PURBANCHAL UNIVERSITY

FACULTY OF ENGINEERING

Course Structure of Bachelor in Bio-Medical Engineering

Effective from 2021 Batch

First Semester

S.N.	Subjects	C.H.	L	T	P	Internal		Final		Total
						Th.	P.	Th.	P	
1	Mathematics I	3	3	3	-	40	-	60	-	100
2	Physics	3	4	2	2	40	10	60	15	125
3	Computer Programming	3	3	1	3	40	30	60	20	150
4	Basic Electrical Engineering	2	2	1	1	20	25	30	-	75
5	Basic Electronics Engineering	3	3	1	3/2	40	25	60	-	125
6	Engineering Drawing	3	1	-	3	-	60	-	40	100
	Total	**17**	**16**	**8**	**10.5**					**675**

Second Semester

S.N.	Subjects	C.H.	L	T	P	Internal		Final		Total
						Th.	P.	Th.	P	
1	Mathematics II	3	3	3	-	40		60	-	100
2	Chemistry	3	3	2	2	40	10	60	15	125
3	Basic Mechanical Engineering	3	3	1	3	40	25	60	-	125
4	Electro Engineering Materials	3	3	1	-	40	25	60	-	125
5	Introduction to Computational System	3	3	1	3	40	25	60	-	125
6	Digital Electronics	3	3	1	3	40	25	60	-	125
	Total	**18**	**18**	**9**	**11**					**725**

Note: C.H.: Credit Hour L: Lecture T: Tutorial P: Practical Th: Theory

Third Semester										
S.N.	Subjects	C.H.	L	T	P	Internal		Final		Total
						Th.	P.	Th.	P	
1	Mathematics III	3	3	3	-	40		60	-	100
2	Bio-Engineering Materials and Components	4	4	1	-	40	-	60	-	100
3	Human Anatomy and Physiology I	4	4	1	3	40	25	60	-	125
4	Fluid Mechanics & Thermodynamics	3	3	1	-	40	-	60	-	100
5	Cell Biology and Immunology	3	3	1	3	40	25	60	-	125
6	Microprocessor	3	3	1	3	40	50	60	-	150
	Total	**20**	**20**	**8**	**9**					**700**

Fourth Semester										
S.N.	Subjects	C.H.	L	T	P	Internal		Final		Total
						Th.	P.	Th.	P	
1	Applied Mathematics	3	3	3	-	40		60	-	100
2	Applied Sociology	3	3	1	-	40		60	-	100
3	Electronic Devices and Circuits	3	3	1	3/2	40	25	60	-	125
4	Biomechanics	4	4	1	-	40	-	60	-	100
5	Biomedical Embedded System Design	3	3	1	3	40	25	60	-	125
6	Human Anatomy and Physiology II	4	4	1	3	40	25	60	-	125
	Total	**20**	**20**	**8**	**7.5**					**675**

Note: C.H.: Credit Hour L: Lecture T: Tutorial P: Practical Th: Theory

Fifth Semester										
S.N.	Subjects	C.H.	L	T	P	Internal		Final		
						Th.	P.	Th.	P	Total
1	Probability and Statistics	3	3	1	-	20	20	60	-	100
2	Numerical Methods	3	3	1	2	40	30	60	20	150
3	Implantable Devices	3	3	1	2	40	-	60	-	100
4	Control Systems	3	3	1	3	40	10	60	15	125
5	Tissue Device Interactions	**3**	3	1	-	40	-	60	-	100
6	Communication Systems	3	3	1	2	40	25	60	-	125
	Total	**18**	**18**	**6**	**9**					**700**

Sixth Semester										
S.N.	Subjects	C.H	L	T	P	Internal		Final		Total
						Th.	P.	Th.	P	
1	Engineering Economics	3	3	1	-	40	-	60	-	100
2	Medical Industry Management	3	3	1	-	40	-	60	-	100
3	Medical Imaging I	3	3	1	2	40	25	60	-	125
4	Biomedical Instrumentation I	4	4	1	2	40	25	60	-	125
5	Medical Electronics	3	3	1	2	40	25	60	-	125
6	Biomedical Digital Signal Processing	3	3	1	2	40	25	60	-	125
	Total	**19**	**19**	**6**	**8**					**700**

Note: C.H.: Credit Hour L: Lecture T: Tutorial P: Practical Th: Theory

Seventh Semester										
S.N.	Subjects	C.H.	L	T	P	Internal		Final		Total
						Th.	P.	Th.	P	
1	Organization & Project Management	3	3	1	-	40		60	-	100
2	Biomedical Instrumentation II	4	4	1	2	40	25	60	-	125
3	Medical Imaging II	3	3	1	2	40	25	60	-	125
4	Elective I	3	3	1	2	40	25	60	-	125
5	Elective II	3	3	1	2	40	25	60	-	125
6	Project	6	-	3	9	-	120	-	80	200
	Total	**22**	**22**	**5**	**14**					**800**

Eighth Semester										
S.N.	Subjects	C.H.	L	T	P	Internal		Final		Total
						Th.	P.	Th.	P	
1	Engineering Professional Practice	2	2	1	-	20	-	30	-	50
2	Elective III	3	3	1	2	40	25	60	-	125
3	Internship	3	3	1	-	-	60	-	40	100
4	Project	6	-	3	9	-	120	-	80	200
	Total	**14**	**14**	**3**	**8**					**475**

Total 150

Note: C.H.: Credit Hour L: Lecture T: Tutorial P: Practical Th: Theory

Purbanchal University

Faculty of Engineering

Biratnagar, Morang

Micro Syllabus and Model Question

Program: Bachelor in Biomedical Engineering

Semester: First

Effective from: 2021 (2078) Batch

S.N	Course code	Subjects	Credit Hours	Lecture/Week (Hrs)	Tutorial/Week (Hrs)	Practical /Week (Hrs)
First Semester						
1.		**Mathematics I**	**3**	**3**	**3**	**-**
2.		**Physics**	**4**	**4**	**2**	**2**
3.		**Computer Programming**	**3**	**3**	**1**	**3**
4.		**Basic Electrical Engineering**	**2**	**2**	**1**	**2/2**
5.		**Basics Electronics Engineering**	**3**	**3**	**1**	**1.5**
6.		**Engineering Drawing**	**3**	**1**	**-**	**3**
		Total:	**18**	**16**	**8**	**10.5**

Engineering Mathematics-I BEG101SH										
Year: I										Semester: I
Teaching Hours/week				Examination Scheme						Total Marks
				Internal		Final				
				Theory	Practical	Theory		Practical		
Cr	Theory	Tutorial	Practical			Duration	Marks	Duration	Marks	
3	3	3		40		3hrs	60	-	-	100

Objective: The main objective of the course is to provide the students a sound knowledge of calculus (differential and integral), vector algebra and analytic geometry through theoretical explanations and numerical examples via problem solving techniques and applications.

Micro-Syllabus

Chapter 1: Derivatives and their Application

1.1 Review of limit, continuity and differentiability

1.2 Tangents and Normals: Equation of tangents and normal to the curves, Angle between two curves, Pedal equations.

1.3 Higher Order Derivatives, and Leibnitz's Theorem: Leibnitz's Theorem (without proof) and its applications to numerical problems.

1.4 Power Series of Single valued functions: Taylor's series (without proof) and Maclaurin's series (without proof), expansion of trigonometric, exponential and logarithmic functions using Macluarin's series.

1.5 Indeterminate forms and L' Hospital's Rule (without proof): Indeterminate forms and use of L'Hospital's rule to find the limit.

1.6 Curvature: Radius and chord of curvature

1.7 Asymptotes of Cartesian Curves

1.8 Partial Derivatives: Euler's theorem (proof only for two variables) and its applications.

1.9 Extreme values of functions of two and three variables: Criterion for extreme values, use of Lagrange's Multiplier.

Chapter 2: Antiderivatives and its Applications

2.1 Review of indefinite and definite integrals

2.2 Properties of definite integrals

2.3 Improper Integrals

2.4 Differentiation under integral sign: Lebinitz's Integral Rule (statement only) and problem related to constant limit of integration.

2.5 Reduction formula and Beta Gamma functions: Reduction of

$$\int x^n e^x dx, \quad \int \sin^n x\, dx, \quad \int \cos^n x\, dx, \quad \int \tan^n x\, dx, \quad \int cosec^n x\, dx,$$

$$\int \sec^n x\, dx \quad \int \cot^n x\, dx$$

Definition, properties, relation between Beta and Gamma function (without proof), numerical application of Beta Gamma function.

