School of Engineering and Technology

Diploma

Programme Structure & Syllabus

Mechanical Engineering

2023-24

K.K. University

Bihar Sharif, Nalanda - 803115

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KK University
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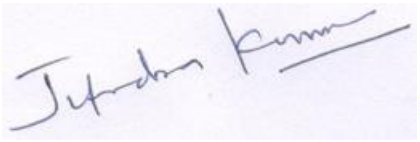
Contents



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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 Chaudhary, 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 inter disciplinary 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 Shri 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)

MECHANICAL ENGINEERING (DIPLOMA)

PROGRAM OUTCOMES (PO'S)

Program Outcomes (POs):- Based on Program Educational Objectives (PEOs) of Mechanical Engg. Department,Students will be able to

PO1	Apply knowledge of applied mathematics & science in Mechanical Engineering problems.
PO2	Identify, formulate and solve society and industries related problems.
PO3	Apply knowledge to design a system, component or process to meet desired needs within realistic constraints.
PO4	Conduct laboratory experiments and to critically analyze and interpret experimental data.
PO5	Use the recent techniques, skills, and modern tools necessary for engineering practices.
PO6	Understand the impact of engineering problems, solutions in a global and societal context.
PO7	Demonstrate professional and ethical responsibilities.
PO8	Apply leadership quality to work with team in the area of electrical engineering towards the solution of multi-disciplinary tasks.
PO9	Communicate effectively through verbally, technical writing, reports and presentation.
PO10	Develop confidence for self-education and ability to engage in life-long learning.
PO11	Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.

PROGRAM SPECIFIC OUTCOMES (PSO'S)

PSO1	The students of Mechanical Engineering are capable of applying the knowledge of mathematics and sciences in modern power industry.
PSO2	Analyze and design efficient systems to generate, transmit, distribute and utilize Mechanical energy to Electrical energy to meet social needs using power electronic systems.
PSO3	Mechanical junior Engineers are capable to apply principles of management and economics for providing better services to the society with the technical advancements in renewable and sustainable energy integration.
PSO4	Practice professional ethics and work in a team and communicate to keep abreast of latest developments to achieve project objectives for the betterment of the society.

PROGRAM EDUCATIONAL OBJECTIVES (PEO'S)

PEO1	Have a strong foundation in the principles of Basic Sciences, Mathematics and Engineering to solve real world problems encountered in modern electrical engineering and pursue higher studies/placement.
PEO2	Have an integration of knowledge of various courses to design an innovative and cost effective product in the broader interests of the organization & society.

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

PEO3	Have an ability to lead and work in their profession with multidisciplinary approach, cooperative attitude, effective communication and interpersonal skills by participating in team oriented and open ended activities.
PEO4	Have an ability to enhance in career development, adapt to changing professional and societal needs by engage in lifelong learning.

SEMESTERWISE-WISE DETAILED ENGINEERING

Ist SEMESTER DIPLOMA IN MECHANICAL ENGINEERING

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	
1	PAS1101P	Basic Physics Lab.	0	0	3	2
2	PAS1102P	Basic Chemistry Lab	0	0	2	1
3	PAS1105P	Computer Fundamental	0	0	2	1
4	PME1102P	Basic Workshop Practice	0	0	2	1
					Total	30

IInd SEMESTER DIPLOMA IN MECHANICAL ENGINEERING

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	

K.K. UNIVERSITY 803115 NALANDA

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

S.No.	CourseCode	Course Title	Hours per Week			Credit
			L	T	P	
1	P1M2101	Applied Mathematics Common	4	1	0	4
2	PME2101	Mechanical Engineering Drawing	3	1	0	4
3	PME2102	Mechanics of Solids	3	1	0	4
4	PME2103	Mechanical Engineering Materials	3	1	0	4
5	PEE2104	Electrical Engineering	3	1	0	4
Total			**16**	**5**	**0**	**21**

1	PAS1201P	Communication Skills (Language Lab)	0	0	2	1
2	PAS1203P	Applied Science	0	0	2	1
3	PME1201P	Engineering Mechanics	0	0	2	1
4	PME1203P	Workshop Practice	0	0	3	2
					Total	27

SEMESTER-WISE DETAILED ENGINEERING

IIIRD SEMESTER DIPLOMA IN MECHANICAL ENGINEERING

THEORY

PRACTICAL

S.NO	Course Code	Course Title	Hours per week			Credit
			L	T	P	
1	PME2101P	Mechanical Engineering Drawing	0	0	3	2
2	PME2102P	Mechanics of Solids Lab	0	0	2	1
3	PEE2104P	Electrical Engineering Lab	0	0	2	1
4	PME2104P	Manufacturing Technology Lab	0	0	2	1
Total			**0**	**0**	**9**	**5**

K.K. UNIVERSITY 803115 NALANDA

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

IVth SEMESTER DIPLOMA IN MECHANICAL ENGINEERING

THEORY

S.No.	Course Code	Course Title	Hours per Week			Credit
			L	T	P	
1	PME 2201	Theory of Machines & Mechanisms	3	1	0	**4**
2	PME 2202	Production Processes	3	1	0	**4**
3	PME 2203	Thermal Engineering	3	1	0	**4**
4	PME 2204	Fluid Mechanics and Machinery	3	1	0	**4**
5	PEC 2206	Fundamentals of Electronics	5	0	0	**5**
					Total	**21**

PRACTICAL

S.NO	Course Code	Course Title	Hours per week			Credit
			L	T	P	
1	PME 2201P	Theory of Machines & Mechanisms Lab	0	0	3	2
2	PME 2202P	Production Processes Lab	0	0	2	1
3	PME 2203P	Thermal Engineering Lab	0	0	2	1
4	PME 2204P	Fluid Mechanics and Machinery Lab	0	0	2	1
		Total	**0**	**0**	**9**	**5**

SEMESTERWISE-WISE DETAILED ENGINEERING

Vth SEMESTER DIPLOMA IN MECHANICAL ENGINEERING

THEORY

S.No.	Course Code	Course Title	Hours per Week			Credit
			L	T	P	
1	PME3101	Advanced Manufacturing Processes	3	1	0	4
2	PME3102	Power Engineering	5	0	0	5
3	PME3103	Environmental Pollution & Control	3	1	0	4
4	PME3104	Metrology & Quality Control	3	1	0	4
5	PME3105	Automobile Engineering	3	1	0	4
					Total	**21**

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K.K. UNIVERSITY 803115 NALANDA

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

S.NO	Course Code	Course Title	Hours per week			Credit
			L	T	P	
1	PME3101 P	Advanced Manufacturing Processes Lab	0	0	3	2
2	PME3104 P	Metrology & quality Control Lab	0	0	2	1
3	PME3106 S	In Plant Training & Visit to Work	0	0	2	1
4	PME3107 S	Professional Practices - V	0	0	2	1
					Total	**5**

VIth SEMESTER DIPLOMA IN MECHANICAL ENGINEERING

THEORY

S.No.	Course Code	Course Title	Hours per Week			Credit
			L	T	P	
1	PSH3201	Management (Common)	4	1	0	5
2	PME3201	Design of Machine Elements	5	0	0	5
3	PME3202	Industrial Fluid Power	3	1	0	4
4	PME3203	Production Technology	3	1	0	4
5	PME3204	Elective-(Any One)	3	1	0	4
Elective- (i) Alternate Energy Sources & Management (PME 3204A)		(ii) Material Handling Systems (PME 3204B)	(iii) Refrigeration & Air- Conditioning (PME 3204C)		(iv) CAD-CAM & Automation (PME 3204D)	
					Total	**21**

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K.K. UNIVERSITY 803115 NALANDA

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

S.NO	Course Code	Course Title	Hours per week			Credit
			L	T	P	
1	PME3201P	Design of Machine Elements	0	0	3	2
2	PME 3202P	Industrial Fluid Power Lab	0	0	2	1
3	PME 3204P	Elective-(Any One)Lab	0	0	2	1
4	PME3205**S**	Industrial Project	0	0	2	1
					Total	**5**

1st SEMESTER DIPLOMA

THEORY

S.no	Course Code	Course Title	Contact Hours per week			
			L			Credit
			5	T	P	
1	PAS1101	Basic Physics	**3**	**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	Engineering Graphics	**3**	**1**	**0**	**4**
6	PAS1105	Computer Fundamentals	**3**	**1**	**0**	**4**
						25

K.K. UNIVERSITY 803115 NALANDA

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

PRACTICAL

S.no	Course Code	Course Title	Teaching Scheme			Credit
			Contact Hours per week			
			L	T	P	
1	PAS1101P	Basic Physics Lab	0	0	3	2
2	PAS1102P	Basic Chemistry Lab	0	0	1	1
3	PAS1105P	Computer Fundamentals Lab	0	0	1	1
4	PME1102P	Basic WorkshopPractice	0	0	1	1
					Total	05

Course Code	PAS1101
Course Title	**Basic Physics**
Number of Credits	5 (L: 5, T: 0, P: 0)
Prerequisites	NIL
Course Category	PAS

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 variousfields 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

K.K. UNIVERSITY 803115 NALANDA

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

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 ofphysical 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 strainwith 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, Ultimateand breaking stress, Factor of safety. 2.2 **Surface Tension:** Forces—cohesive and adhesive, angle of contact, shape ofliquid surface in a capillary tube, capillary action with examples, relation betweensurface 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 ofheat - 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

K.K. UNIVERSITY 803115 NALANDA

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

04	**LIGHT** 3.1 **Properties of light:** Reflection and refraction, Snell's law, physical significance ofrefractive 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 ofwaves, Interference of light, constructive and destructive interference, Young's experiment. Analytical treatment of interference, conditions for stationary interferencepattern. 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 Seriesexpansions of even and odd functions.	6
	TOTAL	33

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- Hillpublication, 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

K.K. UNIVERSITY 803115 NALANDA

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Nalanda - 803115 (Bihar)

Course outcomes:

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

CO1	familiarize and analyze the signal accordance to accuracy, precision, sensitivity, resolution, errors etc.
CO2	Identify and describe properties of matter Solid ,liquid and gas , including: flexibility, strength, transparency, hardness, water resistance, size, color, weight, and texture.
CO3	Understand the basic laws of heat transfer and Distinguish between conduction, convection andradiation; identify different methods for reducing heat losses and mode of heat transfer between bodies at different temperatures.
CO4	Apply the knowledge of light related event , Illustrate the conditions for light amplification in various LASER and laser based instruments and optical devices.
CO5	Apply the knowledge photo electric effect and x-ray , application of x- ray.

Course Code	**PAS1012**
Course Title	**Basic Chemistry**
Number of Credits	**4 (L: 3, T: 1, P: 0)**
Prerequisites	**NIL**
Course Category	**PAS**

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.

K.K. UNIVERSITY 803115 NALANDA

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

- 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 ofElectrovalent & 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, InsulatorsorDielectrics, Electrolyte, Non Electrolyte, Electrolysis, Electrolytic Cell, Electrodes, Current Density, Temperature, Mechanism of Electrolysis – Primary &Secondary Reactionsat 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 ofDry Cell / Laclanche Cell & Lead – Acid Storage Cell, Applications of Electrolys is 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 suchas 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

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

K.K. UNIVERSITY 803115 NALANDA

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

Course outcomes:

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

CO1	Develop innovative methods to produce soft water for industrial use and potable water at cheaper cost.
CO2	Substitute metals with conducting polymers and also produce cheaper biodegradable polymers to reduce environmental pollution.
CO3	Design economically and new methods of synthesis nano materials.
CO4	Apply their knowledge for protection of different metals from corrosion .
CO5	Have the knowledge of converting solar energy into most needy electrical energy efficiently andeconomically to reduce the environmental pollution.

Course Code	**PAS1103**
Course Title	**Basic Mathematics**
Number of Credits	**4 (L: 3, T: 1, P: 0)**
Prerequisites	**NIL**
Course Category	**PAS**

Course Objectives: To make the students

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 ofvarious 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 givesawareness 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	HOURS
01	**Algebra** **1.1 Revision :** 1.1.1 Laws of Indices 1.1.2 Formula of factorization and expansion ((a2-b2), (a+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
	1.3 Determinant and Matrices : **Determinant** 1.3.1 Definition and expansion of determinants of order 2 and 3. 1.3.2 Cramer's rule to solve simultaneous equations in 2 and 3 unknowns. **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 andmultiplication. 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.	12

	1.3.7 Solution of simultaneous equations containing 2 and 3 unknowns by matrix inversionmethod.	
	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
02	**Trigonometry.** **2.1 Revision :** 2.1.1 Measurement of an angle (degree and radian). Relation Between degree andradian. 2.1.2 Trigonometric ratios of 00 , 300 , 450 etc. 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
	2.3 Factorization 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, centriod of triangle. 3.1.2 Area of triangle and condition of collinearity.	4
	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 Length of perpendicular from a point on the line and perpendicular distancebetween parallel lines.	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.	

K.K. UNIVERSITY 803115 NALANDA

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Berauti, Nepura, Bihar Sharif
Nalanda - 803115 (Bihar)

04	**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 defactorization formulae.
9	Trigonometry-inverse trigonometric ratios.
10	Point and distances
11	Straight line
12	Circle.
13	Vectors
14	Vectors' applications

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 NewDelhi

K.K. UNIVERSITY 803115 NALANDA

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

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:

CO1	Apply the knowledge of matrices to solve the problems.
CO2	Know and to understand various types of numerical methods
CO3	Ability to interpret the mathematical results in physical or practical terms for complex numbers
CO4	Inculcate the Habit of Mathematical Thinking through Indeterminate forms and Taylor series expansion
CO5	Solve and analyze the Partial derivatives and its application in related field of engineering.

Course Code	**PAS1104**
Course Title	**Communication Skill-I**
Number of Credits	**4(L: 3, T: 1, P: 0)**
Prerequisites	**NIL**
Course Category	**PAS**

Course Objectives: To make the students etc.

- 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:

K.K. UNIVERSITY 803115 NALANDA

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

- 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

	fgUnh	Hours
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K.K. UNIVERSITY 803115 NALANDA

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Nalanda - 803115 (Bihar)

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	dqy	**14**

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

K.K. UNIVERSITY 803115 NALANDA

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

Dictionary	Longman	Oriental Longman
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
A Practical Guide to EnglishGrammar	Dr. K.P. Thakur	Bharti Bhawan
Essentials of English Grammar	N.K. Aggarwala	Goyal Brother Prakashan
A student's Grammar of the English Language	Sidney greenbaum & Randorph	Quirk Pearson Education

Course outcomes:

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

CO1	Develop basic speaking and writing skills including proper usage of language and vocabulary sothat they can become highly confident and skilled speakers and writers.
CO2	Be informed of the latest trends in basic verbal activities such as presentations, facing interviews andother forms of oral communication.
CO3	Also develop skills of group presentation and communication in team.
CO4	Develop non-verbal communication such as proper use of body language and gestures.
CO5	Students will heighten their awareness of correct usage of English grammar in writing and speaking
CO6	Students will improve their speaking ability in English both in terms of fluency and comprehensibility.
CO7	Students will give oral presentations and receive feedback on their performance.
CO8	Students will increase their reading speed and comprehension of academic article.
CO9	Students will improve their reading fluency skills through extensive reading.
C10	Students will enlarge their vocabulary by keeping a vocabulary journal.
C11	Students will strengthen their ability to write academic papers, essays and summaries using theprocess approach.

Course Code	**PME1101**
Course Title	**Engineering Graphics**
Number of Credits	**4(L: 3, T: 1, P: 0)**
Prerequisites	**NIL**
Course Category	**PME**

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
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

K.K. UNIVERSITY 803115 NALANDA

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

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:

CO1	Learning how to draw the shapes, angels and lines and others which is essential for engineer
CO2	Develop student's imagination and ability to represent the shape size and specifications of physicalobjects.
CO3	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
CO4	Learning the main idea from assembly and detail drawing.

Course Code	**PAS1105**
Course Title	**Computer Fundamentals**
Number of Credits	**4(L: 3, T: 1, P: 0)**
Prerequisites	**NIL**
Course Category	**PAS**

Course Objectives: To make the students etc.

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

K.K. UNIVERSITY 803115 NALANDA

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

hardware and software, the Internet, networking andmobile 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 inthis 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 desktopMoving from one window to another Reverting windows to its previous size Opening task bar buttons into a windowsCreating 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 EmailAccount Internet chatting.	2
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

K.K. UNIVERSITY 803115 NALANDA

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

Comdex Computer Course kit	Vikas Gupta	Dreamtech
Information Technology forManagement	Henry Lucas	Tata McGraw Hills
Computer FundamentalsArchitecture 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:

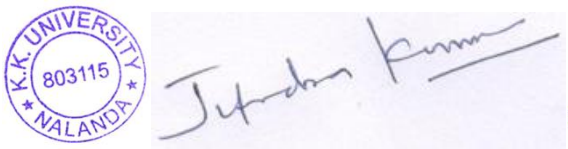
CO1	To acquire knowledge on editor, spread sheet and presentation software.
CO2	Converse in basic computer terminology
CO3	Formulate opinions about the impact of computers on society
CO4	Possess the knowledge of basic hardware peripherals
CO5	Familiarizing with Open Office (Word processing, Spreadsheets and Presentation).
CO6	The students will be able to perform documentation and accounting operations.
CO7	Students can learn how to perform presentation skills.

Course Code	**PAS1101P**
Course Title	**Basic Physics lab**
Number of Credits	**2(L: 0, T: 0, P: 3)**
Prerequisites	**NIL**
Course Category	**PASP**

CONTENTS: PRACTICAL

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



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

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.

Course Code	**PAS1102P**
Course Title	**Basic chemistry lab**
Number of Credits	**1(L: 0, T: 0, P: 1)**
Prerequisites	**NIL**
Course Category	**PASP**

CONTENTS: PRACTICAL

Laboratory Experiments(Any ten experiments to be performed)

01 – 07 Qualitative Analysis of **Seven Solutions,** Containing One Basic & One Acidic Radical Listedbelow :-
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.

K.K. UNIVERSITY 803115 NALANDA

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

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.

