 Energy Conservation: Importance and need of Energy Conservation, Measures for Energy Conservation in (i) ElectricDrives (ii) Electric Traction (iii) Electric Heating (iv) Refrigeration and Air Conditioning (v) Illumination.	
	TOTAL	**64**

Text /Reference Books:		
Titles of the Book	**Name of Authors**	**Name of the Publisher**
Art & Science of Utilisation of Electrical Energy	H. Partab	Dhanpat Rai & Sons
Utilisation of Electric Power & Electric Traction.	J. B. Gupta	S. K. Kataria & Sons
Utilisation of Electric Power & Electric Traction.	G. C. Garg	Khanna Publishers
Electric Traction	J. Upadhyay S. N. Mahendra	Allied Publisher Ltd.
Fundamentals of Electrical Drives	G. K. Dubey	Narosa Publishing House.
Generation & utilization of Electrical Energy	S. Shivnagaraju, M. Balasubba Reddy, D. Srilatha	Pearson Publications
Utilization of Electrical Energy	E. Openshaw Taylor	Orient Longman Pvt. Ltd.
Utilization of Electrical Energy	Rajiv Ranjan	Foundation Publishing

Course Outcomes:

At the end of the course, the student will be able to:

- Study the basic principles of illumination and its measurement.
- To acquaint with the different types of heating and welding techniques
- To know about the working of electric drives and their applications in industries.
- To know about the working principle of elevators and the motor involved in it.
- To know about the economic aspects of utilizing electrical energy such as tariffs, power factor improvement methods.

ELECTRIC TRACTION – I

Subject Code	**Theory**			**Credits**
PEE3104	**No. of Period Per Week**			
	L	**T**	**P**	**4**
	3	**1**	**0**	
	-	**-**	**-**	

Course Objectives:

The main objective of this subject is to understand and to know the following concepts:

- To maintain electric traction systems.
- To understand different traction systems and latest trends in traction systems.
- To differentiate services of traction system based on speed time curve.
- To Understand the Control of different types of traction motors

CONTENTS:THEORY

Unit	Name Of The Topic	Hours
01	**Power Supply Arrangements:** 1.1 – Introduction 1.2 – High Voltage Supply. 1.3 – Constituents of Supply System - Substations. - Feeding Posts. - Feeding and Sectioning - Arrangements. Sectioning and - Paralleling Post. - Sub sectioning and Paralleling Post. - Sub sectioningPost. - ElementarySection. 1.4 – Major Equipments at Substation - Transformer. - CircuitBreaker. - Interrupter. - Protective System for AC Traction (A) Transformer Protection (B) and 25 KV Catenary Protection 1.5 – Location and Spacing of Substations.	12
02	**Overhead Equipments:** 2.1 – Overhead Equipments (OHE). 2.2 – Principles of Design of OHE: - Composition of OHE. - Height of Contact Wire. - Contact WireGradient. - Encumbrances. - Span Length. 2.3 – Automatic Weight Tension and Temp. Compensation. 2.4 – Uninsulated Overlaps. 2.5 – Insulated Overlaps. 2.6 – Neutral Section. 2.7 –Section Insulator.	12

	2.8 – Isolator. 2.9 – Polygonal OHE: - Single Catenary Construction. - Compound CatenaryConstruction. - Stitched CatenaryConstruction. - Modified -YCompound Catenary. 2.10 – Effect of Speed on OHE. 2.11 – OHE Supporting Structure. 2.12 – Different types of signal boards of OHE. 2.13 – Maintenance of OHE, OHE Maintenance Schedule. (No Derivation and NoNumerical)	
03	**Current Collecting Equipments:** 3.1 – Introduction. 3.2 – Systems of Supplying Power in Electric Traction: (i) Third Rail or Conductor Rail System (ii) Overhead System. 3.3 – Current Collectors for Overhead System: - Trolley Collector or Pole Collector, - Bow Collector, PentographCollector. 3.4 – Types of Pantographs: Diamond Pentograph and Faiveley Type. 3.5 – Construction of Faiveley Type Pantograph. 3.6 – Methods of Raising and Lowering of Pentograph. 3.7 – Maintenance of Pentograph.	10
04	**Signalling and Supervisory Control:** 4.1 – Requirements of Signalling System 4.2 – Types of Signals. 4.3 – Colour Light Signals. 4.4 – Three and Four Aspects of Colour Light Signals. 4.5 – Track Circuits: (i) DC Track Circuit (ii) AC Track Circuit. 4.6 – Supervisory Control:Introduction. - Advantages of Remote Control. - Systems of Remote Control: DC versus VoiceFrequency (VF) Signalling. - Remote Control SystemEquipment and Network. - MimicDiagram&Control Deskfor TPC.	10
05	**Train Lighting:** 5.1 – Systems of Train Lighting. 5.2 – Special Requirements of Train Lighting. 5.3 – Method of obtaining Unidirectional Polarity. 5.4 – Method of obtaining Constant Output. 5.5 – Single Battery System. 5.6 – Double Battery Parallel Block System. 5.7 – Failure of Under frame Generating Equipments. 5.8 – End on Generation. 5.9 – Railway Coach Air Conditioning: - Requirements. - Types of Installations. - Air Conditioned Rolling Stock. 5.10 – Air Conditioning Equipments on Coaches.	08

	TOTAL	**50**

Text /Reference Books:		
Titles of the Book	**Name of Authors**	**Name of the Publisher**
Modern Electric Traction	H. Partab	Dhanpat Rai & Sons
Electric Traction	J. Upadhyay S. N. Mahendra	Allied Publishers Ltd.
Viddut Engine Parichay (In Hindi)	Om Prakash Kesari	S. P. Graphics, Nashik.
Electric Traction –Motive Power and Energy supply	Andreas Steimel	Oldenbourg-indstrieverlag
Electric Traction-I	Deepak Srivastava	Foundation Publishing

Course Outcomes:

At the end of the course, the student will be able to:

- Interpret the traction layout and its Systems
- Maintain the power supply arrangements.
- Maintain the function of the overhead equipment for electrictraction
- Maintain the different components of the electric locomotive.
- Maintain the traction motor and train lighting system
- Maintain the signaling and supervisory control systems.

INDUSTRIAL AUTOMATION

Subject Code	**Theory**			**Credits**
PEE3105	**No. of Period Per Week**			
	L	**T**	**P**	**4**
	3	**1**	**0**	
	-	**-**	**-**	

Course Objectives:

The main objective of this subject is to understand and to know the following concepts:

- About need, advantages and requirements of automation.
- About the control system, its types & application.
- About the control system components & electrical actuators such as sensors, relays, proximity switch,
  Servo motorsetc.

- About the introduction, advantages & disadvantages of PLC
- About Distribution Control System(DCS)

CONTENTS:THEORY

Unit	Name Of The Topic	Hours
01	**Automation** 1.1 Need of automation 1.2 Advantages of automation 1.3 Requirements of automation	02
02	**Control System** 2.1 Concept of control system 2.2 Basic block diagram of control system 2.3 Transfer function 2.4 Block diagram reduction Techniques. 2.5 Types of control system 2.6 Applications of control system	04
03	**Control System Components & Electrical Actuators** 3.1 I/P devices- switches-push buttons, foot switch, selector switch, Pilot switch, Proximity Switch. 3.2 Sensors 3.3 Relays [Electro mechanical, reed] 3.4 Valves, pilot lamps, contactors 3.5 Potentiometer- working uses as error detector 3.6 Servo motors - AC & DC working Principle. 3.7 Synchros- Transmitter & control transformer 3.8 Tacho generator- working Principle 3.9 Stepper motor (Permanent magnet & Variable reluctance)-working Principle 3.10 Power & control circuits for different applications like hoist,ganes, comeyer belt	16
04	**Controllers & Control Actions** 4.1 Electric & Electronic Controllers & Lead log networks. 4.2 Digital controllers :- Brief overview of microprocessor & microcontroller to be worked as controller 4.3 P, I P+I, P+D, P+I+D actions. 4.4 P+I+D action using hydraulic pneumatic & electronic controller 4.5 Tacho - generator	14
05	**Programmable logic Controller** 5.1 Introduction 5.2 Advantages & disadvantages. 5.3 PLC vs PC 5.4 Block diagram of PLC	10

06	**Introduction to special control system** 6.1 Distribution control system (DCS)- brief introduction to hardware & Software used.	02
	TOTAL	**48**

Text /Reference Books:		
Titles of the Book	**Name of Authors**	**Name of the Publisher**
Control System Engg.	Nagrath Gopal	Wiley Eastern
Modern Control Engg.	Ogata	Prentice Hall
Industrial Control Engg	Jacob	Prentice Hall
Hydraulics & Pneumatics	Andrew Parr	Jaico Publication
Programmable Logic Controller: Principle applications	Webb & Reis	Wiley Eastern
Control of Electrical Machines	S.K. Bhattachrya Brijinder Singh	New Age International
Industrial automation and process control	Jon stenerson	Prentice Hall
Handbook of Industrial automation	Richad Shell	Taylor and Francis
Industrial Automation	Balakrishnan	Foundation Publishing

Course Outcomes:

At the end of the course, the student will be able to:

- Understand the need, advantages and requirements of automation.
- Understand the concept of control system, block diagram of control system, block reduction techniques, transfer function, types of control system & its application.
- Learn about control system components & electrical actuators such as sensors, relays, proximity switch,
  Servo motors, stepper motor etc.
- Introduction, advantages & disadvantages of PLC
- Understand the concept of Distribution Control System(DCS)

SWITCHGEAR & PROTECTION LAB

Subject Code	Theory			Credits
PEE3101P	No. of Period Per Week			
	L	T	P	1
	0	0	2	
	-	-	-	

Course objectives:

The aim of this course is to help the student to attain the following industry identified competency through various teaching learning experiences:

- Maintain switchgear schemes used in electrical power systems.
- Maintain the different types of circuit breakers.
- Maintain protection schemes used in electrical power systems.