2.6 Applications of integrals: ideas of curve tracings; area, arc-length, volume and surface area in cartesian form: Basic concept of curve tracing related to ellipse, parabola, astroid, hypocycloid and loops generating Cartesian curves, curves bounded by horizontal and vertical assymptotes. Arc length, Area, Surface area and volume of solid of revolution related to above curves.

2.7 Multiple Integrals: Double Integral in Cartesian form; Triple Integral in rectangular form.

2.8 Change of order of integration in double integral: Cartesian form only.

Chapter 3: Plane Analytic Geometry

3.1 Translation and Rotation of axes.

3.2 Parabola: standard equations, tangent and normal: Standard equation of parabola, equation of tangents and normal, condition of tangency and condition of normality to the standard equations of parabola and related numerical problems.

3.3 Ellipse and Hyperbola: Standard Equations, foci, directrices, latera recta, equations of tangent and normal: Standard equation of ellipse and hyperbola, equation of tangents and normal, condition of tangency and condition of normality to the standard equations of ellipse and hyperbola and related numerical problems.

3.4 General Equation of conic sections.

Chapter 4: Vector Algebra

4.1 Review of product of two vectors.

4.2 Product of three and four vectors with applications.

4.3 Reciprocal System of vector triads.

4.4 Vector Equation of lines (parametric form, symmetric form and related numerical problems) and planes in space (line of intersection of two planes and angle between two planes) by vector method.

REFERENCE BOOKS:

1. M. B. Singh and B. C. Bajracharya, *Differential Calculus*, Sukunda Pustak Bhawan, Kathmandu, Nepal.
2. G. B. Thomas and R. L. Finney, *Calculus and Analytic Geometry*, Addison Wesley Publishing Company.
3. M. B. Singh and B. C. Bajracharya, *A textbook of Vector Analysis*, National Book Center, Kathmandu, Nepal
4. D. G. Zill an M. R. Cullen, *Advanced Engineering Mathematics*, 3rd Edition, Jones and Bartlett Publishers Inc.
5. E. Kreyszig , *Advanced Engineering Mathematics* , 9th Edition, John Wiley and Sons, Inc.
6. G. D. Pant and G. S. Shrestha, *Integral Calculus and Differential Equation*, Sunila Prakashan, Kathmandu, Nepal.
7. S. P. Shrestha, H. D. Chaudhary and P. R. Pokhrel, *A Text book of Engineering Mathematics*- Volume I, Vidhyarthi Pustak Bhandar, Kathmandu, Nepal.
8. S. P. Pradhanang and N. B. Khatakho, *Engineering Mathematics*- Volume I, Vidhyarthi Pustak Bhandar, Bhotahity, Kathmandu, Nepal.

Evaluation Scheme

Marks Division

Question Type	No. of Questions	Marks	Total Marks
Short	10	2	20
Long	10	4	40

Chapter wise marks division in final examination

SN	Chapter	Number of short questions	Number of long questions	Total
1	Derivatives and their Application	3	3	6
2	Antiderivatives and its Applications	4	3	7
3	Plane Analytic Geometry	2	2	4
4	Vector Algebra	1	2	3
Total		10	10	20

Notes:

- Three long questions with one "OR" and three short questions from 1.2 to 1.9 and each question from different topics.
- One long question and two short questions from 2.2 to 2.5; one long question with "OR" and two short questions from 2.6; one long question from 2.7 to 2.8.
- One long and one short questions from 3.1 to 3.2; one long with "OR" and one short question from 3.3 to 3.4
- Two long questions and one short question from 4.2 to 4.4 with one "OR" long question.

PURBANCHAL UNIVERSITY

I SEMESTER (MODEL QUESTION)

LEVEL:- B. E. Civil / Computer / Electronics, Communication and Automation / Electrical / B. Architecture I/I

SUBJECT:- BEG101SH, Engineering Mathematics-I

FULL MARKS:- 60

TIME:- 03:00 hrs.

PASS MARKS:- 24

Group A

Attempt all questions. [10 x 2 = 20]

1) State L' Hospital's rule. What are indeterminate forms?

2) Define asymptotes of a curve. Find the vertical asymptotes of $x^2y - 9y + 3 = 0$.

3) Define curvature and radius of curvature of a curve. Illustrate with figure.

4) Integrate: $\int_0^{\frac{\pi}{2}} \frac{\sin x}{\sin x+\cos x}\, dx$

5) Find the area of the region bounded by $y = x^2$, $x = 2$ and x-axis.

6) Evaluate the improper integral $\int_0^{\infty} \frac{1}{x^2+9} dx$.

7) Discuss the symmetry for the curve $x^3 + y^3 = 7xy$ with reasons.

8) Define foci, centers and directrices of an ellipse. Illustrate with a figure.

9) Find the equation of tangent to the parabola $y^2 = x$ at (1, 1)

10) Find the value of n if $2\vec{i}\text{-}\vec{j} + \vec{k}$, $\vec{i} + 2\vec{j} + 3\vec{k}$ and $3\vec{i} + 2\vec{j} + n\vec{k}$ are coplanar.

Group B

Attempt all questions. **[10 x 4 = 40]**

11) If $y = (\text{Sin}^{-1}x)^2$, prove that $(1-x^2)\,y_{n+2} - (2n+1)\,x\,y_{n+1} - n^2\,y_n = 0$

12) Applying the Maclaurin's theorem find the expansion of $logsecx$ as far as the term x^6 and hence find the expansion of $tanx$.

13) Find the pedal equation of the curve $r^2 = a^2cos2\theta$.

OR

Find the minimum value of $x^2 + y^2 + z^2$ when $\frac{1}{x} + \frac{1}{y} + \frac{1}{z} = 1$

14) Use Gamma function to evaluate: $\int_0^a x^3(a^2 - x^2)^{5/2}\, dx$.

15) Find the area of the hypocycloid $(\frac{x}{a})^{2/3} + (\frac{y}{b})^{2/3} = 1$

OR

Prove that the volume and surface area of a sphere of radius r is $\frac{4}{3}\pi r^3$ *and* $4\pi r^2$, respectively.

16) Evaluate $\int_0^\infty \int_x^\infty \frac{e^{-y}}{y} dydx$ by changing the order of integration.

17) Transform the equation $3x^2 - 2xy + 4y^2 + 8x - 10y + 8 = 0$ by translating the axis in to an equation with linear terms missing.

18) Find the equations of tangents drawn from the point $(-15, -7)$ to the ellipse $\frac{x^2}{4} + \frac{y^2}{9} = 1$. Find the acute angle between them.

OR

Find the axis, the vertex, latus rectum and focus of the parabola $16x^2 - 24xy + 9y^2 - 104x - 172y + 44 = 0$.

19) Find the linear relation between four vectors $\vec{a}, \vec{b}, \vec{c}, \vec{d}$.

20) Find the equation of plane through $(1,2,3)$ and $(3,2,1)$ perpendicular to the plane $4x - y + 2z = 7$ by vector method.

OR

Find the equation of the line of intersection of the planes 3x - 6y -2z = 15 and 2x - y + 3z = 5 in symmetric form by using vector method

PURBANCHAL UNIVERSITY
Faculty of Engineering
Micro Syllabus (New Course)

Physics (BEG - - - SH)
For BE (Civil/ Electrical/ Electronics, Communication & Automation/Computer/Biomedical/Geomatics)

Teaching Schedule Hours/Week				Examination Scheme				
Cr	Theory	Tutorial	Practical	Internal Assessment		Final		Total Marks
				Theory	Practical	Theory	Practical	
4	4	2	2	40	10	60	15	125

