National Education Policy (NEP)
Scheme and Syllabus (I Year)

(Common to all Branches)

(With effect from 2021-22 Academic Year)

Bachelor Degree in Engineering

Out Come Based Education

with

Choice Based Credit System

P.E.S. College of Engineering, Mandya - 571 401, Karnataka

(An Autonomous Institution Affiliated to VTU, Belagavi)

Grant -in- Aid Institution (Government of Karnataka)

World Bank Funded College (TEQIP), Accredited by NBA, NAAC & Approved by AICTE, New Delhi.

ಪಿ.ಇ.ಎಸ್. ತಾಂತ್ರಿಕ ಮಹಾವಿದ್ಯಾಲಯ

ಮಂಡ್ಯ–571 401, ಕರ್ನಾಟಕ

[ವಿ.ಟಿ.ಯು., ಬೆಳಗಾವಿ ಅಡಿಯಲ್ಲಿನ ಸ್ವಾಯತ್ತ ಸಂಸ್ಥೆ]

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P.E.S. COLLEGE OF ENGINEERING, MANDYA

(An Autonomous Institution affiliated to VTU, Belagavi)

Bachelor of Engineering (I – Semester)

NEP Scheme of Teaching and Examination [CBCS with OBE]

I – Semester [Physics Group]

Sl. No.	Course Code	Course Title	Teaching Department	Hrs / Week			Credits	Examination Marks		
				L	T	P		CIE	SEE	Total
1	P21MA101	Engineering Mathematics - I	MA	3	2	-	4	50	50	100
2	P21PH102	Engineering Physics	PH	2	2	-	3	50	50	100
3	P21CV103	Engineering Mechanics	CV	3	-	-	3	50	50	100
4	P21ME104	Elements of Mechanical Engineering	ME	2	2	-	3	50	50	100
5	P21EE105	Basic Electrical Engineering	EE	2	2	-	3	50	50	100
6	P21MEL106	Basic Mechanical Engineering Science Laboratory	ME/AU/IP	-	-	2	1	50	50	100
7	P21PHL107	Engineering Physics Laboratory	PH	-	-	2	1	50	50	100
8	P21HSMC108	Employability Enhancement Skills - I	HSMC	-	2	-	1	50	50	100
9.	P21AEC109A	Health & Wellness	Physical Ed.	-	2	-	1	50	50	100
Total							**20**	**450**	**450**	**900**

I – Semester [Chemistry Group]

Sl. No.	Course Code	Course Title	Teaching Department	Hrs / Week			Credits	Examination Marks		
				L	T	P		CIE	SEE	Total
1	P21MA101	Engineering Mathematics - I	MA	3	2	-	4	50	50	100
2	P21CH102	Engineering Chemistry	CH	2	2	-	3	50	50	100
3	P21CS103	Problem-solving through C	CS	3	-	-	3	50	50	100
4	P21MED104	Computer-Aided Engineering Drawing	ME	2	2	-	3	50	50	100
5	P21EC105	Basic Electronic Basic Electronic Devices and Circuits	EC	2	2	-	3	50	50	100
6	P21CSL106	C Programming Laboratory	CS	-	-	2	1	50	50	100
7	P21PCHL107	Engineering Chemistry Laboratory	CH	-	-	2	1	50	50	100
8	P21HSMC108	Employability Enhancement Skills - I	HSMC	-	2	-	1	50	50	100
9	P21AEC109B	Ecology & Environment	CV	-	2	-	1	50	50	100
Total							**20**	**450**	**450**	**900**

CIE: Continuous Internal Evaluation, SEE: Semester End Examination

AICTE Activity Points to be earned by the students admitted for BE Programme (For more details refer to Chapter 6, AICTE Activity Point Programme, Model Internship Guidelines): Over and above the academic grades, the BE regular student admitted to the 4 years Degree programme and every student entering 4 years Degree programme through lateral entry, shall earn 100 and 75 Activity Points respectively for the award of degree through AICTE Activity Point Programme. Students transferring from other institutions and Universities to the fifth semester are required to earn 50 Activity Points from the year of entry to PES College of Engineering, Mandya. The Activity Points earned shall be reflected on the student's eighth semester Grade Card. The activities can be spread over the years, anytime during the semester weekends and holidays, as per the liking and convenience of the student from the year of entry to the programme. However, the minimum hours' requirement should be fulfilled. Activity Points (non-credit) do not affect SGPA/CGPA and shall not be considered for vertical progression. In case students fail to earn the prescribed activity Points, the Eighth semester Grade Card shall be issued only after earning the required activity Points. Students shall be awarded for the degree only after the release of the Eighth semester Grade Card.

P.E.S. COLLEGE OF ENGINEERING, MANDYA

(An Autonomous Institution affiliated to VTU, Belagavi)

Bachelor of Engineering (II – Semester)

NEP Scheme of Teaching and Examination [CBCS with OBE]

II – Semester [Physics Group]										
Sl. No.	Course Code	Course Title	Teaching Department	Hrs / Week			Credits	Examination Marks		
				L	T	P		CIE	SEE	Total
1	P21MA201	Engineering Mathematics - II	MA	3	2	-	4	50	50	100
2	P21PH202	Engineering Physics	PH	2	2	-	3	50	50	100
3	P21CV203	Engineering Mechanics	CV	3	-	-	3	50	50	100
4	P21ME204	Elements of Mechanical Engineering	ME	2	2	-	3	50	50	100
5	P21EE205	Basic Electrical Engineering	EE	2	2	-	3	50	50	100
6	P21MEL206	Basic Mechanical Engineering Science Laboratory	ME/AU/IP	-	-	2	1	50	50	100
7	P21PHL207	Engineering Physics Laboratory	PH	-	-	2	1	50	50	100
8	P21HSMC208	Employability Enhancement Skills - II	HSMC	-	2	-	1	50	50	100
9	P21AEC209A	Health & Wellness	Physical Ed.	-	2	-	1	50	50	100
Total							**20**	**450**	**450**	**900**

II – Semester [Chemistry Group]										
Sl. No.	Course Code	Course Title	Teaching Department	Hrs / Week			Credits	Examination Marks		
				L	T	P		CIE	SEE	Total
1	P21MA201	Engineering Mathematics - II	MA	3	2	-	4	50	50	100
2	P21CH202	Engineering Chemistry	CH	2	2	-	3	50	50	100
3	P21CS203	Problem-solving through C	CS	3	-	-	3	50	50	100
4	P21MED204	Computer-Aided Engineering Drawing	ME	2	2	-	3	50	50	100
5	P21EC205	Basic Electronic Basic Electronic Devices and Circuits	EC	2	2	-	3	50	50	100
6	P21CSL206	C Programming Laboratory	CS	-	-	2	1	50	50	100
7	P21PCHL207	Engineering Chemistry Laboratory	CH	-	-	2	1	50	50	100
8	P21HSMC208	Employability Enhancement Skills - II	HSMC	-	2	-	1	50	50	100
9	P21AEC209B	Ecology & Environment	CV	-	2	-	1	50	50	100
Total							**20**	**450**	**450**	**900**

CIE: Continuous Internal Evaluation, SEE: Semester End Examination

AICTE Activity Points to be earned by the students admitted for BE Programme (For more details refer to Chapter 6, AICTE Activity Point Programme, Model Internship Guidelines): Over and above the academic grades, the BE regular student admitted to the 4 years Degree programme and every student entering 4 years Degree programme through lateral entry, shall earn 100 and 75 Activity Points respectively for the award of degree through AICTE Activity Point Programme. Students transferring from other institutions and Universities to the fifth semester are required to earn 50 Activity Points from the year of entry to PES College of Engineering, Mandya. The Activity Points earned shall be reflected on the student's eighth semester Grade Card. The activities can be spread over the years, anytime during the semester weekends and holidays, as per the liking and convenience of the student from the year of entry to the programme. However, the minimum hours' requirement should be fulfilled. Activity Points (non-credit) do not affect SGPA/CGPA and shall not be considered for vertical progression. In case students fail to earn the prescribed activity Points, the Eighth semester Grade Card shall be issued only after earning the required activity Points. Students shall be awarded for the degree only after the release of the Eighth semester Grade Card.