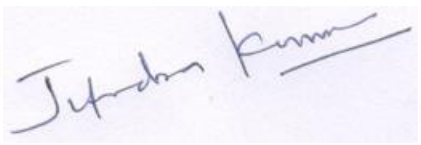
Course Code	**PAS 1105P**
Course Title	**Computer Fundamental lab**
Number of Credits	**1(L: 0, T: 0, P: 1)**
Prerequisites	**NIL**
Course Category	**PASP**

CONTENTS: PRACTICAL

Laboratory Experiments (Any ten experiments to be performed)

1. Working with Windows 2000 desktop ,start icon, taskbar, Recycle Bin, My Computer icon The 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 printqueues, 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.
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



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

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 thewindow 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

Course Code	**PME 1102 P**
Course Title	**Basic workshop practice**
Number of Credits	**1(L: 0, T: 0, P: 1)**
Prerequisites	**NIL**
Course Category	**PME**

CONTENTS: PRACTICAL

S. No.	**List Of Practical's**

K.K. UNIVERSITY 803115 NALANDA

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

	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.
	Welding shop : • Demonstration of different welding tools / machines. • Demonstration on Arc Welding, Gas Welding, gas cutting and rebuilding of broken partswith welding. • One simple job involving butt and lap joint.
	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.
	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.
	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 andPublishers, New Delhi
Workshop Technology B.S. Raghuwanshi Dhanpat Rai andSons	New Delhi	Workshop Technology B.S. Raghuwanshi Dhanpat Rai and Sons

2nd SEMESTER

DIPLOMA

THEORY

K.K. UNIVERSITY 803115 NALANDA

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

S.no	Course Code	Course Title	Teaching Scheme			Credit
			Contact Hours per week			
			L	T	P	
1	PAS1201	Communication Skills-II	3	1	0	4
2	PAS1202	Engineering Mathematics	4	1	0	5
3	PAS1203	Applied Science	3	1	0	4
4	PME1201	Engineering Mechanics	3	1	0	4
5	PME1202	Engineering Drawing	4	1	0	5
Total						22

PRACTICAL

S.no	Course Code	Course Title	Teaching Scheme			Credit
			Contact Hours per week			
			L	T	P	
1	PAS1201P	Communication Skills (Language Lab)	0	0	2	1
2	PAS1203P	Applied Science	0	0	2	1
3	PME1201P	Engineering Mechanics	0	0	2	1
4	PME1203P	Workshop Practice	0	0	3	2
					Total	05

Course Code	PAS 1201
Course Title	Communication Skill -II
Number of Credits	3(L: 3, T: 1, P: 0)
Prerequisites	NIL
Course Category	PAS

K.K. UNIVERSITY 803115 NALANDA

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

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
	हिन्दी	Hours
	परिचय एवं प्रक्रिया, संप्रेषण के तत्व, प्रेषक, संदेश, चैनल, ग्राहक, फीडबैक एवं संदर्भ संप्रेषण प्रक्रिया की परिभाषा, संप्रेषण, प्रक्रिया के सोपान, संदर्भ,	2

K.K. UNIVERSITY 803115 NALANDA

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

	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
	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
	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

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.

Course Code	**PAS 1202**
Course Title	**Engineering Mathematics**

K.K. UNIVERSITY 803115 NALANDA

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

Number of Credits	**5(L: 4, T: 1, P: 0)**
Prerequisites	**NIL**
Course Category	**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	
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, 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**	12

K.K. UNIVERSITY 803115 NALANDA

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

	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.	
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

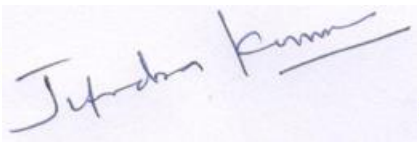
K.K. UNIVERSITY 803115 NALANDA

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

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.



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Nalanda - 803115 (Bihar)

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**
	3. Non –destructive testing of Materials.	

03	**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, 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** 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	5

K.K. UNIVERSITY 803115 NALANDA

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

	Electroplating), Impregnated Coating or Cementation on Base Metal Steel – Coating Metal Zn (Sheradizing),Cr (Chomozing), Al (Colorizing), Applications, Advantages & Disadvantages.	
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.	6

K.K. UNIVERSITY 803115 NALANDA

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

	Special Paints – Heat Resistant, Cellulose Paint, Coaltar Paint, Antifouling Paint their constituents & applications.	
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.

K.K. UNIVERSITY 803115 NALANDA

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

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
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 graphical method.	12
	Equilibrium:	

K.K. UNIVERSITY 803115 NALANDA

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

02	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

K.K. UNIVERSITY 803115 NALANDA

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

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.

K.K. UNIVERSITY 803115 NALANDA

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Berauti, Nepura, Bihar Sharif
Nalanda - 803115 (Bihar)

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

K.K. UNIVERSITY 803115 NALANDA

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

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

K.K. UNIVERSITY 803115 NALANDA

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

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):

K.K. UNIVERSITY 803115 NALANDA

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

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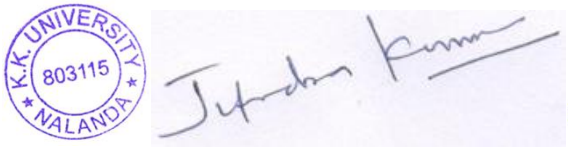
Course Code	**PME 1201P**
Course Title	**Engineering Mechanics**
Number of Credits	**1(L: 0, T: 0, P: 2)**
Prerequisites	**NIL**
Course Category	**PMEP**

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:



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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.
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.

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Nalanda - 803115 (Bihar)

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./

Semester : III

THEORY

S. No.	Course Code	Course Title	Teaching Scheme			Credit
			Contact Hours per week			
			L	T	P	
1	P1M2101	Applied Mathematics Common	5	0	0	5
2	PME2101	Mechanical Engineering Drawing	3	1	0	4
3	PME2102	Mechanics of Solids	3	1	0	4
4	PME2103	Mechanical Engineering Materials	3	1	0	4
5	PEE2104	Electrical Engineering	3	1	0	4
			Total			**21**

K.K. UNIVERSITY 803115 NALANDA

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Berauti, Nepura, Bihar Sharif
Nalanda - 803115 (Bihar)

PRACTICAL

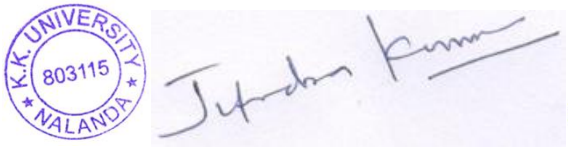
S. No.	Course Code	Course Title	Teaching Scheme			Credit
			Contact Hours per week			
			L	T	P	
1	PME2101P	Mechanical Engineering Drawing	0	0	3	2
2	PME2102P	Mechanics of Solids Lab	0	0	2	1
3	PEE2104P	Electrical Engineering Lab	0	0	2	1
4	PME2104P	Manufacturing Technology Lab	0	0	2	1
					Total	**05**

Semester – III

Course Code	P1M2101
Course Title	Applied Mathematics
Number of Credits	5 (L: 4, T: 1, P: 0)
Prerequisites	NIL
Course Category	BS

Course Objectives: To make the students

CO1: Discuss definition and properties of Laplace, Fourier and Z transform.
CO2: Apply Numerical methods to solve first order ordinary differential equations and Algebraic and
Transcendental equation.
CO3: Demonstrate the ability of solving ordinary differential equations and partial differential equations
by Laplace transform and Fourier transform.
CO4: Determine the solution of difference equations by use of z transform.
CO6: To learn about some advanced numerical techniques e.g. solving a nonlinear equation,



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linear system
of equations, Interpolation and Approximation techniques

Course Contents:

Unit 1: Integration

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. Area bounded by two curves,
- 1.5.2 Volume of revolution.
- 1.5.3 Centre of gravity of a rod, plane lamina.
- 1.5.4 Moment of Inertia of uniform rod, rectangular lamina

Unit 2: Differential Equation

2.1 Definition of differential equation, order and degree of differential equation. Formation of differential equation for function containing single constant.

2.2 Solution of differential equations of first order and first degree such as variable 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.

Unit 3: Probability Distribution:

3.1 Binomial distribution.
3.2 Poisson's distribution.
3.3 Normal distribution

Simple examples corresponding to production process.

Unit 4: Numerical Methods :

4.1 Solution of algebraic equations Bisection method, Regulafalsi method and Newton – Raphson method.

4.2 Solution of simultaneous equations containing 2 and 3 unknowns Gauss elimination method.

4.3 Iterative methods- Gauss Seidal and Jacobi's methods.

Reference Books:

1. Basic Mechanical Engineering – M.P. Poonia & S.C. Sharma, Khanna Publishing House, Delhi

K.K. UNIVERSITY 803115 NALANDA

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Berauti, Nepura, Bihar Sharif
Nalanda - 803115 (Bihar)

2. Elements of Mechanical Engineering – M. L. Mathur, F. S. Mehta and R. P. Tiwari, Jain Brothers, New Delhi
3. Engineering Heat Transfer – Gupta &Prakash, Nem Chand & Brothers, New Delhi
4. Workshop Technology (Vol. 1 and 2) – B. S. Raghuvanshi, Dhanpath Rai and Sons, New Delhi.
Basic Mechanical Engineering – J Benjamin

Course outcomes:

CO1	Solve non-linear equations in one variable and system of linear equations using iteration methods.
CO2	Choose appropriate interpolation formulae based on the given data.
CO3	Compute the value of a definite integral using numerical integration techniques.
CO4	Predict the numerical solution of the derivative at a point from the given initial value problem using appropriate numerical method.
CO5	Transform line integrals to surface and surface to volume integrals and evaluate them.

Course Code	**PME2101**
Course Title	**Machine Drawing**
Number of Credits	4 (L: 3, T: 1, P: 0)
Prerequisites	NIL
Course Category	PC

Course Objectives:

- To use computer aided drafting,
- To prepare geometrical model of various machine elements
- To draw the different views of machine elements
- To interpret the drawing in engineering field and illustrate three dimensional objects

Course Content:

UNIT-01: Auxiliary views : Study of auxiliary planes, Projection of objects on auxiliary planes. Completing the regular views with the help of given auxiliary views (Use first angle method of projection).

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UNIT-02: Intersection of solids: Curves of intersection of the surfaces of the solids in the following cases

(a) Prism with prism, Cylinder with cylinder, Prism with Cylinder When

(i) the axes are at $90^0$and intersecting

(ii) The axes are at $90^0$and Offset

Cylinder with Cone When axis of cylinder is parallel to both the reference planes and cone resting on base on HP and with axis intersecting and offset from axis ofcylinder

UNIT-03: Developments of Surfaces: Developments of Lateral surfaces of cube, prisms, cylinder, pyramids, cone and their applications such as tray, funnel, Chimney, pipe bends etc.

UNIT-04: Conventional Representation - Standard convention using SP – 46(1988)

(a) Materials C.I.,M.S, Brass, Bronze, Aluminum, wood, Glass, Concrete and Rubber

(b) Long and short break in pipe, rod and shaft.

(c) Ball and Roller bearing, pipe joints, cocks, valves, internal/external threads.

(d) Various sections-Half, removed, revolved, off set, partial and aligned sections.

(e) Knurling, serrated shafts, splined shafts, and chain wheels.

(f) Springs with square and flat ends, Gears, sprocket wheel

(g) Countersunk & counter bore.

(h) Tapers

UNIT-05: Limits, Fits and Tolerances:

1. Characteristics of surface roughness- Indication of machining symbol showing direction of lay, roughness grades, machining allowances, manufacturing methods.
2. Introduction to ISO system of tolerencing, dimensional tolerances, elements of interchangeable system, hole & shaft based system, limits, fits & allowances. Selection of fit.
3. Geometrical tolerances, tolerances of form and position and its geometric representation.

General welding symbols, sectional representation and symbols used in Engineering practices.

UNIT-06: Details to Assembly - 1. Introduction

2. Couplings – Universal couplings & Oldham's Coupling
3. Bearing – Foot Step Bearing & Pedestal Bearing
4. Lathe tool Post
5. Machine vice & Pipe Vice
6. Screw Jack
7. Steam Stop Valve

UNIT-06: Assembly to Details - 1. Introduction

2. Pedestal Bearing
3. Lathe Tail Stock
4. Drilling Jig

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Berauti, Nepura, Bihar Sharif
Nalanda - 803115 (Bihar)

5. Piston & connecting rod
6. Gland and Stuffing box Assembly
7. Valve – Not more than eight parts
8. Fast & loose pulley

Reference Books:

1. Machine Drawing, N.D.Bhatt, Charotar Publication
2. Machine Drawing, P.S.Gill, S.K. Kataria and Sons
3. Machine Drawing, Sidheshwar, Tata McGraw Hill
4. Engineering Drawing, D. Jolhe, Tata McGraw Hill
5. Mechanical Engineering Drawing, Bishwajeet Ranjan & Deepak Kumar, Foundation Publishing

Course outcomes:

Course Code	**PME2102**
Course Title	**Strength of Materials**
Number of Credits	4 (L: 3, T: 1, P: 0)
Prerequisites	NIL
Course Category	PC

Course Objectives:

- To understand the concept of Simple Stresses and Strains.
- To understand the concept of Strain Energy.
- To understand the concept of Shear Force and Bending Moment Diagrams.
- To understand the concept of Theory of Simple Bending and Deflection of Beams.
- To understand the concept of Torsion in Shafts and Springs.

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Course Content:

UNIT-I: Simple Stresses and Strains: Types of forces; Stress, Strain and their nature; Mechanical properties of common engineering materials; Significance of various points on stress – strain diagram for ductile & brittle materials, Poisson's ratio, Thermal stresses, Hoop stresses & corresponding strains, Volumetric Strain, Bulk modulus, Hook's law, Young's modulus, Modulus of Rigidity.

UNIT-II: Strain Energy: Strain energy or resilience, proof resilience and modulus of resilience; Derivation of strain energy for the following cases: i) Gradually applied load, ii) Suddenly applied load, iii) Impact/ shock load; Related numerical problems.

UNIT-III: Shear Force & Bending Moment Diagrams: Types of beams with examples: a) Cantilever beam, b) Simply supported beam, c) Over hanging beam; Types of Loads – Point load, UDL and UVL, Types of Support; Definition and explanation of shear force and bending moment; Calculation of shear force and bending moment and drawing the S.F and B.M. diagrams by the analytical method only for the following cases: a) Cantilever with point loads, b) Cantilever with uniformly distributed load, c) Simply supported beam with point loads, d) Simply supported beam with UDL,

UNIT-IV: Theory of Simple Bending and Deflection of Beams: Explanation of terms: Neutral layer, Neutral Axis, Modulus of Section, Moment of Resistance, Bending stress, Radius of curvature; Assumptions in theory of simple bending; Bending Equation $M/I = \sigma/Y = E/R$ with derivation; Problems involving calculations of bending stress,
Deflection of beam: Introduction, Differential equation of the Deflection curve, Deflections by of the bending moment equation. (Simple numerical only)

UNIT-V: Torsion: Concept of Pure Torsion, Torsion equation for solid and hollow circular shafts. Assumptions in theory of pure Torsion. Comparison between Solid and Hollow Shafts subjected to pure torsion. (no problem on composite and non-homogeneous shaft)

Reference Books:

1. Strength of Material, M. Chakraborty, S.K. Kataria & Sons
2. Strength of Material, Dr. Sadhu Singh, Khana Publishers.
3. Strength of Material, S Ramamrutham, Dhanpat Rai & Publication New Delhi
4. Strength of Material, Dr. R. K.Bansal, Laxmi Publication New Delhi
5. Strength of Material, R.S. Khurmi, S. Chand Company Ltd. Delhi

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Course Outcomes:

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

CO1	Understand basics of Simple Stress and Strain to the Solid materials.
CO2	Understand basics concept of Strain Energy
CO3	Understand Shear Force & Bending Moment Diagrams for the solid material
CO4	Understand Theory of Simple Bending and Deflection of Beams
CO5	Understand for the Pure Torsion to the solid shaft.

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Course Code	**PME2103**
Course Title	Material Science
Number of Credits	4 (L: 3, T: 1, P: 0)
Prerequisites	NIL
Course Category	PC

Course Objectives:

- To understand Engineering material and there properties
- To understand Crystal structures and atomic bonds.
- To understand the properties of different types of ferrous metals and alloys.
- To understand the properties of different types of non-ferrous metals and alloys.

K.K. UNIVERSITY 803115 NALANDA

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Course Content:

UNIT- I: Engineering Materials and their Properties: Introduction, Classification and Application of Engineering materials, I.S specification of materials like plain carbon steel, Grey Cast iron, low alloy steels & bearing Materials. Properties of metals. Physical Properties– Structure, Density, Melting point. Mechanical Properties– Strength, elasticity, ductility, malleability, plasticity, toughness, hardness, hardenability, brittleness, fatigue, thermal conductivity, electrical conductivity, thermal coefficient of linear expansion. Introduction to Corrosion, types of Corrosion, Corrosion resisting materials

UNIT- II: Phase diagrams, Ferrous metals and its Alloys: Isomorphs, eutectic and eutectoid systems; Iron-Carbon binary diagram; Iron and Carbon Steels; flow sheet for production of iron and steel; Iron ores – Pig iron: classification, composition and effects of impurities on iron; Cast Iron: classification, composition, properties and uses; Wrought Iron: properties, uses/applications of wrought Iron; comparison of cast iron, wrought iron and mild steel and high carbon steel; standard commercial grades of steel as per BIS and AISI; Alloy Steels – purpose of alloying; effects of alloying elements – Important alloy steels: Silicon steel, High Speed Steel (HSS), heat resisting steel, spring steel, Stainless Steel (SS): types of SS, applications of SS – magnet steel – composition, properties and uses

UNIT- III: Non-ferrous metals and its Alloys: Properties and uses of aluminium, copper, tin, lead, zinc, magnesium and nickel; Copper alloys: Brasses, bronzes – composition, properties and uses; Aluminium alloys: Duralumin, hindalium, magnesium – composition, properties and uses; Nickel alloys: Inconel, monel, nicPerome – composition, properties and uses. Anti-friction/Bearing alloys: Various types of bearing bronzes - Standard commercial grades as per BIS/ASME

UNIT- IV: Heat Treatment of Steels

4.1 Introduction to Heat treatment process such as Annealing, subcritical annealing, Normalizing, Hardening, Tempering (Austempering & Martempering) - Principle, Advantages, limitations and applications.

4.2 Surface Hardening - Methods of surface hardening, i) case hardening ii) Flame Hardening, iii) Induction Hardening, iv) Nitriding, v) Carburizing

- Principle, advantages, limitations and applications

Reference Books:

1. A Text Book of Material Science and Metallurgy by O.P. Khanna Dhanpat Rai and Sons
2. Material Science and Engineering by R.K.Rajput S.K. Katari and Sons
3. Material Science and Processes by S.K. Hazra and Choudhari Indian Book Distribution Co.
4. Material Science by R.S Khurmi, S .Chand Publication

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Course Outcomes:

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

CO1	understand Engineering material and there properties
CO2	understand Crystal structures and atomic bonds.
CO3	understand the properties of different types of ferrous metals and alloys.
CO4	understand the properties of different types of non-ferrous metals and alloys.

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Course Code	**PEE 2104**
Course Title	Basic Electrical Engineering
Number of Credits	4 (L: 3, T: 1, P: 0)
Prerequisites	NIL
Course Category	PC

Course Objectives:

- To understand the concept of DC circuit and various theorems related to it.
- To understand the concept of AC circuit through phasor diagrams.
- To understand the concept of magnetic circuit and concept of electromagnetic induction.
- To understand the concept of AC machines like transformer and DC motor.

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Nalanda - 803115 (Bihar)

Course Content:

Unit- I: D.C. Circuits:

Voltage and current sources, dependent and independent sources, Units and dimensions, Source Conversion, Ohm's Law, Kirchhoff's Law, Superposition theorem, Thevenin's theorem and their application for analysis of series and parallel resistive circuits excited by independent voltage sources, Power & Energy in such circuits. Mesh & nodal analysis, Star Delta transformation & circuits.