CONTENTS: PRACTICAL

Skills to be developed:

Intellectual Skills:

5. Identify different types of circuit breakers
6. Identify various faults on the system
7. Calculate the

fault levels **Motor Skills:**

1. Simulate circuit configuration to create various faults
2. Set the relays for various fault levels

List of Practical:

1) Identify the components of different types of circuit breakers with their specifications (**through visits , video or model**).

(I) Low tension air circuit breaker.(including protective devices)

(II) Minimum oil circuit breaker (M O C B)

(III) Miniature circuit breaker (M C B)

(IV) Moulded case circuit breaker (M C C B)

(V) Earth Leakage circuit breaker (E L C B) or Residual leakage circuit breaker (R L C B)

(VI) Sulpher - Hexa fluoride circuit breaker (S F 6)

(VII) Vacuum circuit breaker.

2) Plot performance characteristics of over current relay.

3) Simulation of alternator protection.

4) Simulation of transformer protection.

5) Comparative study of specifications of earthing at different substations / different locations & new trends in earthing schemes (information search)

6) Comparative study of specification of lightning arresters of different manufacturers Through Brochures / Literature

7) For a given 3-ph induction motor with D.O.L. starter

a. Check the operation of over current relay for various loads.

b. Check the operation of single phasing preventer by creating single phasing fault.

c. Check the operation of D.O.L. starter under short circuit condition.

List of Laboratory Experiments :

1. To identify given 3-ph induction motor with D.O.L. starter

a. Check the operation of over current relay for various loads.

b. Check the operation of single phasing preventer by creating single phasing fault.

Check the operation of D.O.L. starter under short circuit condition.

2. Plot performance characteristics of over current relay.

3. To perform an experiment on Simulation of

A. Alternator protection.

B. Transformer protection.

4. Comparative study of specifications of earthing at different substations / different locations & new trends in earthing schemes (information search)

5. Comparative study of specification of lightning arresters of different manufacturers through Brochures / Literature

6 .Explain the different types of circuit breakers with their specifications

Course Outcomes:

The theory, practical experiences and relevant soft skills associated with this course are to be taught and
implemented, so that the student demonstrates the following industry oriented COs associated with the above
mentioned competency:

- Identify various types of faults in power system.
- Select suitable switchgears for different applications.
- Test the performance of different protective relays.
- Maintain protection systems of alternators and transformers

A.C MACHINES LAB

Subject Code PEE3102P	Theory			Credits
	No. of Period Per Week			
	L	T	P	1
	0	0	2	
	-	-	-	

Course objectives:

The aim of this course is to help the student to attain the following industry identified competency
through various teaching learning experiences:

- To expose the concepts of energy conversion theory between electrical and mechanical systems by introducing electromechanical energy conversion principles.
- To impart knowledge on construction principle of operation and performance of synchronous motor as well alternator.
- To expose the concepts of single and three phase induction motor and its industrial applications.
- Maintain Induction, Synchronous and Fractional horse power (FHP)machines used in different applications.

CONTENTS: PRACTICAL

Intellectual Skills: 1. Analytical Skills
2. Identification Skills
Motor Skills: 1. Measuring Skills
2. Connecting instruments / machines
List of Practical's:
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 sameto 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-ϕ alternator by synchronous impedance method atvarious power factors.
6) To find the percentage regulation of 3-ϕ alternator by directloading method at various power factors.
7) To list & explain various starting methods of synchronous motor & applyingone of them to start the
Synchronous motor. Plot V & inverted V curve of thesame.
8) To list the various types of 1-phase IM, Collect the literature for themfrom Dealers / manufacturers of
local places & compare on thefollowing pts.
(i) Method of starting (ii) Cost (iii) Performance (iv) Starting torque etc.
Prepare a report

List of Laboratory Experiments :
1. To measure the performance of 3-phase IM by direct loading.
2. Using an MG set (DC motor-Alternator) observe the effect of excitation & speed oninduced e.m.f. & plot O.C.C. of the given alternator.
3.To find the percentage regulation of 3-phase alternator by direct loading method atvarious power factors.
4.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.
5.To list & explain various starting methods of synchronous motor & applying one of themto start the Synchronous motor. Plot V & inverted V curve of the same.

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

Course Outcomes:

The theory, practical experiences and relevant soft skills associated with this courseare to be taught and

implemented, so that the student demonstrates the following industry oriented COs associated with the above

mentioned competency:

- Maintain three phase induction motor used in different applications.
- Maintain single phase induction motor used in different applications.
- Maintain 3-ϕ alternators used in different applications.
- Maintain synchronous motors used in different applications.
- Maintain FHP motors used in different applications.

ELECTRIC TRACTION-I LAB

Subject Code	Theory			Credits
PEE3104P	No. of Period Per Week			
	L	T	P	1
	0	0	2	
	-	-	-	

Course objectives:

The aim of this course is to help the student to attain the following industry identified competency
through various teaching learning experiences:

- About the introduction and need of layout diagram in electric traction
- About the layout diagram and components used in traction substation, feeding post.
- About the layout diagram of different OHE catenary, pantographs
- About the layout diagram of OHE supporting structures in electric traction

CONTENTS:PRACTICAL

List of Experiments:-
1 Drawing Sheets:
(i) Drawing on half Imperial sheet for Traction Substation Layout or Feeding Post. (ii) Drawing of half Imperial sheet for Pentagonal OHE Catenary, Different Catenary. according to speed limit, Cantilever assembly OHE Supporting structure, Pentograph, Cross section of Contact Wire. **Note:** Students should be able to identity, explain the functions of various components of substation and OHE. **Visits:** Visit to Traction Substation (for substation layout and OHE) or Railway Station (for signaling and train lighting) and writing a report.

Course Outcomes:

The theory, practical experiences and relevant soft skills associated with this courseare to be taught and
implemented, so that the student demonstrates the following industry oriented COs associated with the above
mentioned competency:

- To introduction and need of layout diagram in electric traction.
- To learn about the layout diagram and components used in traction substation, feeding post.
- To understand the layout diagram of different OHE catenary, pantographs.
- To understand the concept of layout diagram of OHE supporting structures in electric traction.

INDUSTRIAL AUTOMATION LAB

Subject Code	Theory			Credits
PEE3105P	No. of Period Per Week			
	L	T	P	1
	0	0	2	
	-	-	-	

Course objectives:

The aim of this course is to help the student to attain the following industry identified competency
through various teaching learning experiences:

- About need, advantages and requirements of automation.
- About the characteristics of potentiometer, Synchro Transmitter
- To impart knowledge on construction principle of DC & AC Servo motors
- To observe various components /parts/symbols/connections of a PLC demonstration kit
- To impart knowledge on construction principle of P, I, PI, PD & PID controller using op-amps & R-C circuits. Plot V-I characteristics

CONTENTS:PRACTICAL

Intellectual Skills:
a. Logical development
b. Programming skills
Motor Skills :
a. Interpretation skills
b. Connecting properly
List of Practical's:
1) a) To plot the characteristics of potentiometer
b) Use of potentiometer as error detector
2) To plot V-I characteristics of DC & AC Servomotors. compare them with DC & AC motor characteristics
3) a) To plot the characteristics of Synchro Transmitter
b) Use of Synchro transmitter- control transformer pair as error detector.
4) Measure step angle for a stepper motor in forward & reverse direction.
5) Draw a power circuit & control circuit using control symbols for a 3-phase IM using DOL starter.
6) Observe various components /parts/symbols/connections of a PLC demonstration kit in your laboratory.
7) Draw a ladder logic diagram for two different examples.
8) By using above ladder logic diagram observe the status of I/Os using PLC.
9) Perform stepper motor/ temperature control using PLC.
10) Identify the parts of hydraulic/ pneumatic servomotor from cut-section/model.