ENGINEERING MATHEMATICS-I

[As per Choice Based Credit System (CBCS) & OBE Scheme]

SEMESTER - I

Course Code:	**P21MA101**	**Credits:**	**04**
Teaching Hours/Week (L:T:P):	**3:2:0**	**CIE Marks:**	**50**
Total Number of Teaching Hours:	**50**	**SEE Marks:**	**50**

Course Learning Objectives: This course will enable students to:

- Apply principles of mathematics through Calculus and Differential Equations that serves as an essential tool in several engineering applications.
- Acquire knowledge of multivariate functions, types of derivatives involved with these functions and their applications
- Appreciate the significance of vector differentiation and its applicability to Electromagnetic theory, Mechanics and other allied areas.
- Recognize and model differential equations, apply analytical techniques to compute solutions for engineering problems.

UNIT – I	**10 Hours**

Diferential Calculus-I: Basics of Polar Coordinates. Polar curves- angle between the radius vector and the tangent, angle of intersection. Pedal equation (for polar curves) - problems only. Derivatives of arcs, curvature and radius of curvature-Cartesian, parametric, polar and pedal forms (No derivation)-Problems only. Centre and circle of curvature: Applications to evolutes and involutes.

Self-Study Component: Review of Differential Calculus, nth derivative of standard functions and Leibnitz's rule.

UNIT – II	**10 Hours**

Diferential Calculus-II: First fundamental theorem of Differential Calculus-Lagrange's and Cauchy's mean value theorem (statement only) - Illustrative examples, Taylor's theorem for a function of single variable and Maclaurin's series expansion (statement only) Illustrative examples. Indeterminate forms- L'Hospital's rule (without proof), 0x∞, ∞-∞, 0^0, ∞^0 and 1^∞.

Self-Study Component: Continuity and Differentiability, Rolle's theorem and its geometric interpretation, indeterminate forms $\frac{0}{0}$ and $\frac{\infty}{\infty}$.

UNIT – III	**10 Hours**

Partial Differntial Calculus: Introduction to Partial Differential Calculus-Partial Differentiation and problems, Euler's theorem and Euler's extension theorem (No proof-problems only). Total derivatives-differentiation of composite and implicit functions-Problems. Vector differentiation: Differentiation of vectors/scalar point functions. Velocity and acceleration of a particle moving on a space curve. Gradient of a scalar point function, directional derivative –Problems only. Divergence and curl, solenoidal and irrotational vector fields-Problems only.

Self-study component: Elementary problems of partial differentiation, vector identities.

UNIT – IV	**10 Hours**

Integral Calculus: Reduction formulae for $\int cos\,^n x$, $\int sin^n x$, $\int sin^m x\, cos^n x$ and evaluation of these with limits [0, π/2]. Differentiation under integral sign (integrals with constant limits). Tracing of curves and its applications connected with standard curves viz., Cissoids, Astroid in parametric form and Cardioids. Application of integrals to area, length, volume and surface area of solids of revolution.

Self study component: Reduction formula for $\int tan\,^n x$, $\int sec^n x$ and its reciprocals, Tracing of curves: Cycloid, Strophoid.

UNIT – V	**10 Hours**

Ordinary Differential Equations-I: (ODE's)- solutions of first order and first degree differential equations; reducible to homogeneous equation, Exact and reducible to Exact equations, Bernoulli equations. Applications of first order and first degree ODE's-orthogonal trajectories of Cartesian and polar curves. Newton's cooling, simple L-R circuits and Laws of decay and growth-Illustrative examples from engineering field.

Self study component: Solution of ODE by Variable separable and homogeneous types, Linear Equations.

Course Outcomes: On completion of this course, students are able to:

CO – 1: Apply the knowledge of calculus to solve problems related to polar curves and its applications in determining the bentness of a curve.

CO – 2: Explain mean value theorems and evaluate indeterminate form and power series using Taylor's and Maclaurin's series.

CO – 3: Differentiate the function of several variables and composite functions. Evaluate the vector differentiation.

CO – 4: Evaluate some standard integrals by applying reduction formula and solve application problems.

CO – 5: Solve differential equations of first order and solve application problems in engineering field.

Text Book(s):

1. B. S. Grewal, Higher Engineering Mathematics, 43rd Edition, Khanna Publishers, New Delhi, 2015.
2. N. P. Bali and Manish Goyal, Engineering Mathematics, Lakshmi Publications, 7th Edition, 2007.

Reference Book(s):

1. E. Kreyszig, Advanced Engineering Mathematics, John Wiley and Sons, 9th Edition, 2011.
2. G. B. Thomas and R. L. Finney, Calculus and Analytical geometry, 9th Edition, Pearson reprint, 2002.
3. J. Stewart, Calculus-Early Transcendentals, 7th Edition, Cengage, 2012.

Web and Video link(s):

1. https://www.youtube.com/watch?v=czt5Wmj_rvI
2. https://nptel.ac.in/courses/111/105/111105121/
3. https://nptel.ac.in/courses/111/106/111106100/

COURSE ARTICULATION MATRIX [Engineering Mathematics-I - P21MA101]														
COs	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO-1	***3***	***2***												
CO-2	***3***	***2***												
CO-3	***3***	***2***												
CO-4	***3***	***1***												
CO-5	***2***	***3***												
3 – HIGH, **2** – MEDIUM, **1** - LOW														

ENGINEERING PHYSICS

[As per Choice Based Credit System (CBCS) & OBE Scheme]

SEMESTER – I / II

Course Code:	**P21PH102 / 202**	**Credits:**	**03**
Teaching Hours/Week (L:T:P):	**2:2:0**	**CIE Marks:**	**50**
Total Number of Teaching Hours:	**40**	**SEE Marks:**	**50**

Course Learning Objectives: This course will enable the students to:

- Define the laws and principles of Physics used in the topics of the course pertaining to the engineering field.
- Explain the concepts and theories used in the topics to understand the properties and applications relevant to engineering field.
- Build a foundation in formulating the expressions for the quantities and solve the problems by applying the knowledge of Mathematical science pertaining to engineering and technology.

UNIT – I	**Quantum Mechanics**	**8 Hours**

Quantum theory of radiation: Properties of photons, Assumptions of Planck's law of radiation, Planck's radiation formula (Qualitative).

Matter waves*:* Wave-Particle duality, definitions of phase velocity, group velocity and particle velocity. Expression for deBroglie wavelength using group velocity concept. Heisenberg's uncertainty principle and its illustration**.** Application: Non-existence of electrons in the nucleus.

Wave function: Statement, Physical significance and properties. Definitions for Eigen functions and Eigen values. Time-independent one dimensional Schrodinger's wave equation. Applications: Particle in one dimensional potential well – Expression for Eigen functions, Eigen values and normalized wave function - Numerical Problems.

Pedagogy	➢ Chalk and talk; power point presentation and videos. ➢ **Self-study component:** Concept of Black body radiation spectrum, Wien's law, Rayleigh-Jean's law, Stefan-Boltzmann's law and their limits. ➢ **Practical Topics:** Stefan's law; Planck's constant.

UNIT – II	**Properties of Engineering Materials**	**8 Hours**

Elastic materials: Concept of elasticity, definition for stress and strain, different elastic moduli, Poisson's ratio and its limits. Relation between the elastic constants and expression for poisson's ratio in terms of elastic constants. Expression for bending moment of a beam with rectangular cross section. Applications: Couple per unit twist of a wire; I - shaped girders.

Dielectric Materials: Electric dipole, dipole moment, Dielectric constant, polarization of dielectric materials and types of polarization. Expression for internal field in solids (one dimension). Expression for Clausius-Mossotti equation. Applications of dielectrics in transformers.

Superconducting Materials: Properties of superconductors - Zero resistance, Meissner's effect, Critical field (Qualitative), BCS theory. Types of Superconductors: Type-I and Type-II. Applications of superconductivity – i) Superconducting magnets and ii) Maglev vehicle. Numerical Problems.

Pedagogy	➢ Chalk and talk; power point presentation and videos. ➢ **Self-study component:** Hooke's law and stress-strain diagram. Application of

	superconductors in medicine (SQUIDS) ➢ **Practical Topics:** Uniform bending; Torsional pendulum; Dielectric constant.

UNIT – III	**Electrical Conductivity in Solids**	**8 Hours**

Metals: Quantum free electron theory – Assumptions, Fermi Dirac Statistics (qualitative), Fermi level, Fermi energy, Fermi temperature, Fermi velocity and Fermi factor. Variation of Fermi factor with Energy and temperature, Expression for density of states. Mention the expression for Fermi energy and Electron density. Merits of quantum free-electron theory.

Semiconductors: Classification of Semiconductors, Fermi level in intrinsic and extrinsic semiconductors. Expression for electron concentration in conduction band and Mention the expression for hole concentration in valance band of an intrinsic semiconductor. Relation between E_F and E_g. Expression for conductivity and resistivity of an intrinsic semiconductor in terms of mobility of charge carriers. Numerical Problems.