Unit – II: 1- Phase AC Circuits:

Generation of sinusoidal AC voltage, definition of average value, R.M.S. value, form factor and peak factor of AC quantity, Concept of phasor, Concept of Power factor, Concept of impedance and admittance, Active, reactive and apparent power, analysis of R-L, R-C, R-L-C series & parallel circuit 3-phase AC Circuits: Necessity and advantages of three phase systems, Meaning of Phase sequence, balanced and unbalanced supply and loads. Relationship between line and phase values for balanced star and delta connections. Power in balanced & unbalanced three-phase system and their measurements.

Unit – III: Magnetic Circuits:

Basic definitions, magnetization characteristics of Ferro magnetic materials, self-inductance and mutual inductance, energy in linear magnetic systems, coils connected in series, AC excitation in magnetic circuits, magnetic field produced by current carrying conductor, Force on a current carrying conductor. Induced voltage, laws of electromagnetic Induction, direction of induced E.M.F.

Unit-IV: Single phase transformer-:

General construction, working principle, e.m.f. equation, equivalent circuits, phasor diagram, voltage regulation, losses and efficiency, open circuit and short circuit test.

Unit V: DC Motor:

Construction and principle of operation. Speed torque characteristics. Types, specifications & ratings and applications. Types of insulation used.

References:

1. D.P. Kothari & I.J. Nagrath, Basic Electrical Engineering, Tata McGraw Hill, latest edition.
2. S.N. Singh , Basic Electrical Engineering, P.H.I.,2013

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Nalanda - 803115 (Bihar)

3. Rajendra Prasad, Fundamentals of Electrical Engineering, Prentice Hall,2014
4. M.S. Sukhija, T. K. Nagsarkar, Basic Electrical and electronics engineering, Oxford University press

Course Outcomes:

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

CO1	Analyse various DC circuits and solve problems using theorems
CO2	Understand various AC circuits like R-L, R-C and RLC using phasor diagram.
CO3	Understand the terms related to magnetic circuits and various important laws.
CO4	Understand the working of Transformer and DC motor.

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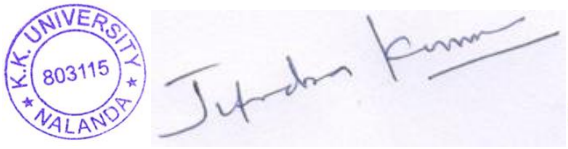
Course Code	**PME2101P**
Course Title	Machine Drawing Lab
Number of Credits	2 (L: 0, T: 0, P: 3)
Prerequisites	NIL
Course Category	PC

List of Term Work :-

(Use first angle method of projection)



1. Intersection of Solids (i) One Sheet containing at least two problems.
(ii) At least four problems for home assignment in sketchbook.
2. Introduction of Full Section, Half Section, Revolved-section, Off-set section

3. Nuts & Bolts**,** Rivets & Riveted Joint, Thread Profile, Screw Jack.

4. Conventional Representation as per SP – 46 (1988) – one sheet 5. Limit, Fit, Tolerances and Machining Symbols – one sheet

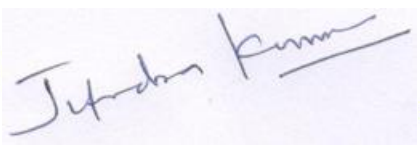
5. Assemblytodetaileddrawingsofcomponentsincludingconventionalrepresentationoftoleranc es and surface finish symbols: One sheet covering any one assembly and its details At least two problems as home assignment in sketch book.

6. Details to Assembly Draw One sheet covering any one assembly and its details. Solve at least two problems as home assignment in sketchbook.

7. Two problems on assembly drawings using any CAD Package (Assembly containing maximum 6 to 7 components

Course Code	**PME 2102P**
Course Title	Strength of Materials Lab
Number of Credits	2 (L: 0, T: 0, P: 2)
Prerequisites	NIL
Course Category	PC

CONTENTS: PRACTICAL




Skills to be developed:

Intellectual Skill:

1. Identification of different parts of machine and their function.
2. Interpretation failure patterns of different metal under different action.
3. Extrapolating test result or observation during test.
4. Testing different metals and comparison of experimental result.

Motor Skill:

1 Sketch of standard specimen, arrangement for test on respective machines.
2 Measurement of different parameters.
3 Handling Instrument.
4 Observing behaviour of different metal during test.

List of Practical: -

1. Tension Test on mild steel, Aluminium& compression test on cast iron on Universal Testing Machine.

2. Direct Shear Test of mild steel on Universal Testing Machine.

3. Brinell Hardness Test on Mild Steel.

4. Rockwell hardness Test on Hardened Steel.

5. Izod & Charpy - Impact tests of a standard specimen.

6. Torsion Test on Mild steel bar.

7. Term Work: - Drawing sheet on shear force & bending Moment diagrams for a given loading (At least four problems.). a) Estimation of principal stresses and maximum shear strain for a given combined loading by analytical (At least two problems.

Course Code	**PME 2104P**
Course Title	**Manufacturing Technology Lab**
Number of Credits	2 (L: 0, T: 0, P: 2)
Prerequisites	NIL
Course Category	PC

CONTENTS: PRACTICAL

Contents :Practical		Hrs/Week
Chapter	**Name of the Topic**	**Hours**
Unit-01	**Forging** 1.1 Forging Processes – Drop forging, Upset forging, Dieforging or press forging. 1.2 Types of dies - Open Die, Closed Die(Single Impression and impression) Closed die Forging operations - Fullering, Edging, Bending, Blocking, Finishing 1.3 Forgeable material and forge ability, Forging temperature, Grain flow in forged parts, Types of Presses and hammers.	
Unit-02	**Rolling and Extrusion** 2.1 Principles of rolling and extrusion. 2.2 Hot and cold rolling. 2.3 Types of rolling mills. 2.4 Different sections of rolled parts. 2.5 Methods of extrusion – Direct, Indirect, backward & impact Extrusion, Hot extrusion, Cold extrusion Advantages, disadvantages and applications.	
Unit- 03	**Press working** 3.1 Types of presses and Specifications. 3.2Press working operations-Cutting, bending, drawing, punching, blanking, notching, lancing 3.3Dieset components.- punch and die shoe, guide pin, bolster plate, stripper, stock guide, feed stock, pilot. 3.4 Punch and die Clearances for blanking and piercing, effect of clearance.	
Unit-04	**Lathe Operations** 4.1 Types of lathes – light duty, Medium duty and heavy duty geared lathe, CNC lathe. 4.2 Specifications. 4.3 Basic parts and their functions. Operations and tools – Turning, parting off, Knurling, facing, Boring, drilling, threading, step turning, taper turning.	

K.K. UNIVERSITY 803115 NALANDA

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

Unit-05	**Drilling** 5.1 Classification. 5.2 Basic parts and their functions - Radial drilling machine. 5.3 Types of operations. 5.4 Specifications of drilling machine. 5.5 Types of drills and reamers 02	
Unit-06	**Milling** 6.1 Classification. 6.2 Basic parts and their functions – column and knee typ 6.3 Types of operations 6.4 Types of milling cutters.	
Unit-07	**Casting** 7.1 Patterns-Material used, types, Patterns allowances, Cores, Core allowances. 7.2 Moulds- Mould materials,Types of sand, Mounding processes Sand molding, Pit molding, machine molding. Shell molding. 7.3 Melting practice. Types of furnaces with specific application Cupola furnace, Electric arc furnace. 7.4 Casting principle and operation 7.5 Special casting processes. Viz die casting, centrifugal casting, Investment casting. 7.6 Casting defects	
Unit-08	**Welding** 8.1 Classification. 8.2Gas welding techniques. 8.3 Types of welding flames. 8.4 Arc Welding – Principle, Equipment, Applications 8.5 Shielded metal arc welding. 8.6 Submerged arc welding. 8.7 TIG / MIG welding. 8.8 Resistance welding -Spot welding, Seam welding, Projection welding 8.9 Welding defects. 8.10 Brazing and soldering: Types, Principles, Applications	

Course Code	**PEE 2104P**
Course Title	**Basic Electrical Eng. Lab**

K.K. UNIVERSITY 803115 NALANDA

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

Number of Credits	2 (L: 0, T: 0, P: 2)
Prerequisites	NIL
Course Category	PC

Course Objectives: To make the students

CO1: Understand the connection and working of Ammeter, voltmeter and wattmeter in series and parallel circuits

CO2: Plot DC motor characteristics and control speed above and base speed.

CO3: See the construction feature of transformer and perform various tests on it.

CO4: To understand stair case wiring, go down wiring and casing capping wiring.

List of Experiments:

1) For a given resistive & inductive series & parallel circuit, select ammeter, voltmeter & watt meter. Make the connections and measure current, voltage and power drawn by the circuit. Measure it by clip on meter & compare it.

2) For a given DC Shunt/Series motor, select suitable meters, make connections as per diagram, check the connections and run the motor. Take the meter readings to draw speed torque characteristics. Make suitable changes in the connections to reverse the direction of rotation.

3) For the above given motor prepare a circuit to control its speed above & below normal, plot its graph.

4) List the specifications of given single-phase transformer. Perform no load test on the transformer to find transformation ratio.

5) Prepare actual wiring on a board to study and operate one lamp controlled by one switch, stair case wiring, go down wiring using casing capping.

B) Fieldwork:

6) Observe the Electric wiring of main building in your campus list the accessories used and draw a general layout

7) Observe earthing of your laboratory, measure its resistance & list its significance

Course Outcomes:

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

CO1	Connect Ammeter, Voltmeter and Wattmeter in series and parallel circuits and take readings
CO2	Perform the speed control on DC motor and plot its characteristics
CO3	Perform OC and SC test on transformer and calculate voltage regulation
CO4	Perform various types of wiring like stair case wiring, go down wiring and casing capping wiring.

K.K. UNIVERSITY 803115 NALANDA

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

Semester : IV

THEORY

S. No.	Course Code	Course Title	Teaching Scheme Contact Hours per week			Credit
			L	T	P	
1	PME 2201	Theory of Machines & Mechanisms	3	1	0	4
2	PME 2202	Production Processes	3	1	0	4
3	PME 2203	Thermal Engineering	3	1	0	4
4	PME 2204	Fluid Mechanics and Machinery	3	1	0	4
5	PEC 2206	Fundamentals of Electronics	5	0	0	5
					Total	**21**

PRACTICAL

S. No.	Course Code	Course Title	Teaching Scheme Contact Hours per week			Credit
			L	T	P	
1	PME 2201P	Theory of Machines & Mechanisms Lab	0	0	3	2
2	PME 2202P	Production Processes Lab	0	0	2	1
3	PME 2203P	Thermal Engineering Lab	0	0	2	1
4	PME 2204P	Fluid Mechanics and Machinery Lab	0	0	2	1
Total						**05**

K.K. UNIVERSITY 803115 NALANDA

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

Course Code	**PME 2201**
Course Title	Theory of Machines & Mechanisms
Number of Credits	4 (L: 3, T: 1, P: 0)
Prerequisites	NIL
Course Category	PC

Course Content:

Unit-1 Fundamentals and types of Mechanism:

Kinematics of Machines: - Definition of Kinematics, Dynamics, Statics, Kinetics, Kinematic link, Kinematic Pair and its types, constrained motion and its types, Kinematic chain and its types, Mechanism, inversion, machine and structure. Inversions of Kinematic Chain: Inversion of four bar chain, coupled wheels of Locomotive & Pentograph. Inversion of Single Slider Crank chain- Rotary

I.C. Engines mechanism, Whitworth quick return mechanism, Crank and Slotted lever quick return mechanism. Ackerman's Steering gear mechanism. Foot operated air pump mechanism.

Unit-2 Velocity and Acceleration in Mechanism:

Concept of relative velocity and relative acceleration of a point on link, angular velocity and Angular acceleration, inter- relation between linear and angular velocity and acceleration. Drawing of velocity and acceleration diagram of a given configuration, diagrams of simple mechanisms. Determination of velocity and acceleration of a point on link by relative velocity method [Excluding coriollis components of acceleration].

Analytical method [no derivation] and Klein's construction to determine velocity and acceleration of different link single slider crank mechanism.

Unit-3 Cams and Followers:

Concept, definition and application of Cams and Followers.

Classification of Cams and Followers. Different follower motions and their displacement diagrams like uniform velocity, SHM, uniform acceleration and Retardation. Drawing of profile of radial cam with knife-edge and roller follower with and without off-set with reciprocating motion (graphical method).

Unit-4 Cams and Followers:

Concept, definition and application of Cams and Followers.

Classification of Cams and Followers. Different follower motions and their displacement diagrams like uniform velocity, SHM, uniform acceleration and Retardation. Drawing of profile of radial cam with knife-edge and roller follower with and without offset with reciprocating motion (graphical method).

Course Outcomes :-

CO1	Know different machine elements and mechanism.
CO2	Understand Kinematics and Dynamics of different machines and mechanisms.
CO3	Select Suitable Drives and Mechanisms for a particular application.
CO4	Appreciate concept of balancing and Vibration.
CO5	Develop ability to come up with innovative ideas.

K.K. UNIVERSITY 803115 NALANDA

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

CO6	Understand different types of Cams and their motions and also draw cam profiles for various motions.

Course Code	**PME 2202**
Course Title	Production Processes
Number of Credits	4 (L: 3, T: 1, P: 0)
Prerequisites	NIL
Course Category	PC

Course Content:

Unit-01: Turning : Lathe: Angle calculations for taper turning.
Cutting tool nomenclature and tool signature. Cutting parameters and machining time calculation.
CNC Lathe:
Introduction, classification, advantages, positioning system, constructional features. Part programming: programming format, word, statement, and block. Preparatory and miscellaneous code, Fixed cycles in programming – canned cycle, do-loop, sub routine.

Unit-02: Drilling :
Twist drill nomenclature. Cutting parameters, machining time calculation, Deep hole drilling.

Unit-03: Milling and gear cutting :
Milling: Cutting parameters, machining time calculation, Milling operations – plain milling, side and face milling, form milling, gang milling, end milling, face milling, T- slot milling, slitting.
Gear cutting:
Gear cutting on milling machine –Dividing head and Indexing methods Gear hobbing, Principle of operation, Advantages And limitations.
Hobbing techniques – climb and conventional, Gear shaping - Principle of operation, advantages, disadvantages, Gear finishing processes - Gear shaving , Gear grinding, Gear burnishing, gear lapping .

Unit-04: Grinding :
Classification of machines, Grinding wheel composition, types and shapes, Designation. Types of Grinding operations.

Unit-05: Super Finishing Processes:
Honing,
Lapping,
Burnishing,
Buffing and polishing.

Unit-06: Plastic Moulding :
Types of plastic, Compression molding, Transfer moulding, Injection moulding, blow molding, vacuum forming, extrusion, calendaring and rotational moulding.

K.K. UNIVERSITY 803115 NALANDA

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

Course Outcomes :-

CO1	To understand function of CNC Lathe.
CO2	To understand function of cutting tool and welding operation.
CO3	To understand machining time calculation in turning operation.
CO4	To understand CAD/CAM operation.
CO5	To understand moulding, air duct and Honing processes.

Text/Reference Books:		
Titles of the Book	**Name of Authors**	**Name of the Publisher**
Elements of workshop Technology-Volume I&II	S. K. Hajra Chaudary, Bose, Roy	Media Promoters and Publishers Limited.
Production Technology Volume- I & II	O. P. Khanna & Lal	Dhanpat Rai Publications.
Workshop Technology- Volume –I,II & III	W. A. J. Chapman, S. J. Martin	Viva Books (p) Ltd.
A text book of Foundry Tech.	O.P. Khanna	Dhanpat Rai Publications.
Production Technology	R.B. Gupta	Satya Prakashan New Delhi
Workshop Technology Volume-I& II	H.S. Bawa	Tata McGraw-Hill
Introduction to Manufacturing Processes	John A. Schey	McGraw-Hill
Manufacturing Technology	M. Adithan A. B. Gupta	New age International
CNC machines	Pabla B. S. M. Adithan	New age international limited.
Fundamental of metal cutting and machine tools	B. L. Juneja	New age international limited.
Technology of Machine Tools.	Steve Krar, Albert Check	McGraw-Hill International.
CAD/CAM Principals and Applications	P. N. Rao	Tata McGraw-Hill
Manufacturing Technology Metal Cutting &Machine tools	P. N. Rao	Tata McGraw-Hill
Production Processes	R.N. Pandey, S.P. Sharma	Foundation Publishing

K.K. UNIVERSITY 803115 NALANDA

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

Course Code	**PME 2203**
Course Title	THERMAL ENGINEERING
Number of Credits	4 (L: 3, T: 1, P: 0)
Prerequisites	NIL
Course Category	PC

Course Content:

Unit-01: Sources of energy: Brief description of energy sources, Classification of energy sources Renewable, Non-Renewable, Fossil fuels, including CNG, LPG.
Solar- Flat plate and concentrating collectors & its application, Solar Water Heater, Photovoltaic Cell, Solar Distillation.
Wind, Tidal, Geothermal, Biogas, Biomass, Bio-diesel, Hydraulic, Nuclear, Fuel cell – list of fuel cells

Unit-02: Fundamentals of Thermodynamics: Concepts of pure substance, types of systems , properties of systems , Extensive and Intensive properties with units and conversion like P,V, And temperature. Point function and path function.
Work and Energy Thermodynamic definition of work, heat, difference between heat and work, P.E., K.E, Internal Energy, Flow work, concepts of enthalpy, entropy.
Laws of Thermodynamic Zeroth Law, Temperature measurement, principle of energy conservation, irreversibility, Second Law of Thermodynamics, Kelvin Plank, Clausius statements and their equivalence, Concept of perpetual motion machine 1 and 2.
Application of Thermodynamic laws Steady Flow Energy equation and its application to open system like boiler, engine, nozzle, turbine, compressor & condenser.
Application of Second law to Heat Engine, Heat Pump and Refrigerator.

Unit-03: Ideal Gases : Concept of Ideal gas, Charle's law, Boyle's law, Avogadro's law, equation of state, characteristic gas constant and universal gas constant.
Ideal gas processes:- Isobaric, Isochoric, Isothermal, Adiabatic, Polytropic, Isentropic with representation of the processes on P-V and T-S diagram (only simple numerical).

Unit-04: Steam and Steam Boiler : Generation of steam at constant pressure with representation on various charts such as T-H, T-S, H-S, P-H. Properties of steam and use of steam table, Quality of steam and its determination with Separating, throttling and combined Separating and throttling calorimeter (no numerical).
Vapour process :- Constant pressure, constant volume, constant enthalpy, constant entropy (numerical using steam table and Mollier chart), Rankine Cycle.
Steam Boilers:- Classification of boilers.
Construction and working of Cochran, Babcock and Wilcox, La- mont and Loeffler boiler.
Boiler draught natural and Mechanical. Boiler mounting and accessories [to be covered in practical].

Unit-05: Steam Turbines and Condensers :
Steam nozzle:- Continuity equation, types of nozzles, concept of Mach number, critical pressure, application of steam nozzles.
Steam turbine:- Classification of turbines, Construction and working of Impulse and Reaction

turbine. Compounding of turbines, Regenerative feed heating, bleeding of steam, nozzle control governing (no velocity diagrams and numerical).