B) Mini Project: (one in a group of eight students)
11) Collect the data of various PLC brands market & list.
12) Collect the data from internet about hardware & software of new control systems like SCADA, DCS.
13) Use the various control components in your laboratory to built a AC/DC position control system.
14) Built P, I, PI, PD & PID controller using op-amps & R-C circuits. Plot V-I characteristics

List of Laboratory Experiments :
1. a) To plot the characteristics of potentiometer b) Use of potentiometer as error detector
2 .To plot V-I characteristics of DC & AC servomotors. compare them with DC & AC motor characteristics
3. Observe various components /parts/symbols/connections of a PLC demonstration kit in your laboratory.
4 .Collect the data from internet about hardware & software of new control systems like SCADA,

DCS
5 .Make a study of DC/AC position control system using Various control components

Course Outcomes:

The theory, practical experiences and relevant soft skills associated with this course are to be taught and implemented, so that the student demonstrates the following industry oriented COs associated with the above mentioned competency:

- Introduction of automation in practical life, its need, advantages and requirements.
- Characteristics of potentiometer, Synchro Transmitter
- Construction principle of DC & AC Servo motors
- To understand the various components /parts/symbols/connections of a PLC demonstration kit
- To understand the construction principle of P, I, PI, PD & PID controller using op-amps & R-C circuits. Plot V-I characteristics
- To understand construction principle ofhardware & software of new control systems like SCADA, DCS.

IN PLANT TRAINING AND VISIT TO WORK

Subject Code	Term Work			Credits
PEE3106S	No. of Period Per Week			
	L	T	P	2
	0	0	4	

	-	-	-	

Rationale:

A student is required to develop his knowledge skill and attitudes gained while joining through different course. It is desirable to expose the students to the world of work to be familiar with the real life situations and understand the problem there in. The "In plant training and visit to work "being introduced for the final year part time diploma technicians for Electrical Engineering with the above objective in view. This course will help the students to observe how the technical, managerial, quality control safety and other principle are being applied in real life situation. They will be able to observe the technique of decision making on the shop floor. He will also, be able to observe the technique of decision making on the shop floor. He will, also be able to observe how his sub-ordinate perform in their day to day work and co-ordinate shop floor activities. The course will also, help bring attitudinal changes in a student.

Course objectives:

A student will be able to:

- Understand the working of the machines, tools and equipments more clearly.
- Write down the specifications of the machines, tools, equipments.
- Know the process of material storing / material management.
- Learn to maintain office records / filing.
- Know the process of planning, implementation and monitoring.
- Learn the skill shop floor co-ordination.
- Know the skill of office management and inventory Control.
- Understand the process of production.
- Know the skill of quality control.
- Know the organizational set-up and plant Lay-out.
- Locate the plants and industries related to Electrical Engineering State and Nation wise.
- Find out Characteristics, Functions, and activities of those industries.
- Find out opportunities and method of recruitments.
- Know the source of raw materials and markets for industries.
- Find out the special characteristics of the industries.
- Observe and understand special machines which they may not have been in their institutes.
- Observe the energy consumption in on industry method to same energy.
- Try to learn techniques to same energy.
- Observe the environment Pollutants and learn how to minimize environmental Pollution.

CONTENTS: SESSIONAL

An electrical engineering Diploma holders technician should preferably visit the following industries/works:

- Thermal Power Stations.
- Hydro Power Stations.
- Chemical Plant.
- Cement Plant.
- Steel Plant.

- Transmission/Distribution Power Stations.
- High Tension Insulator Factory.
- Electrical Equipment manufacturing factory.
- Any other factory of importance/relevance.

REPORT WRITING:

A report should include the following:

S.No.	**Topics**
01	Introduction.
02	Name and types of Industries visited:- - Their specific characteristics - Layout of the Plant - Production/Generation capacity - Production/Generation target for a year - Actual Production/Generation - Reason for shortfall - Load factor in case of power generation. - Lay out of 33 KV/132 KV/220 KV/400 KV - Lay out of switchyard with specification of equipments - Other points of relevance.
03	Working of different industries:- - Location - Lay-out - Raw materials(if any) (a) Their Availability (b) Mode of raw materials (c) Cost of raw materials - Product - Organizational Structure - Special Machine/Tools/Equipments
04	Conclusions - Observations - Typical Characteristics - Area of Weakness/Bottle necks/Materials - Suggestions.

The report on visit to works should be presented and assessed in the form of Seminar.

Course Outcomes:

The theory, practical experiences and relevant soft skills associated with this course are to be taught and

implemented, so that the student demonstrates the following industry oriented COs associated with the

above mentioned competency:

- Understand the working of the machines, tools and equipments more clearly.

- Know the process of planning, implementation and monitoring.
- Know the skill of quality control.
- Know the skill of office management and inventory Control.
- Observe and understand special machines which they may not have been in their institutes.
- Observe the environment Pollutants and learn how to minimize environmental Pollution.

VITH SEMESTER DIPLOMA IN ELECTRICAL ENGINEERING

(Effective from Session 2019-20 Batch)

THEORY

S. No.	Course Code	Course Title	Teaching Scheme			Credit
			Contact Hours per week			
			L	T	P	
1	PSH3201	Management(Common)	5	0	0	5

2	PEE3201	Testing &Maintenance of ElectricalMachines	3	1	0	4
3	PEE3202	Power Electronicsand Drives	3	1	0	4
4	PEE3203	AutomaticControl System	3	1	0	4
5	PEE3204	Elective- (AnyOne)	3	1	0	4
(i)	Electric Traction-II (PEE3204A)	(ii)Maintenance and Repairs of ElectricalEquipment (PEE3204B)	(iii) Microprocessors and Microcontrollers(PEC3205C)			

PRACTICAL

S. No.	Course Code	Course Title	Teaching Scheme			Credit
			Contact Hours per week			
			L	T	P	
1	PEE3201P	Testing &Maintenance of ElectricalMachines Lab	0	0	2	1
2	PEE3202P	Power Electronicsand Drives Lab	0	0	2	1
3	PEE3203P	AutomaticControl System Lab	0	0	2	1
4	PEE3204P	Elective- (AnyOne)	0	0	2	1
(i)	Electric Traction-II Lab(PEE3204PA)	(ii)Maintenance and Repairsof Electrical Equipment Lab (PEE3204PB)	(iii) Microprocessors and Microcontrollers (PEC3205PC)			
5	PEE3205**S**	Industrial Project	0	0	4	2
			Total			**27**

MANAGEMENT (COMMON)

Subject Code	Theory			Credits
PSH3201	No. of Period Per Week			
	L	T	P	5
	5	0	0	
	-	-	-	

Course Objectives:

The main objective of this subject is to understand and to know the following concepts:

- To develop an understanding of key project management skills and strategies.
- To make them understand the feasibility analysis in Project Management and network analysis tools for cost and time estimation.

- To make them capable to analyze, apply and appreciate contemporary project management tools and methodologies in Indian context.
- To learn the process and skills of creation and management of entrepreneurial venture.
- To familiarize with various uses of human resource for earning dignified means of living.
- To acquire entrepreneurial quality, competency, and motivation.

CONTENTS:THEORY

Unit	Name Of The Topic	Hours
01	**Overview Of Business** Types of Business, Service, Manufacturing, Trade Industrial sectors Introduction to:- Engineering industry Process industry Textile industry Chemical industry Agro industry Globalization:- Introduction Advantages & disadvantages w.r.t. India Intellectual Property Rights (I.P.R.)	02
02	**Management Process** What is Management? Evolution Various definitions Concept of management Levels of management Administration & management Scientific management by F.W.Taylor Principles of Management (14 principles of Henry Fayol) Functions of Management:-Planning, Organizing, Directing, Controlling	07
03	**Organizational Management** Organization :-Definition Steps in organization Types of organization Line, Line & staff Functional Project Departmentation Centralized & Decentralized Authority & Responsibility Span of Control Forms of ownership Propriotership Partnership Joint stock Co-operative Society Govt. Sector	07