Pedagogy	➢ Chalk and talk; power point presentation and videos. ➢ **Self-study component:** Expressions for carrier concentration, conductivity and resistivity in terms of energy gap of an intrinsic semiconductor. ➢ **Practical Topics:** Fermi energy, Energy gap of a semiconductor; Transistor Characteristics.

UNIT – IV	**Photonics**	**8 Hours**

Lasers: Review of absorption, spontaneous and stimulated emission of radiation, Expression for energy density in terms of Einstein coefficients. Requisites and conditions for laser action. Principle, Construction and Working of CO_2 Laser. Applications: Range finder, data storage, welding and cutting.

Fibre Optics: Propagation mechanism. Expression for angle of acceptance and Numerical aperture. Fractional index change, V - number and number of modes. Types of optical fibres. Attenuation: Expression for attenuation coefficient. Application: Telecommunication system. Numerical problems.

Pedagogy	➢ Chalk and talk; power point presentation and videos. ➢ **Self-study component:** Construction and working of Ruby LASER. Application of Optical fibre: Sensors. ➢ **Practical Topics:** Wavelength of LASER source by diffraction; Optical fibre; Newton's rings.

UNIT – V	**Technical Acoustics**	**8 Hours**

Architectural Acoustics: Absorption, reverberation and time of reverberation, Sabine's formula (Mention the expression), Factors affecting acoustics of a building and their remedies.

Ultrasonics: Introduction, Principle, Measurement of ultrasonic velocity in liquids. Application: Non-destructive method of testing the materials.

Shock Waves: Mach number and Mach angle, properties of shock waves, construction and working of Reddy shock tube, characteristics of Reddy shock tube, applications of shock waves. Numerical Problems.

Pedagogy	➢ Chalk and talk; power point presentation and videos. ➢ **Self-study component:** Basics of SHM; free, damped and forced vibrations (Qualitative).

	➢ **Practical Topics:** Spring constant; Ultrasonic interferometer; LCR resonance.

Course Outcomes: On completion of this course, students are able to:

COs	**Course Outcomes** with ***Action verbs*** for the Course topics – ***Quantum Mechanics, Properties of the Materials, Conductivity in Solids, Photonics and Technical Acoustics.***	**Bloom's Taxonomy Level**	**Level Indicator**
CO1	**Recall** the fundamental **Definitions** or **Laws of physics** relevant to Engineering field.	Remember	L1
CO2	**Mention** the various **Properties** and **Applications** by understanding the course topics pertaining to Engineering field.	Understanding	L2
CO3	**Explain** various **Concepts** and **Principles** used in the topics to understand the theory related to Engineering field.	Understanding	L2
CO4	**Derive** the expressions for the **Physical Quantities** on the topics of the course by applying the theory relevant to Engineering field.	Applying	L3
CO5	**Solve** the numerical **problems** by applying proper solutions to verify the theoretical concepts related to Engineering field.	Applying	L3

Text Book(s):

1. Engineering Physics – Wiley precise textbook series, Wiley India Pvt. Ltd, New Delhi.
2. R. K. Gaur, S. L. Gupta ; Engineering Physics – Dhanpat Rai Publications; 2011 Edition
3. Hitendra K Malik, A K Singh; Engineering Physics – Tata McGraw Hill Education; 2017

Reference Book(s):

1. S. O. Pillai: Solid State Physics, (New Revised Sixth Edition) – New Age International (P) Limited, Publishers, New Delhi, 2009.
2. N. H. Ayachit, P. K. Mittal: Engineering Physics – I. K. International Publishing House Pvt. Ltd. New Delhi, 2011.
3. M. N. Avadhanulu and P.G. Kshirsagar: Engineering Physics – S Chand & Company Ltd., Ram Nagar, New Delhi, 2010.
4. D. Halliday, R. Resnick, and J. Walker: Fundamentals of Physics - Wiley publications, 2017.

Web and Video link(s):

1. Quantum Mechanics: https://youtu.be/xlrvgLUsKqU
2. Lasers: https://youtu.be/Ab1nxxkgjH8
3. Fiber optics: https://youtu.be/9seDKvbaoHU

E-Books/Resources:

- http://de.physnet.net/PhysNet/education.html
- http://hyperphysics.phy-astr.gsu.edu/hbase/hframe.html

Course Articulation Matrix [Engineering Physics - P21PH102 / 202]														
COs	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO-1	***3***	***1***												
CO-2	***3***	***2***												
CO-3	***3***	***2***												
CO-4	***3***	***2***												
CO-5	***3***	***2***												
3 – HIGH, **2** – MEDIUM, **1** - LOW														

ENGINEERING CHEMISTRY

[As per Choice Based Credit System (CBCS) & OBE Scheme]

SEMESTER – I / II

Course Code:	**P21CH102 / 202**	**Credits:**	**03**
Teaching Hours/Week (L:T:P):	**2:2:0**	**CIE Marks:**	**50**
Total Number of Teaching Hours:	**40**	**SEE Marks:**	**50**

Course Learning Objectives: The course will enable the students to

- Impart the basic knowledge of chemistry and its principles involved in electrochemistry, energy storage devices and its commercial applications.
- Understand the basic principles of corrosion and its prevention, metal finishing and its technological importance
- Master the knowledge of synthesis, properties and utilization of engineering materials like composites, lubricants, cement and polymers.
- Apply the knowledge of Green Chemistry, principles for production of chemical compounds. Understanding the concepts of synthesis of nano-materials.
- Understand the theory, basic principle and applications of liquid crystals and Analytical instruments.

General Instructions:

i. These are sample Strategies, which teachers can use to accelerate the attainment of the various course outcomes.
ii. Lecturer method (L) does not mean only the traditional lecture method, but different type of teaching methods may be adopted to develop the outcomes.
iii. Show Video/animation films to explain methods of synthesis of non materials.
iv. Encourage collaborative (Group Learning) Learning in the class.
v. Ask at least three higher order thinking questions in the class, which promotes critical thinking.
vi. Adopt Problem Based Learning (PBL), which fosters student's analytical skills, develop thinkingskills such as the ability to evaluate, generalize, and analyze information rather than simply recall it.
vii. Topics will be introduced in a multiple representation.
viii. Show the different ways to solve the same problem and encourage the students to come up withtheir own creative ways to solve them.
ix. Discuss how every concept can be applied to the real world - and when that's possible, it helps to improve the students understanding.

UNIT – I — 8 Hours

Electrochemical energy and solar energy:

Chemical energy: Fuels: Introduction, Definition, importance of fuels, calorific value, types, fluidized bed catalytic cracking, knocking(Petrol engine), mechanism and its ill effects, biodiesel, power alcohol, octane and cetane number.

Electrochemical energy: Introduction, EMF of cell, Free Energy, electrode potential- Assumption of Nernst equation for emf of the cell with problems. Reference Electrodes: Introduction, Construction, working and applications of Calomel electrode, Ion selective electrodes-Glass electrode, determination of pH of an electrolyte and pK_a of an weak acid using Glass electrode.

Energy storage Systems: Battery technology: Introduction, Classification, characteristics,

construction, working and applications of Li-ion battery, Ni-MH battery, Silver oxide- Zinc battery. **Solar Energy:** Introduction, construction, working and applications of photovoltaic cell. **Green fuel**: Hydrogen-production by photo catalytic water splitting method, storage and applications of Hydrogen. Construction, working and applications of Methanol-Oxygen fuel cell (H_2SO_4 as electrolyte)	
Pedagogy	Electrochemistry and energy systems-chalk and talk method, power point presentation, **Practical topic:** Determination of pKa value of weak acid using glass electrode. Energy storage Systems-Power point presentation, **YouTube videos** for Li-ion battery construction and working. **Self-study component:** recycling of Lithium-ion batteries, Solar Energy and types of fuel cells-you tube videos, chalk and talk method.

UNIT – II	**8 Hours**
Corrosion technology and it's control: Introduction, Electrochemical theory of corrosion, Types of corrosion - Differential metal and differential aeration – (pitting and water line) caustic embritlement. Factors affecting the rate of corrosion: ratio of anodic to cathodic areas, nature of corrosion product , nature of metals, pH, conductivity and temperature. Corrosion control: Cathodic protection - sacrificial anode and impressedcurrent methods, Metal coatings – Galvanization and tinning, Anodizing – Anodizing of aluminum, Organic coatings: Paint and varnishes. Numerical problems on weight loss method. **Metal finishing:** Introduction, Technological importance. Principles of electroplating. Electroplating of chromium. Electro less plating: Introduction, electro less plating of nickel & copper on PCB with applications.	
Pedagogy	Chalk and talk method and power point presentation - Electrochemical theory of corrosion, Factors affecting the rate of corrosion, Types of corrosion and corrosion control. Technological importance. Electroplating: Introduction. **Videos:** Electroplating of chromium, electro less plating of nickel & copper **Self-study component:** Organic coatings: Paint, components of paints and theirfunctions. Varnish, definition, differences between paints and varnishes.