Steam condenser:- Dalton's law of partial pressure, function and classification of condensers, construction and working of surface condensers.

Sources of air leakage, concept of condenser efficiency, vacuum efficiency (no numerical).

Cooling Towers. Force draught, natural draught and induced draught.

Unit-06: Heat Transfer :

Modes of heat transfer:- Conduction, convection and radiation, Conduction by heat transfer, Fourier's law, thermal conductivity, conduction through cylinder, thermal resistance, composite walls, combined conduction and convection (Simple numerical).

Heat transfer by Radiation:- Thermal Radiation, Absorptivity, Transmissivity, Reflectivity, Emissivity, black and gray bodies, Stefan-Boltzman law.

Heat Exchangers:- Shell and tube, plate type, multiphase heat exchangers. Materials Used and applications of heat exchangers.

Course Outcomes :-

CO1	Understand the different energy sources and renewable , non renewable energy
CO2	Understand the concept of thermal engg. And its application
CO3	Understand the concept of ideal gases and different thermodynamics porcess
CO4	Understand the concept of steam formation and boiler
CO5	Understand the concept of steam turbine and its component
CO6	Understand the concept of different mode of heat tranfer

Text/Reference Books:		
Titles of the Book	**Name of Authors**	**Name of the Publisher**
A Course in Thermal Engineering	Domkundwar V. M.	Dhanpat Rai& Co.
A Course in Thermal Engineering	P. L. Ballaney	Khanna Publishers
A text book of Thermal Engineering.	R. S. Khurmi	S. Chand & co. Ltd.
A Course in Thermal Engineering	R. K. Rajput	Laxmi Publication, Delhi
Heat Engine Vol. - I & II	Patel and Karmchandani	Acharya Publication
Engineering Thermodynamics	P. K. Nag	Tata McGraw Hill
Thermal Engineering	B. K. Sarkar	Tata McGraw Hill

K.K. UNIVERSITY 803115 NALANDA

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

Course code	**PME 2204**
Course Title	Fluid Mechanics and Machinery
Number of Credits	4 (L: 3, T: 1, P: 0)
Prerequisites	NIL
Course Category	PC

Course Content:

Unit-01: Properties of fluid:
Density, Specific gravity, Specific Weight, Specific Volume Dynamic Viscosity , Kinematic Viscosity, Surface tension, Capillarity Vapour Pressure, Compressibility.

Unit-02: Fluid Pressure & Pressure Measurement:
Fluid pressure, Pressure head, Pressure intensity, Concept of absolute vacuum, gauge pressure, atmospheric pressure, absolute pressure. Simple and differential manometers, Bourden pressure gauge. Concept of Total pressure on immersed bodies, center of pressure.
Note: Numerical, on Manometers, Total Pressure & Centre of pressure.

Unit-03: Fluid Flow:
Types of fluid flows, Continuity equation, Bernoulli's theorem
Venturimeter – Construction, principle of working, Coefficient of discharge, Derivation for discharge through venturimeter.
Orifice meter – Construction, Principle of working, hydraulic coefficients, Derivation for discharge through Orifice meter, Pitot tube – Construction, Principle of Working.
Note :- Numerical on Venturimeter, orifice meter, pitot tube

Unit-04: Flow Through Pipes:
Laws of fluid friction (Laminar and turbulent), Darcy's equation and Chezy's equation for frictional losses. Minor losses in pipes Hydraulic gradient and total gradient line.
Hydraulic power transmission through pipe.
Note: Numerical to estimate major and minor losses.

Unit-05: Impact of jet:
Impact of jet on fixed vertical, moving vertical flat plates. Impact of jet on curved vanes with special reference to turbines & pumps.
Note - Simple Numerical on work done and efficiency

Unit-06: Hydraulic Turbines:
Layout of hydro electric power plant, Features of Hydroelectric power plant.
Classification of hydraulic turbines, Selection of turbine on the basis of head and discharge available. Construction and working principle of Pelton wheel, Francis and Kaplan turbine.

K.K. UNIVERSITY 803115 NALANDA

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

Draft tubes–types and construction, Concept of cavitations in turbines.
Calculation of Work done, Power, efficiency of turbine.

Course Outcomes :-

Text/Reference Books:		
Titles of the Book	**Name of Authors**	**Name of the Publisher**
Hydraulic, fluid mechanics & fluid machines	Ramamrutham S.	DhanpatRai and Sons New Delhi
Hydraulics and fluid mechanics including Hydraulic machines	Modi P. N. and Seth S. M.	Standard Book House. New Delhi
Fluid Mechanics	Streeter Victor, Bedford K.W., Wylie E.B	McGraw Hill Int.
One Thousand Solved Problems in Fluid Mechanics	K. Subramanya	Tata McGraw Hill
Fluid Mechanics and Machinery	BishwajetRanjan, Anand Sharma	Foundation Publishing

CO1	Solve practical problems involving fluid properties and hydrostatic pressure, and predict the stability of floating bodies
CO2	Evaluate fluid kinematic properties to classify types of fluid flow using flow visualization techniques
CO3	Apply the governing equations for mass, momentum and energy based on Reynolds Transport Theorem and utilize them in practical problems
CO4	Estimate the pumping power by considering major and minor losses in flow through pipes
CO5	Apply dimensional analysis for fluid problems based on Buckingham-Pi Theorem and utilize it for model testing of fluid machineries
CO6	Analyze the performance characteristics of centrifugal pumps and hydraulic turbines

Pump manufactures' catalogs such as Kirloskar Brothers, KSB, Kishor pumps etc

K.K. UNIVERSITY 803115 NALANDA

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

Course code	**PEC 2206**
Course Title	Fundamentals of Electronics
Number of Credits	5(L: 05, T: 0, P: 0)
Prerequisites	NIL
Course Category	PC

Course Content:

UNIT- 01: Electronic Devices

Introduction to electronic devices, their symbols, principle of working and testing procedure – Diode, Zener diode, Power diode, Varactor diode, Bipolar Junction Transistor (BJT), Field Effect Transistor (FET)-JFET & MOSFET, Uni- junction Transistor(UJT), power devices – DIAC,TRIAC, SCR, Photo devices-, LDR, Photo diode, Photo transistor, LED & LED display (7 segment), Liquid crystal display(LCD), opto–coupler, thermister- NTC, PTC Power supply.

UNIT -02: Circuit diagram and operation:

Half wave, full wave & bridge rectifier. Filters – L, C, L-C, π filter Concept of unregulated power supply, regulated power supply- line regulation &load regulation. Principle of operation, block diagram and application of shunt regulated power supply, series regulated power supply, switch mode power supply (SMPS), 3 pin IC regulated, IC 723 adjustable power supply. Block diagram of UPS, Concept of online and off line UPS. Concept of constant current limiting and fold back current limiting, concept of constant voltage source, constant current source.

UNIT -03: Transistor:

Transistor as a switch and amplifier, single stage transistor amplifier CB, CE and CC configuration and their applications, RC coupled and direct coupled amplifier, their frequency response and application.

Power amplifier- class A, class B, class C, class AB, their comparison on operating point, conduction cycle, efficiency, application.(No circuits expected)

Oscillator: Requirement of oscillator circuit, Barkhauson's criteria of oscillator, circuit diagram

K.K. UNIVERSITY 803115 NALANDA

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

and its application-. Phase shift oscillator, Hartley oscillator, Colpitts oscillator,

UNIT -04: OP Amp:

Block diagram, configurations and use of op amp as - Inverting, Non- inverting, Summing, Voltage to current converter, current to voltage converter, differentiator, Comparator, Wien bridge oscillator, Schmitt's trigger, Instrument amplifier.

UNIT -05: Digital Electronics:

Number system- Decimal, Binary, Hexadecimal, BCD, Decimal to binary conversion, Decimal – Hexadecimal conversion.

Study of logic gates, Symbol, truth table and IC numbers - NOT, AND, OR, NAND, NOR, XOR, XNOR and NAND as universal gate.

Flip Flops – Block diagram of flip flop, RS flip flop, D flip flop ,Toggle , JK flip flop, Master Slave JK flip flop, Clocked flip flop – level triggered and edge triggered , Application of flip flop – Frequency divider, Ring counter, Shift register. Seven segment driving circuit, Encoder, Decoder, Multiplexer, Demultiplier.

UNIT -06 : IC 555 :

Block diagram, Multi vibrator circuit diagram and working for Mono stable, Bi-stable and Astable Multi vibrator, Analog to Digital Converters, Digital to Analog converter.

Block diagram and working of – Welding control circuits –sequential timer Temperature control circuits using SCR, FWR Speed control circuits Level control circuit using variable **IC 555:**

Block diagram, Multi vibrator circuit diagram and working for Mono stable, Bi-stable and Astable Multi vibrator, Analog to Digital Converters, Digital to Analog converter.

Block diagram and working of – Welding control circuits –sequential timer Temperature control circuits using SCR, FWR Speed control circuits Level control circuit using variable capacitor and potentiometer.

Text /Reference Books:		
Titles of the Book	**Name of Authors**	**Name of the Publisher**
Principles of Electronics	V.K. Mehta	S. Chand & Company Ltd. New Delhi
Electronic Principles	Paul Malvino	Tata McGraw Hill Publishers
Electronic Devices & Components'	A. Mottershead	Prentice Hall of India
Modern Digital Electronics	R.P. Jain	Tata McGraw Hill Publishers
Basic Electronics	Grob Bernard	Tata McGraw Hill Publishers
Basic Electronics - a Text Lab Manual	Paul B. ZBar, Albertp. Malvino, Michael	Tata McGraw Hill Publishers
Industrial Electronics - a Text Lab Manual	Paul B. ZBar	Tata McGraw Hill Publishers
Fundamentals of Electronics	Ashish K Majumdar	Foundation Publishing

K.K. UNIVERSITY 803115 NALANDA

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

Course code	**PME 2201P**
Course Title	THEORY OF MACHINES & MECHANISMS LAB
Number of Credits	2(L: 0, T: 0, P: 3)
Prerequisites	NIL
Course Category	PC

List of Term Work :- (Perform any four)-

1. To study the various types of kinematic links, pairs, chains and mechanisms.
2. To study of all inversions of four-bar mechanisms, Single & double slider Crank mechanisms, using models.
3. To study the various types of steering mechanism .
4. To draw velocity and acceleration polygons of all moving link joints in slider crank mechanism.
5. To study the various types Gears- Helical, Cross helical, Worm, Bevel gear.
6. To study various types of gear trains- simple, compound, reverted and epicyclic.
7. To determine gyroscopic couple on Motorized Gyroscope.
8. To study various types of cam and follower arrangements.

Course code	**PME 2202P**
Course Title	PRODUCTION PROCESSES LAB
Number of Credits	1(L: 0, T: 0, P: 2)
Prerequisites	NIL
Course Category	PC

Note: Six hours practical work will be performed during practical examination Student will prepare one jobs from the following list of practical.

List :

1) Electric welding/Gas welding jobs.
2) Industrial visit to observe plastic processing shop and report on the visit.
3) One job on lathe containing the operation like plain turning , threading ,boring, taper turning.
4) One job on CNC lathe containing the operations like plain turning, taper turning and curvature. (Group of two students ,each group must use different program for different job dimensions)
5) One job containing drilling, milling, reaming, gear cutting (spur gear) per job max two students.
6) One job containing surface grinding / cylindrical grinding for tolerances ± 30 micron,(For the job already made on milling machine /lathe).

K.K. UNIVERSITY 803115 NALANDA

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

7) One assignment on accessories & attachment – chucks, mandrels, carrier and catch plates rests, face plate and angle plate, grinding attachment used on lathe.
8) One assignment on accessories & attachment, work holding & tool holding devises used on milling machine.
9) One assignment each on shaper, planer, boring machine, broaching machine.
10) Fittings related jobs.
11) One assignment on types of grinding wheels

Course code	**PME 2203P**
Course Title	THERMAL ENGINEERING LAB
Number of Credits	1(L: 0, T: 0, P: 2)
Prerequisites	NIL
Course Category	PC

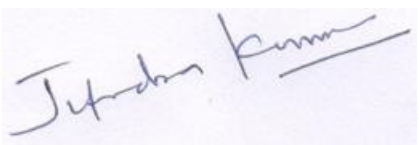
Practical: Skills to be developed: Intellectual

Skill :

1. Understand different sources of energy and their applications.
2. Understand various concepts and fundamentals of thermodynamics.
3. Understand concepts and laws of ideal gasses.
4. Understand vapour processes, steam boilers and different mountings and accessories.
5. Understand modes of heat transfer and concept of heat exchanges.
6. Interpret steam tables, mollier chart and relationship between different thermodynamic properties.

Motor Skills:

1. Collect and write technical specifications of photovoltaic cells and identify different components on panels of photo voltaic cells.
2. Conduct trial on the setup for calculation of thermal conductivity of metal rod.
3. Trace path of flue gases and water steam circuit in a boiler.
4. Conduct trial on solar water heating system.




List of practical:

1. Collection of technical data and specification of photovoltaic cell by referring to manufacturers' catalogues.
2. Study and Trial on solar water heating system.
3. Report on visit to wind power generation plant / biogas plant / hydraulic power plant.
4. Trace the flue gas path and water-steam circuit with the help of boiler model and write a report.
5. Report on visit to sugar factory/Dairy/steam power plant with specification of boiler and list of mountings and accessories.
6. Calculation of thermal conductivity of a solid metallic rod.
7. Verification of Stefan-Boltzman's law
8. Study and compare various heat exchangers such as radiators, evaporators, condensers, plate heat exchangers etc.

Numerical on vapour processes and ideal gas processes (minimum two problems on each)

Course code	**PME 2204P**
Course Title	FLUID MECHANICS AND MACHINERY LAB
Number of Credits	1(L: 0, T: 0, P: 2)
Prerequisites	NIL
Course Category	PC

Practical: Skills to be developed:

Intellectual Skills:

1) Select and use appropriate flow measuring device.

2) Select and use appropriate pressure measuring device.

3) Analyze the performance of pumps and turbines. Motor Skills:

1) Use flow measuring device.

2) Use pressure measuring device.

3) Operate pumps and turbines.

List of Practical:

1. Calibration of Bourden pressure gauge with the help of Dead Weight Pressure gauge.

2. Verification of Bernoulli's Theorem.

3. Determination of Coefficient of Discharge of Venturimeter.

4. Determination of Co-efficient of Discharge, co-efficient of contraction and coefficient of velocity of orifice meter.

5. Determination of coefficient of friction of flow through pipes.

6. Trial on Pelton wheel to determine overall efficiency.

7. Trial on centrifugal pump to determine overall efficiency.

8. Trial on reciprocating pump to determine overall efficiency.

Semester :V
THEORY

S. No.	Course Code	Course Title	Teaching Scheme			Credit
			Contact Hours per week			
			L	T	P	
1	PME3101	Advanced Manufacturing Processes	3	1	0	4
2	PME3102	Power Engineering	5	0	0	5
3	PME3103	Environmental Pollution & Control	3	1	0	4
4	PME3104	Metrology & Quality Control	3	1	0	4
5	PME3105	Automobile Engineering	3	1	0	4
			Total			**21**

PRACTICAL

K.K. UNIVERSITY 803115 NALANDA

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

S. No.	Course Code	Course Title	Teaching Scheme			Credit
			Contact Hours per week			
			L	T	P	
1	PME3101P	Advanced Manufacturing Processes Lab	0	0	3	2
2	PME3104P	Metrology & quality Control Lab	0	0	2	1
3	PME3106S	In Plant Training & Visit to Work	0	0	2	1
4	PME3107S	Professional Practices - V	0	0	2	1
					Total	**04**

Course Code	**PME 3101**
Course Title	ADVANCED MANUFACTURING PROCESSES
Number of Credits	4 (L: 3, T: 1, P: 0)
Prerequisites	NIL
Course Category	PC

Course Contents:

Unit-01: Non-traditional machining processes:
1.1 Electrical discharge Machining. Principle of working, Setup of EDM, Dielectric fluid, tools (electrodes), Process parameters, Output characteristics, Applications e.g. micro hole drilling, curve hole drilling.
1.2 Wire cut EDM - Principle of working, Setup of WEDM, controlling Parameters, Applications.
1.3 Laser Beam Machining. Physical principle of Laser, Laser action in ruby rod, Types of Lasers. Set-up for LBM. Characteristics, controlling Parameters, Applications, Application Of Laser Beam for Welding (LBW)
1.4 Other non-traditional machines such as ECM Principle of working, Applications.

Unit-02: CNC milling machines: Vertical and horizontal machining center: Constructional features, Axis identification, Electronic control system. Automatic tool changer and tool magazine. CNC programming: Preparatory functions (G code), miscellaneous functions (M code), Part programming including subroutines and canned cycles. Principles of computer aided part programming.

K.K. UNIVERSITY 803115 NALANDA

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

Unit-03: Machine Tool Automation: Introduction and Need:

(A) Single spindle automates, transfer lines.

(B) Elements of control system, Limit switches, Proximity switches, Block diagram for feed back and servo control system, Introduction to PLC, Block diagram of PLC.

Unit-04: Special Purpose Machines (SPM):

Concept, General elements of SPM, Productivity improvement by SPM, Principles of SPM design.

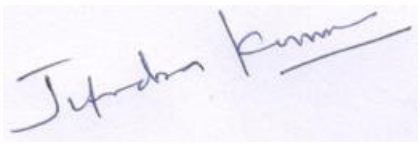
Unit-05: Maintenance of Machine Tools:

Types of maintenance, Repair cycle analysis, Repair complexity, Maintenance manual, Maintenance records, Housekeeping. Introduction to Total Productive Maintenance (TPM).

Course Outcomes:

CO1	Know the Operation and control of different advanced machine tools and equipment.
CO2	Produce jobs as per specified requirements by selecting the specific machining process.
CO3	Develop the mind set for modern trends in manufacturing and automation.
CO4	Identify the different fabrication methods viz., sheet forming, blow moulding, laminating and reinforcing of plastics.
CO5	Know different non-traditional machining processes, CNC milling machines, special purpose machines.
CO6	Work as maintenance engineer.

Text /Reference Books:		
Titles of the Book	**Name of Authors**	**Name of the Publisher**
Manufacturing Science	Amitabh Ghosh , Mallik	East-West Press Pvt. Ltd.
Production Technology	HMT, Banglore	Tata Mc-Graw Hill
CNC machines	Pabla B. S. M. Adithan	New Age international limited.



Industrial maintenance	H.P.Garg	S. Chand & Co. Ltd.
Non-conventional Machining	P. K. Mistra	NarvasaPublishining House
Maintenance Engg. Handbook	Lindley R. Higgins	Mc-Graw Hill
Manufacturing Processes	Begman, Amsted	John Willey and Sons.
Fundamental of metal cutting and machine tools	B. L. Juneja	New age international limited.
Technology of Machine Tools.	Steve Krar, Albert Check	Mc-Graw-Hill International.