04	**Human Resource Management** Personnel Management:- Introduction, Definition, Functions, Staffing Introduction to HR Planning Recruitment Procedure Personnel– Training & Development Types of training Induction Skill Enhancement Leadership & Motivation Maslow's Theory of Motivation Safety Management Causes of accident Safety precautions Introduction to – Factory Act ESI Act Workmen Compensation Act Industrial Dispute Act	08
05	**Financial Management** Financial Management-:- Objectives & Functions Capital Generation & Management Types of Capitals Sources of raising Capital Budgets and accounts Types of Budgets Production Budget (including Variance Report) Labour Budget Introduction to Profit & Loss Account (only concepts) ; Balance Sheet Introduction to –Excise Tax, Service Tax, Income Tax, VAT, Custom Duty	08
06	**Materials Management** Inventory Management (No Numerical) Meaning & Objectives ABC Analysis Economic Order Quantity Introduction & Graphical Representation Purchase Procedure Objects of Purchasing Functions of Purchase Dept. Steps in Purchasing Modern Techniques of Material Management Introductory treatment to JIT / SAP / ERP	08
07	**Project Management (No Numerical)** Project Management Introduction & Meaning Introduction to CPM & PERT Technique Concept of Break Even Analysis 7.2 Quality:- Management Definition of Quality , concept of Quality , Quality Circle,Quality Assurance Introduction to TQM, Kaizen, 5 'S',	08

	TOTAL	**48**

Text /Reference Books:		
Titles of the Book	**Name of Authors**	**Name of the Publisher**
Industrial Engg & Management	Dr. O.P. Khanna	Dhanpal Rai & sons New Delhi
Business Administration & Management	Dr. S.C. Saksena	Sahitya Bhavan Agra
The process of Management	W.H. Newman E.Kirby Warren Andrew R. McGill	Prentice- Hall
Industrial Management	Rustom S. Davar	Khanna Publication
Industrial Organisation & Management	Banga & Sharma	Khanna Publication
Industrial Management	Jhamb & Bokil	est Publication , Pune
Management	Deepak Chandra	Foundation Publishing

Course Outcomes:

At the end of the course, the student will be able to:

- Understand the importance of projects and its phases.
- Analyze projects from marketing, operational and financial perspectives.
- Evaluate projects based on discount and non-discount methods.
- Develop network diagrams for planning and execution of a given project

TESTING & MAINTENANCE OF ELECTRICAL MACHINES

Subject Code	**Theory**			**Credits**
PEE3201	**No. of Period Per Week**			
	L	**T**	**P**	**4**
	3	**1**	**0**	
	-	**-**	**-**	

Course Objectives:

The main objective of this subject is to understand and to know the following concepts:

- To understand the safety & prevention of accidents in rotating machines and their protection schemes.
- To understand routine tests&special tests of electrical machines.
- To understandtesting & maintenance of Transformers.
- To understandClassification of insulating materials
- Identify common troubles in Electrical machines and switch gear.

CONTENTS:THEORY

Unit	**Name Of The Topic**	**Hours**

01	**Safety & Prevention of Accidents:** 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 & equipments working with electrical installation, Dos & don'ts for substation operators as listed in IS Meaning & causes of electrical accidents factors on which severity of shock depends, Procedure for rescuing the person who has received an electric shock, methods of providing artificial respiration, Precautions to be taken to avoid fire due to electrical reasons, operation of fire extinguishers.	05
02	**General Introduction:** Objectives of testing significance of I.S.S. concept of tolerance, routine tests, type tests, special tests. Methods of testing:-(a) Direct (b) Indirect (c) Regenerative. Concept of routine, preventive & breakdown maintenance, advantages of preventive maintenance, procedure for developing preventive maintenanceschedule, Factors affecting preventive maintenance schedule. Introduction to total productive maintenance.	08
03	**Testing & maintenance of rotating machines:** Type tests, routine tests & special tests of 1 & 3 phase Induction motors, Routine, Preventive, & breakdown maintenance of 1 & 3 phase Induction motors as per IS 9001:1992 Parallel operation of alternators, Maintenance schedule of alternators & synchronous machines as per IS 4884-1968 Brake test on DC Series motor.	07
04	**Testing & maintenance of Transformers:** Listing type test, routine test & special test as per I.S. 2026-1981 Procedure for conducting following tests: Measurement of winding resistance, no load losses, & no load current, Impedance voltage, load losses, Insulation resistance, Induced over voltage withstand test, separate source voltage withstand test, Impulse voltage withstand test, Temperature rise test of oil & winding, Different methods of determining temp rise- back to back test, short circuit test, open delta (delta – delta) test. Preventive maintenance & routine maintenance of distribution transformer asper I.S. 10028(part III): 1981, Periodic checks for replacement of oil, silica gel,parallel operation of 1 & 3 phase transformer, load sharing calculations(numerical)	12
05	**Testing & maintenance of Insulation:** Classification of insulating materials as per I.S. 8504(part III)1994, factors	10

	affecting life of insulating materials, measurement of insulation resistance & interpretation of condition of insulating. Methods of measuring temperature of internal parts of windings/machines & applying the correction factor when the machine is hot. Properties of good transformer oil, list the agents which contaminates the insulating oil, understand the procedure of following tests on oil as per I.S. 1692-1978 (a) acidity test (b) sludge test (c) crackle test (e) flash point test. Filtration ofinsulating oil protection of electrical equipments (insulation) during the periodof inactivity. Methods of cleaning the insulation covered with loose, dry dust, sticky dirt, & oily viscous films, procedure for cleaning washing & drying of insulation & Revarnishing Methods of internal heating & vacuum impregnation.	
06	**Installation:** Factors involved in designing the machine foundation, Requirement of different dimension of foundation for static & rotating machines procedure for levelling & alignment of two shafts of directly & indirectly coupled drives, effects of misalignment. Installation of rotating machines as per I.S. 900-1992. Use of various devices & tools in loading & unloading, lifting, carrying heavy equipment.	06
	TOTAL	**48**

Text /Reference Books:		
Titles of the Book	**Name of Authors**	**Name of the Publisher**
Electrical Technology Vol I To IV	B. L. Theraja	S. Chand & Co., New Delhi
Operation & Maintenance Of Electrical	B. V. S. Rao	Media Promoters & Publisher Ltd.

Machines Vol - I		Mumbai
Operation & Maintenance Of Electrical Machines Vol - II	B. V. S. Rao	Media Promoters & Publisher Ltd. Mumbai
Preventive Maintenance Hand Books & Journals	C.J. Hubert	Media Promoters & Publisher Ltd. Mumbai
Testing & Maintenance of Electrical Machines	Manoj Sinha	Foundation Publishing

Course Outcomes:

At the end of the course, the student will be able to:

- Explain & perform routine test single-phase and three-phase induction motor.
- Explain & perform polarity test and back-to-back test on single phase transformer to find voltage regulation.
- Explain & perform parallel operation of alternator and transformer
- Explain & perform OC and SC test on Induction Motor and plot circle diagram
- Explain & perform brake test on DC motor and plot characteristics against torque, speed and load current.
- Explain & perform of Transformers testing & maintenance & rotating machines.

POWER ELECTRONICS AND DRIVES

Subject Code	Theory			Credits
PEE3202	No. of Period Per Week			4
	L	T	P	
	3	1	0	
	-	-	-	

Course Objectives:

The main objective of this subject is to understand and to know the following concepts:

- To understand and acquire knowledge about various power semiconductor devices.
- Maintain the proper functioning of power electronic devices.
- To analyze and design different power electronics circuits such as power converters, inverters, choppers, etc.

CONTENTS:THEORY

Unit	Name Of The Topic	Hours
01	**Power Semiconductor Devices:** 1.1 Thyristor (SCR) 1.2 Construction, Operation and Symbol 1.3 V-I Characteristics 1. 4 Thyristor Turn Methods: Voltage Triggering, Gate Triggering, dv/dt Triggering and Light Triggering. 1.5 Gate Control: DC Gate Signal, AC Gate Signal and Pulse. 1.6 Thyristor Turn off Process or commutation method. 1.7 Thyristor Specifications and Ratings Voltage Ratings, Current Ratings, Power Ratings and Temperature Ratings. 1.8 Heat Sinks and Mountings 1.9 Thyristor Family: Symbols & V-I Characteristics	06
02	**Converters:** 2.1 – Introduction 2.2 – Single Phase Fully Controlled Half Wave Converter - With Resistive Load - With RL Load and Freewheeling Diode. 2.3 - Single Phase Fully Controlled Full Wave Converter - With Resistive Load - With RL Load. 2.4 - Single Phase Fully Controlled Bridge Converter - With Resistive Load - With RL Load 2.5 - Comparison of 3 f and 1 f Phase Converters. 2.6- Effect of Source Impedance on Converter Operation. 2.7 - Cycloconverters principle of operation, Input output waveforms.(1-Q only)	08
03	**Inverters:** 3.1 - Introduction 3.2 – Classification: Line Commutated & Forced Commutated Inverters, Series, Parallel, & Bridge Inverters. 3.3 – Series Inverter - Operation of Basic Series Inverter Circuit - Modified Series Inverter 3.4 – Parallel Inverter - Operation of Basic Parallel Inverter Circuit	08