UNIT – III	**8 Hours**
Engineering Materials and Technology: **Composites:** Introduction, constitution, classification. Types: Particle, fiber, fiber glass, hybrid and reinforced Composites with applications. **Lubricants:** Introduction, Classifications, functions, Properties- Viscosity index, Flash point, oiliness, cloud point, ash point and applications of lubricants. **Cement:** Types of cement, constituents, properties of cement. Determination of percentage of CaO in cement. **Polymers:** Introduction, Synthesis and applications of Polyurethane, polycarbonates, araldite (Epoxy resin), Kevlar, butyl rubber, Thiokol. **Conducting Polymers**: Synthesis & Mechanism of conduction in poly acetylene. **Biodegradable polymers:** Introduction and their requirements. Synthesis and properties of Poly lactic acid. Applications of biodegradable polymers in medical industry.	
Pedagogy	Chalk and talk method and power point presentation- Polymers, Conducting Polymers.

	Self-study component: Lubricants. Determination of CaO in cement.	
	UNIT – IV **8 Hours**	
Green Chemistry: Introduction, definition, Major environmental pollutants, Basic principles of green chemistry. Various green chemical approaches – Microwave synthesis, Bio catalyzed reactions, Phase transfer catalysis. Super critical conditions for solvent free reactions. Synthesis of typical organic compounds by conventional and green route i) Adipic acid ii) Paracetamol. **Atom economy –** Synthesis of Ethylene oxide and Methyl Methacrylate. Industrial applications of green chemistry, Numerical problems on Atom economy. **Nano materials:** Introduction, size dependent properties (Surface area, Electrical, Optical, Catalytic and Thermal properties). Synthesis of nano materials: Top down and bottom up approaches, Synthesis by Sol-gel, precipitation and chemical vapour deposition, Nano scale materials: Fullerenes, Carbon nano tubes and graphenes – properties and applications.		
Pedagogy	Chalk and talk/power point presentation - Basic principles of green chemistry, size dependent properties of nanomaterials. Nanoscale materials: Fullerenes, Carbon nanotubes and graphenes – properties and applications. **Videos:** Various green chemical approaches, Synthesis of nano materials: Top down and bottom up approaches, Synthesis by Sol-gel, precipitation and chemical vapour deposition. **Self-study component:** Atom economy.	
	UNIT – V **8 Hours**	
Water technology: Introduction, sources and impurities in water, portable water; meaning and specifications (as per WHO standards), Hardness of water, types, determination of hardness using EDTA titration, softening of hard water by ion- exchange process. Numerical problems on hardness of water. Biological oxygen demand (BOD) and Chemical Oxygen Demand (COD) with Numerical problems on COD. Determination of COD of industrial waste water. Purification of water for town supply. **Instrumental methods of analysis:** Introduction, Theory, Instrumentation and applications of colorimetry, Flame Photometry, Potentiometry, Conductometry. **Liquid Crystals:** Introduction, Classification-Thermo-tropic and Lyo-tropic with example. Applications of liquid crystals in electronic and computer instruments and in medicine. **Electroluminescence:** Definition, Electroluminescent colors for various colors, Preparation of LED, Synthesis of poly (p-phenylene vinylene) PPV and its applications. **Photoresist:** Components, requirements, types of photo resist. Reactions in two components: positive and negative photoresist.		

Pedagogy	Chalk and talk/power point presentation – principles of water technology. Instrumental methods of analysis and liquid crystals. **Practical topic:** Volumetric titrations, instrumental methods. **Self-study component -** definition of equivalent weight, acidity, basicity, primary and secondary standards. Requirement of a primary standard solution, units of standard solutions (normality, molarity, molality, mole fraction, ppm)

Text books:

1. Uppal M.M, Jain and Jain. Engineering Chemistry, Khanna Publishers, 45th Edition, 2020.
2. P.C. Jain and Monica Jain, A test Book of Engineering Chemistry, Dhanpat Rai Publications, New Delhi, 20th Edition, 2020.

Reference books:

1. S S Dara -A Text book of Engineering Chemistry, S Chand & Company Ltd., 15th Edition, 2020.
2. B. S. Jai Prakash, R. Venugopal, Sivakumaraiah & Pushpa Iyengar.,- "Chemistry for Engineering Students", Subash Publications, Bangalore. 10th Edition, 2020.
3. F. W. Billmeyer, Text Book of Polymer Science, John Wiley & Sons, 15th Edition, 2020.
4. B. K. Sharma- A text book of Industrial Chemistry. 15th Edition, 2020.
   G.A. Ozin & A.C. Arsenault, "Nanotechnology A Chemical Approach to Nanomaterials". RSC Publishing, 5th Edition, 2020.

Web links and Video Lectures (e-Resources):

- https://www.youtube.com/watch?v=faESCxAWR9k
- https://www.youtube.com/watch?v=TBqXMWaxZYM&list=PLyhmwFtznRhuz8L1bb3X- 9IbHrDMjHWWh
- https://www.youtube.com/watch?v=j5Hml6KN4TI
- https://www.youtube.com/watch?v=X9GHBdyYcyo
- https://www.youtube.com/watch?v=1xWBPZnEJk8
- https://www.youtube.com/watch?v=wRAo-M8xBHM.

Course Outcomes: On completion of this course, students are able to:

COs	**Course Outcomes** with ***Action verbs*** for the Course topics – ***Electrochemical Energy, Corrosion , Properties of the Materials, Green chemistry, Water technology, Liquid crystals, Electroluminiscence and Nano materials.***	**Bloom's Taxonomy Level**	**Level Indicator**
CO1:	**Recollect** the fundamental **Definitions** or **Laws of Chemistry** relevant to Engineering field.	Remember	L1
CO2:	**Discuss** the various **Properties** and **Applications** by understanding the course topics pertaining to Engineering field.	Understanding	L2
CO3:	**Explain** various **Concepts** and **Principles** used in the topics to understand the theory related to Engineering field.	Understanding	L2
CO4:	**Describe** the Synthesis and applications of materials in the engineering field.	Applying	L2
CO5:	**Solve** the numerical **problems** by applying proper solutions to verify the theoretical concepts related to engineering.	Applying	L3

Course Articulation Matrix [Engineering Chemistry - P21CH102 / 202]														
COs	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO-1	***2***	***1***												
CO-2	***3***	***2***												
CO-3	***3***	***2***												
CO-4	***3***	***2***												
CO-5	***3***	***2***												
3 – HIGH, **2** – MEDIUM, **1** - LOW														

ENGINEERING MECHANICS

[As per Choice Based Credit System (CBCS) & OBE Scheme]

SEMESTER – I / II

Course Code:	**P21CV103 / 203**	**Credits:**	**03**
Teaching Hours/Week (L:T:P):	**3:0:0**	**CIE Marks:**	**50**
Total Number of Teaching Hours:	**40**	**SEE Marks:**	**50**

UNIT – I — **8 Hours**

INTRODUCTION: Basic idealization of mechanics, particle, rigid body, mass, time, continuum, force, force system, system of units, principle of transmissibility of forces, principle of superposition.

COPLANAR CONCURRENT FORCE SYSTEM: Resultant of forces. Resolution of forces, Composition of coplanar concurrent, parallel and non-concurrent forces, Moment of a force, Varignon's theorem, free body diagram, equilibrant, equilibrium of particles and rigid bodies.

Self-Study Component: Application of triangle and polygon Law, vector method of resolution and Composition of forces.

UNIT – II — **8 Hours**

SUPPORT REACTIONS: Types of loads and types of supports, statically determinant beams, Numerical problems on support reactions for beams with point loads (normal and inclined), uniformly distributed load, uniformly varying load and moment.

FRICTION: Introduction, types of friction, laws of friction, angle of friction, angle of repose , cone of friction, characteristics of dry friction, application –body on horizontal plane and inclined plane and ladder friction.

Self-Study Component: Numerical problems on support reaction of beams loaded with trapezoidal loads, Support reactions for Compound beams and wedge friction - numerical problems.