S. N.	Topics	Lecture hours	Sub topics	Depth
1	**Mechanical oscillation**	**5 hrs**	1.1 Physical Pendulum: Interchangeability of point of suspension and oscillation, minimum and maximum time period, Torsion pendulum	Definition, derivation, Proof, explanation, example,
			1.2 Free oscillation	Definition, explanation, example
			1.3 Damped oscillations: angular frequency, critical damping, overdamping, and under damping	Definition, explanation, example
			1.4 Forced oscillation: Damped oscillation with a periodic driving force, Resonance, and its consequences	Definition, explanation, example
2	**Ultrasonics**	**3 hrs**	2.1 Introduction; Production of ultrasonics: Mechanical method (introduction only); Piezoelectric generator; Magnetostriction oscillator	Definition, explanation, example
			2.2 Detection of ultrasonic; Applications of ultrasonics	explanation, example
			2.3 Acoustic grating: Determination of velocity of sound in a liquid	Definition, explanation, example
3	**Relativity**	**5 hrs**	3.1 Frame of reference; Inertial and non-inertial frames of references	Definition, explanation, example
			3.2 Postulates of the special theory of	explanation

			relativity	
			3.3 Lorentz transformation equations; Length contraction; Time dilation. Twin paradox	Definition, derivation, Proof, explanation, example,
			3.4 Simultaneity; Relativistic mass; Mass and energy	Definition, derivation, Proof, explanation, example,
			3.5 Space-time diagram.	explanation
4	**Optics**	**Geometrical optics 3 hrs**	4.1.1 Sign Convention (Cartesian coordinate system), Equivalent focal length of two thin lenses separated by a finite distance; Cardinal points of an optical system.	Definition, derivation, Proof, explanation, example,
			4.1.2 Chromatic aberration in a lens (longitudinal chromatic aberration), Condition for achromatism of two thin lenses in contact and separated by a finite distance	Definition, derivation, Proof, explanation, example,
		Fiber optics 3 hrs	4.2.1 Introduction; Step index optical fiber, Graded index optical fiber.	Definition, explanation, example,
			4.2.2 Self-focusing; Acceptance angle; Numerical aperture.	derivation, explanation, example,
			4.2.3 Application of optical fiber.	explanation, example,
	10 hrs	**Interference**	**Interference:** Young's double-slit experiment; Analytical treatment of interference; Fresnel's Biprism; Interference in thin-film: reflected and transmitted light; Wedge shape thin film: determination of fringe width; Newton's rings: reflected and transmitted light; determination of the wavelength of light and refractive index of the liquid.	Definition, derivation, Proof, explanation, example,
		Diffraction	**Introduction:** Fresnel and Fraunhofer diffraction; Faunhofer's diffraction at a single slit; Intensity in single diffraction pattern (qualitative); Fraunhofer diffraction at double slit; Diffraction grating; Holography and Interference pattern	Definition, explanation, example
		Polarization	Malus Law, Double refraction; Nicol	Definition,

			prism Quarter wave plate; Half-wave plate; Optical activity; Specific rotation	explanation, example
5	**Electrostatics**	**7 hrs**	5.1 Electric field intensity, Electric dipole and dipole moment, Electric field intensity due to a dipole (at an axial and equatorial line), Electric quadrupole and quadrupole moment, Electric field intensity due to quadrupole (at an axial line)	Definition, derivation, Proof, explanation, example,
			5.2 Electric potential, Electric potential due to a dipole, Electric potential due to quadrupole (at an axial line)	Definition, derivation, Proof, explanation, example,
			5.3 Electric flux, Gauss's law (statement only), Application of Gauss's law: Spherical charge distribution (non-conducting and conducting)	Definition, Derivation explanation, example,
			5.4 Ink-jet printing; Volcanic lightning	Definition, explanation,
			5.5 Capacitor and capacitance, Parallel plate capacitor and Cylindrical capacitor, Supercapacitor (introduction only), Energy stored in electric field and energy density	Definition, explanation, example,
			5.6 Polar and non-polar dielectrics, Polarization, Gauss's law, and dielectrics (Relation between **E**, **D,** and **P**)	Definition, explanation, example,
6	**Direct current**	**3 hrs**	6.1 Electric Current; Current Density, Drift Speed	Definition, explanation, example,
			6.2 Effect of Temperature on Resistance and Resistivity; Microscopic view of Ohm's Law.	Definition, explanation, example,
			6.3 Superconductivity, Critical Magnetic field, ,The Meissner Effect, Types of Super conductors	Definition, explanation, example,
7.	**Magnetism and Magnetic field**	**8 hrs**	7.1 Magnetic properties of matter; Domain theory; Ferromagnetism; Saturation and hysteresis	Definition, explanation, example,
			7.2 Lorentz force; Cyclotron; Cyclotron frequency; Synchrotron; Hall effect	Definition, derivation, Proof, explanation, example,
			7.3 Current carrying coil as a magnetic	Definition,

			dipole; Magnetic field produced by a magnetic dipole	derivation, Proof, explanation, example,
			7.4 Faraday's law of electromagnetic induction; Lenz's law; Electric guitars	Definition, explanation, example,
			7.5 Self-induction; Inductance of a Solenoid; Metal detector	Definition, explanation, example,
			7.6 Eddy currents; Induction stoves	Definition, explanation, example,
			7.7 LR circuit, Energy stored in magnetic field; Energy density of magnetic field.	Definition, derivation, Proof, explanation, example,
			7.8 Induced Magnetic Field; Displacement Current	Definition, explanation, example,
8	**Electromagnetic waves**	**5 hrs**	8.1 Gauss divergence theorem and Stoke's theorem (statement only).	Definition, explanation, example,
			8.2 Maxwell's equation (integral to differential form); Equation of continuity.	Definition, derivation, explanation, example,
			8.3 Wave equation in free space and medium.	Definition, derivation, explanation, example,
			8.4 Speed of electromagnetic wave; Ratio of electric field and magnetic field.	Definition, explanation, example,
			8.5 Poynting vector	Definition, explanation, example,
9	**Quantum Mechanics**	**5 hrs**	9.1 Newtonian mechanics and Quantum mechanics	explanation, example,
			9.2 Matter wave: de-Broglie wave equation; Uncertainty Principle (qualitative); Phase velocity and group velocity: relation between phase velocity and group velocity	Definition, explanation, example,
			9.3 Wave function; Physical	Definition,

			interpretation of the wave function	explanation, example,
			9.4 Schrodinger wave equation (time-independent and time-dependent)	Definition, derivation, explanation, example,
			9.5 Applications of Schrodinger wave equation: Particle in one dimensional infinite potential well; Normalization and probability density; Potential barriers and Tunneling effect (transmission coefficient qualitative); Application of Tunneling	Definition, derivation, explanation, example,
10	**Non-Destructive Testing**	**3 hrs**	10.1 Introduction; Methods of non-destructive testing: Magnetic method; Electrical method; Radiographic method; Ultrasonic method; Thermal method	Definition, explanation, example,
			10.2 Comparisons of γ-ray radiography and X-ray radiography; Thermography	Definition, explanation, example,

Reference Books:

1. Halliday, Resnick, and Walker-**Fundamentals of Physics, 6th Edition**, John Wiley & Sons
2. Vasudeva A.S.-**Modern Engineering Physics**, S. Chand & Company Ltd, New Delhi
3. Subrahmanyam and Brij Lal-**A Text Book of Optics,** S. Chand & Company Ltd, New Delhi
4. B.K. Sapkota, B. Pokharel and B. K. Bhattarai**, Fundamentals of Engineering Physics**, Benchmark Publication, Kathmandu.
5. Sears and Zemansky's-**University Physics with Modern Physics, 12th Edition**, Pearson Education.
6. C. L. Arora-**BSc Practical Physics**, S. Chand & Company Ltd.
7. B. K. Sapkota and B. Pokharel**, Engineering Practical Physics**, Benchmark Publication, Kathmandu.

S. N.	Topics	Time allocation	Marks	Types of questions		
				Very short	Short	Long
1	Mechanical oscillation/relativity	10 hrs	14	1	1	1
2	Ultrasonics	3 hrs	4		1	
3	Geometrical Optics/Physical Optics	13 hrs	18	1	1 or 1	1
4	Fiber optics	3 hrs	4		1	
5	Electrostatics/ Direct current	10 hrs	14	1	1	1
6	Magnetism and Magnetic field/	13 hrs	14	1	1	1

	Electromagnetic waves					
7	Quantum Mechanics	5 hrs	6	1	1	
8	Non-Destructive Testing	3 hrs	4		1	
	Total	**60 hrs**	**60/78**	**4/5**	**7/9**	**3/4**

There will be 4 questions in very short type, carrying 2 marks each. There must be at least 2 theoretical questions and 2 compulsory numerical.

There will be 7 questions in **short** type, carrying 4 marks each. There must be at least 2 theoretical questions and 5 compulsory numerical.

There will be 3 questions in **long** type carrying 8 marks each. There may be some breakdown in this type of question. All questions can be of derivation/analysis/explanatory type.

Recommendation: The credit hours allocated seems to be 3 which is insufficient with the depth of the course. Therefore, this workshop recommends the university **to allocate 4 credit hours** for the prescribed curriculum so that the objective mentioned will be fulfilled.