	3.5 – Single Phase Bridge Inverter - Half Bridge Inverter - Full Bridge Inverter 3.6 - Pulse Width Modulation(PWM) Method: - Single Pulse Width Modulation - Multiple Pulse Width Modulation - Sinusoidal Pulse Width Modulation	
04	**Choppers:** 4.1 – Introduction 4.2 – Chopper Principle 4.3 – Control Techniques: - Constant Frequency System - Variable Frequency System 4.4 – Classification of Choppers: Class A, Class B, Class C, Class D and Class E 4.5 - Commutations Methods for Choppers: Auxiliary Commutation, Load Commutation 4.6 – Jones Chopper 4.7 – Step Up Chopper & step down choppers with problems	08
05	**Power Electronic Applications:** 5.1 – DC Drives: 5.1.1 – Speed control of DC series motor with single phase and three phase half and full controlled converter, step up and step down chopper. 5.2 – AC Drives: 5.2.1 – Speed control of three phase Induction Motor with Variable frequency PWM VSI, Variable frequency square wave VSI, Variable frequency CSI, Variable frequency Variable Voltage, Cycloconverters. 5.3 – Other Applications: - Static Circuit Breakers (DC & AC). - Induction Heating Control. - Di-electric Heating Control. - Electric Welding Control. - Battery Charging Control. - Static Excitation System for Alternators. - Static VAR Compensation System.	18
	TOTAL	**48**

Text /Reference Books:		
Titles of the Book	**Name of Authors**	**Name of the Publisher**
Power Electronics	B. R. Gupta ,V. Singhal	S. K. Kataria & Sons
Power Electronics	Muhammad H. Rashid	Prentice-Hall of India Pvt. Ltd.
Power Electronics	M. D. Singh, K. B. Khanchandani	Tata McGraw-Hill

Fundamentals of Electric Drives	G. K. Dubey	Narosa Publishing House
Electric Drives – Concepts and Applications	V. Subrahmanyam	Tata McGraw-Hill
Power Electronics and Drives	R.N. Dutta	Foundation Publishing

Course Outcomes:

At the end of the course, the student will be able to:

- Select a suitable power electronics device for a given application.
- Choose a suitable turn & turnoff circuit for a thyristor for a given application.
- Use different types of power electronic converters for a given application
- Select a suitable chopper for a given application.
- Choose an appropriate inverter for a given application

AUTOMATIC CONTROL SYSTEM

Subject Code	Theory			Credits
PEE3203	No. of Period Per Week			
	L	T	P	4
	3	1	0	
	-	-	-	

Course Objectives:

The main objective of this subject is to understand and to know the following concepts:

- To interpret different physical and mechanical systems in terms of electrical system toconstruct equivalent electrical models for analysis.

- To employ time domain analysis to predict and diagnose transient performance parameters of the system for standard input functions.
- To formulate different types of analysis in frequency domain to explain the nature ofstability of the system.
- To assess controllability and observability of control systems.

CONTENTS:THEORY

Unit	Name Of The Topic	Hours
01	**[1] INTRODUCTION:** 1.1 The Control system, open loop and closed loop control 1.2 Servomechanism 1.3 Control of physical quantity live temperature, flow, liquid lend etc. 1.4 Feedback and nonfeedback systems, Regenerative feedback	06
02	**[2] LAP LACE TRANSFORM:** 2.1 The lap lace transform 2.2 The inverse lap lace transform 2.3 Properties of Lap lace transform 2.4 Solving differential equations by lap lace transform method.	06
03	**[3] MATHEMATICAL MODELING OF PHYSICAL SYSTEM:** 3.1 Differential equations of physical system 3.2 Transfer Function	04
04	**[4] CONTROL SYSTEM COMPONENTS:** 4.1 Introduction 4.2 Controller Components 4.3 A.C & D.C Servomotor 4.4 Potentiometer, Synchros, Tachometer, Amplidyne and Metadyne.	07
05	**[5] ROOT LOCUS TECHNIQUE :** 5.1 Introduction 5.2 The Root locus Technique 5.3 Construction of root loci & solution of problems	04
06	**[6] TIME RESPONSE ANALYSIS :** 6.1 Standard test signals 6.2 Time response of first order systems 6.3 Time response of second order system 6.4 Time response specification 6.5 Steady state errors and error constants	06
07	**[7] CONCEPT OF STABILITY AND ALGEBRAIC CRITERIA :** 7.1 The concept of stability 7.2 Necessary conditions for stability 7.3 Routh Huraitz stability criterion & problems	06
08	**[8] FREQUENCY RESPONSE ANALYSIS :** 8.1 Introduction 8.2 Correlation between time response and frequency response. 8.3 Bode plots and polar plots of different types of transfer function.	08
	[9] STABILITY IN FREQUENCY DOMAIN :	

09	9.1 Introduction 9.2 Nyquisty stability criterion 9.3 Assessment of relative stability using Nyquist stability Criterion, Phasemargin, Gain marging. 9.4 Closed loop frequency response.	08
10	**[10] INTRODUCTION TO STATE SPACE APPROACH :** 10.1 Concept of state 10.2 State space Variables & models 10.3 Controllability and observability	05
	TOTAL	**60**

Text /Reference Books:		
Titles of the Book	**Name of Authors**	**Name of the Publisher**
Control system engineering	I.J Nagrath / M. Gopal	Wiley Eastern
Control system engineering	Sushil Das gupta	
Control system engineering	S. Hassan Saeed –s.k kataria & sons	
Control system engineering	Nise- Willey	
Automatic Control System	S.N. Goyal	

Course Outcomes:

At the end of the course, the student will be able to:

- Characterize any system in Laplace domain to illustrate different specification of thesystemusing transfer function concept.
- Interpret different physical and mechanical systems in terms of electrical system toconstruct equivalent electrical models for analysis.
- Employ time domain analysis to predict and diagnose transient performanceparametersof the system for standard input functions.
- Formulate different types of analysis in frequency domain to explain the nature ofstability of the system.

ELECTIVE-(ANY ONE)-(i)
ELECTRIC TRACTION-II

Subject Code	**Theory**			**Credits**
PEE3204A	**No. Of Period Per Week**			
	L	**T**	**P**	**4**
	3	**1**	**0**	
	-	**-**	**-**	

Course Objectives:

The main objective of this subject is to understand and to know the following concepts:

- Understand the Electric Locomotives systems and latest trends in traction systems.
- Maintenance of Locomotives
- Understand the Protection of Electric Locomotive
- Understand the Linear Electric Motor (LEM)Propelled Traction

CONTENTS:THEORY

Unit	Name Of The Topic	Hours
01	**Electric Locomotives:** 1.1 - Nomenclature used For Electric Locomotives 1.2 - Types of Electric Locomotives By Nomenclature. 1.3 – AC Locomotive: 1.3.1 - Equipments of AC Electric Locomotive: - Power Circuit Equipments and Auxiliary Circuit Equipments. 1.3.2- Equipments in Power Circuit and their Functions: - Power Circuit Diagram of AC Locomotive: Pantograph, Circuitbreaker, Tap Changer Traction Transformer, Rectifier,Smoothing Choke Traction Motor. 1.3.3 - Equipments in Auxiliary Circuit & their Functions: Head Light,Flasher Light, Horn, Marker Light,Batteries, Arno Converter, Blowers, Exhausters Compressors,Selsyn transformer. 1.3.4 – List and Purpose of Different Type of Relays: 1.3.5 – List and Purpose of Different Type of Contactors: 1.4 – Three Phase Locomotive. 1.4.1 – Power Circuit of Three Phase Locomotive. 1.4.2 – Power Supply Arrangement for Auxiliary Machines in Three Phase Locomotive.	14
02	**Maintenance of Locomotives:** 2.1 – Locomotive Maintenance 2.2 – Need of Maintenance and Policy of Obselence. 2.3 – Defects. 2.4 – Ideal Maintenance: - Means to Improve the Reliability of Locomotive. - Means to Improve Availability of Locomotive. - Means to Reduce Maintenance Cost. - Maintenance Record. - Training Facility. - Characteristics of Efficient Maintenance. 2.5 – Electrical Faults and Their Causes. 2.6 – Fault Localization. 2.7 – Necessity of Testing. - Testing Procedure. - Individual Equipment Tests.	10
03	**Protection of Electric Locomotive:** 3.1 – Introduction. 3.2 – Broad Strategy For Protection. 3.3 – Surge Protection: - Direct Lightening Strokes.	08