Course Code	**PME 3102**
Course Title	POWER ENGINEERING
Number of Credits	4 (L: 3, T: 1, P: 0)
Prerequisites	NIL
Course Category	PC

Course Contents:

Unit-01: I.C. Engine:

1.1 Power Cycles - Carnot, Otto, Diesel, Dual, Brayton Cycle, representation on P-V, T-S diagram and Simple numerical on Otto cycle only.

1.2 Classification of I.C. Engines

1.3 Two stroke and four stroke Engines Construction and working, comparison, valve timing Diagram.

1.4 Brief description of I.C. Engine combustion (SI & CI), scavenging, pre ignition, detonation, supercharging, turbo charging, simple Carburetor, M.P.F.I., fuel injection pump. List of fuel, lubricant additives and their advantages.

Unit-02: I.C. Engine Testing and Pollution Control:

2.1 Engine Testing - I.P., B.P. Mechanical, Thermal relative and volumetric efficiency, BSFC, Heat Balance sheet.

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

2.2 Morse Test, Motoring test

2.3 Pollution Control - Pollutants in exhaust gases of petrol and diesel engines, their effects on environment, exhaust gas analysis for petrol and diesel engine, Catalytic Converter, Bharat stage I, II, III norms.

Unit-03: AIR COMPRESSER :

3.1 Introduction

3.2 uses of compressed air

- Classification of air compressors
- Definition: - Compression ratio
- Compressor capacity
- Free Air Delivered
- Swept volume

Reciprocating air compressor -Construction and working of single stage and two stage compressor

- Efficiency: - Volumetric , Isothermal &Mechanical (only simple numerical)
- Advantages of multi staging.

3.4 Rotary Compressor

- Construction and working of screw, lobe, vane, centrifugal compressors (No numerical)
- Comparison and applications of reciprocating and rotary compressors
- Purification of air to remove oil, moisture and dust

3.5 Methods of energy saving in air compressors

Unit-04: Gas Turbine And Jet Propulsion :

4.1 Classification and applications of gas turbine.

4.2 Constant volume and constant pressure gas turbines.

- Closed cycle and open cycle gas turbines and their comparison.

4.3 Methods to improve thermal efficiency of gas turbine- Regeneration, inter- cooling, reheating using T- Ø diagram (no analytical treatment).

4.4 Jet Propulsion Principles of turbojet, turbo propeller, Ramjet.

4.5 Rocket propulsion Solid propellants and liquid propellants, components of liquid propellants rocket engine.

Unit-05: Refrigeration and Air- Conditioning :

- Introduction: COP of Heat Pump and refrigerator , Tonnes of Refrigeration.

5.2 Vapour compression system

- Vapour compression refrigeration cycle, components of Vapour Compression Cycle. Applications-Water cooler Domestic refrigerator, Ice plant & cold storage.

5.3 Psychrometry

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

- Properties of air, psychrometric chart & processes (No Numerical)

5.4 Air conditioning systems

- Definition of Air conditioning and classification of Air conditioning Systems.

Course Outcomes:

CO1	To understand the working and application of IC Engine.
CO2	To understand of the concept of IC Engine testing and pollution control.
CO3	To Understand the working and application of Air Compressor.
CO4	To understand the working and application of Gas turbine and Jet Propulsion.
CO5	To Understand the concept of Refrigeration and Air conditioning.

Text / Reference Books:		
Titles of the Book	**Name of Authors**	**Name of the Publisher**
Course in Thermal Engineering	V. M. Domkundwar	Dhanpat Rai & Co
Thermal Engineering	P.L. Ballaney	Khanna Publishers
Text Book of Thermal Engineering	R.S. Khurmi	S. Chand & Co. Ltd
Heat Engine Vol.-I and Vol.-II	Patel. Karamchandani	Acharya Publication
Automobile Engineering	R. k. Jain	Tata McGraw Hill
Industrial power engg. &application handbook	K.C. Agrawal	
Power Engineering	Bishwajeet Ranjan, Rajesh Verma	Foundation Publishing

Course Code	**PME 3103**
Course Title	ENVIRONMENTAL POLLUTION & CONTROL
Number of Credits	4 (L: 3, T: 1, P: 0)
Prerequisites	NIL
Course Category	PC

Course Contents:

Unit-01: Introduction:

1. Environment
2. Ecosystem
3. Classification of pollution & pollutants
4. Environment & pollution control acts
5. ISO 14OOOstandards,

Kyototreaty / protocol, carbon units.

Unit-02: Air Pollution:

Part A

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Berauti, Nepura, Bihar Sharif
Nalanda - 803115 (Bihar)

- Sources & classification of air pollution
- Effects of air pollution on human health
- Effects of air pollution on economy
- Photochemical air pollution

  Air pollution from major Industrial operations e.g. Fertilizer industries aluminum manufacturing plants, Acid plants, Cement industries, Coal & tar industries, paper industries, Refinery & petro chemical industries.

Part B

Air pollution due to Automobiles-design and operating parameters and methods of control

- Pollution due to S.I. Engines. Design & operating parameters responsible for emission and methods of pollution control.
- Pollution due to C.I. Engines. Design & operating parameters responsible for emission and methods of pollution control.
- Air quality & emission standards of India & Europe

Air pollution in Indian metro cities-Delhi, Mumbai, Chennai, Kolkata

Unit-03: Water Pollution:

- Sources of water pollution.
- Effects of water pollution.
- Water pollution analysis
  - Physical examination of water
  - Chemical characteristics of water
  - Biological investigation of water
- Definitions of Important terms used in water pollution–DissolvedO_2, ChemicalO_2 demand, Biological O_2 demand, Theoretical O_2 demand, Total solids, Total suspended solids, Total dissolved solids, Turbidity, Alkalinity, Acidity.
- Water quality standards
- Steps in Water treatment

Sampling & analysis of water pollution

Unit-04: Noise Pollution :

- Definition of noise
- Sources of noise
- Types of noise–Impulsive &sonic noise
- Effects of noise on health
- Noise measurement

Noise mapping

Unit-05: Other Types Of Pollution :

- Solid waste
  - Classification of solids
  - Solid waste management
  - Method of solid waste disposal
  - Reuse ,Recycling & recovery of materials from refuse
- Soil pollution
  - Chemistry of soil
  - Soil irrigation by effluents

K.K. UNIVERSITY 803115 NALANDA

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

- Agricultural pollution
- Radiation pollution
  - Sources & effects of radiation
  - Radiation exposure standards
  - Radiation protection

  5.3.4 Treatment & disposal of radiation waste
- Global pollution
  - Green house effect
  - Acid rain

Ozone depletion problem .

Course Outcomes:

CO1	Classify and identify the sources of air, water, noise, soil & global warming pollutions and predict the effects of its pollutant on human health and environment.
CO2	Apply and relate the significance of various pollutions dispersion models.
CO3	Analysis of different pollutions quality and relate with its pollution regulation.
CO4	Design various noise, soil and global warming pollution control equipment and evaluate its use.

Text/ Reference Books:-

Titles of the Book	Name of Authors	Name of the Publisher
Air pollution	M.N. Rao& H.V.N. Rao	Tata McGraw Hill
Automotive Mechanics	WilliamH.Course & DonaldL. Anglin	Tata McGraw Hill
Internal Combustion Engines	K.K. Ramlingam	Scitech
Water Supply and Sanitary Engineering	G.S. Bilgi	Dhanpat Rai and Sons.
Elements of Environment Science & Engineering	P. Meenakshi	Prentice-Hall
A basic course in environmental studies	S. Deswal& A. Deswal	Dhanpat Rai and Sons.
Introduction to Environmental Engineering.	P. Aarne Vesilind & SusanM. Morgan	Thomson

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Nalanda - 803115 (Bihar)

Environmental Pollution Control Engineering	C.S Rao	
Environmental pollution control microbiology	McKinney	

Course Code	**PME 3104**
Course Title	METROLOGY & QUALITY CONTROL
Number of Credits	4 (L: 3, T: 1, P: 0)
Prerequisites	NIL
Course Category	PC

Course Contents:

Unit-01: Introduction to metrology :

1.1 Metrology Basics

Definition of metrology, Categories of metrology, Scientific metrology,

Industrial metrology, Legal metrology, Need of inspection, Revision of (no questions be set) - Precision,Accuracy,Sensitivity,Readability,Calibration,Traceability, Reproducibility, Sources of

errors, Factors affecting accuracy, Selection of instrument, Precautions while using instruments for getting higher precision and accuracy.

1.2 Standards and Comparators

Definition and introduction to line standard end standard, Wavelength standard, Slip gauge and its accessories, Length bars. Definition, Requirement of good comparator, Classification, use of comparators, Working principle of comparators, Dial indicator, Sigma comparator, Pneumatic comparator, Electrical, Electronic, Relative advantages and disadvantages.

1.3 Limits, Fits ,Tolerances and Gauges

Concept of Limits, Fits, And Tolerances, Selective Assembly, Interchangeability, Hole And Shaft Basis System, Taylor's Principle, Design of Plug, Ring Gauges, IS919-1993 (Limits, Fits & Tolerances, Gauges IS 3477-1973, concept of multi gauging and inspection.

1.4 Angular Measurement

Concept, Instruments For Angular, Measurements, Working And Use of Universal Bevel Protractor, Sine Bar, Spirit Level, Principle of Working of Clinometers, Angle Gauges (With Numerical on Setting of Angle Gauges).

Unit-02: Threads and Gear Metrology :

2.1 Screw thread Measurements

ISO grade and fits of thread, Errors in threads, Pitch errors, Measurement of different elements such as major diameter, minor diameter, effective diameter, pitch, Two wire methods, Thread gauge micrometer, Working principle of floating carriage dial micrometer.

2.2 Gear Measurement and Testing

Analytical and functional inspection, Rolling test, Measurement of tooth thickness (constant chord method), gear tooth vernier, Errors in gears such as backlash, run out, composite.

Unit-03: Testing Techniques :

3.1 Measurement of surface finish : Primary and secondary texture, Sampling length, Lay, terminology as per IS 3073- 1967, direction of lay, Sources of lay and its significance, CLA, Ra, RMS, Rz values and their interpretation, Symbol for designating surface finish on drawing, Various techniques of qualitative analysis, Working principle of stylus type instruments.

Machine tool testing Parallelism, Straightness, Squareness, Coaxiallity, roundness, run out, alignment testing of machine tools as per IS standard procedure.

Unit-04: Quality Control :

A) Quality : Definitions, meaning of quality of product & services, Quality characteristics, Quality of design, Quality of conformance, Quality of performance, Concept of reliability, Cost, Quantity assurance, Cost of rework & repair, Quality &Inspection, Inspection stages.

B) Total Quality Management:

1) Principles of total quantity management.

i) Customer focus.

ii) Commitment by top management.

iii) Continuous improvement–PDCA, Quality Circles.

iv) Employee empowerment (JIDOKA).

2) Quality Audit: Concept of audit practices, lead assessor certification.

3) Six sigma: Statistical meaning, methodology of system Improvement , DMAIC cycle, Yellow belt, Green belt, Black belt certification.

K.K. UNIVERSITY 803115 NALANDA

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Nalanda - 803115 (Bihar)

C) ISO 9000 Series & other standards:
Concept, ISO 9000 series quality standards, QS14000, Standards in general, Its evaluation & Implications, necessity of ISo certification, other Quality systems.

Unit-05: Elementary Statistics & it's application in quality control :

5.1 Statistical Quality Control – Meaning and importance of SQC, Variable and attribute Measurement. control charts – inherent and assignable sources of variation, control charts for variables – X & R charts, control charts for attributes p, np, C charts, process capability of machine, determination of statistical limits, different possibilities, Rejection area, Statistically capable and incapable processes, Cp, Cpk.

Acceptance Sampling – Concept, Comparison with 100% inspection, Different types of sampling plans, with merits and demerits, OC curve, It's importance and significance, Producers risk, Consumer's risk, AQL, AOQL, IQL, LTPD

Course Outcomes:

CO1	Create & apply the concept of inspection, quality control and its importance to industry.
CO2	Demonstrate the skills of controlling various out of control processes using statistical quality and control tools.
CO3	Understand the importance of improving production and productivity using work study approach.
CO4	Apply the knowledge of various measurement standards and techniques in the industry to measure various parameters related to metrology.

Text/ Reference Books:-

Text / Reference Books:-		
Titles of the Book	**Name of Authors**	**Name of the Publisher**
Engineering metrology	R. K. Jain	Khanna Publisher, Delhi.
Metrology for Engineers	J.F.W. Galyer and C. R. Shotbolt	ELBS
Engineering Metrology	K. J. Hume	Kalyani publishers
A text book of Engineering metrology	I.C. Gupta	Dhanpat Rai and Sons,

K.K. UNIVERSITY 803115 NALANDA

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Nalanda - 803115 (Bihar)

Metrology Lab. Manual	M. Adithan and R. Bahn	T.T.T.I. Chandigarh.
Statistical Quality Control	M. Mahajan	Dhanpat Rai and Sons ,
Quality control	T.T.T.I. Chennai	Tata McGraw Hill,
Quality planning and analysis	Juran U.M. and Gryna	Tata McGraw Hill,
Inspection and quality control	National productivity council	N.P.C., New Delhi.
Managing for Total Quality	N. Logothetis	Prentice – Hall, Delhi.
Statistical Process analysis	Lauth Alwan	Tata McGraw Hill.
Metrology & Quality Control	S.P. Singhal	Foundation Publishing
Metrology & Precision Engg.	A.J.T. Scarr	Tata McGraw hill

2. IS/ International Codes :

IS 919 – 1993 Recommendation for limits, fits and tolerances IS 2029 – 1962 Dial gauges.

IS 2103 – 1972 Engineering Square

IS 2909 – 1964 Guide for selection of fits.
IS 2921 – 1964 Vernier height gauges

IS 2949 – 1964 V Block.

IS 2984 – 1966 Slip gauges.

IS 3139 – 1966 Dimensions for screw threads. IS 3179 – 1965 Feeler gauges.

IS 3455 – 1966 Tolerances for plain limit gauges.
IS 3477 – 1973 Snap gauges.

Course Code	**PME 3105**
Course Title	AUTOMOBILE ENGINEERING
Number of Credits	4 (L: 3, T: 1, P: 0)
Prerequisites	NIL
Course Category	PC

Course Contents:

K.K. UNIVERSITY 803115 NALANDA

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

Unit-01: Introduction of Automobile :

1.1 Classification of automobiles
1.2 Vehicle layout &types
1.3 Body construction- Types & Nomenclature of car body. Introduction to aerodynamic body shapes
Automobile market in India of "on road vehicles", major manufacturers, their products & their collaborations.

Unit-02: Automobile Transmission :

2.1 Clutch- necessity, construction & working of coil spring & diaphragm spring type clutch.
2.2 Gear Box- tractive effort and tractive resistance, types of G.B construction & working of constant mesh G.B., & synchromesh G.B., Epicyclic G.B., Torque converter, Overdrive, Transfercase
2.3 Final drive- necessity, construction &working of propeller shaft & differential.
Axle- Type of rear axles, front axles & their applications.

Unit-03: Control Systems :

3.1 Steering system- Requirement of steering system. Construction and working of steering linkage. Steering gearbox – construction & working of rack and pinion & re-circulating ball type gearbox. Introduction to Power steering, Steering geometry- camber, caster, toe-in, toe-out, Kingpin inclination & their effects.
3.2 Brake system- construction & working of hydraulic &Pneumatic brakes.

Unit-04: Suspension systems, wheels &Tyres :

4.1 Necessity & classification of suspension system.
4.2 Working & construction of Leaf spring, rigid axle suspension.
4.3 Introduction to air suspension
4.4 Construction & working of Mc Pherson & wish bone, trailing link suspensions.
4.5 Construction & working of telescopic shock absorbers.
4.6 Construction & working of spoked wheel, disc wheel & light alloy cast wheel.
4.7 Types of rims, their construction & working.
4.8 Construction, working & comparison of radial, cross-ply and tube, tubeless tyre & tyre specifications
4.9Factors affecting tyre life Wheel Alignment and Balancing

Unit-05: Automobile Electrical Systems & Body :

5.1 Battery- working, construction & rating of battery.
5.2 Ignition system – construction & working of electronic and CD Ignition system.
5.3 Starting system- construction & working of starting motor.
5.4 Charging system- construction & working of alternator
5.5Wiring system- harnessing & colour codes.
5.6 Lighting system-headlight, tail light, indicator light & their circuits.

K.K. UNIVERSITY 803115 NALANDA

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

5.7 Gauges- construction & working of Fuel level gauge, oil gauge and water temperature gauge. Use of microprocessor in automobile control systems

Course Outcomes:

CO1	Understand the basics of automobile engineering and its components.
CO2	Idea creation of cooling system, electrical system and ignition system.
CO3	Analysis of transmission system and types of gears box.
CO4	Design and development of suspension and lubrication

Text / Reference Books:		
Titles of the Book	**Name of Authors**	**Name of the Publisher**
Automobile Engineering	K. K. Jain and R.B. Asthana	Tata Mcgraw hill
Automobile Mechanics	William Crouse	Tata Mcgraw hill
Automobile Mechanics	SRINIVASAN	Tata Mcgraw hill
Automotive Technology	H.M.Sethi	Tata Mcgraw hill
Automobile Engineering	G.B.S. Narang	Khanna Publication
Auto Mechanics	Harold T. Glenn	Bennett &Mckknight
Automobile Engineering Vol. I and Vol. II	Kirpal Singh	Standard Publication
Automotive Mechanics	Joseph Hitner	--
Automobile Engg.	Kaushik Berman	Foundation Publishing

Course Code	**PME 3101P**
Course Title	ADVANCED MANUFACTURING PROCESSES LAB
Number of Credits	2 (L: 0, T: 0, P: 3)
Prerequisites	NIL
Course Category	PC

K.K. UNIVERSITY 803115 NALANDA

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

Practical: Skills to be developed:

Intellectual skills:

1) To select an appropriate non conventional machining process for required component.
2) To write programs for CNC milling machine.
3) To specify the requirement for special purpose machines and automation. To select the Maintenance procedure for given machine tool.

Motor Skills:

1) To execute part programs on CNC milling machine / machining center.
2) To repair and maintain machine tools and subsystems.
3) To use and operate different hand tools required for repair and maintenance.
4) To identify and rectify the faults in the given subassembly.

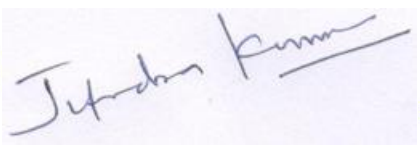
Test:

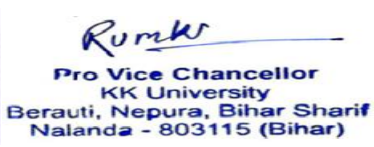
1. The workshop instructors should prepare specimen job in each shop as demonstration practice before the student (as per the drawing given by subject teacher / workshop superintendent)
2. Theory behind practical is to be covered by the concerned subject teacher / workshop superintendent.
3. Workshopdiaryshouldbemaintainedbyeachstudentdulysignedbyrespectiveshopinstructors

List of Practical:

1) Two jobs on CNC milling having following operations – face milling, slotting, Contour machining. (Groupoftwostudents,eachgroupmustusedifferentprogramfordifferentjobdimensions)
2) One assignment on part programming on machining center.
3) One assignment on machine tool installation procedure.
4) Industrial visit to observe automats and report on the tools, fixtures and cams used on automats.
5) Industrialvisittoobserveatleastonenontraditionalmachiningprocess and report on visit.
6) Dismantling and Assembly of anyone– a) Tail stock on lathe b) Apron Mechanism. c) Tapping attachment on drilling machine. d) Lathe Chuck
7) Report on mounting and dismounting procedure of following (any two) – a) Milling machine arbor. b) Vertical milling head. c) Tool post
8) One assignment on USM, CHM, EBM, AJM, WJM, PAM.