UNIT – III — **8 Hours**

CENTROID AND CENTRE OF GRAVITY: Introduction to centroid and centre of gravity, Centroid of rectangular, triangular, circle, semicircle, quarter circle lamina and sector from first principles. Numerical problems on Centroid of composite lamina.

Self-Study Component: Determining Centroid for Composite Lamina with openings.

UNIT – IV — **8 Hours**

MOMENT OF INERTIA: Introduction, radius of gyration, parallel axis theorem, perpendicular axis theorem, polar moment of inertia, moment of inertia of standard geometrical figures by first principles. Numerical problems on moment of inertia of composite sections.

Self-Study Component: Determining moment of Inertia of Composite sections with reference to given axis.

UNIT – V — **8 Hours**

DYNAMICS: Introduction to dynamics, Classification, linear and curvilinear motion- projectiles, centripetal and centrifugal forces, banking/super elevation.

Introduction to work, power and energy, impulse – numerical problems.

Self-Study Component: Concept of motion with varying acceleration. Collision of elastic bodies.

Course Outcomes: On completion of this course, students are able to:	
CO – 1:	Apply the knowledge of basic science and mathematics to classify the force systems and Compute its resultant.
CO – 2:	Analyse the system of forces in equilibrium with or without frictional forces.
CO – 3:	Locate the centroid and composite moment of inertia of irregular and built up sections.
CO – 4:	Analyse the problems with respect to linear motion, curvilinear motion and energy.

Text Book(s):

1. S.S Bhavikatti, A text on elements of Civil Engineering and mechanics, New age International publishers, 2015.
2. R.S. Khurmi, A text book of engineering mechanics, S. CHAND & COMPANY LTD.

Reference Book(s):

1. Ramamrutham S: A text book of applied mechanics, Dhanpatrai and sons
2. S. Rajashekaran, G Shankar Subramanian: Engineering Mechanics- Statics and Dynamics, Vikas Publishing House 1999.
3. Ferdinand Beer and Johnson F.R (Jr) Mechanics for Engineers, Tata Mc Graw-hill Publishing comp. Ltd New Delhi.

Course Articulation Matrix [Engineering *Mechanics* - P21CV103 / 203]														
COs	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO-1	*3*	*2*											*3*	*1*
CO-2	*3*	*2*											*3*	*1*
CO-3	*2*	*2*	*1*										*2*	
CO-4	*3*	*2*	*2*										*3*	*1*
3 – HIGH, **2** – MEDIUM, **1** - LOW														

PROBLEM SOLVING THROUGH C

[As per Choice Based Credit System (CBCS) & OBE Scheme]

SEMESTER – I / II

Course Code:	**P21CS103 / 203**	**Credits:**	**03**
Teaching Hours/Week (L:T:P):	**3:0:0**	**CIE Marks:**	**50**
Total Number of Teaching Hours:	**40**	**SEE Marks:**	**50**

Course Learning Objectives:

1. Compose step by step procedure/flow diagram to solve a given problem
2. Identify the appropriate data and its type for the given problem
3. Apply programming constructs of C language to solve the real-world problem
4. Explore user-defined data structures like arrays, structures and pointers in implementing solutions to the problems
5. Design and Develop solutions to problems using functions
6. To process the large data stored in files

UNIT I	**8 HOURS**

Algorithms and Flowchart: Algorithms, Flowcharts, Writing algorithm and flowcharts for simple exercises.

Overview of C: Basic structure of C program, Variables and Data Types, Constants, Operators and expressions.

Self-Study Component: Execution of c program, Evaluation of Expression.

UNIT II	**8 HOURS**

Managing Input and Output Operations: scanf(), printf()(unformatted)

Decision making and Branching: Simple if statement, if…else statement, nested if…else statement, switch statement.

Decision making and looping: While statement, do statement and for statement, unconditional branching: break, continue, return.

Self-Study Component: Formatted Input and Output, unconditional branching: Go To statements, else…if ladder.

UNIT III	**8 HOURS**

Arrays: 1D- declaration and initialization of 1D arrays, 2D- declaration and initialization of 2D arrays, operations on strings without using built-in functions.

Self-Study Component: Multi-dimensional Arrays, String handling functions (strlen, strcpy, strrev, strcat, strcmp).

UNIT IV	**8 HOURS**

User-defined Functions: Elements of user-defined functions, categories of functions, parameter passing technique- call by value and call by reference.

Structures and Unions: Structure-Defining a structure, declaring structure variable, accessing structure variables, structure initialization, arrays of structure, **Unions**- Defining union, declaring union variable, accessing union variables.

Self-Study Component: passing arrays to functions, passing string to functions, size of structures, Bit fields.

UNIT V	**8 HOURS**

Pointers: Understanding pointers, declaring pointer variables, initialization of pointer Variables, accessing a variable through its pointers, pointer to an array.

File Management in C: Definition, Declaration, Operations on files.

Self-Study Component: Operations on pointers, error handling during I/O operations.

Course Outcomes:

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

CO1: Compose step by step procedure /flow diagram to solve a given problem
CO2: Identify the right data types based on the requirements of the problem
CO3: Apply suitable programming constructs of C language **and/or** suitable data structures to solve the given problem
CO4: Analyse and Identify the errors in given code snippet and determine the output
CO5: Design and develop solutions to problems using structured or modular programming concept

Text Book(s):

1. E. Balaguruswamy, Programming in ANSI C, 7th Edition, Tata McGraw-Hill, 2017.
2. V Rajaraman, Fundamentals of Computers, 6th Edition, PHI Learning Pvt. Ltd, 2015.

Reference Book(s):

1. Reema Thareja, Programming in C, 2nd Edition, Oxford University Press, 2016.
2. Schaum's outlines, Programming with C, Byron Gottfried, 3rdEdition, Tata McGraw-Hill Publication, 2017.

Web and Video link(s):

1. https://nptel.ac.in/courses/106/105/106105171/

Course Articulation Matrix [Problem Solving through C - P21CS103 / 203]

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO-1	1	2	2									1		
CO-2	1	2										1		
CO-3	2	2										1		
CO-4	2	2										1		
CO-5	2	2	3									1		

3 – HIGH, **2** – MEDIUM, **1** - LOW

ELEMENTS OF MECHANICAL ENGINEERING

[As per Choice Based Credit System (CBCS) & OBE Scheme]

SEMESTER – I / II

Course Code:	**P21ME104 / 204**	**Credits:**	**03**
Teaching Hours/Week (L:T:P):	**2:2:0**	**CIE Marks:**	**50**
Total Number of Teaching Hours:	**40**	**SEE Marks:**	**50**

Relevance of the course: This course provides the essential basic knowledge of mechanical engineering science to all the students belonging to different disciplines of engineering.

UNIT-I	**8 HOURS**

Introduction: Role of mechanical engineering science in technology, definitions with examples: Prime movers, Mechanisms, Machines, & Machine Tools.

Source of Energy: Conventional (Fossil fuels, hydel energy) and Non-Conventional (Solar flat plate collector, Wind, Tidal, Geothermal, Bio- gas and Nuclear).

Properties of steam: Formation of steam with constant pressure, type and properties of steam-specific volume, internal energy and dryness fraction (numerical problems).

Self-Learning Component: Present energy resources in India and its sustainability, opportunities and obstacles to renewable energy for the present and future.

UNIT-II	**8 HOURS**

Energy Conversion Systems:

Steam turbine: Introduction, classification, working principle of impulse & reaction turbines. **Gas turbine:** Introduction, classification, working principle of open and closed type. **Hydraulic turbine**: Introduction, classification, working principle of impulse (Pelton Wheel) & reaction (Francis) turbines.

IC Engines: Classification, parts & its nomenclature, 4 stroke petrol and diesel engines (P-V diagram of Otto & Diesel cycles), diesel engine vs petrol engine, simple numericals on engine performance parameters - indicated power, brake power, indicated thermal efficiency, brake thermal efficiency, mechanical efficiency and specific fuel consumption Automobiles - Transmission systems, suspension system, E-Vehicles, Hybrid vehicles.

Self-Learning Component*:* Working principle of MPFI and CRDI system

UNIT-III	**8 HOURS**

Refrigeration & Air Conditioning: Introduction, types of refrigerants & their properties, working of vapour compression refrigeration system, window and split air conditioners, simple numericals on COP of refrigerator.

Power Transmission: Belt Drives: Flat belt drives-open and cross (No derivation), slip & creep, velocity ratio, and idler pulley (No numerical), Gear drives: Classification of gears, velocity ratio for simple and compound gear trains (No derivation and numerical).

Self-Learning Components*:* Working principle of rope and chain drive.