	- Switching Surges: External and Internal. 3.4 – Overload Protection of Main Power Circuit. 3.5 – Earth Fault Protection of Power and Auxiliary Circuit. 3.6 – Protection from Over Voltage and Under Voltage. 3.7 – Differential Current Protection of Traction Circuits. 3.8 – Protection Against High and Low Air Pressure in theCompressed Air Circuit. 3.9 – Temperature Monitoring. 3.10 – Protection of Transformer By Buchholz's Relay. 3.11 – Monitoring of Ventilation System of Key LocomotiveEquipments. 3.12 – Protection Against Accidental Contact with HTEquipment. 3.13 – Protection Against Fire. - Fire Prevention Strategy.	
04	**LEM Propelled Traction:** 4.1 – Introduction. 4.2 – Linear Electric Motor (LEM) 4.3 – Linear Induction Based Traction System: - Moving Primary Fixed Secondary Single Sided LIM. - Moving Secondary Fixed Primary Single Sided LIM. - Moving Primary Fixed Secondary Double Sided LIM. 4.4 – Strengths/Weaknesses of LIM Propelled Railway Traction: - Strengths of LIM Propelled Railway Traction System. - Weaknesses of LIM Propelled Railway Traction System. 4.5 – Practical Possibilities of LIM Propelled Transportation. 4.6 – Inputs/Modifications for Adoption of LIM Propulsion in the ExistingSystem: - Track Modification. - Vehicle Modification. - Voltage and Speed Control. 4.7 – LIM Propelled Underground Metro Rail System: - Factors Influencing Adoption of LIM for Metro Rail. - International Scenario. 4.8 – Wheel Less Traction: - Levitation Schemes. - Present Scenario.	10

05	**Application of Computers in Management of Electric Traction:** 5.1 – Introduction. 5.2 – Computer's Capability Relevant to Electric Traction Management. 5.3 – Areas of Computer Application in Traction System Management: - Optimization of OHE and Power Supply Installation Designs. - Computer Aided Locomotive Designs. - Monitoring of Maximum Demand. - Energy Saving Driving Approach. - Training of Drivers on Simulators. - Aiding Drivers and Maintenance DepotThrough On Board Computers - History of Locomotive and OHE Equipment. - Failure Analysis. - Monitoring Execution of Trip Inspection	06

	- Schedules of Locomotives. - Inventory Control. 5.4 – Possible Other Areas for Computer Controlled Monitoring. 5.5 – Advantages of Use of Computers for Management of Electric TractionSystem.	
	TOTAL	**48**

Text /Reference Books:		
Titles of the Book	**Name of Authors**	**Name of the Publisher**
Modern Electric Traction	H. Partab	Dhanpat Rai & Sons
Electric Traction	J. Upadhyay S. N. Mahendra	Allied Publishers Ltd.
Viddut Engine Parichay (In Hindi)	Om Prakash Kesari	S. P. Graphics, Nashik. Phone No. (0253) 2580882
Electric Traction-II	Deepak Kumar	Foundation Publishing

Course Outcomes:

At the end of the course, the student will be able to:

- Explain Electric Locomotives systems and latest trends in traction systems.
- Maintenance of Locomotives
- Explain the Protection of Electric Locomotive
- Explainthe Linear Electric Motor (LEM)Propelled Traction

ELECTIVE-(ANY ONE)-

(ii) Maintenance and Repairs of ElectricalEquipment

Subject Code	**Theory**			**Credits**
PEE3204B	**No. of Period Per Week**			
	L	**T**	**P**	**4**
	3	**1**	**0**	
	-	**-**	**-**	

Course Objectives:

The main objective of this subject is to understand and to know the following concepts:

- This course deals with the various methods used for maintenance and repairing of electrical equipments.
- This course deals with the various electrical as well as mechanical tools such as multimeter,

wattmeter, hammer, pliers etc used for testing and repairing of instruments.

- This course deals with the construction, testing, fault finding, dismantling and assembling of electrical equipment such as electric iron, geyser, water heater, toaster, fan etc.
- This course deals with the various electronic circuit such as rectifiers, oscillators, timers etc. used in electric equipment.
- This course deals with construction, testing, fault finding, dismantling and assembling of advanced electrical equipment such as UPS, Inverter, Battery Charger, CD/DVD/VCD etc.

CONTENTS:THEORY

Unit	Name Of The Topic	Hours
01	**Introduction** Principle different effects of electric currents, materials used in electricalequipments, tools / instruments necessary for repair works, jointingmethods, soldering, testing of instruments, Interpretation, location &identification of faults, recording / estimation of materials / componentsrequired & their cost, approximate costing of repair of equipment.	08
02	Domestic electrical equipment, Principle, types, construction, operation,testing, fault finding, dismantling, assembly & testing after repairs offollowing equipments electric Iron all types, electric ovens, electric fans &regulators, water heaters, geysers mixers, food processors, toasters.	16
03	Circuits used for control & regulation of electronic circuits like rectifiersamplifier timer, oscillator, identification of component, component testing,with multimeters replacement of components, microwave & use microwave for heating, laser & laser equipment	08
04	Advanced equipments principle, types, construction, operation, Testing,fault finding, dismantling, assembly & testing after repairs of followingequipments- UPS / Inverters, battery chargers, microwaves ovens, aircoolers, Washing machines – semi automatic / fully automatic, remotecontrollers of different equipments, VCD / DVD / ACD players.	16
	TOTAL	**48**

Text /Reference Books:		
Titles of the Book	**Name of Authors**	**Name of the Publisher**
Maintenance and Repairs of Electrical Equipment	Rajiv Kumar	Foundation Publishing

Course Outcomes:

At the end of the course, the student will be able to:

- Maintain and repair of electrical equipments such as electric iron, geyser, water heater, toaster, fan etc.
- Construct, test, find the fault, dismantling and assembling of electrical equipments such as electric iron, geyser, water heater, toaster, fan etc.
- Construct, test, find the fault, dismantling and assembling of advanced electrical equipment such as UPS, Inverter, Battery Charger, CD/DVD/VCD etc.

ELECTIVE-(ANY ONE)-

(iii) MICROPROCESSORS AND MICROCONTROLLERS

Subject Code	Theory			Credits
PEC3205C	No. of Period Per Week			4
	L	T	P	
	3	1	0	
	-	-	-	

Course Objectives:

The main objective of this subject is to understand and to know the following concepts:

- To understand the applications of Microprocessors, need of microprocessor in computer system.
- To understand architecture and features of typical Microprocessors.
- Understanding the 8051: Learn the 8051's architecture, operation, and design concepts

- Comparing microprocessors and microcontrollers: Understand the differences between the two
- Learning about addressing modes& assembly language of the 8051
- Understanding peripheral devices: Learn about the importance of peripheral devices and how to interface them with the 8051
- Learning about external interfaces: Learn about different external interfaces like LCDs, LEDs, keypads, switches, and seven segment displays
- Learning about interrupts: Learn how to write Assembly and C language programs for interrupts
- Learning about interfacing: Learn how to interface the microcontroller with external hardware for real-time applications

CONTENTS:THEORY

Unit	Name Of The Topic	Hours
01	**Microprocessor 8085** 1.1 Evolution of microprocessors 1.2 Architecture of 8085 1.3 Pin diagram 1.4 Control signals 1.5 Multiplexing of address & Data Bus	06
02	**8085 Assembly Language Programming** 2.1 Programming Model of 8085 2.2 Addressing Modes 2.3 Instruction classification, Instruction format 2.4 Instruction set 2.5 Stacks & subroutines 2.6 Assembly Language programming	08
03	**Microcontroller Basics** 3.1 Introduction and applications 3.2 Comparison between microcontrollers and microprocessors 3.3 Evolution of microcontrollers 3.4 Commercial microcontroller devices (some important Ics & brief idea)	02
04	**8051 Architecture** 4.1 Block diagram of 8051 microcontroller 4.2 Registers in 8051 4.3 General purpose or working registers 4.4 Stack Pointer and Program counter 4.5 Special function registers (SFR) 4.6 Program Status word 4.7 Data pointer (DPTR) 4.8 Timer resisters 4.9 Ports 4.10 Control registers	05
05	**8051 connections, I/O ports and memory organization** 5.1 8051 pin description 5.2 8051 connections 5.3 Parallel I/O ports 5.4 Memory organization	05
06	**8051 addressing modes and instructions** 6.1 8051 addressing modes	08

	6.2 8051 instruction set	
07	**8051 interrupts, timer/counters and serial communication** 7.1 Interrupts in 8051 7.2 Initializing 8051 interrupts & their priorities 7.3 Timers and counters, timer counter modes 7.4 Serial communication, serial communication modes	06
08	**Applications of microcontrollers** 8.1 Square wave and rectangular wave generation 8.2 Pulse generation 8.3 Pulse width modulation 8.4 Frequency counter 8.5 Interfacing small keyboards 8.6 Interfacing LCD display, 8.7 Interfacing D/A and A/D converters 8.8 Interfacing relay 8.9 Interfacing stepper motor 8.10 Interfacing DC motor.	08
	TOTAL	**48**

Text /Reference Books:		
Titles of the Book	**Name of Authors**	**Name of the Publisher**
Microcontrollers theory and applications	Ajay V Deshmukh	TMH, New Delhi
8051 microcontrollers architecture, Programming and Applications	Kenneth J Ayala,	International Thomson publishing, India
Microprocessor & Microcomputer	B. Ram	S. Chand publications
Microprocessor Architecture, Programming & Applications with the 8085	Ramesh Gaonkar	Penram International Publishing (India) Pvt. Ltd.
Microprocessors and Microcontrollers	S.N. Mathur	Foundation Publishing

Course Outcomes:

At the end of the course, the student will be able to:

- Learn importance of Microprocessors in designing real time applications.
- Understanding the architecture-Students will understand the architecture and operation of the 8051 microcontroller.
- Programming-Students will be able to write assembly language programs for embedded system applications. They will also be able to implement middle level programming and interfacing concepts.
- Designing applications-Students will be able to design applications using the 8051 microcontroller's peripherals. They will also be able to design electrical circuitry to interface the processor to external devices.
- Analyzing data transfer-Students will be able to analyze data transfer information through serial and parallel ports.
- Applying concepts-Students will be able to apply concepts to real-time applications.