Course Code	**PME 3104P**
Course Title	METROLOGY & QUALITY CONTROL LAB
Number of Credits	1 (L: 0, T: 0, P: 2)
Prerequisites	NIL
Course Category	PC





Intellectual Skills:

1. To understand principle, working of various measuring instruments.
2. Selection of proper instruments for measurement.
3. Calculation of least count of instrument.
4. Take reading using the instrument
5. Interpret the observation and results
6. Collection and recording of data
7. Analysis of data.

Motor Skills:

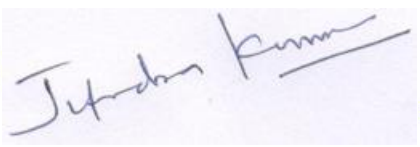
1. Setting the instruments for zero error adjustment.
2. Proper alignment of the instrument with work piece
3. Handling of instruments
4. Care and maintenance of instruments.
5. Measure the dimensions form the instruments.
6. Calibration and traceability of the instruments
7. Graphical representation of data.

Notes:

1. The practical shall be conducted by the subject teacher, by taking actual measurements of different parameters on the jobs prepared by earlier batches in workshop practice or actual measurement of component dimension.
2. The data collected from the practical of basic measuring instruments may be used for experiments of SQC.
3. During practical examination student should measure at least five parameters by using two to three different measuring instruments and evaluation of practical be done considering
   (a) Selection of appropriate measuring instrument by the examinee.
   (b) Computation of Least count of instrument used.
   (c) Correctness of measurements of the measured.

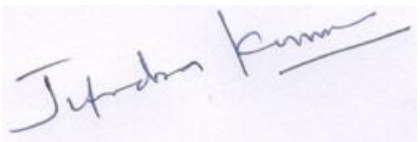
List of Practical:

1. Standard use of basic measuring instruments. Surface plate, v-block, sprit level, combination set, filler gauge, screw pitch gauge, radius gauge, vernier caliper, micrometer and slip gauges to measure dimension of given jobs.
2. To find unknown angle of component using sine bar and slip gauges.
3. Study and use of optical flat for flatness testing.
4. Measurement of screw thread elements by using screw thread micrometer, screw pitch gauge.
5. Study and use of dial indicator as a mechanical comparator for run out measurement, roundness comparison.
6. Measurement of gear tooth elements by using gear tooth vernier caliper and span micrometer, verification of gear tooth profile using profile projector,.
7. Testing of machine/machine tool for flatness, parallelism, perpendicularity by auto collimator.
8. Draw the frequency histogram, frequency polygon and ogee for given samples (min 5o reading) and find mean, mode, median.




9. To draw the normal distribution curve and find standard deviation, variance, range
10. To draw and interpret the control limit for variable measurement (X and R chart).

Course Code	**PME 3106S**
Course Title	IN PLANT TRAINING & VISIT TO WORK
Number of Credits	1 (L: 0, T: 0, P: 2)



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Prerequisites	NIL
Course Category	PC

Rationale:

A student is required to develop a skill to synthesise 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" is being introduced for the final year diploma technicians for Mechanical 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. He will be able to observe how his supervisor performs day-to-day work and coordinate shop floor activities. The course will, no doubt, be a of great help in developing skills required for a diploma holder technician, and will also help in bringing attitudinal change in him.

Objective:

A student will be able to:

- Understand the working of the machines, tools and equipments more clearly.
- Write specifications of the machines, tools, equipments.
- Learn to maintain office records.
- Know the process of planning, implementation and monitoring.
- Learn the skill for 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 skill of maintenance management.
- Know the skill of production control.
- Acquire the skill of man/machine loading.
- Know the organizational set-up and plant layout.
- Locate the plants and industries related to Mechanical Engineering-State and Nation wise.
- Find out Characteristics, Functions, and activities of those industries.
- Know the source of raw materials and markets for the industries.
- Find out opportunities and method of recruitment.
- Find out the special characteristics of the industries.
- Observe the special purpose production machines, which the student may not have seen in the institution, in production.
- Learn the special testing machine / equipments which have not been provided in institution.

CONTENTS

Visit to Works

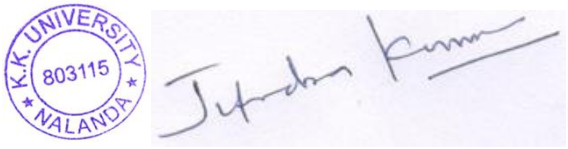
Visit to works of following industries (any four):

- Automobile Industry.
- Engineering Industry (both heavy and medium).
- Steel Plant.
- Thermal Power Plant.
- Hydel Power Stations.
- Cement Factory.
- Computer Manufacturing Unit.
- Financial Institution.
- Refrigeration Plant.

REPORT WRITING:
Industrial Tour

Sl. No.	Topics
1	Introduction
2	Name and types of Industries visited :- Their specific characteristics
3	Working of different industries:- - Location - Lay-out - Raw materials used - Products - Organizational Structure - Special Machine Special Tools
4	Conclusions - Observations - Typical Characteristics - Area of Weakness Suggestions.

Course Code	**PME 3107S**



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Course Title	PROFESSIONAL PRACTICES V
Number of Credits	1 (L: 0, T: 0, P: 2)
Prerequisites	NIL
Course Category	PC

Unit-01: Industrial Visits: Structured industrial visits be arranged and report of the same shall be submitted by the individual student, to form a part of the term work.(2 visits) Following are the suggested types of Industries/ Fields –

i) Automobile manufacturing / auto component manufacturing units to observe the working of SPM
ii) Refrigeration and air conditioning manufacturing/servicing units/ industries /workshops
iii) Automobile service stations for four wheelers
iv) Co-ordinate measuring machine to observe its construction working specifications and applications.
v) Auto Engine Testing unit to gather details regarding the testing procedures/parameters etc.
vi) Wheel Balancing unit for light and/or heavy motor vehicles.
vii) Food processing unit.
viii) Textile industry machinery manufacturing / servicing units.
ix) Hydroelectric and Thermal power plants.
x) Automotive Research Association of India, Pune, Central Institute of Road Transport, Pune, Vehicle Research and Development establishment, Ahmednagar.
xi) Engine testing, exhaust gas analysis and vehicle testing
xii) PWD workshop.

Safety museum at Central Labour Institute, Sion, Mumbai

Unit-02: The Guest Lecture/s: From field/industry experts, professionals to be arranged (2 Hrs duration), minimum 4 nos. from the following or alike topics. The brief report to be submitted on the guest lecture by each student as a part of Term work

a) Electronic fuel injection systems
b) Exhaust gas analysis.
c) Vehicle testing.
d) Transducer application in automobiles.
e) Environmental pollution &control.
f) Vehicle aerodynamics &design.
g) Earth moving machines.
h) Automobile pollution, norms of pollution control.
i) iotechnology
j) Nanotechnology
k) Rapid prototyping
l) Programmable logic controllers
m) TQM
n) MPFI
o) Hybrid motor vehicles
p) Packaging technology

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

q) Appropriate technology
r) Six sigma systems
s) LPG / CNG conversion kit.

Unit-03: Group Discussion :
The students should discuss in group of six to eight students and write a brief report on the same, as a part of term work. The topic of group discussions may be selected by the faculty members. Some of the suggested topics are (any one)-

i) CNG versus LPG as a fuel.
ii) Petrol versus Diesel as a fuel for cars.
iii) Trends in automobile market.
iv) Load shading and remedial measures.
v) Rain water harvesting.
vi) Trends in refrigeration Technology.
vii) Disaster management.
viii) Safety in day to day life.
ix) Energy Saving in Institute.
x) Nanotechnology.

Unit-04: Seminar: (any 2 topics)

Seminar topic should be related to the subjects of fifth semester / topics from guest lectures.

Students shall submit a report of at least 10 pages and deliver a seminar (Presentation time – 10 minutes for a group of 2 students)

Unit-05: Mini Projects : (in a group of 4-5 students)

1) Design / drawing of simple jigs, fixtures
2) Thermocouple based temperature controller.
3) Pump on / off timer
4) Models of jigs /fixtures
5) Layout design of SSI units / factory / workshop of the institute

Models of material handling route systems

OR

Modular Course on any one of the suggested or alike relevant topic be under taken by a group of students (Min10):

a) LPG/CNG conversion of vehicles b) Advance features in CAD – CAM c) basics of PLC programming d) die design e) JIT techniques f) Nontraditional manufacturing methods g) jigs and fixture design h) 3D Modeling I) finite element method j) Mechatronics k) Advanced computer programming l)maintenance of home appliances m) value stream mapping n) piping technology

Unit-06: Student Activities – Students in a group of 3 to 4 shall perform ANY TWO of the following activities (Other similar activities may be considered) and write a report as a part of term work.
Activities :-

1. Collection of data regarding loan facilities or other facilities available through different

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

organizations / banks to budding entrepreneurs

2. Survey and interviews of successful entrepreneurs in nearby areas
3. Survey of opportunities available in thrust is as identified by Government or DIC.
4. Measuring Screw thread parameters on floating carriage dial micrometer and select the optimum diameter of wire.
5. Survey of data regarding different types of pumps with specifications from manufacturers catalogue,

   local markets, end users (any other engineering products may be considered for survey)
6. Survey of farm implements used by farmers

Text / Reference Books:-		
Titles of the Book	**Name of Authors**	**Name of the Publisher**
Nanotechnology	Mark Ratner and Daniel Ratner	Pearson Educatuion, New Delhi
Computer Control of Manufacturing System	YoramKorem	Mcgraw Hill Publication
Supply Chain Management	Sunil Chopra, Peter Meindl	Pearson Educatuion, New Delhi

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Nalanda - 803115 (Bihar)

Semester :VI

THEORY

S. No.	Course Code	Course Title	Teaching Scheme			Credit
			Contact Hours per week			
			L	T	P	
1	PSH3201	Management (Common)	4	1	0	5
2	PME3201	Design of Machine Elements	5	0	0	5
3	PME3202	Industrial Fluid Power	3	1	0	4
4	PME3203	Production Technology	3	1	0	4
5	PME3204	Elective-(Any One)	3	1	0	4
	Elective- (i) Alternate Energy Sources & Management (PME 3204A)	(ii) Material Handling Systems (PME 3204B)	(iii) Refrigeration & Air-Conditioning (PME 3204C)		(iv) CAD-CAM & Automation (PME 3204D)	
			Total			**22**

PRACTICAL

S. No.	Course Code	Course Title	Teaching Scheme			Credit
			Contact Hours per week			
			L	T	P	
1	PME3201P	Design of Machine Elements	0	0	3	2
2	PME 3202P	Industrial Fluid Power Lab	0	0	2	1
3	PME 3204P	Elective-(Any One)Lab	0	0	2	1
4	PME3205**S**	Industrial Project	0	0	2	1
					Total	**05**

K.K. UNIVERSITY 803115 NALANDA

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Nalanda - 803115 (Bihar)

Course Code	**PSH 3201**
Course Title	MANAGEMENT (COMMON)
Number of Credits	5 (L: 4, T: 1, P: 0)
Prerequisites	NIL
Course Category	PC

Course Contents:

Unit-01: Overview Of Business

Types of Business

- Service
- Manufacturing
- Trade
- Industrial sectors

Introduction to

- Engineering industry
- Process industry
- Textile industry
- Chemical industry
- Agroindustry

Globalization

- Introduction
- Advantages & disadvantages w.r.t. India

Intellectual Property Rights(I.P.R.)

Unit-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

Unit-03: Organizational Management

Organization :-

- Definition
- Steps in organization

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Types of organization

- Line
- Line &staff
- Functional
- Project

Depart mentation

- Centralized &Decentralized
- Authority & Responsibility
- Span of Control

Forms of ownership

- Proprietorship
- Partnership
- Joint stock
- Co-operative Society
- Govt. Sector

Unit-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

Unit-05: Financial Management

Financial Management- Objectives &Functions

Capital Generation &Management

- Types of Capitals
- Sources of raising Capital

Budgets and accounts

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- Types of Budgets
  - ➢ Production Budget (including Variance Report)
  - ➢ Labor Budget
- Introduction to Profit & Loss Account (only concepts); Balance Sheet

Introduction to–

- Excise Tax
- Service Tax
- Income Tax
- VAT
- Custom Duty

Unit-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

Unit-07: Project Management (No Numerical)

Project Management

- Introduction &Meaning
- Introduction to CPM & PERT Technique
- Concept of Break Even Analysis

Quality Management

- Definition of Quality, concept of Quality, Quality Circle, Quality Assurance
- Introduction to TQM, Kaizen, 5 'S', & 6Sigma

Text/ Reference Books:		
Titles of the Book	**Name of Authors**	**Name of the Publisher**
Industrial Engg& Management	Dr. O.P. Khanna	DhanpalRai& sons New Delhi
Business Administration & Management	Dr. S.C. Saksena	SahityaBhavan Agra
The process of Management	W.H. Newman E.Kirby Warren Andrew R. McGill	Prentice- Hall
Industrial Management	Rustom S. Davar	Khanna Publication
Industrial Organization& Management	Banga& Sharma	Khanna Publication

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Course Outcomes:

CO1	Understand the importance of projects and its phases.
CO2	Analyze projects from marketing, operational and financial perspectives.
CO3	Evaluate projects based on discount and non-discount methods.
CO4	Develop network diagrams for planning and execution of a given project

Course Code	**PME 3201**
Course Title	DESIGN OF MACHINE ELEMENTS
Number of Credits	5 (L: 4, T: 1, P: 0)
Prerequisites	NIL
Course Category	PC

Course Contents:

Unit-01: Introduction to Design

Machine Design philosophy and Procedures, General Considerations in Machine Design Fundamentals:- Types of loads, concepts of stress, Strain, Stress – Strain Diagram for Ductile and Brittle Materials, Types of Stresses such as Tension, Compression, Shear, Bearing pressure Intensity, Crushing, bending and torsion, Principle Stresses (Simple Numerical)

Creep strain and Creep Curve

Fatigue, S-N curve, Endurance Limit.

Factor of Safety and Factors governing selection off act or of Safety.

Stress Concentration – Causes &Remedies

Converting actual load or torque into design load or torque using design factors like velocity factor, factor of safety & service factor.

Properties of Engineering materials, Designation of materials as per IS and introduction to International standards & advantages of standardization, use of design data book, use of standards in design and preferred numbers series.

Theories of Elastic Failures–Principal normal stress theory, Maximum shear stress theory & maximum distortion energy theory.

Unit-02: Design of simple machine parts

Cotter Joint, Knuckle Joint, Turn buckle

Design of Levers:- Hand/Foot Lever & Bell Crank Lever

Design of C–Clamp, Off-set links, Overhang Crank, Arm of Pulley

Unit-03: Design of Shafts, Keys and Couplings and Spur Gears

Types of Shafts, Shaft materials, Standard Sizes, Design of Shafts (Hollow and Solid) using strength and rigidity criteria, ASME code of design for line shafts supported between bearings with one or two pulleys in between or one over hung pulley.

Design of Sunk Keys, Effect of Keyways on strength of shaft.

Design of Couplings–Muff Coupling, Protected type Flange Coupling, Bush-pin type flexible coupling.

Spur gear design considerations. Lewis equation for static beam strength of spur gear teeth. Power

transmission capacity of spur gears in bending.

Unit-04: Design of Power Screws

Thread Profiles used for power Screws, relative merits and demerits of each, Torque required to overcome thread friction, self-locking and overhauling property, efficiency of power screws, types of stresses induced.

Design of Screw Jack, Toggle Jack.

Unit-05: Design of springs

Classification and Applications of Springs, Spring–terminology, materials and specifications.

Stresses in springs, Wahl's correction factor, Deflection of springs, Energy stored in springs.

Design of Helical tension and compression springs subjected to uniform applied loads like I.C. engine valves, weighing balance, railway buffers and governor springs.

Leaf springs – construction and application

Unit-06: Design of Fasteners

Stresses in Screwed fasteners, bolts of Uniform Strength.

Design of Bolted Joints subjected to eccentric loading.

Design of parallel and transverse fillet welds, axially loaded symmetrical section, Merits and demerits of screwed and welded joints

Unit-07: Antifriction Bearings

Classification of Bearings – Sliding contact & rolling contact.

Terminology of Ball bearings – life load relationship, basic static load rating and basic dynamic load rating, limiting speed. Selection of ball bearings using manufacturer's catalogue.

Unit-08: Ergonomics & Aesthetic consideration in design

Ergonomics of Design–Man–Machine relationship. Design of Equipment for control, environment &safety. Aesthetic considerations regarding shape, size, color &surface finish.

Text / Reference Books:		
Titles of the Book	**Name of Authors**	**Name of the Publisher**
Introduction to Machine Design	V.B. Bhandari	Tata Mc- Graw Hill
Machine Design	R.K. Jain	Khanna Publication
Machine design	Pandya& Shah	DhanpatRai& Son
Mechanical Engg. Design	Joseph Edward Shigley	Mc- Graw Hill
Design Data Book	PSG Coimbtore	PSG Coimbtore
Hand Book of Properties of Engineering Materials & Design Data for Machine Elements	Abdulla Shariff	DhanpatRai& Sons
Theory and Problems of Machine Design	Hall, Holowenko, Laughlin	Mc- Graw Hill

K.K. UNIVERSITY 803115 NALANDA

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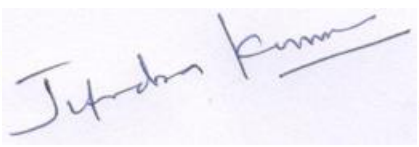
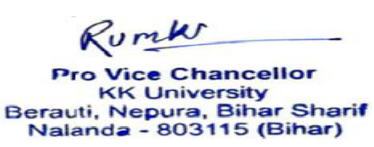
Design of Machine Elements	D.P. Mandal	Foundation Publishing

1. IS/ International Codes
   a) IS4218:1967 ISO Metric Threads
   b) IS2693:1964 Cast Iron Flexible Couplings
   c) IS2292: 1963 Taper keys &Keyways
   d) IS2293:1963 Gib Head Keys &Keyways
   e) IS2389:1963 Bolts, Screws, Nuts & Lock Nuts
2. IS4694:1968 Square threads
   g) IS808:1967 Structural Steel
3. SKF Catalogue for Bearings
2. SOFTWARE
   1) Think 3 CAD Software developed by ace brain.
   2) E-Yantra Software, developed by FEAST.