UNIT-IV	8 HOURS

Manufacturing Processes and Machine Tools:

Castings processes: Patterns & moulding, hot working and cold working. **Metal forming processes**: Extrusion, drawing, rolling, forging, forging operations **Metal Joining Processes:** Soldering, Brazing**,** Arc Welding & Gas Welding.

Machine Tools: Lathe: working principle, lathe specifications, operations - turning, facing, knurling, thread cutting, taper turning by swiveling of compound rest. Drilling machine tool: working principle, operations- drilling, reaming, boring, counter boring, counter sinking and tapping.

Self-Learning Component: Super finishing operations- lapping and honing.

UNIT-V	8 HOURS

Modern Manufacturing Technologies:

Non-conventional manufacturing: Working principle and applications of EDM, ECM and WJM, Additive manufacturing: Definition, classification, advantages and dis-advantages, Basics of 3-D printing technology.

Robotics: Introduction, joints and links, end effectors, common robot configurations; Cartesian, cylindrical, polar and spherical coordinates. Sensors in robotics, applications of robots.

Automation: Introduction, types of Automation, Computer Numerical Control (CNC) machines: Basic elements of CNC, advantages and disadvantages.

Self-Learning Component: Working principle of servo and stepper motors.

Course Outcomes:

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

CO1: Identify the basic concept and fundamentals of mechanical engineering and understanding of technical and operational features.

CO2: Describe the working principle of energy sources, energy conversion and power transmission systems in terms of societal and environmental aspects.

CO3: Understand and Explain the conventional and non-conventional methods of manufacturing process.

CO4: Identify various automation of manufacturing process encountered in engineering practice.

Text Book(s):

1. Elements of Mechanical Engineering, K R Gopala Krishna, 30th Edition, Subhas Publications, 2015,ISBN 13-1234567153375
2. Principles of Modern Manufacturing, Mikell P.Groover, SI Version, Wiley India, 2018, ISBN-108126573058

Reference Book(s):

1. A text book of Elements of Mechanical Engineering, S Trymbaka Murthy, I K International Publishing House Pvt. Ltd , 2008, ISBN-3980578571
2. Basic and applied Thermodynamics, P.K.Nag, 2nd Edition, 2017, Mc Graw Hill Education, ISBN-100070151318
3. Elements of Mechanical Engineering by K.P. Roy, S K Hajra Choudhury, A K Hajra Choudhury, Media Promoters, 2012.
4. Elements of Mechanical Engineering by R.K. Rajput, Firewall Media, 2005.

Web and Video link(s):

1. https://www.youtube.com/watch?v=Zgp86PVXXuQ (Energy resources)
2. https://nptel.ac.in/courses/112/103/112103249/ (Hydraulic Machines)
3. https://www.youtube.com/watch?v=c52hmb-IPJw (Types of Boilers)
4. https://nptel.ac.in/courses/112/103/112103262/ (I C Engine)
5. https://nptel.ac.in/courses/112/105/112105128/ (Refrigeration)
6. https://nptel.ac.in/courses/116/102/116102012/ (Notes on Drives)
7. https://nptel.ac.in/courses/112/107/112107213/ (Manufacturing and Joining)
8. https://nptel.ac.in/courses/112/105/112105233/ (Metal forming Processes)
9. https://nptel.ac.in/courses/112/105/112105211/ (CNC)
10. https://nptel.ac.in/courses/112/105/112105249/ (Robotics)

Course Articulation Matrix [Elements of Mechanical Engineering - P21ME104 / 204]

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO-1	3	1	2			2	1					1		
CO-2	3	2	1			1								
CO-3	3	1	1											
CO-4	3		1		1							1		

3 – HIGH, **2** – MEDIUM, **1** - LOW

COMPUTER-AIDED ENGINEERING DRAWING

[As per Choice Based Credit System (CBCS) & OBE Scheme]

SEMESTER – I / II

Course Code:	**P21MED104 / 204**	**Credits:**	**03**
Teaching Hours/Week (L:T:P):	**2:2:0**	**CIE Marks:**	**50**
Total Number of Teaching Hours:	**40**	**SEE Marks:**	**50**

Relevance of the course: The course aims at imparting the knowledge of drafting skills, enhancing imagination and visualization capacity of the students.

UNIT-I	**4 HOURS**

Orthographic Projections of Points: Introduction to drawing standards, creation of 2D environment using CAD software, principles of orthographic projections, projections of points in all the four quadrants.

UNIT-II	**6 HOURS**

Orthographic Projections of Lines: Projections of straight lines using first angle projection, true and apparent lengths, true and apparent inclinations with reference planes.

UNIT-III	**8 HOURS**

Orthographic Projections of Plane Surfaces: Triangle, square, rectangle, pentagon, hexagon and circular plates resting on HP in different positions by change of position method only.

UNIT-IV	**12 HOURS**

Projections of Solids: Projections of hexahedron, right regular prisms, cylinders, pyramids and cones resting on HP.

UNIT-V	**10 HOURS**

Isometric Projections: Introduction to isometric scale, isometric projection of cube, right regular prisms, pyramids, cylinders, cones, spheres, cut spheres, frustums of cones and pyramids in simple positions, combination of solids (Maximum of two solids).

Course Outcomes:

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

CO1: Understand basics of engineering graphics and use of computer tools to create simple geometries.

CO2: Recognize the location of the object with respect to the reference planes and draw its orthographic views.

CO3: Create simple two dimensional objects, draw their orthographic views and show the dimensions.

CO4: Draw the isometric projection of regular solids.

Text Book(s):

1. Engineering Graphics, K.R. Gopalakrishna, Subhas Publications Bangalore, 32nd edition, 2005, ISBN: 5551234018854.
2. Engineering Drawing, N.D. Bhatt & V.M. Panchal, Charotar Publishing House, Gujarat, 48th edition, 2005, ISBN: 978-93-80358-96-3.

Reference Book(s):

1. Computer Aided Engineering Drawing, S. Trymbaka Murthy, I.K. International Publishing House Pvt. Ltd., New Delhi, 3rd. revised edition, 2006, ISBN: 9788188237944.
2. Fundamentals of Engineering Drawingwith an Introduction to Interactive Computer Graphics for Design and Production, Luzadder Warren J., Duff John M., Prentice Hall of India Pvt. Ltd., Eastern Economy Edition, 2005,ISBN: 9788188237944.

A. Evaluation Scheme				
Scheme	**Weightage**	**Marks**	**Event Break Up**	
CIE	50%	50	**Test**	**Submission**
Unit I & II to be evaluated only through CIE			20	30
SEE	50%	50	**Questions to be Set:** 06	**Questions to Answer:** 03

Scheme for Semester End Examination	
One out of two Questions from unit III	15 Marks
One out of two Questions from unit IV	20 Marks
One out of two Questions from unit V	15 Marks
Total	**50 Marks**

Course Articulation Matrix Computer-Aided Engineering Drawing - P21MED104 / 204]

COs	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO-1	3	3	1		3					3				
CO-2	3	3	1		3					3				
CO-3	3	3	2		3					3				
CO-4	3	3	2		3					3				

3 – HIGH, **2** – MEDIUM, **1** - LOW

BASIC ELECTRICAL ENGINEERING

[As per Choice Based Credit System (CBCS) & OBE Scheme]

SEMESTER – I / II

Course Code:	**P21EE105 / 205**	**Credits:**	**03**
Teaching Hours/Week (L:T:P):	**2:2:0**	**CIE Marks:**	**50**
Total Number of Teaching Hours:	**40**	**SEE Marks:**	**50**

Course Learning Objectives: This course will enable students to:

- Analyze the basic concepts of single phase and three phase AC circuits.
- Describe the working of DC & AC Machines.
- Discuss the concept of Green energy & Power system

UNIT – I	**8 Hours**

Single Phase AC circuits

Generation of sinusoidal AC voltage, Definition of Average value, RMS value, Form factor and Peak factor of sinusoidally varying voltage and current, meaning of lagging and leading of sinusoidal wave, Real power, Reactive power, Apparent power and Power factor, Analysis of RL, RC & RLC series circuits & problems, parallel circuits (only problems)

Self-Study Component: Analysis of series - parallel circuits

UNIT – II	**8 Hours**

DC Generator & Motors

DC Generator: Working principle of DC machine as generator and motor, constructional features, EMF equation of generator, types of armature winding, types of DC generators, problems on EMF equation.