TESTING AND MAINTENANCE OF ELECTRICAL MACHINE LAB

Subject Code	Theory			Credits
PEE3201P	No. of Period Per Week			
	L	T	P	1
	0	0	2	
	-	-	-	

Course Objectives:

The aim of this course is to help the student to attain the following industry identifiedcompetency through

various teaching learning experiences:

- To acquire knowledge on safety measures and precautions.
- Testing of DC and AC rotating machines and transformers.

- Identify common troubles in Electrical machines and switch gear.
- Plan and carry out routine and preventive maintenance.
- Initiate total productive maintenance.

CONTENTS: PRACTICAL

Skills to be developed:
Intellectual skills:
1. Select appropriate meters & equipment
2. Recollect Testing &Maintenance procedures.
Motor Skills:
1. Accuracy of Measurement
2. Proper connections
3. Draw characteristics
List of Practical:
1) Draw circuit diagram select appropriate meters, connect it to perform routine test on single phase Induction motor
2) As per the given circuit diagram perform routine test on three phase Induction motor, & calculate the
different parameters
3) Select two single phase transformers, perform polarity test, mark its terminals, select appropriate meters
& perform back to back test, compare its regulation with direct loading method
4) Perform parallel operation of transformer as per I.S.
5) Perform parallel operation of alternator as per I.S.
6) Carry out OC & SC test on Induction motor, plot circle diagram, & calculate parameters
7) Perform brake test on DC series motor & plot characteristic of output against torque, speed, load current as per I. S. list suitable applications.
B) Field work:
8) Observe & carry out weekly, monthly & yearly maintenance of motor in your workshop & prepare its
report
C) Mini project:
9) Prepare trouble-shooting chart for single and three phase transformers
10) Prepare trouble-shooting chart for single and three phase motors

Course outcomes:

At the end of the course, the student will be able to:

- Perform routine test single-phase and three-phase induction motor.
- Perform polarity test and back-to-back test on single phase transformer to find voltage regulation
- Perform parallel operation of alternator and transformer
- Perform OC and SC test on Induction Motor and plot circle diagram
- Perform brake test on DC motor and plot characteristics against torque, speed and load current
- Able to generate different basic waveforms using OP-amp.

POWER ELECTRONICS AND DRIVES LAB

Subject Code	Theory			Credits
PEE3202P	No. of Period Per Week			
	L	T	P	1
	0	0	2	
	-	-	-	

Course Objectives:

The aim of this course is to help the student to attain the following industry identified competency through
various teaching learning experiences:

- To provide students with practical knowledge of Power Electronics devices

- Design and Development of power converter circuits.
- Understand applications of power electronics.

CONTENTS: PRACTICAL

Skills to be developed:
Intellectual skills:
1. Select appropriate devices and instruments
2. Testing & troubleshooting
Motor Skills:
1. Accuracy of Measurement
2. Proper connections
3. Draw characteristics
List of Practical's:
(1) To identify the terminals and plot V-I Characteristics of Thyristor.
(2) To study Full Wave Rectifier Using SCR and UJT.
(3) To study Parallel Inverter Using SCR.
(4) To study Bridge Rectifier Using SCR and UJT.
(5) To study series Inverter Using SCR.
(6) To study Chopper Using SCR.
(7) To study Circuit Breaker Using SCR.
(8) To study Battery Charger Using SCR.
(9) To Perform Speed control of DC series motor by static armature voltage control using singlephase
half/full controlled converter.
(10) To Perform speed control of three phase Induction motor using PWM/CSI Inverter. Interpret thespeed – torque characteristics. Use the circuit as Variable Voltage Variable Frequency(V. V. V. F.) drive.

Course outcomes:

At the end of the course, the student will be able to:

- Understand the operation of power electronic devices and its applications.
- Analyze the I-V characteristics of SCR, UJT, and Diode.
- Analyze the characteristics of the DC series motor as a speed controller.
- Illustrate the functioning of the PWM and CSI Inverter.
- Distinguish the speed control of DC motors using converters.

AUTOMATIC CONTROL SYSTEM LAB

Subject Code	Theory			Credits
PEE3203	No. of Period Per Week			
	L	T	P	1
	0	0	2	
	-	-	-	

Course Objectives:

The aim of this course is to help the student to attain the following industry identifiedcompetency through

various teaching learning experiences:

- To provide students with practical knowledge of automatic control system.
- Transient response of First Order System.
- D.C. position control servomechanism system.
- Design and Development ofON-OFF temperature Control.

CONTENTS: PRACTICAL

1	Study of D.C. position control servomechanism system.
2	Study of Control System Components.
3	Transient Response of First Order System.
4	Transient Response of Second Order System.
5	Frequency Response of Second Order System.
6	ON-OFF temperature Control.
7	Analogue Computer, Solution of different equation.

Course outcomes:

At the end of the course, the student will be able to:

- Understand the operation ofControl System Components.
- Design of ON-OFF temperature Control.
- Design of minor project in which automatic control system will be used.
- Understand the transient response & frequency response of 2^{nd} order system.

ELECTIVE-(ANY ONE)
(i)ELECTRIC TRACTION-II LAB

Subject Code	Theory			Credits
PEE3204PA	No.Of Period Per Week			
	L	T	P	1
	0	0	2	
	-	-	-	

Course Objectives:

The aim of this course is to help the student to attain the following industry identifiedcompetency through

various teaching learning experiences:

- About electric Ac locomotives
- About overload protection, earth fault protection of power & auxiliary circuit in electric

traction

- About differential current protection in traction circuits

CONTENTS:PRACTICAL

List of Laboratory Experiments :
1. Study of Electric AC Locomotives.
2 .Study of Relays, Contactors
3 .Individual Equipment Testing
4 .Overload Protection,Earth Fault Protection of Power and Auxiliary Circuit.
5 .Differential Current Protection of Traction Circuits
6 .Linear Induction Based Traction System:
7 .Computer Aided Locomotive Designs
8 .Monitoring Execution of Trip Inspection
9 .Use of Computers forManagement of Electric Traction

List of Assignments:-

1 Drawing Sheets:

(i) Drawing (on half Imperial sheet) for Power Circuit of any type of Electric Locomotive

(ii) Drawing (on half Imperial sheet) for Protection of Electric Locomotive.

(**Note:** Students should be able to identity, explain the functions of various equipmentsused in Electric locomotive).

Mini Project:

Collection of information using Internet on any two topics in the contents andsubmission of printouts

2 Mini Project:

Collection of information usingInternet on any two topics in the contents andsubmission of printouts

Course outcomes: At the end of the course, the student will be able to:

- Understand electric Ac locomotives.
- Do individual equipment Testing
- Design of overload protection, earth fault protection of power & auxiliary circuit in electric traction.
- Design of differential current protection in traction circuits.
- Do execution of Trip Inspection.

ELECTIVE-(ANY ONE)
(ii)MAINTENANCE & REPAIRS OF ELECTRICALEQUIPMENT LAB

Subject Code	Theory			Credits
PEE3204PB	No. of Period Per Week			
	L	T	P	1
	0	0	2	
	-	-	-	

Course Objectives:

The aim of this course is to help the student to attain the following industry identifiedcompetency through
various teaching learning experiences:

- About dismantling of electric equipments such as:- iron all types, oven (Microwave), toasters, fan (CF, TF, PF, & EF & regulators), Water heaters & geysers, Mixer & food processors, UPS / Inverters / battery chargers, Air coolers (portable / desert type), Semi automatic & fully automatic washing machine, VCD / DVD / AVD players etc.
- About assembling of electric equipments such as:- iron all types, oven (Microwave), toasters, fan (CF, TF, PF, & EF & regulators), Water heaters & geysers, Mixer & food processors, UPS / Inverters / battery chargers, Air coolers (portable / desert type), Semi automatic & fully automatic washing machine, VCD / DVD / AVD players etc.
- Abouttestingof electric equipments such as:- iron all types, oven (Microwave), toasters, fan (CF, TF, PF, & EF & regulators), Water heaters & geysers, Mixer & food processors, UPS / Inverters / battery chargers, Air coolers (portable / desert type), Semi automatic & fully automatic washing machine, VCD / DVD / AVD players etc.