Course Outcomes:

CO1	Explain the design procedures and methods, properties of engineering materials and their selection, design against static and fluctuating loads.
CO2	Solve the design problems of different types of joints i.e. bolted, riveted joint and welded joint under different loading conditions.
CO3	Analyse the design problems related to the design of springs under different loading conditions.
CO4	Analyse the transmission shafts and keys under different loading conditions.
CO5	Design problems related to clutches, brakes and selection of bearings from manufacturer's catalogue.

Course Code	**PME 3202**
Course Title	INDUSTRIAL FLUID POWER
Number of Credits	4 (L: 3, T: 1, P: 0)
Prerequisites	NIL
Course Category	PC

Course Contents:

Unit-01: Introduction to oil hydraulic systems: Practical applications of hydraulic systems. General layout of oil hydraulic systems. Merits and limitations of oil hydraulic systems

Unit-02: Components of Hydraulic systems :

Pumps – Vane pump, gear pump, Gerotor pump, screw pump, piston Pump.

Valves – Construction, working and symbols of Pressure control valves – pressure relief valve, pressure reducing, pressure unloading Direction control valves – Poppet valve, spool valve, 3/2, 4/2 D.C. valves, Sequence valves.

Flow control valves –pressure compensated, non-pressure compensated flow control valve.

Actuators- Construction, working and symbols of Rotary Actuators – Hydraulic motors.

Linear Actuators – Cylinders - single acting, double acting.

Accessories – Pipes, Hoses, fittings, Oil filters, Seals and gaskets, Accumulators.

(Types, construction, working principle and symbols of all components)

Unit-03: Hydraulic Circuits :

Meter in, Meter out circuits Bleed off circuit Sequencing circuit

Hydraulic circuits for Milling machine, Shaper machine, Motion synchronization circuit

Unit-04: Introduction to pneumatic Systems :

Applications of pneumatic system General layout of pneumatic system Merits and limitations of pneumatic systems

Unit-05: Components of pneumatic system :

Compressor – Reciprocating & Rotary compressors.

Control Valves – Pressure regulating valves, Flow Control valves, Direction Control Valves.

Actuators – Rotary - Air motors, Types, construction, working principle Linear- Cylinders- Types, construction & working principle.

Accessories – Pipes, Hoses, Fittings, FRL unit (Types, construction, working principle and symbols of all components)

Unit-06: Pneumatic Circuits Speed control circuits. Sequencing circuits.

K.K. UNIVERSITY 803115 NALANDA

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Nalanda - 803115 (Bihar)

Text / Reference Books:		
Titles of the Book	**Name of Authors**	**Name of the Publisher**
Industrial Hydraulics	Pippenger Hicks	McGraw Hill International
Oil Hydraulic system- Principle and maintenance	Majumdar S.R	Tata McGraw Hill
Pneumatics Systems Principles and Maintenance	Majumdar S.R	Tata McGraw Hill
Hydraulics and Pneumatics	Stewart	Taraporewala Publication
Industrial Fluid Power	S. Laxmikant	Foundation Publishing
Industrial fluid power	Charles Hedges	Womack Educational Publications
Industrial hydraulic control	Peter Rhoner	Prentice Hall

Course Outcomes :-

CO1 : Apply the fundamentals of fluid mechanics.

CO2 : Select various components of hydraulic systems.

CO3 : Build/prepare different hydraulic circuits for given simple automation applications.

CO4 : Select various components of pneumatic systems.

CO5 : Build/prepare different pneumatic circuits for given simple automation applications.

CO6 : Construct Electro-hydraulic and Electro-pneumatic circuits for simple automation.

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Nalanda - 803115 (Bihar)

Course Code	**PME 3203**
Course Title	Production Technology
Number of Credits	4 (L: 3, T: 1, P: 0)
Prerequisites	NIL
Course Category	PC

Course Contents:

Unit-01: Production System

Production - Definition , Types of production systems Productivity - Importance , Measurement of Productivity , Techniques of improving productivity Elements of cost- Fixed cost, Variable Cost. Break even analysis, Calculation of Break even point.

Unit-02: Plant location, Plant layout and Material Handling

Plant Location - Importance of Site Selection, Factors affecting Site Selection, Government Policies, and relaxation for Backward Areas.

Plant Layout - Objectives, types, design principles, characteristics of Plant Layout, Symptoms of Bad Plant Layout. Group technology, Cellular layout, Material handling – Need, Principles and Types of material handling devices – conveyors, Hoist & cranes, forklift truck, trolleys, Pipes, Automated Guided Vehicles(AGV's) Selection of Material Handling systems **.**

Unit-03: Process Planning :

Planning of Processes from raw material to finished product, Factors affecting Process Planning, Deciding sequence of operations, Operation Sheet, Combined operations, Determination of Inspection Stages. Selection of Machine Techniques of assembly planning, Types of assembly. Plant Capacity, Machine Capacity, Plant Efficiency. Numerical not to beasked,

Unit-04: Production Planning and Control :

Routing, Sequencing [n job 2 machines], Scheduling, Dispatching, Meaning of Control, Progressive Control, Gantt chart. Concept of Line balancing,

Unit-05: Work Study :

Method Study- Objectives, Procedure, Selection of work. Recording Techniques-ProcessCharts– Outlineprocesschart,Flowprocesschart,Two Hand process chart, Multiple activity chart, Flow diagram, String diagram, Travel chart.

Micro motion study-Critical Examination, Principles of Motion Economy. Concept of ergonomics and workplace layout.

Work Measurement -

Objectives, procedure, Time Study, Time Study Equipments. Stop Watch Time Study, Standard Time, Work Sampling, Analytical Estimating, Predetermined Motion Time Study, Allowances, Calculation of Standard

Time, Concept of Merit Rating.

Unit-06: Inventory Control :

Methods of Inventory Management, Inventory Cost relationship, Deciding Economic Batch

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Berauti, Nepura, Bihar Sharif
Nalanda - 803115 (Bihar)

Quantity, EOQ Model, Calculation of EOQ, Concepts of discounts. Introduction of Material Requirement Planning, Stores Function
– Storage systems – One bin , Two bin system, Material issue request (MIR), bin card.

Unit-07: Jigs and Fixtures :
Introduction. Difference between jig and fixture Different components of Jig/ fixture3-2-1principleoflocation.Typesoflocatorsandclampingdevices.
General principles of jig/fixture design. Types of jigs and fixtures.

Unit-08: Modern Trends :
Just In Time manufacturing – Pull and push types of manufacturing systems, Waste reduction, 5'S', inventory reduction, single piece production systems. Concept of continuous improvement (Kaizen) – DMIAC cycle, Brain storming. Poka Yoke. Concept of Rapid Prototyping Concept of Flexible manufacturing system.

Text / Reference Books:		
Titles of the Book	**Name of Authors**	**Name of the Publisher**
Industrial Management	L.C. Jhamb	Everest
Production System, Planning, Analysis & Control	James C. Rigs	N.Y.Wiley& Sons
Industrial Engineering and Management	O.P. Khanna	DhanpatRai& Sons
Work Study	ILO	ILO Geneva
Jigs & Fixtures	P. H. Joshi	--
Production Engineering	P.C. Sharma	--
Introduction to Jigs and Fixtures Design	Kempster	--
Modern Production and Operations Management	Baffna , Sarin	--
Total productive maintenance	Terry Wireman	Industrial press inc.
Toyota production system	Taiichiohno	Productivity Press
Production Technology	R.N. Pandey, S.P. Goyal	Foundation Publishing

Course Outcomes :-

CO1 : Understand the concept of machining, various machine tool and analyze the various forces acting during machining.

CO2 : Study the various tool materials, cutting fluids and concept of tool life used in machining operations.

CO3 : Understand the concept of metrology, inspection tools with their applications.

CO4 : Understand the various methods used to make threads and study of different jigs and fixtures used in machine tools with their materials.

K.K. UNIVERSITY 803115 NALANDA

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

CO5 : Explain about different gear generation and production processes and gear finishing processes used in Industries.

ELECTIVE - (ANY ONE)

Course Code	**PME 3204 A**
Course Title	ALTERNATE ENERGY SOURCES AND MANAGEMENT
Number of Credits	4 (L: 3, T: 1, P: 0)
Prerequisites	NIL
Course Category	PC

Course Contents:

Unit-01: Introduction to Energy Sources

Introduction: Major sources of energy: Renewable and Non-renewable, Primary and secondary energy sources.

Energy Scenario: Prospects of alternate energy sources. Need of Alternate energy sources.

Unit-02: Solar Energy

Principle of conversion of solar energy into heat and electricity

Solar Radiation: Solar Radiations at earth's surface

Solar Radiation Geometry: Declination, hour angle, altitude angle, incident angle, zenith angle, solar azimuth angle

Applications of Solar energy:-

- Construction and working of typical flat plate collector and solar concentrating collectors and their applications, advantages and limitations
- Space heating and cooling.
- Photovoltaic electric conversion.
- Solar distillation, Solar cooking and furnace.
- Solar pumping and Green House.

Agriculture and Industrial process heat. (no derivations and numericals)

Unit-03: Wind Energy

Basic Principle of wind energy conversion.

Power in wind, Available wind power formulation, Power coefficient, Maximum power

Main considerations in selecting a site for windmills.

Advantages and limitations of wind energy conversion.

Classification of windmills

Construction and working of horizontal and vertical axis wind mills, their comparison

Main applications of wind energy for power generation and pumping.

Unit-04: Energy from Biomass

Common species recommended for biomass.

Methods for obtaining energy from biomass

K.K. UNIVERSITY 803115 NALANDA

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

Thermal classification of biomass
a) Gasified, b) Fixed bed and fluidized
Application of gasifier
Biodiesel production and application
Agriculture waste as a biomass
Biomass digester
Comparison of Biomass with conventional fuels

Unit-05: Energy Conservation & Management:-

Global and Indian energy market
Energy scenario in various sectors and Indian economy
Need and importance of energy conservation and management
Concept of Payback period, Return on investment (ROI), Life cycle cost, Sankey diagrams, specific energy consumption.

Unit-06: Energy Conservation Techniques

Distribution of energy consumption, Principles of energy conservation, Energy audit, Types of audit
Methods of energy conservation, Co-generation and its application, Combined cycle system,
Concept of energy management, Study of different energy management techniques like

- Analysis of input
- Reuse and recycling of waste
- Energy education
- Conservative technique and energy audit

Unit-07: Economic approach of Energy Conservation

Costing of utilities like steam, compressed air, electricity and water. Ways of improving boiler efficiency
Thermal insulation, Critical thickness of insulation, Waste heat recovery systems, their applications, criteria for installing unit.
An introductory approach of energy conservation in compressed air, refrigeration, air conditioning, pumps and fans.

Text/ Reference Books:		
Titles of the Book	**Name of Authors**	**Name of the Publisher**
Non conventional energy Resources	DrB.H.Khan	Tata McGraw Hill
Non conventional energy sources	G. D. Rai	Khanna publication
Solar energy	S. P. Sukhatme	Tata McGraw Hill
Solar energy	H. P. Garg	Tata McGraw Hill
Power plant engineering	ArroraDomkundwar	DhanpatRai& co.
India- The energy sector	P.H. Henderson	University Press
Industrial energy conservation	D. A. Ray	Pergaman Press
Energy management handbook	W. C. Turner	Wiley Press
Non-conventional energy source	K. M. Mittal	-
Energy resource management	Krupal Singh Jogi	Sarup and sons
Energy Resources and Systems	Ghosh, Tushar K., Prelas, Mark	Springer

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Nalanda - 803115 (Bihar)

Alternate Energy Sources & Management	-	-

Course Outcomes:

CO1	Understand the different energy sources and energy conservation methods, energy management techniques.
CO2	Understand the solar energy and its uses.
CO3	Understand the wind energy and biomass energy.
CO4	Understand the renewable energy sources and working of Nuclear power plants.
CO5	Understand the geothermal energy and its sources.

ELECTIVE - (ANY ONE)

Course Code	**PME 3204 B**
Course Title	MATERIAL HANDLING SYSTEMS
Number of Credits	4 (L: 3, T: 1, P: 0)
Prerequisites	NIL
Course Category	PC

Course Contents:

Unit-01: Introduction to Material Handling System

Main types of material handling equipment's & their applications, types of load to be handled, types of movements, methods of stacking, loading & unloading systems, principles of material handling systems.

Unit-02: Hoisting Machinery &Equipment's

Construction, working & maintenance of different types of hoists such as lever operated hoist , portable hand chain hoist, differential hoists, worm geared and spur geared hoists, electric & pneumatic hoists, jumper.

Construction, working & maintenance of different types of cranes such as rotary cranes, trackless cranes, mobile cranes, bridge cranes, cable cranes, floating cranes & cranes traveling on guiderails.

Construction, working & maintenance of elevating equipment such as stackers, industrial lifts, freight elevators, passenger lifts, and mast type's elevators, vertical skip hoist elevators.

Unit-03: Conveying Machinery

Construction, working & maintenance of traction type conveyors such as belt conveyors, chain conveyors, bucket elevators, escalators.

Construction, working & maintenance of traction less type conveyors such as gravity type conveyors, vibrating & oscillating conveyors, screw conveyors, pneumatic & hydraulic conveyors, hoppers gates &feeders.

Unit-04: Surface Transportation Equipment

Construction, function, working of trackless equipment such as hand operated trucks, powered trucks, tractors, AGV- Automatic Guided vehicle, industrial Trailers.

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Construction, function, working of cross handling equipment such as winches, capstans, Turntables, Transferable, monorail conveyors.

Unit-05: Components of material handling systems

Flexible hoisting appliances such as welded load chains, roller chains, hemp ropes, steel wire ropes, fastening methods of wire & chains, eye bolts ,lifting tackles lifting & rigging practices.

Load handling attachments.

a) Various types of hooks-forged, triangular eye hooks, appliances for suspending hooks,
b) Crane grab for unit & piece loads
c) Electric lifting magnet, vacuum lifter.
d) Grabbing attachment for loose materials
e) Crane attachment for handling liquids / molten metals

Arresting gear & Brakes.

a) Arresting gear – construction &working
b) Construction & use of electromagnetic shoe brakes Thruster operated shoe brakes, control brakes.

Unit-06: Mechanism used in material handling equipment

Steady state motion, starting & stopping of motion in following mechanisms.

Hoisting mechanism

- Lifting Mechanism
- Traveling Mechanism
- Slewing Mechanism

Rope & chain operated Cross- Traverse Mechanism.

Unit-07: Selection of material handling equipment

Factors affecting choice of material handling equipment such as type of loads, hourly capacity of the unit, direction & length of travel, methods of stocking at initial, final & intermediate points, nature of production process involved, specific load conditions & economics of material handling system.

Text / Reference Books:		
Titles of the Book	**Name of Authors**	**Name of the Publisher**
Material handling equipment	N. Rundenko	Peace Publisher, Moscow
Material handling equipment	M. P. Alexandrov	MIR Publisher, Moscow
Material handling	Y. I. Oberman	MIR Publisher, Moscow
Material handling equipment	R. B. Chowdary& G. R. N. Tagore	Khanna Publisher, Delhi
Material handling (Principles & Practice)	Allegri T. H.	CBS Publisher, Delhi
Plant layout & materials handling	Apple j. M	JohnWiley Publishers.
Material handling Hand book	Bolz and others	- -
Encyclopedia of materials handling	Daylas R. W. Pergaman, Berlin	- -
Material handling	Immer J. R.	McGraw Hill, New York

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Material handling equipment	Parameswaran M. A.	C.D.C. in Mechanical Engg., I.I.T., Chennai
Material Handling Cyclopedia	Roy V. Wright, John G. Little, Robert C. Augur	Kessinger Publishing
Manufacturing facilities design and material handling	Matthew P. Stephens	
Material Handling System	-	-

ELECTIVE - (ANY ONE)

Course Code	**PME 3204 C**
Course Title	REFRIGERATION AND AIRCONDITIONING
Number of Credits	4 (L: 3, T: 1, P: 0)
Prerequisites	NIL
Course Category	PC

Course Contents

Unit-01: Basics of Refrigeration

Definition of refrigeration.
Necessity of refrigeration

Methods of refrigeration:- Ice refrigeration
Refrigeration by expansion of air Refrigeration by throttling of gas Vapour refrigeration system Steam jet refrigeration system

Non-conventional methods of refrigeration like Vortex tube, Pulse tube refrigeration, solar refrigeration

Concept of heat engine, heat pump and refrigerator.
Unit of refrigeration, C.O.P. and refrigerating effect.
Major application areas of R.A.C. like domestic, commercial and industrial.

Unit-02: Refrigeration Cycles

Reversed Carnot Cycle and its representation on PV and TS diagram.
Air Refrigeration Cycles:-

- Bell Coleman air refrigerator, it's representation on PV and TS diagram, types and applications like air craft refrigeration using simple air cooling system..
- (Simple numerical on Reversed Carnot cycle.)

Vapour Compression Cycle(V.C.C):-

-principle, components, Representation on P-H and T-S diagram, effects of wet compression, dry compression, calculation of COP, Effect of superheating, undercooling, suction pressure and discharge pressure, Actual V.C.C., (simple numerical), Methods of

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improving COP (no description).

- Introduction to multistage V.C.C., its necessity, advantages.

Vapour Absorption system :-

- Principle, components and working of aqua- ammonia system (simple &practical)

Li-Br Absorption System Electrolux Refrigeration System, Desirable properties of Refrigerant and absorbent used in Vapour Absorption System.

Comparison of above Refrigeration Cycles.

Unit-03: Refrigerants

Classification of refrigerants.
Desirable properties of refrigerants.
Nomenclature of refrigerants.
Selection of refrigerant for specific applications.
Concept of Green House Effect, Ozone depletion, Global warming.
Eco-friendly refrigerants like R-134a, hydrocarbon refrigerants etc.

Unit-04: Equipment selection

Components of Vapour Compression Refrigeration System
Compressors:

- Classification, Construction and working of open type, hermetic, centrifugal, rotary, screw and scroll compressor and their applications.

Condensers:

- Classification, description of air cooled and water cooled condensers, comparison and applications
- Evaporative condensers.

Expansion devices:

- Types:-Capillary tube, automatic, thermostatic and their applications

Evaporators and chillers:-

- Classification of evaporators Construction and working of Bare tube, Plate surface, finned, shell and tube, flooded and dry expansion evaporator
- Capacity of evaporator and their applications
- Classification of chillers
- Construction and working of dry expansion Chillers and flooded chillers and their applications.

Selection criteria for Vapour compression refrigeration system components for the following applications:

Water coolers, ice plants, cold storage, domestic refrigerator

Unit-05: Psychrometry

Definition and necessity of air conditioning.
Properties of Air, Dalton's law of partial pressure
Psychrometric chart
Psychrometric processes, Bypass Factor, ADP, concept of SHF, RSHF, ERSHF,GSHF
Adiabatic mixing of Airstreams
Simple numerical using Psychrometric chart
Equipments used for Air-conditioning like humidifier, dehumidifier, filter, heating and cooling coils.