DC Motor: Back EMF and its significance, types of DC motors, torque equation of DC motor and numerical problems, Applications of DC Motors

Self-Study Component: Construction & Working of Special motors

UNIT – III	**8 Hours**

Three Phase AC circuits & Induction motors

Three Phase AC circuits: EMF Generation, Necessity and advantages of three phase system, Phase sequence, balanced supply and load, relationship between line and phase values for balanced star and delta connections

Induction motors: Concept of rotating magnetic field, principle of operation, types and constructional features, Slip and its significance, Illustrative examples

Self-Study Component: Measurement of 3-Phase power by Two wattmeter method

UNIT – IV	**8 Hours**

Transformer & Alternator

Transformers: Principle of operation and construction of single phase transformers (core and shell type), EMF equation, power losses, efficiency, illustrative problems on EMF equation and efficiency only.

Synchronous Generators: Principle of operation, Types and constructional features, EMF equation numerical problems of emf equation

Self-Study Component: Regulation of Transformer & winding factors of alternators

UNIT – V	**8 Hours**

Green Energy & Basics of Power systems

Green Energy: Concept of renewable energy sources, Types, working of solar and wind energy system.

Power system: Introduction**,** Single Line Diagram of AC Power Transmission System
Safety & Protection**:** Electric **s**hock & Precautions, HRC Fuse, circuit breaker & its types
Earthing: necessity & working of pipe earthing
Self-Study Component: Working of Biomass energy source

Course Outcomes: On completion of this course, students are able to:

CO – 1: Analysis of single phase AC circuits.
CO – 2: Illustrate the working DC Machine as a Generator and Motor
CO – 3: Analyze the three phase AC circuits and explain the working of three phase induction motor.
CO – 4: Discuss the working of transformer and alternator.
CO – 5: Describe the concept of green energy and basics of power systems.

Text Book(s):

1. M V Rao, "Basic Electrical Engineering", Publisher: Subhas Stores, 2015
2. G.D. Rai, Non-Conventional Energy Sources, Khanna publishers, ISBN: 978-81-7409-073-7

Reference Book(s):

1. P.M. Chandrashekaraiah , "Basic electrical Engineering", New Edition, Rajeswari publications
2. B.L. Theraja, A.K. Theraja A Textbook of Electrical Technology, Vol. 2, 23rd Edition, Publisher: S Chand & Co Ltd

Web and Video link(s): Basic Electrical Technology

1. https://nptel.ac.in/courses/108/108/108108076/

COURSE ARTICULATION MATRIX [Basic Electrical Engineering - P21EE105 / 205]

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO-1	2	1						2	1	3			2	1
CO-2	2	1						2	1	3			2	1
CO-3	2	1						2	1	3			2	1
CO-4	2	1						2	1	3			2	1
CO-5	2	1						2	1	3			2	1

Basic Electronic Devices and Circuits

[As per Choice Based Credit System (CBCS) & OBE Scheme]

SEMESTER - I

Course Code:	**P21EC105 / 205**	**Credits:**	03
Teaching Hours/Week (L:T:P):	2:2:0	**CIE Marks:**	50
Total Number of Teaching Hours:	40	**SEE Marks:**	50

Course Learning Objectives: This course will enable students to:

1. Understand the principles and operation of semiconductor devices, circuits and communication system.
2. Analyze the circuits by applying the knowledge of devices and circuits.
3.Design primitive analog and digital circuits.

UNIT – I	**8 Hours**

Diode Applications: Introduction, Load-line analysis, Series diode configuration, Parallel and series – parallel configurations, Sinusoidal inputs Half Wave Rectification, Full wave rectification, Zener diodes.

Power Supplies: Introduction, General filter considerations, Capacitor filter.

Text 1: 2.1 to 2.4, 2.6, 2.7, 2.11, 15.1 to 15.3.

Self-Study Component: Other diode applications like Clipper and clamper circuits

UNIT – II	**8 Hours**

Field-Effect Transistors: Depletion-Type MOSFET, Enhancement-Type MOSFET.

FET Biasing (Only voltage divider method): Depletion-Type MOSFET, Enhancement-Type MOSFET.

FET Amplifiers: Depletion-Type MOSFET, Enhancement-Type MOSFET, E-MOSFET Voltage divider configuration.

Feedback and Oscillator Circuits: Feedback Amplifier—Phase and Frequency Considerations

Text 1: 6.7, 6.8, 7.7, 7.8, 8.8, 8.9, 8.11, 14.4.

Self-Study Component: LC Tank circuit, Hartley, Colpitts and RC phase shift oscillators

UNIT – III	**8 Hours**

Operational Amplifiers: Introduction, Op-Amp Basics, Practical Op-Amp Circuits, Differential and Common-Mode Operation.

Op-Amp Applications: Constant-Gain Multiplier, Voltage Summing, Voltage Buffer, Controlled Sources, Instrumentation Circuits (Instrumentation Amplifier Only), Active Filters (First order LPF and HPF Filters).

Text 1: 10.1, 10.4, 10.5, 10.9, 11.1 to 11.6.

Self-Study Component: Opamp precision rectifiers

UNIT – IV	**8 Hours**

Digital logic: Switching and Logic levels, Digital Waveforms, Logic gates.

Digital Electronics: Introduction, Number Systems, Boolean Algebra Theorems, Example of Combinational Circuits,

Boolean algebra and Combinational Circuit: Binary number systems, Number Conversion, Binary Arithmetic, Signed Numbers, Hexadecimal Number Systems, Hexadecimal to Binary and Binary to Hexadecimal conversion, Hexadecimal Arithmetic, Algebraic simplification, NAND and NOR Implementation

Text 2: 9.2, 9.3, 9.5, 10.1, 10.2, 10.3, 10.4.2, 11.2, 11.2.1, 11.2.2, 11.2.3, 11.4, 11.4.1, 11.4.2, 11.7, 11.8.

Self-Study Component: Encoder/Decoder, Mux/DeMux and Flipflops.

UNIT – V	**8 Hours**

Communication Engineering: Introduction, Elements of Communication Systems, Modulation, Amplitude modulation, Frequency (FM) and Phase (PM) Modulation, Transmitter, Digital communication, Multiplexing, Pulse demodulation, The telephone systems, Data transmission, Digital modulation, Multiplexing and multi access, Transmission lines, Radio waves, Antennas, Television, Satellite Communication, Principle of operation of Mobile Phone, Microwave Communication, Optical fibre communication.

Text 2: 18.1, 18.2, 18.3, 18.3.1, 18.3.3, 18.4, 18.6, 18.7, 18.8, 18.9, 18.10, 18.11, 18.12, 18.13, 18.14, 18.15, 18.16, 18.17, 18.18, 18.21, 18.22.

Self-Study Component: GSM, GPS

Course Outcomes: On completion of this course, students are able to:

CO #	**Course Outcome**	**Program Outcome Addressed (PO#) with BTL**
CO – 1:	Apply the knowledge of physics and mathematics to understand the principle of devices, number system, circuits and communication system.	PO1[L1,L2]
CO – 2:	Analyze the analog and digital circuits.	PO2[L3]
CO – 3:	Design circuits for rectification, regulation, amplification and filtering.	PO2,PO3[L3, L4],
CO – 4:	Design the combination logic circuit.	PO2,PO3[L3, L4],

Text Book(s):

1. Electronic Devices and Circuit Theory, 11e, by Robert Boylestad and Louis Nashelsky, PHI, 2015. ISBN: 978-93-325-4260-0

2. Basic Electronics, D P Kothari, I J Nagrath, McGraw Hill Education, 2014. ISBN: 978-93-329-0158-2

Reference Book(s):

4. Electronic Devices & Circuits, 5e, by David A Bell, Oxford University Press. ISBN: 978-01-956-9340-9

5. Electronic Principles, 7e, by Albert Malvino and David J. Bates, Mcgraw Hill Education. ISBN: 978-00-706-3424-4

6. Digital Principles & Applications, 8e, Albert Paul Malvino, Donald P Leach, Goutam Saha, Mcgraw Hill Education. ISBN: 9789339203405

7. Kennedys Electronic Communication Systems, 6e, George Kennedy, Bernard Davis, Srm Prasanna, Mcgraw Hill Education, ISBN: 9789352606603

Web and Video link(s):

4. https://nptel.ac.in/courses/108/101/108101091/

COURSE ARTICULATION MATRIX (Basic Electronic Devices and Circuits - P21EC105 / 205)

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO-1	3												3	
CO-2		2												2
CO-3		2	2											2
CO-4		2	2											2

BASIC MECHANICAL ENGINEERING SCIENCE LABORATORY

[As per Choice Based Credit System (CBCS) & OBE Scheme]

SEMESTER – I/II

Course Code:	**P21MEL106 / 206**	**Credits:**	**01**
Teaching Hours/Week (L:T:P):	**0:0:2**	**CIE Marks:**	**50**
Total Number of Teaching Hours:	**26**	**SEE Marks:**	**50**

Relevance of the course: The course aims at making the students to understand, the use of different fabrication techniques, characteristics of fuels and to provide basic knowledge of robotics, CNC through activity based environment to develop kinesthetic skills for students.