Purbanchal University

Model Question - I

Time: 03 hrs. **Full Marks:** 60

BEG103SH: Physics *(New Course)* Pass **Marks:** 24

B.E. (Civil/Computer/Electrical/Biomedical/Geomatics/E&C automation)

Candidates are required to give their answers in their own words as far as practicable.

The figures in the margin indicate full marks

Answer ALL questions.

Group A (4 2 = 8)

1. Is it possible to have damped oscillation when a system is at resonance? Explain. **(2)**
2. If the plane of polarization of a given solution is turned through 6.6°, calculate the specific rotation of the sample. The length of 20% solution is 10 cm. **(2)**
3. In parallel plate capacitor the capacitance increase from 4 μF to 80 μF on introduction dielectric medium between the plates. What is the dielectric constant of the medium? **(2)**
4. Discuss in brief the similarities between the energy stored in the electric field of a charged capacitor and energy stored in the magnetic field of a current -carrying coil. **(2)**

Or

If matter has a wave nature, why is this wave-like characteristic not observable in our daily experiences? **(2)**

Group B (7×4=28)

5. Discuss the principal of producing ultrasonics by Piezo-electric method. **(4)**
6. Define accepatance angle. Show that accepatance angle , where and are the refractive index of the core and cladding. **(1+3)**

Or

How X-ray radiography differ from γ-ray radiography. Illustrate your answer with important of each technique. **(4)**

7. A thin converging lens and a thin diverging lens are placed co-axially at a distance 5 cm. If the focal length of each lens is 10 cm, find for the combination (i) focal length (ii) power (iii) positions of the principal points. **(1+1+2)**

Or

Calculate the first and second-order angles for the light of wavelength 400 nm, if the grating contains 10,000 lines/cm.

8. A certain process requires 10^{-6} sec to occur in an atom at rest in the laboratory. How much time will this process require to an observer in the laboratory when the atom is moving with a speed of 5×10^{7} m/s. **(4)**
9. What is the drift speed of the conduction electrons in a copper wire with radius when it has a uniform current ?Assume that each copper atom contributes one conduction electron to the current and the current density is uniform across the wire's cress section. **(4)**
10. A radio station on the surface of the earth radiates a sinusoidal waves with an average total power of 50 Kw. Assuming that the transmitter equally in all directions above the ground(which is unlikely in real situations), find the amplitudes and detected by a satellite at a distance 100 km from the antenna. **(4)**

11. A beam of electrons having the energy of each 3 eV is incident on a potential barrier of height 4 eV. If the width of the barrier is 20 Å. Calculate the percentage transmission of the beam through the barrier. **(4)**

Group C (8 3 = 24)

12. Point out the similarities and dissimilarities between the oscillations of the physical pendulum and torsional pendulum. Derive an expression for the time period and modulus of the rigidity of the suspension wire incase of the torsional pendulum. **(2+3+3)**

13. Give the theory of wedge shaped thin film for determining the fringe width. **(8)**

14. What is a quadrupole moment? Is it vector quantity? Derive an expression for electric field intensity due to quadrupole at a point on the axial line. Draw the graphical representation of electric field intensity E with axial distance r from mid-point. **(1+1+5+1)**

Or

What is Hall effect? Derive an expression for the Hall coefficient and establish a relation between the mobility of the charge carrier and the conductivity of the metallic conductor. Elaborate on quantized Hall Effect. **(1+5+2)**

Purbanchal University
Model Question - II

Time: 03 hrs. **Full Marks:** 60
BEG103SH: Physics *(New Course)* Pass **Marks:** 24
B.E. (Civil/Computer/Electrical/Biomedical/Geomatics/E&C automation)

Candidates are required to give their answers in their own words as far as practicable.
The figures in the margin indicate full marks
Answer ALL questions.

Group A (4 × 2 = 8)

1. Is there any real difference between a polarizer and an analyzer? In other words, can a polarizer be used as an analyzer, and vice versa? **(2)**
2. Why does a dipole produce an electric field at all? After all, the dipole has no net charge. **(2)**

OR

List some similarities and difference between inductors and capacitors. **(2)**

3. Calculate the thickness of a quarter-wave plate. (Given that, $\mu_e = 1.5334$, $\mu_0 = 1.544$ and $= \lambda = 5000$ Å)
4. What is the de Broglie wavelength of a 15 kV proton of mass 1.67×10^{-27} kg?

Group B (7×4=28)

5. The amplitude of a lightly damped oscillator decreases by 3.0 % during each cycle. What fraction of the mechanical energy of the oscillator is lost in each full oscillation. **(4)**
6. Discuss in brief various methods for detecting ultrasonic. **(4)**

OR

What are γ-ray radiography and X-ray radiography? Explain. **(2+2)**

7. A glass-cladding fiber is made with the core glass of a refractive index of 1.5 and the cladding is doped to give a fractional index change of 0.0005. Calculate: (a) the R.I. of the cladding (b) the acceptance angle, and (c) the numerical aperture. **(1.5+1.5+1)**
8. Two thin lenses (same material) of focal length f_1 and f_2 separated by a certain distance d have an equivalent focal length of 50 cm. The combination satisfies the condition for no chromatic aberration and minimum spherical aberration. Find the values of f_1, f_2, and d. **(1.5+1.5+1)**

OR

A plane transmission grating having 600 lines/cm is used to obtain a spectrum of light from a sodium lamp in the second order. Calculate the angular separation between the two sodium lines whose wavelengths are 5890 Å and 5896 Å. **(4)**

9. A conductor of uniform radius 1.2 cm carries a current of 3 A due to the potential gradient of 120 V/m. What are the value of current density and specific resistance of the materials? **(2+2)**
10. A copper strip 150 m thick is placed in a magnetic field of strength 0.65 T perpendicular to the plane of the strip and a current of 23 A is set up in the strip. Calculate: (a) the Hall voltage, (b) the Hall coefficient, and (c) Hall mobility. (Given, number of electrons per unit volume = 8.5×10^{28} m^{-3} and resistivity = 1.72×10^{-8} ohm-m) **(1.5+1.5+1)**
11. What is the significance of the wave function? Derive the time-independent Schrodinger wave. **(1+3)**

Group C (3 × 8 = 24)

12. (a) Write down the basic postulates of the special theory of relativity. **(4)**
    (b) Derive the Lorentz space-time transformation formulae. Also, discuss time dilation and length contraction. **(4)**
13. For interference in thin film show that the film which appears bright in reflected light appear dark in transmitted light. **(4+4)**
14. A current carrying coil behaves as magnetic dipole. What magnetic field does the magnetic diploe produce at a point in the surrounding space. **(8)**

OR

Write Maxwell's equations in integral form and convert them into differential form. **(2+6)**

♦ ♦ ♦

Purbanchal University

Model Question - III

Time: 03 hrs. **Full Marks:** 60

BEG103SH: Physics *(New Course)* Pass **Marks:** 24

B.E. (Civil/Computer/Electrical/Biomedical/Geomatics/E&C automation)

Candidates are required to give their answers in their own words as far as practicable.

The figures in the margin indicate full marks

Answer ALL questions.

Group A (4 2 = 8)

1. Why is critical damping desirable in a car's suspension system? **(2)**
2. Suppose that the electric field of an electromagnetic wave decreases in magnitude. Does the magnetic field increase, decrease or remains the same? Account for your answer. **(2)**

OR

A capacitor is said to carry a charge Q. What's the net charge on the entire capacitor?