CONTENTS:PRACTICAL

Skills to be developed:

Intellectual Skills:

1. Analytical Skills
2. Identification Skills
3. Fault finding Skills

Motor Skills:

1. Measuring Skill
2. Connecting instruments
3. Proper use of instruments, tools for repairs

A) Laboratory Experiences:

Dismantling, assembly, testing, preparation of list of components, parts and their cost for:

1) Electric iron all types
2) Electric oven
3) Electric toasters
4) Electric fan (CF, TF, PF, & EF & regulators)
5) Water heaters & geysers
6) Mixer & food processors
7) UPS / Inverters / battery chargers
8) Air coolers (portable / desert type)
9) Semi automatic & fully automatic washing machine
10) VCD / DVD / AVD players
11) Microwave Ovens
12) All types remote controllers

B) Field work:

13) Visit servicing centers of manufacturing companies,write the procedure of servicing of any one of them

14) Visit a manufacturing unit & prepare a report based on it.

C) Mini project:
15) For given specific application of any two equipments collect literature ofdifferent manufacturing company& prepare a comparative chart
16) Prepare test reports & bills for servicing of above any two equipments.

Learning Resources:
1. Service Manuals of manufacturers

Course outcomes:

At the end of the course, the student will be able to:

- Do dismantling and assembling of electric equipments such as:- iron all types, oven (Microwave), toasters, fan (CF, TF, PF, & EF & regulators), Water heaters & geysers, Mixer & food processors, UPS / Inverters / battery chargers, Air coolers (portable / desert type), Semi automatic & fully automatic washing machine, VCD / DVD / AVD players etc.
- Do testing of electric equipments such as:- iron all types, oven (Microwave), toasters, fan (CF, TF, PF, & EF & regulators), Water heaters & geysers, Mixer & food processors, UPS / Inverters / battery chargers, Air coolers (portable / desert type), Semi automatic & fully automatic washing machine, VCD / DVD / AVD players etc.

ELECTIVE-(ANY ONE)-(iii)
MICROPROCESSORS ANDMICROCONTROLLERS LAB

Subject Code	Theory			Credits
PEC3205PC	No. of Period Per Week			
	L	T	P	1
	0	0	2	
	-	-	-	

Course Objectives:

The aim of this course is to help the student to attain the following industry identifiedcompetency through
various teaching learning experiences:

- To makingProgram for addition&subtraction of two hexadecimal numbers
- To makingProgram such as :- for finding largest / smallest number, for arranging numbers in

ascending / descending order, for 16 bit addition, for multiplication of two eight bit numbers

- To demonstrate and study of microcontroller kit
- To demonstrate and use of software simulator / assembler such as:- Programming examples (any two):-

Data transfer instructions, Logical Operations, Jump and Call instructions

- To demonstration and testing of the following applications:- LCD display Interface, D/A or A/D converter Interface, Relay Interface, Stepper motor control, DC motor control

CONTENTS:PRACTICAL

Intellectual Skills:

1. Logical development
2. Programming skills

Motor Skills:

1. Data entry, Error Correction and Execution of assembly language programms
2. Connection Skills

List of Practicals:

(I) Using microprocessor 8085 kit:

1. Demonstration and study of microprocessor kit
2. Program for addition of and subtraction of two hexadecimal numbers
3. Program for finding largest / smallest number
4. Program for arranging numbers in ascending / descending order
5. Program for 16 bit addition
6. Program for data masking
7. Program for multiplication of two eight bit numbers
8. Program using JMP Instruction
9. Two programs using loop&Counter

(II) Using microcontroller 8051 kit:

1. Demonstration and study of microcontroller kit
2. Demonstration and use of software simulator / assembler
3. Programming examples (any two) – Data transfer instructions
4. Programming examples (any two) – Logical Operations
5. Programming examples (any two) – Jump and Call instructions
6. Demonstration and testing of the following applications (Any four)

• Keyboard Interface
• LCD display Interface
• D/A or A/D converter Interface
• Relay Interface
• Stepper motor control
• DC motor control
• Any other practical application using microcontroller 8051

Course outcomes:

At the end of the course, the student will be able to:

- MakingProgram for addition&subtraction of two hexadecimal numbers
- MakingProgram such as :- for finding largest / smallest number, for arranging numbers in ascending / descending order, for 16 bit addition, for multiplication of two eight bit numbers
- Understand the concept of microcontroller kit
- Understand the concept of software simulator / assembler such as:- Programming examples (any two):-

Data transfer instructions, Logical Operations, Jump and Call instructions

- Understand the concept of demonstration and testing of the following applications:- LCD display Interface, D/A or A/D converter Interface, Relay Interface, Stepper motor control, DC motor control

INDUSTRIAL PROJECT

Subject Code PEE3205S	Theory			Credits
	No. of Period Per Week			
	L	T	P	1
	0	0	2	
	-	-	-	

Rationale:

A student is required to develop his knowledge skill and attitudes gained while joining through different course. It is desirable to expose the students to the world of work to be familiar with the real life situations and understand the problem there in. The “Industrial Project” being introduced for the final year diploma technicians for Electrical Engineering with the below objective in view. This course will help the students to observe how the technical, managerial, quality control safety and other principle are being applied in real life situation. They will be able to observe the technique of decision making inany project. He will also, be able to observe the technique of decision making in project. He will, also be able to observe how his sub-ordinate perform in their day to day work and

co-ordinate projects activities. The course will also, help bring attitudinal changes in a student.

Course objectives:

A student will be able to:

- Understand the working of the machines, tools and equipments more clearly.
- Write down the specifications of the machines, tools, equipments.
- Know the process of material storing / material management.
- Learn to maintain office records / filing.
- Know the process of planning, implementation and monitoring.
- Learn the skill shop floor co-ordination.
- Know the skill of office management and inventory Control.
- Understand the process of production.
- Know the skill of quality control.
- Know the organizational set-up and plant Lay-out.
- Locate the plants and industries related to Electrical Engineering State and Nation wise.
- Find out Characteristics, Functions, and activities of those projects.
- Find out opportunities and method of recruitments.
- Know the source of raw materials and markets for projects.
- Find out the special characteristics of the project.
- Observe and understand special equipments which they may not have been study in their branch.
- Observe the energy consumption in project.
- Try to learn techniques which are used in making of their projects.
- Observe the environment Pollutants which will be due to making of project and learn how to minimize environmental Pollution.

CONTENTS: SESSIONAL

1. Design of Illumination Scheme(Up to 20 KW) for Hospital / ShoppingMall/Cinema Theatre/Commercial
Complex/Educational Institute/Industrial Complex.
2. Design of Rural Electrification Scheme for small Village, Colony.
3. Case Studies Related to Industries – Operation / Maintenance / Repair and Fault Finding. (Refer Guideline Document).
4. Energy Conservation and Audit.
5. Substation Model (Scaled)
6. Wind Turbine Model (Scaled)
7. Pole Mounted Substation Model (Scaled)
8. Rewinding of Three Phase/Single Phase Induction Motor.
9. Rewinding of Single Phase Transformer.
10. Fabrication of Inverter up to 1000 VA.
11. Fabrication of Battery Charger.
12. Fabrication of Small Wind Energy System for Battery Charging.
13. Fabrication of Solar Panel System for Battery Charging.
14. Microprocessor/ Micro controller Based Projects.
15. PC Based Projects.

16. Simulation Projects. **Note: -** Students can choose any project which will relevant to their stream as well as in engineering field.
Seminar: Seminar on any relevant latest technical topic based on latest research, recent trends, new methods and developments in the field of Electrical Engineering / Power Electronics.
Note:- (1) One Project (2) Seminar will be held under Professional Practices.
Website: Using any search engine, such as http://www.google.co.in/ the relevant information can be searched onthe Internet.

Course Outcomes:

The theory, practical experiences and relevant soft skills associated with this course are to be taught and
implemented, so that the student demonstrates the following industrial project oriented COs associated with
the above mentioned competency:

- To understand the working of the machines, tools and equipments more clearly.
- To know the process of planning, implementation and monitoring.
- To know the skill of quality control.
- To know the skill of office management and inventory Control.
- To observe and understand special machines which they may not have been in their institutes.
- To observe the environment Pollutants and learn how to minimize environmental Pollution.