Unit-06: Comfort conditions and cooling load calculations

Thermal exchange of body with environment
Factors affecting human comfort
Effective temp. and comfort chart
Components of cooling load- sensible heat gain and latent heat gain sources

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Nalanda - 803115 (Bihar)

Unit-07: Air- conditioning systems

Classification of A.C. systems
Industrial and commercial A.C. systems
Summer, winter and year round A.C. systems
Central and unitary A.C. systems
Application areas of A.C. systems

Unit-08: Air distribution systems

Duct systems:-

- Closed perimeter system, extended plenum system, radial duct system, duct materials, requirement of duct materials, lossesin ducts

Fans and Blowers:-

- Types, working of fans and blowers

Air distribution outlets:-

- Supply outlets, return outlets, grills, diffusers

Insulation: -

- Purpose, properties of insulating material, types of insulating materials, methods of applying insulation.

Text / Reference Books:		
Titles of the Book	**Name of Authors**	**Name of the Publisher**
Refrigeration and Air Conditioning	R.S.Khurmi	S.Chand and Co
Refrigeration and Air Conditioning	Arrora and Domkundwar	Dhanpat Rai and Sons
Refrigeration and Air Conditioning	Manohar Prasad	New Age Publications
Refrigeration and Air Conditioning	P.N.Ananthanarayanan	Tata McGraw Hill
Principles of Refrigeration	Roy Dossat	Pearson Education
Commercial Refrigeration	Edwin P. Anderson	Taraporevala Sons & Co
Refrigeration and Air Conditioning	Ahmadul Ameen	Prentice Hall-India
Refrigeration and Air Conditioning	C.P.Arora	Tata McGraw Hill
Refrigeration & Air-Conditioning	Biswajet Ranjan / Anand Pal	Foundation Publishing

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ELECTIVE - (ANY ONE)

Course Code	**PME 3204 D**
Course Title	CAD-CAM & AUTOMATION
Number of Credits	4 (L: 3, T: 1, P: 0)
Prerequisites	NIL
Course Category	PC

Course Contents

Unit-01: Introduction to CAD/CAM
Computers in industrial manufacturing. Product Cycle, CAD/CAM CAD/CAM hardware:-basic structure, CPU, Memory, I/O devices, Storage, devices and system configuration.

Unit-02: Geometric Modelling
Requirement of geometric modelling, Types of geometric models. Geometric construction method-sweep, solid modelling- Primitives & Boolean operations, free formed surfaces (Classification of surface only)
(No numerical treatment)

Unit-03: Introduction to computer numerical Control
Introduction-NC, CNC, DNC, Advantages of CNC, The coordinate system in
CNC, Motion control system - point to point, straight line, Continuous path (Contouring). Application of CNC.

Unit-04: Part programming
Fundamentals, manual part programming, NC –Words, Programming format, part programming, use of subroutines and do loops, computer aided part programming (APT).

Unit-05: Industrial Robotics

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Berauti, Nepura, Bihar Sharif
Nalanda - 803115 (Bihar)

Introduction, physical configuration, basic robot motions, technical features
Such as –work volume, precision and speed of movement, weight carrying capacity, drive system, End effectors, robot sensors.
Application – Material transfer, machine loading, welding, spray coating,

Unit-06: Automation

Basic elements of automated system, advanced automation functions, levels of automation.
Flexible manufacturing system :-Introduction, FMS equipment, FMS application, Introduction to CIM

Text / Reference Books:		
Titles of the Book	**Name of Authors**	**Name of the Publisher**
CAD/CAM Principles and Applications	P.N.Rao	Tata McGraw-Hill
CAD/CAM/CIM	RadhaKrishna P. & Subramanyam	Wiley Eastern Ltd
CNC Machine	B.S. Pabla and M. Adithan	New age International(P)Ltd
Computer Aided design and manufacturing	Groover M.P. & ZimmersJr	Prentice hall of India
Computer Aided design and manufacturing	Lalitnarayan, M. Rao	PHI
CAD-CAM & Automation	S.M. Kiran / S.P. Singh	Foundation Publishing

Course Code	**PME 3201 P**
Course Title	DESIGN OF MACHINE ELEMENTS
Number of Credits	2 (L: 0, T: 0, P: 3)
Prerequisites	NIL
Course Category	PC

Course Contents

Term Work Skills to be developed:
Intellectual skills:

1. Understand the basic philosophy and fundamentals of Machine Design.
2. ApplyandusethebasicknowledgeofearliersubjectslikemechanicalEngineering.materials,strength of materials and theory of machines.
3. Analyse and evaluate the loads, forces, stresses involved in components and subassemblies and decide the dimensions.
4. Understandthemodesoffailuresofm/ccomponentsanddecidethedesigncriteriaandequations.
5. Understand the concept of standardization and selecting standard components.
6. Understand the methods of computer aided design practices.

Motor skills:

1. Draw the components assembly as per the designed dimensions.
2. Modify drawings and design as per requirement.
3. Use the different design software.

Use different design data books and IS codes.

S.No	List of Assignments / Term Work :
1	Assignment on selection of materials for given applications [at least five applications should be covered] using design data book. List the mechanical properties of

	material selected.
2	Problems on design of simple machine parts like Cotter Joint, Knuckle Joint, Bell Crank Lever, Turn Buckle, Off – Set link, Arm of Pulley (One example on each component) with free hand sketches.
3	Design Project No. 1 Observe the system where transmission of power takes place through shaft, Keys, coupling, pulley and belt drive. Get the required information regarding power transmitted (power output by motor or engine etc.). By selecting suitable materials, design the shaft, key and coupling. Also select suitable Ball Bearing from Manufacture's catalogue. Prepare design report and assembly drawing indicating overall dimensions, tolerances, and surface finish. Also prepare bill of materials. (Activity should be completed in a group of five to six students)
4	Design Project No. 2 Observe the System where transmission of power takes place through power Screws. (e.g. Lead screw of lathe, feed screws of machine tools, Clamping screws, Toggle Jack screw, etc.) Get the required information regarding effort, clamping force, etc., and selecting suitable materials design screw, nut and different simple components in assembly. Prepare design report and assembly drawing indicating overall dimensions, tolerances and surface finish. Also prepare bill of materials.(Activity should be completed in a group of five to six students)
5	Assignments on design of Helical Springs, Screwed joints, Welded joints [one each] with free hand sketches.
6	CAD Drawing for project No 1 or 2 should be prepared in practical and print out should be attached along with respective drawing sheets
7	Survey of Prime movers – Electric motors / I.C. Engines available in the market along with specifications suitable for your design project. Survey report should be prepared with the relevant catalogue.

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Course Code	**PME 3202 P**
Course Title	INDUSTRIAL FLUID POWER LAB
Number of Credits	1 (L: 0, T: 0, P: 2)
Prerequisites	NIL
Course Category	PC

Course Contents

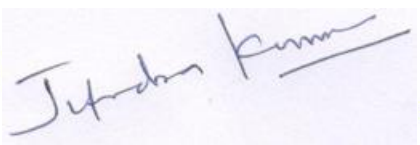
Skills to be developed:

Intellectual skills:

1. Prepare simple hydraulic & pneumatic circuits.
2. Compare the performance of hydraulic & pneumatic systems.
3. Identify the faults & suggest remedies in hydraulic & pneumatic circuits.
4. Select proper circuit considering its application

Motor skills:

1. Connect different components as per given drawing
2. Perform repairing and replacement of defective components in the circuit Draw the hydraulic and pneumatic circuits using symbols




List of Practical:

1) Demonstration of meter in and meter out circuit.
2) Demonstration of sequencing circuit.
3) Demonstration of hydraulic circuit for shaper machine.
4) Demonstration of pneumatic circuit for speed control of double acting cylinders.
5) Demonstration of pneumatic circuit for speed control of pneumatic motor.
6) Study of trouble shooting procedures of various hydraulic and pneumatic circuits.
7) Selection of circuit components for simple hydraulic and pneumatic circuits.

Mini Projects:

1) Survey of oil used for hydraulic circuits-specifications, manufacturer's names, costs etc.
2) Study of anyone mobile hydraulic system like in earthmoving equipments and its detailed report. OR

Study of any one stationary hydraulic system, like in any machine tool and its detailed report.

Course Code	PME 3204 P(A)
Course Title	ALTERNATE ENERGY SOURCES &MANAGEMENT LAB
Number of Credits	1 (L: 0, T: 0, P: 2)
Prerequisites	NIL
Course Category	PC

CONTENTS: PRACTICAL

1	• To collect information about global and Indian energy market.
2	• To perform an experiment on solar flat plate collector used for water heating.
3	• To study construction and working of photo voltaic cell.
4	• To study construction, working and maintenance of solar cooker.
5	• Visit to plant of solar heating system for hotel/hostel/railway station etc.
6	• To study construction and working of horizontal axis windmill or to visit a nearest wind farm.
7	• To visit a biomass/ biogas plant of municipal waste or elsewhere.
8	• Perform energy audit for workshop/Office/Home/SSI unit.
9	• Study of various waste heat recovery devices.

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Nalanda - 803115 (Bihar)

Course Code	PME 3204 P(B)
Course Title	MATERIAL HANDLING SYSTEMS LAB
Number of Credits	1 (L: 0, T: 0, P: 2)
Prerequisites	NIL
Course Category	PC

Course Contents

Skills to be developed:

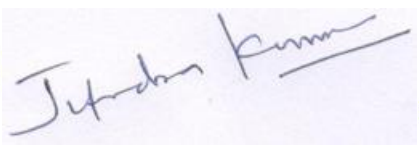
Intellectual Skills

2- Understand the working principle of equipment/devices.
3- Identify & name major component of material handling device.
4- Understand role of material handling equipment in the industrial process.
5- Understand & appreciate safety instrumentation for equipment.

Motors skills

1) Identify & select the material handling devices for a given application.
2) Operate the working model of material handling equipment.
3) Ability to implement preventive maintenance schedule of material handling devices.

List of Practical:



1) Study & demonstration of any one type of conveyor–belt, Screw, pneumatic, hydraulic.
2) Study and demonstration of any one type of crane (working model or actual).
3) Study and demonstration of fork lift truck (using electric drive or diesel engine) Or hoisting equipment.
4) Study of preventive maintenance schedule of any one major material handling equipment using operation manual.
5) Visit to coal handling plant of thermal power plant or cement industry to observe working of different types of bulk material handling devices (at least three equipment).Write report of the visit.

OR

Visit to steel industry or automobile manufacturing unit or sugar industry to observe different types of roller conveyors, Bucket elevators, overhead cranes load handling attachments, electric lifting magnet (at least 3 equipments). Write report of the visit

List of Practice Oriented Projects:

Note: Select any one mini project from following and submit report of the same (min. 5 pages)

1. Collect and write detail specifications of any two major material handling devices.
2. Collect and write information about manufacturer, Cost, Capacity range, availability, application of any one material handling equipment from the following.
    a) Hoisting equipment.
    b) Conveying equipment.
    c) Surface transportation equipment.
3. Collect photographs of ten different types of cranes used in industries. Write name and specific utility of each.
4. Collect photographs often different types of conveyers used in industries. Write name and specific utility of each
5. Write name of material handling devices and their utility after visiting any big industry near by area
6. Using internet collects and writes information about six major manufacturer of material handling equipment

Write report about testing of overhead crane for its lifting capacity.

K.K. UNIVERSITY 803115 NALANDA

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

Course Code	PME 3204 P(C)
Course Title	REFRIGERATION & AIR-CONDITIONING LAB
Number of Credits	1 (L: 0, T: 0, P: 2)
Prerequisites	NIL
Course Category	PC

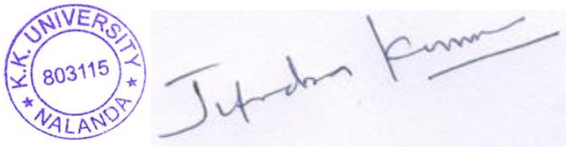
Course Contents

Skills to be developed:

Intellectual skills:

1. Identify various components of refrigeration and air conditioning equipment
2. Analyse cooling load based on application.
3. Interpret psychometric chart to find various properties of air.
4. Observe working of test rigs and calculate coefficient of performance.

Motor skills:



1. Handle various tools used for refrigeration and air conditioning plant maintenance
2. Use of temperature, pressure, energy measuring devices
3. Draw the layout of central Air conditioning plant
4. Perform cooling load calculations for different air conditioning applications
5. Selectanduseofdifferenttypesofinsulatingmaterialandsettingproce duresforapplying insulations

List of Practical:

1. Trial on water cooler test rig.
2. Trial on ice plant test rig.
3. Visit to cold storage
4. Demonstration of domestic refrigerator in View of construction, operation and controls used.
5. Demonstration of various controls like L.P./H.P. cut outs, thermostat, overload protector, solenoid valve used in RAC.
6. Identification of components of 'hermetically sealed compressor'.
7. Visit to repair and maintenance workshop in view of use of various tools and charging procedure.
8. Cooling load calculations for cabin, classrooms, laboratory, canteen and dairy plant, milk storage, small freezers (minimum one).
9. Trial on A.C. test rig.
10. Visit to central A.C. plant in view of ducting system, insulation system and Air distribution system (e.g. frozen food industry/ice- cream industry/mushroom plants/textile industries).
11. Trouble shooting of domestic refrigerator/window air-Conditione

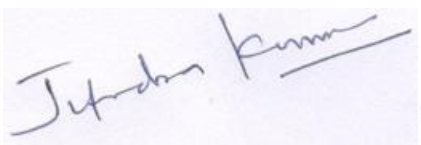
Course Code	PME 3204 P(D)
Course Title	CAD-CAM & AUTOMATION LAB
Number of Credits	1 (L: 0, T: 0, P: 2)
Prerequisites	NIL
Course Category	PC

Course Contents

Skills to be developed:

Intellectual Skills:

1. Interpret the various features in the menu of solid modeling package.
2. Synthesize various parts or components in an assembly.
3. Prepare cnc programmes for various jobs.
4. Understand the concept of finite element method.
5. Prepare a report of visits.




Motor skills:

1. Operate a turning center and a machining center.
2. Operate and use solid modeling packages for drawing of assemblies.
3. Draw sketches of assemblies for converting into solid models.
4. Handle various tools used in cnc.

List of Practical's:

1. Two assignments on CAD for 2D drafting (Using Auto CAD)
2. Two assignments on CAD for 3D Modeling. (Using any 3-D Modeling software like CATIA, ProE, Sdid works etc.)
3. Manufacturing one turning and one Milling component on CNC.
4. At least four assignments on part programming using subroutines do loops for turning and milling component.
5. Report writing on visit to industry having CNC machine.
6. Report writing on visit to industry having robot Application.
7. Report writing on visit to Industry having Automation in manufacturing.

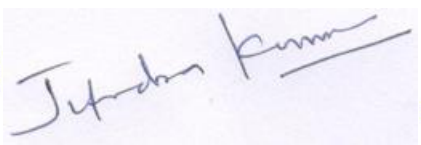
Course Code	PME 3205 S
Course Title	INDUSTRIAL PROJECT
Number of Credits	1 (L: 0, T: 0, P: 2)
Prerequisites	NIL
Course Category	PC

Course Contents

Part A-Project

A) batch of maximum 4 students will select a problem and then plan, organize & execute the project work of solving the problem in a specified duration. Student is expected to apply the knowledge &skills acquired. Batch may select any one problem/project work from following categories.

B) Fabrication of small machine / devices/ test rigs/ material handling devices/ jig & fixtures/ demonstration models, etc. Report involving aspects of drawing, process sheets, costing, Installation, commissioning & testing should be prepared and




submitted.
Design & fabrication of mechanisms, machines, Devices, etc. Report involving aspects of designing & fabricating should be prepared & submitted .

c) Development of computer program for designing and /or drawing of machine components, Simulation of movement & operation, 3D modeling, pick & place robots etc.
d) Industry sponsored projects- project related with solving the problems identified by industry should be selected. One person / engineer from industry is expected to work as co- guide along with guide from institution.
e) Literature survey based projects: Project related with collection tabulation, classification, analysis & presentation of the information. Topic selected must be related with latest technological developments in mechanical or mechatronics field, and should not be a part of diploma curriculum. Report should be of min 60pages.
f) Investigative projects-Project related with investigations of causes for change in performance or structure of machine or component under different constraints through experimentation and data analysis.
g) Maintenance based projects: The institute may have some machine/ equipment/ system which are lying idle due to lack of maintenance. Students may select the specific machines/equipment/system. Overhaul it, repair it and bring it to working condition. The systematic procedure for maintenance to be followed and the report of the activity are submitted.
h) Industrial engineering based project: Project based on work study, method study, methods improvement, leading to productivity improvement, data collection, data analysis and data interpretation be undertaken.
i) Low cost automation projects: Project based on hydraulic/pneumatic circuits resulting into low cost automated equipment useful in the identified areas.
j) Innovative/ Creative projects – Projects related with design, develop & implementation of new concept for some identified useful activity using PLC, robotics, non-conventional energy sources, CIM , mechatronics, etc.
k) Environmental management systems projects: Projects related with pollution control, Solid waste management, liquid waste management, Industrial hygiene, etc, Working model or case study should be undertaken.
l) Market research/ survey based projects: Projected related with identification of extent of demand, sales forecasting, Comparative study of marketing strategies, Comparative study of channels of distribution, Impact of variables on sales volume, etc. The project involves extensive survey & market research activities information to be collected through various mechanisms/tools & report is prepared.
m) Project based on use of appropriate technology particularly benefiting rural society or economically weaker section.

Project can be selected other than the area specified above. Project should provide viable and feasible solution to the problem identified. Report should be of min 50pages.

Part B- Seminar

K.K. UNIVERSITY 803115 NALANDA

Pro Vice Chancellor
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Nalanda - 803115 (Bihar)

Every student will prepare & deliver the seminar. Evaluation of seminar will be carried out by panel of at least three teaching staff from mechanical/ production /automobile department.

1. Selection of topic for the seminar should be finalized in consultation with teacher guide allotted for the batch to which student belongs.
2. Seminar report should be of min.10 & max. 20 pages & it should be certified by guide teacher and head of the department
3. For presentation of seminar, following guidelines are expected to be followed:-
    a) Time for presentation of seminar: 7 to 10 minutes/student.
    b) Time for question/answer: 2 to 3 minutes/student
    c) Use of audio visual aids or power point presentation is desirable.
4. Topic of the seminar should not be from diploma curriculum
5. Seminar can be on project selected by batch.

Skills To Be Developed:

Intellectual Skills

1. Design the related machine components &mechanism.
2. Convert innovative or creative idea into reality.
3. Understand & interpret drawings &mechanisms
4. Select the viable, feasible & optimum alternative from different alternatives.

Motors skills

1. Use of skills learnt in workshop practical.
2. Assemble parts or components to form machine or mechanisms.
3. Classify & analyze the information collected.
4. Implement the solution of problem effectively.

Notes:

1) Project group size: Maximum 4 students

2) Project report will be of minimum 40 pages unless otherwise specified.

3) Project diary should be maintained by each student.

2. Magazines:

1. Invention intelligence magazine
2. Popular mechanics Journals/Magazines

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