(1+1)

3. To make a quarter-wave plate of calcite for the light of wavelength 589 nm, how thick it should be? (Given, $\mu_0 = 1.658$; $\mu_e = 1.486$) **(2)**
4. A beam of aluminum atoms is used to dope a semiconductor chip to set its electrical properties. If atom's velocity is known to within 0.2 m/s, how accurately can they be positioned? **(2)**

Group B (7 4 = 28)

5. A rod 1 m long is moving along its length with a velocity of 0.6 c. Calculate its length as it appears to an observer. **(1.5+1.5+1)**
   (a) On the earth
   (b) Moving with the rod itself
   (c) Calculate the percentage of contraction.
6. In a proton accelerator used in elementary particle physics experiments, the trajectories of protons are controlled by bendings magnets that produce a magnetic field of 6.6 T. What is the energy density in this field in the vacuum between the poles of such magnet? **(4)**
7. Two thin lenses having the power 5 D and 4 D are placed at a distance of 10 cm apart. Calculate the power of the equivalent lens of these two lenses. **(4)**

OR

How many orders will be visible if the wavelength of the incident radiation is 5000 Å and the number of the lines on the grating is 2620 in one inch? **(4)**

8. Assume that an electron is moving along an x axis and that you measure its speed to be , which can be known with a precision of . What is the minimum uncertainty with which you can simultaneously measure the position of the electron along the x axis? **(4)**
9. An observer is 1.8 m from an isotropic point light source whose power is 250 W. Calculate the rms values of the electric and magnetic fields due to the source at the position of the observer. **(2+2)**

10. What is acoustic grating? Explain how an acoustic grating is used to determine the velocity of ultrasonic waves in liquids. **(1+3)**

11. What is the importance of non-destructive tests? How X-ray radiography differs from γ-ray radiography? **(2+2)**

OR

Explain the mechanism of light propagation in optical fiber. Discuss in brief different types of optical fibers. **(2+2)**

Group C (8×3 = 24)

12. What is free oscillation? Derive an expression for the time period of a physical pendulum. Show that point of oscillation and the point of suspension are interchangeable. **(1+4+3)**

OR

Discuss the necessary theory in determining the wavelength of light using Fresnel Biprism. **(8)**

13. State Gauss's law and use it to find an electric field at a point inside and outside the uniformly charged insulating sphere. **(4+4)**

14. Discuss in brief the principle operation of the cyclotron. Derive an expression for the maximum kinetic energy achieved by a particle and mass m in terms of the applied magnetic field and the radius. **(3+5)**

PURBANCHAL UNIVERSITY

Course Title: Computer Programming **Full Marks**: 60
Course no:
Credit hours: 3 **Pass Marks**: 24

Teaching Schedule Hours/Week			Examination Scheme				
Theory	Tutorial	Practical	Internal		Final		Total
			Theory	Practical	Theory	Practical	
3	1	3	40	30	60	20	150

Duration: 3 hours

Course Objective: To study the foundation of computer programming.

Goals: This course provides a thorough understanding of the fundamentals of C programming to a student so that he/she will be able to code, compile and test C programs as well as to take up Systems programming or Advanced C programming course.

Micro Syllabus

Chapter	Course content-breakdown	Lecture Hours	Remarks
1	**Problem Solving Using Computer** 1.1 Problem Analysis • *Introduction to the problem with real example* • *Problem analysis with practical example* 1.2 Algorithm development & Flowcharting • *Algorithm* ➢ *Definition with rules and guidelines and also include examples* • *Flowchart* ➢ *Definition with standard symbols, rules and guidelines and also include examples*	2 hrs.	

	1.3 Coding • *Basic concept of coding with the proper indentation and uses* 1.4 Compilation & Execution 1.5 Debugging & Testing • *Define the concept of bugs or errors* • *Types of errors* • *Debugging process* • *Testing with types (White box and Black box)* 1.6 Program Documentation • *Basic introduction*		
2	**Introduction to C** 2.1 Historical development of C 2.1 Importance of C 2.3 Basic Structure of C programs 2.4 Executing a C program	2 hrs.	
3	**C Fundamentals** 3.1 Character set (letters, digits, special characters, white space, etc.) 3.2 Identifiers & Keywords 3.3 Data types and modifiers • *Basic, derived and user-defined* • *Type conversion (implicit & explicit)* 3.4 Constants and variables • *Use of constants (using const keyword)* • *Rules for variable naming* 3.5 Declarations and initialization of variables 3.6 Expression, statement and delimiter 3.7 Escape sequences 3.8 Preprocessor directives 3.9 typedef statement 3.10 Symbolic Constants (#define)	3 hrs.	
4	**Operators & Expression** 4.1 Operators:	3 hrs.	

	4.1.1 Arithmetic, relational, logical, bitwise, assignment, increment and decrement (prefix & postfix), sizeof(), conditional operator/ ternary operator, comma operator, *address/reference operator (&) and pointer operator (*)* 4.2 Precedence, associativity and order of execution		
5	**Input and Output** 5.1 Types of I/O 5.2 Format Specifier (%d,%ld, %c, %s, %f, %lf,%Lf, etc.) 5.3 Reading & Writing data 5.4 Formatted I/O (scanf(), printf())and Unformatted I/O statements (getchar(), putchar(), gets(), puts(), getch(), putch(), getche())	2 hrs.	
6	**Control Statements** 6.1 Loop/Repetitive control statements: for, while, do-while 6.2Selection/ Conditional control statements: if, if...else, nested if, else if ladder 6.3 Multiple branching control statement: switch...case 6.4 Unconditional control statements: break, continue, goto 6.5 exit() function	6 hrs.	
7	**Functions** 7.1 Introduction and advantages of using functions 7.2 User defined and library functions 7.3 Function prototypes, definition and return statements 7.4 Call by value & Call by reference 7.5 Concept of local, global and static variable 7.6 Recursive function	6 hrs.	

	7.7 Storage classes and visibility, automatic or local variables, global variables, static variables, external variables		
8	**Arrays and Strings** 8.1 Introduction 8.2 Single and Multi-dimension arrays (declaration, initialization) 8.3 Processing an array 8.4 Passing arrays to Functions 8.5 Arrays of Strings 8.6 String Handling Function *(strlen, strcpy, strcat, strcmp, strrev, etc.)*	6 hrs.	
9	**Pointers** 9.1 Fundamentals 9.2 Pointer Declarations and initialization 9.3 Null and wild pointer 9.4 Pointer to a pointer 9.5 Accessing value through a pointer 9.6 Similarities between Pointers and one dimensional arrays 9.7 Pointer with one dimensional and two dimensional arrays 9.8 Passing Pointers to Functions 9.9 Dynamic Memory Allocation *(calloc(), malloc(), realloc(), free())*	5 hrs.	
10	**Structures and Unions** 10.1 Defining a Structure, Arrays of Structures, Structures within Structures 10.2 Processing a Structure 10.3 Structures & Pointers 10.4 Passing Structures to Functions 10.5 Union & its importance	5 hrs.	
11	**Data Files** 11.1 Concept of file with Opening *(fopen()) & Closing (fclose())* a Data File • File modes (read, write, append)	3 hrs.	

	11.2 Creating a Data File (Binary and text files) • *fread(), fwrite(), fprintf(), fscanf(), fgets(), fputs()* • *Random access file (ftell(), fseek(), rewind())* 11.3 Error Handling during I/O Operations (feof(), ferror()) 11.4 Processing a Data File *(Insert, update and delete of data to/from the file)*		
12	**Graphics** 12.1 Concept of graphics and Initialization 12.2 Graphical mode 12.3 Simple programs using built in graphical function *(line(), arc(), circle(), ellipse(), getmaxx(), getmaxy(), etc.)*	2 hrs.	

Assignments:

Assignment should be given for each chapter.

Laboratory Work:

There shall be lab exercises covering concepts mentioned in syllabus of Computer programming.

Text Books:

1. Kelly & Pohl, " A Book on C ", Benjamin/Cummings
2. Brian W. Keringhan & Dennis M. Ritchie, " The „C" Programming Language",PHI
3. Brtons G. Gotterfried, "Programming with „C"", Tata McGraw-Hill
4. Stephen G. Gotterfried, "Programming in C", CBS Publishers & Distributors
5. E. Balguruswamy, "Programming in C", Tata McGraw-Hill
6. Yashvant Kanetkar, "Let us C", BPB Publications

Model Question
PURBANCHAL UNIVERSITY

B.E Computer/Final .
Time: 3:00 hrs. Full Marks: 60/Pass Marks: 24
BEG...: Computer Programming

GROUP-A 4x2=8

1. Write the feature of C programming language.
2. Define variables and keywords of C.
3. What is DMA?
4. Write the output of following program:

```
#include<stdio.h>
#include<conio.h>
void main()
        (
          int a=5, b,c;
          b= ++a  +  a++;
          printf("a=%d and b=%d", a,b);
          getch();
        }
```

GROUP-B 7X4=28

5. What is an operator? List of operator and explain any two of them with appropriate example.
6. Write a program to convert US dollar currency into Nepalese currency vice-versa using function.

   OR,

   Write a program to draw line and circle in C programming.
7. What is function? Differentiate between Library function and User defined function.
8. What is difference between while and do while loop? Give suitable example.
9. Write a program to compute the product of nth terms of the following series
   1*2*3*4*5* .....*nth
10. What is structure and union? Write difference between structure and union in c programming.
11. What is recursive function? Explain with any desire example.

    OR,

    Write a program to solve following equation:

    $KP = 1/2(mv^2) + mgh$ [Where KP is Kinetic and Potential energy]

GROUP-C 3X8=24

12. a) What is pointer? Declare and access of pointer variable name ptr. Write function of pointer.
    b) Write a program in C to perform arithmetic (addition, subtraction, multiplication and division) operation by using pointer.
13. Write a program to create a structure name called STUDENT, add member as Rollno, Name, and Age of the student and store student information to file specified by user using structure and binary file.
14. Discuss basic concept of array. Write a program to accept n numbers of marks and display

Basic Electrical Engineering

Year: I **Subject Code: BEG….EL** **Semester :I**

Teaching Hours/week				Examination Scheme						Total Marks
				Internal		Final				
				Theory	Practical	Theory		Practical		
Cr	L	T	P			Duration	Marks	Duration	Marks	
2	2	1	2/2	20	25	1.5	30	-	-	75

Course Objective: The basic objective of the course is to know basic concept of Electrical Enginering and to Attain the Knowledge of DC, Single Phase and Three Phase AC

Hrs. Req.	As per syllabus	Topic as per syllabus	Topic to be taught
1.5	Chapter 1: General Electric System No. of Hours: 6	1.1 Constituent part of an Electric System (source, load, communication & control)	Define elements of an electric circuit: source, load, path(conductor), switches (control), fuess(protection) with circuit diagram
		1.2 Current flow in a circuit	Define and Explain Current with derivation
		1.3 Electromotive force and Potential Difference	Define EMF and PD and list the differences between them
		1.4 Ohm's Law, its applications and limitations	Statement, Explanation,Application and Limitation of Ohm's Law
1.5		1.5 Resistors and Resistivity	Define Resistors, State laws of Resistance and derive it and solve numerical based on it
2		1.6 Temperature rise and Temperature Coefficient of resistance	Define,Explain and Derive temperature coefficient of resistance and numerical based on it
1		1.7 Voltage and Current Sources	Define and classify the source, limitt to independent sources only.
2	Chapter 2: DC Circuits No. of Hours: 6	2.1 Series and Parallel Combination of resistors	Define, Explain, Derive equvalent resistance, Current and voltage division rule and solve Numerical based on series and parallel combination
1.5		2.2 Kirchhoff's Law and their applications	State, Explain and mention the types of kirchhoff's law and their application
1.5		2.2.1 Mesh Analysis	Explain mesh analysis and it's procedure and solve Numerical
1		2.2.2 Nodal Analysis	Explain nodal analysis and it's procedure and solve Numerical
1	Chapter 3: Network Theorems No. of Hours: 6	3.1 Star-delta transformation and Delta-star transformation	Provide conversion formula Explain and Solve Numericals
1.5		3.2 Superposition Theorem	Statement, Explain and list procedure and Solve Numerical , Application
2		3.3 Thevenin's Theorem	Statement, Explain and list procedure and Solve Numerical , Application
1.5		3.4 Maximum power transfer theorem	Statement, Explain and list procedure and Solve Numerical , Application
2	Chapter 4:Inductance & Capacitance in an Electric Circuit No. of Hours: 4	4.1 Capacitor and its Capacitance, Capacitor in series and parallel	Define, Explain and Derive expression for equivalent Capacitance in series and Parallel, Energy stored in capacitor
2		4.2 Inductor and its Inductance, Inductor in series and parallel	Define, Explain and Derive expression for equivalent Inductor in series and Parallel, Energy stored in inductor, Concept of self and mutual inductance
2		5.1 Generation of AC	Faradays's law of Electromagnetic Induction, Generation of 1 Phase AC, explanation with waveform
2		5.2 Waveform and Terms used in AC	Define basic terms: frequency, time period, cycle, peak value, current and voltage waveform together, phase difference

	Chapter 5: AC Fundamentals No. of Hours: 8	5.3 Average and R.M.S values of Current and Voltage 5.4 Phasor representation	Define Average, RMS value, form and peak factor and phasor representation
2		5.5 AC through Resistance, Inductance and Capacitance	Define, Explain and Derive AC through R, L and C with Phasor diagram and waveforms and Numericals and concept of j operator
2		5.6 AC through RL, RC, and RLC and their phasor representation	Define, Explain and Derive AC through series RL, RC and RLC with Phasor diagram, waveforms and Numericals
1		5.7 Power and Power factor in AC	Define Power (apparent, active and reactive) with Power triangle and define power factor and explain importance of power factor
1		5.8 Concept of three phase system.	1- and 3-phase system from number of conductors perspective, comparison of 3 phase and single phase ac system, Basic Defination: line and phase Voltage and Current, power.

Marks Distribution

Chapters	Marks	Marks Sub Distribution		
1	6	1- Numerical of 4 marks either on Laws of resistance or Temp. Coefficient 2- Theory of 2 marks		
2	6	1- Numerical of 4 marks either on mesh or nodal Analysis 2- Theory of 2 marks	1- Numerical of 3 marks either on mesh or nodal Analysis 2- Numerical of 3 marks on series and parallel reduction	1- Numerical of 4 marks either on mesh or nodal Analysis or series & Parallel 2-Theory of 2 marks on series and parallel or Mesh or nodal
3	6	1- Numerical of 4 marks either on Super Position or Thevenin theorem or Star or Delta Conversion 2 - Theory of 2 marks	1- Numerical of 3 marks either on Super Position or Thevenin theorem 2- Derivation of 3 marks	1- Numerical of 3 marks either on Super Position or Thevenin theorem or Star delta 2- Derivation of 3 marks
4	4	1. Theory of 2 marks 2 - Derivation of 2 marks		
5	8	1- Numerical of 4 marks on R.L and C or Combination 2- Derivation of 2 marks 3. Definition of 2 marks	1- Numerical of 4 marks on R.L and C 2- Numerical of 4 marks on Combination	
Total	**30**			

Final University QuestionFormat:
No. of question: 5
Each question Carry Equal Marks of 6
Each question may have sub question
Attempt all 5 question

PURBANCHAL UNIVERSITY

MODEL QUESTION

LEVEL: - B. E. (Civil) First Semester/Final
SUBJECT: Basic Electrical Engineering **FULL MARKS: - 30**
TIME: - 01:30 hrs. **PASS MARKS: - 12**

All question Carry equal Marks

1. a. Define Resistance and state the laws of resistance. 2

b. A coil connected across a constant DC source of 120V, Draws a current of 12 A at temperature 25℃. After 5 hours of operation, its temperature rises to 65 ℃ and current reduces to 8 A. Calculate:

i. current when temperature is increased to 80 ℃ 4

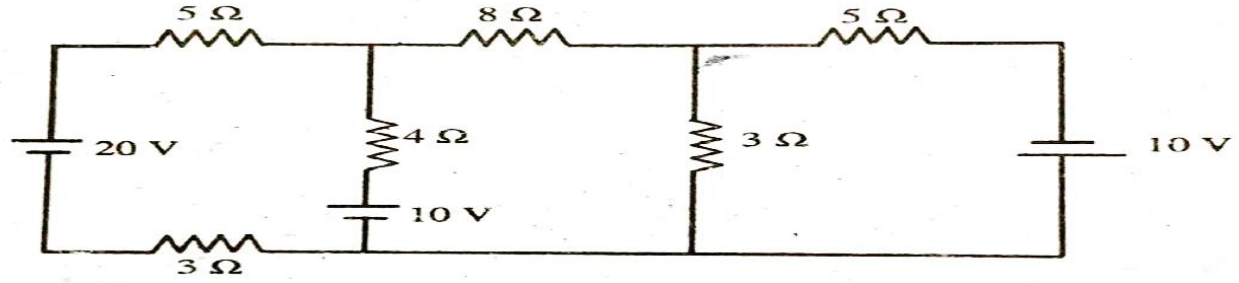
ii. Temperature coefficient of resistance at 30 ℃

OR

b. An aluminium wire 7.5 m long is connected in parallel with a copper wire 6m long. When a current of 5A is passed through the parallel combination, it is found that the current in the aluminium wire is 3A. The diameter of aluminium wire is 1mm. Determine the diameter of copper wire, the resistivity of copper is 0.017 μΩm and that of alumimium is 0.028 μΩm. 4

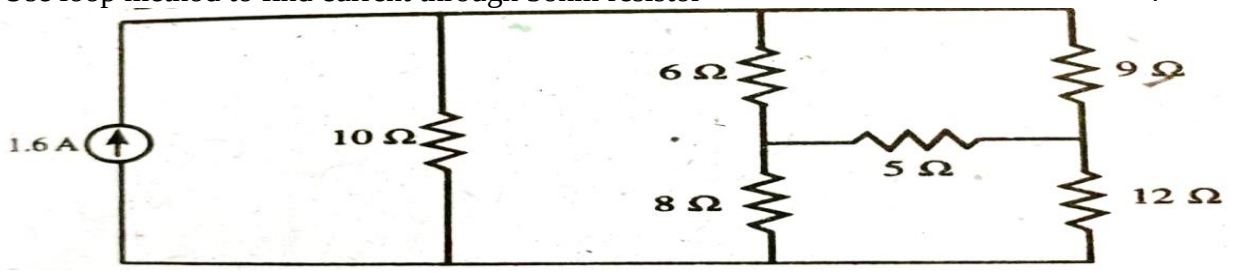
2. a. List the properties of resistance connected in series and obtain the expression for voltage division rule. 2

b. Use Nodal analysis to find the current through 8ohm resistor. 4



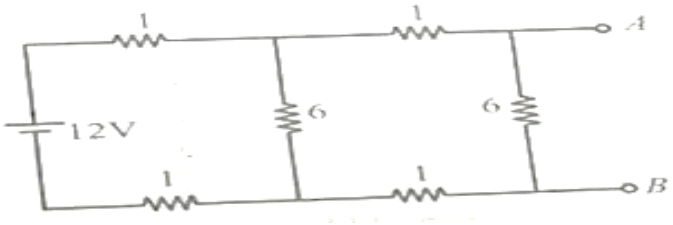
OR

b. Use loop method to find current through 5ohm resistor 4



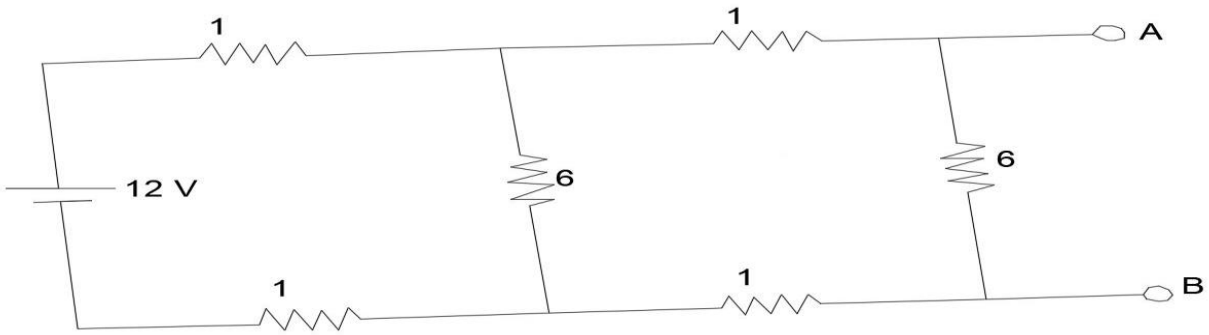
3. a. State and Explain Maximum power transfer theorem. 2

b. Using Thevenin theorem, calculate current through 8ohm resistor of the circuit shown below 4



OR

b. Calculate Current flowing through 2ohm using Superposition theorem



4. a. Derive the expression of energy stored in an inductive coil 2

b. Derive the relationship between voltage and current for a purely inductive circuit excited by ac voltage source and also show that the average power consumed by a purely inductive circuit is zero. 4

OR

b. A circuit of 20ohm resistance in series with capacitance of 200 micro-farad, connected across 50 Hz supply. The current through the circuit is 10.8sin314t A. Determine the voltage across each component and across the circuit. 4

5. a. Explain about series and parallel combination of capacitors 2

b. Derive the expression for impedance and power factor for R-L-C series circuit when AC voltage is applied across it and also draw the phasor diagram 4

OR

b. A series R-L-C circuit having R = 100ohm, L = 0.12 H and C = 28.27 micro-farad is fed from a 100 v, 50 Hz supply. Find the current flowing in the circuit, active and reactive power and draw phasor diagram 4

PURBANCHAL UNIVERSITY

Course Title: Basic Electronics Engineering **Full Marks**: 60
Course no:
Credit hours: 3 **Pass Marks**: 24
Nature of course: Theory (3 Hours), Tutorial (2 Hour) and Practical (3/2 Hours)
Course Objective: To understand the electronics elements and their functionality, basic understanding of analog and digital systems and their applications

Lesson Plan

Chapter	Course content-breakdown	Lecture Hours	Remarks
1	**Introduction** 1.1 History and Development of electronics • Vacuum tube, diode, triode, transistor, FET, JFET, MOSFET, IC 1.2 Introduction to Electronics, Application and uses of Electronics, Electrical Vs Electronics • Definition, • Applications in industry and communications with minimum one example (e.g. cement industry, robotics, aviation, telecommunication network), • Comparison between electrical and electronics 1.3 Signals: Definition and types • Definition • Types i.e. Analog and Digital 1.4 Electronic systems: Definition, components, examples • Definition • list of electronics components (e.g. resister, capacitor, inductor, diode and transistor) • examples: TV, Mobile, Computer, Air-conditioner, Washing Machine 1.5 Filter: Definition, importance, and types • Definition • Importance of filter in electronics (e.g. microphone, radio receiver) • List of the types of filter(low pass, high pass, band pass and band stop filter)	3 hrs.	
2	**Diodes**	7 hrs.	

	2.1 Semiconductor diode characteristics • Definition of semiconductor diode • Volt Ampere characteristics of pn junction diode with graph • Effect of temperature on characteristics of pn junction diode with graph 2.2 Modeling the semiconductor diode: Ideal and Real • Definition of Ideal and Real Diode • features of ideal diode • Comparison between ideal and real diode with VI characteristics • numerical examples of pn junction diode 2.3 Diode circuits: Clipper, Clamper circuits • Definition of clipper • Uses of clipper (e.g. radio receiver, RADAR) • Definition of clamper • Uses of clamper (e.g. radio receiver, RADAR) 2.4 Zener diode, LED, Photodiode, Varacters diode, Tunnel diodes, Schottky diode • Definition • VI characteristics of zener diode • uses of Zener diode (e.g. voltage regulator); LED (e.g. LED display); photodiode (e.g. remote control); Varactor diode (e.g. radio tunning); tunnel diodes (e.g. FM receiver); Schottky diode (e.g. digital computer) 2.5 DC power supply, Rectifier: half wave and full wave (center tapped, bridge) Rectifiers, Zener regulated power supply		

	• definition of DC power supply (unregulated and regulated power supply with block diagram) • definition of rectifier • types of rectifier (half wave rectifier, center tapped rectifier, bridge rectifier) • working principle of half wave rectifier, center tapped rectifier, bridge rectifier with circuit diagram showing input/ output waveform • working principle of Zener diode as a voltage regulators with circuit diagram • numerical examples of zener diode		
3	**The Bipolar Junction Transistor (BJT) (10 Hrs.)** 3.1 Definition, Types and Graphical Symbols • npn transistor, pnp transistor with working principle 3.2 BJT modes of operation and configuration • configuration of BJT (CB, CE, and CC) configuration • Relation between α and β 3.3 Operation of BJT in active mode 3.4 Graphical representation of BJT characteristics • input/output characteristics of CB, CE and CC configurations showing the circuit diagram and VI curve with active mode, saturation mode, cut-off mode 3.5 Transistor as an amplifier • circuit diagram and input/output waveforms 3.6 Graphical load line analysis • Definition of DC load line • numerical examples of DC load line	10 hrs.	

	3.7 BJT biasing methods • definition • types of biasing methods (fixed bias method, self bias method, voltage divider bias method • Numerical examples of biasing methods 3.8 Basic single stage BJT amplifiers (CC, CB, CE configurations) 3.9 BJT as a switch – Cutoff and Saturation modes 3.10 Small signal (T and π) models of BJT • definition of T and π model CE configuration with circuit diagrams 3.11 Large signal model of BJT – The Ebers-Moll Model		
4	**Junction Field Effect Transistors (JFET)** 4.1 Definition, Types, Graphical Symbols, Terminals of JFET 4.2 Physical structure and operation of JFET • construction of an n-channel JFET • operation of an n-channel JFET 4.3 Current – Voltage characteristics of JFET • drain and transfer characteristics of n-channel JFET 4.4 Biasing of JFET • types of biasing (fixed bias method, self bias method, voltage divider bias method) • numerical examples of biasing 4.5 JFET as an amplifier	6 hrs.	

5	**Metal Oxide Semiconductor Field Effect Transistors (MOSFET)** • Definition, Types, Graphical Symbols, Terminals of MOSFET • Physical structure and operation of D Type and E Type MOSFETs • Current – Voltage characteristics of D Type and E Type MOSFET • Biasing of MOSFET • MOSFET as an amplifier • Introduction to CMOS	8 hrs.	
6	**The Operational Amplifier (Op - Amp)** • Basic Model, Ideal and Real Characteristics, Virtual Ground Concept • Inverting and Non – inverting modes of operation • Application of Op – Amp: Summing Amplifier, Integrator, Differentiator, Lossy Integrator	5 hrs.	
7	**Electronic Communication System** • Introduction, elements, and applications • Mobile communication system: Definition, elements, features and advantages • Optical fiber communication system: Definition, elements, features and advantages • satellite communication system: Definition, elements, features and advantages	6 hrs.	

Laboratories: There shall be 5 labs covering diodes, power supply, BJT, MOSFET and Op - Amps.

1. Segregation of passive and active components and its specification
2. Use of soldering iron (to make connections of two wires, rectangle, triangle)
3. Study of VI characteristics of PN junction diode and Zener Diode
4. Study of Zener diode as a voltage regulator
5. Study of PN junction diode as a half wave and center tapped full wave rectifier
6. Study of troubleshooting and fault analysis of electronics circuit board.

Assignments:

Assignment should be given for each chapter.

References:

1. Thomas L. Floyd, "Electronic Devices" 8th Edition, Pearson Education, Inc.
2. A.S. Sedra and K.C. Smith, "Microelectronic Circuits", 6th Edition, Oxford University Press.
3. Robert Boylestad and Louis Nashelsky, "Electronic Devices and Circuit Theory" PHI; 4th Edition.1987
4. Haykin, Simon. Communication systems. John Wiley & Sons, 2008.

Question pattern:

Chapter	Hours	Tentative Marks Distribution
1	3	2
2	7	14
3	10	18
4	6	8
5	8	8
6	5	4
7	6	6

Model Question
PURBANCHAL UNIVERSITY

B.E Electronics Communication and Automation /Final
Time: 3:00 hrs. Full Marks: 60/Pass Marks: 24
BEG……EC : Basic Electronics Engineering

GROUP-A

4x2=8

1. Define signal and its types.
2. What are the applications of clamping circuits?
3. Which BJT configuration is used in an amplifier and why?
4. Write the advantages of mobile communication system.

GROUP-B

7X4=28

5. For a voltage divider CE npn transistor, given: V_{CC}=+16V, R_C=3.9kΩ, R_E=0.68kΩ,R_1=62kΩ, R_2=9.1kΩ and β=80. Draw the circuit diagram. Find I_C, V_E, V_B.
6. What is a rectifier? Explain half wave and full wave centre tapped rectifier with circuit diagrams and input output waveforms.
7. Draw and explain input characteristics of CB configuration.
8. Determine the range of V_s for the shunt regulator of 10V.(max current I_{zmax}=50mA) and Rs=500Ω
9. What are the non ideal characteristics of op-amp.
10. For a self bias N channel JFET find the operating point when V_{DD}=+15V, R_D=1.5kΩ,R_S=600Ω,I_{DSS}=10mA,V_P=-4V.
11. Define satellite communication. What are the elements and features of satellite communication?

GROUP-C

3X8=24

12. What is MOSFET? Explain the construction and operation of N channel E type MOSFET with its drain characteristics.
13. Differentiate between BJT and FET. Explain the operation of BJT as an amplifier with suitable diagrams and waveforms.
14. A Zener diode exhibits a constant voltage of 5.6V for currents greater than 5 times the knee current. I_{ZK} is specified to be 1mA. It is to be used in the design of a shunt regulator fed from a 15V supply. The load current varies over the range of 0 to 15mA. Find the suitable value of series resistor R_s.

ENGINEERING DRAWING
BEG--- ME

Semester I **Year I**

Teaching Schedule Hours/Week			Examination Schedule						Total Marks	Remarks
			Final				Internal Assessment			
			Theory		Practical		Theory Marks	Practical Marks*		
L	T	P	Duration	Marks	Duration	Marks				
1		2	3 hrs	60			40	50	150	

* Continuous

COURSE OBJECTIVE: To develop basic projection concepts and to develop sketching, drafting working drawings to facilitate communication.

1.0 Instrumental Drawing, Practices and Techniques: **(1 hour)**

1.1. Description of drawing instruments
Drawing board, T square, Set square, Protractor, Drafting machine, Instrument Box, French curve, Pencils, Drawing papers and sizes

1.2. Techniques of Instrumental Drawing
Pencil sharpening, securing paper, proper use of T-squares, Drafters, Set squares, erasing shields, French curves

2.0 Technical Lettering& Dimensioning: **(5 hours)**

2.1. Lettering strokes, letter proportions, use of pencils, inclined and vertical letters and numerals, upper and lower cases, line types

2.2. Fundamentals of dimensioning, size and location dimensioning, use of scales, measurement units, reducing and enlarging scales

2.3. Placement of dimensions, aligned and unidirectional dimensioning, chain and parallel dimensioning

3.0 Plane Geometrical Construction: **(9 hours)**

3.1. Bisecting and trisecting lines and angles, proportional division of lines, construction of pentagon, hexagon and any other polygons circumscribing or inscribing a circle, methods for drawing tangents and circular arcs

3.2. Methods for drawing ellipses, parabolas, hyperbolas

4.0 Basic Descriptive Geometry: **(6 hours)**

4.1. Projection rays, source, Projection planes, Positioning of objects in three dimensional spaces

4.2. Projection of points, lines and planes in space

4.3. Auxiliary views of lines and planes

4.4. True length and angle of inclination of a line using revolution and auxiliary projection plane method

4.5. Parallel lines, Perpendicular lines

4.6. Shortest distance from a point to a line

4.7. True shape of an oblique plane and angle of inclination with projection plane

5.0 Multiview Drawings (Orthographic Projection): **(9 hours)**

5.1. Orthographic Projection
5.2. Problems of Orthographic projection of objects without curved surfaces
5.3. Problems of orthographic projection of objects with curved surfaces and holes

6.0 Pictorial Drawing: **(6 hours)**

6.1. Methods to draw Isometric Drawing
6.2. Methods to draw Oblique Drawing

7.0 Introduction to AutoCad: **(9 hours)**

7.1. AutoCad version interface
7.2. Coordinate systems: Cartesian coordinate system, absolute.coordinate system, relative coordinate system
7.3. AutoCad commands: Line, polyline, rectangle, circle, arc
7.4. Modify commands: move,rotate, scale, copy, mirror, erase, trim, extend
7.5. Dimensioning: Linear, aligned, radial, angular, arc length
7.6. Text command: single line text, multiline test
7.7. Layers: layer properties
7.8. Blocks: insert blocks
7.9. Creating and saving AutoCad files
7.10. Introduction to 3-D surface and solids

Drawing Practicals : (2 hrs/ Week)

1.0 Freehand technical lettering and use of drawing instruments, Dimensioning	(4 hrs)
2.0 Plane geometrical construction	(6 hrs)
3.0 Basic descriptive geometry	(6 hrs)
4.0 Orthographic projection	(6 hrs)
5.0 Pictorial drawing	(4 hrs)
6.0 AutoCad	(6 hrs)

Textbooks and Reference Books:

1. M C Luintel, " Engineering Drawing I," Heritage Publishers, 2019
2. W.J. Luzadder, "Fundamentals of Engineering Drawing," Prentice Hall, 1981.
3. T.E. French, C.J. Vierck and R. J. Foster, "Engineering Drawing and Graphic Technology," Mcgraw Hill, 1981.

Elective I

1	Structural & Functional Biomaterials	3	3	1	-	**4**
2	Biomedical Equipment Maintenance I	3	3	1	2	**6**
3	Physiological Modeling	3	3	1	2	**6**

Elective II

1	Minimally Invasive Medical Technology	3	3	1	-	**4**
2	Medical Image Processing	3	3	1	2	**6**
3	Principles of Tissue Engineering	3	3	1	-	**4**
4	Theory of Medical Robotics	3	3	1	2	6

Elective III

1	Neural Network	3	3	1	2	**6**
2	Medical Informatics	3	3	1	2	**6**
3	Telemedicine and Telehealth	3	3	1	-	**4**
4	Biomedical Applications of Nanotechnology	3	3	1	-	**4**
5	Biomedical Equipment Maintenance II	3	3	1	2	**6**
6	Bio-Electromagnetism	3	3	1	2	**6**