PART – A	**12 Hours**
1. Metal joining processes – soldering, brazing and welding.	3hrs
2. Determination of flash and fire point of lubricating oils.	2hrs
3. Demonstration on lathe milling, drilling, grinding and CNC Machine tools.	3hrs
4. Demonstration on fitting and tapping methods.	2hrs
5. Study of four wheeler chassis layout.	2hrs
PART – B	**14 Hours**
1. Use of planimeter to calculate area of irregular shape.	2hrs
2. Calibration of pressure gauge and thermocouple	3hrs
3. Hands on training on co-ordinate system of robots.	3hrs
4. Hands on training on sensing and actuation system in robots.	3hrs
5. Study of dismantle and assembling of petrol and diesel engines	3hrs

Course Outcomes: On completion of this course, students are able to:

1. **Learn** the concepts of metal joining process, calibration of thermocouple and pressure gauge.
2. **Test** lubrication oil for flash and fire points, measure area of irregular shapes using planimeter.
3. **Study** the assembling, dissembling of engines and working of conventional machine tools.
4. **Create** a learning environment by training to evaluate applications of robots and its features.

Text Book(s) / Reference Book(s):

1. Workshop Technology-Vol 2, Hajra Choudhry, Media promoters and publishers pvt. ltd., 2010, ISBN: 978-8185099156.
2. Industrial Robots, Michell Grover, Mitchel weiss, Roger nagel McGraw Hill2012,India ,2nd edition, ISBN-13:9780070265097
3. A Text Book of Mechanical Engineering Science, K.R. Gopalakrishna, Subhash Publications, Bangalore, 15th edition, 1999, ISBN: 9789383214075.

A. Evaluation Scheme

Scheme	**Weightage**	**Marks**	**Event Break Up**	
			Test	**Record**
CIE	50 %	50	20	30
SEE	50 %	50		

B. Scheme for Semester End Examination

Part –A	20 Marks
Part -B	20 Marks
Viva – Voice	10 Marks
Total	**50 Marks**

Course Articulation Matrix (Basic Mechanical Engineering Science Laboratory -P21MEL106 / 206)														
COs	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO-1	2													
CO-2	1						1							
CO-3	2								2				1	1
CO-4	2				2				2			1	1	1

C PROGRAMMING LABORATORY

[As per Choice Based Credit System (CBCS) & OBE Scheme]

SEMESTER – I/II

Course Code:	**P21CSL106 / 206**	**Credits:**	**01**
Teaching Hours/Week (L: T: P):	**0:0:2**	**CIE Marks:**	**50**
Total Number of Teaching Hours:	**26 Hrs**	**SEE Marks:**	**50**

OBJECTIVES

1. To design the given problem using Flowchart/Algorithms
2. To introduce students to the basic knowledge of fundamentals of C language.
3. To impart writing skill of C programming to the students in solving the problems.
4. To apply the concepts like looping, array, functions, pointers, file, structure for the given Problem.

Programs List

1	A Person invest Rs.1000.00 in a saving account yielding 5% interest. Assuming all interest is left on deposit in the account. Calculate & print the amount of money in the account at the end of each year for n years.Use the following formula for determining these amounts $a=p(1+r)^n$ where p→Principal (original amount invested) r→the annual interest rate n→number of years a→amount on deposit at the end of n^{th} year
2	Create a BMI(Body mass Index) that reads the person weight in kg & height in meters then calculate & displays the body mass index. your application should display the following information [BMI =weight(kg)/height $(m)^2$] **BMI Values**: Under weight: less than 18.5 Normal:18.5 to 24.9 Over weight: 25 to 29.9 Obese: 30 or greater
3	Write a program that will help an elementary school student to learn multiplication. Use the **rand()** to produce two positive one-digit integers. The program should then prompt the user with a question, such as: How much is 6 times 7? The student then inputs the answer. Next, the program checks the student's answer. If it is correct, display the message "**Very good!"** and ask another multiplication question.If the answer is wrong, display the message "**No. Please try again**" and let the student try the same question repeatedly until the student finally gets it right.
4	Write a Program to read name and grade of n students. Display the number of students who received each grade (both lower- & upper-case letters are allowed). Check for the validity of grades(S, A, B, C, D, E, F).
5	Write a program to find the value of $y=2x^2+x+1$,where x varies from -3 to +3 in step of 0.1

6	Write a program to evaluate the following series up to given accuracy $e^X = 1+x/1!+x2/2!+$ ……..
7	Write a program to read a sentence & replace every character by next character in the alphabet set [z/Z by a/A]
8	Write a program that uses 2D array to store daily maximum temperature of four different cities and print the average weekly temperature of each city.
9	Write a program to check whether the given n numbers are sorted or not. If not sorted, call the function by name BUBBLE_SORT to sort the elements.
10	Create a structure called complex with data member as real and imaginary. Write a program to perform addition and multiplication of two complex numbers.
11	Write a program to store n integer data in a file and find their sum. Write the sum to another file
12	Write a program to find the sum of all the element of an array using pointers

Course outcomes

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

1. **Apply knowledge** of C constructs to **design and develop** programs/applications
2. Conduct **practical experiments** for demonstrating features of C using Turbo C.

Text Book(s):

1. E. Balaguruswamy, Programming in ANSI C, 7th Edition, Tata McGraw-Hill

Reference Book(s):

1. Reema Thareja, Programming in C, Oxford University Press

COURSE ARTICULATION MATRIX [C Programming Laboratory - P21CSL106/206]

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO-1	2	2	2					1	1			1		
CO-2	2	2	2		2			1	1			1		

ENGINEERING PHYSICS LABORATORY

[As per Choice Based Credit System (CBCS) & OBE Scheme]

SEMESTER – I/II

Course Code:	**P21PHL107 / 207**	**Credits:**	**01**
Teaching Hours/Week (L:T:P):	**0:0:2**	**CIE Marks:**	**50**
Total Number of Teaching Hours:	**26**	**SEE Marks:**	**50**

Course Learning Objectives: This course will enable students to:

- Identify the laws or principles of physics on which the experiments are working relative to Engineering field.
- Setup the experiment or construct the circuit to perform the experiments pertaining to Engineering applications.
- Apply the knowledge of mathematical science to calculate or analyse the results correlated with theory pertaining to Engineering field.

PART – A	**Non-Circuit Experiments**	**12 Hours**

1. **Newton's ring** - Determination of wavelength of the given monochromatic source.
2. **Uniform bending** - Determination of the Young's modulus of the given material.
3. **Diffraction grating** - Determination of wavelength of the given LASER source.
4. **Torsional pendulum** - Determination of Rigidity modulus of the given material.
5. **Optical fibre** - Determination of acceptance angle, V-parameter and number of modes of optical fibre.
6. **Hooke's law** – Determination of spring constant and verification of series and parallel combination of springs.

PART – B	**Circuit Experiments**	**12 Hours**

7. **Transistor** - Draw the output characteristics of a transistor in CE-mode and hence find output resistance, current gain and current amplification factor.
8. **Capacitor** - Determination of the dielectric constant of a material by charging and discharging method of a capacitor
9. **Fermi energy** - Determination of the Fermi energy and Fermi temperature of a given metal.
10. **Stefan-Boltzmann law** - Verification of Stefan's 4^{th} power law of radiation.
11. **Planck's Radiation law** - Determination of wavelengths of different LED's and Planck's constant.
12. **LCR resonance circuits** - Determination of self-inductance of a given coil.

PART – C	**Open Ended Experiments**	**2 Hours**

13. **Ultrasonic Interferometer** - Determination of velocity of ultrasonics and compressibility of the given liquid.
14. **Semiconductor** - Determination of energy gap of a given semiconductor by four probe method.

Course Outcomes: On completion of this course, students are able to:			
COs	**Course Outcomes** with ***Action verbs*** for the Engineering Physics Laboratory Course – Experiments related to the theory Course.	**Bloom's Taxonomy Level**	**Level Indicator**
CO1	**Recall** the **laws** or **Principles** of Physics on which the Experiments are **working** related to engineering field.	Remember	L1
CO2	**Develop** the practical knowledge to **setup the experiments** related to Engineering field.	Understanding	L2
CO3	**Construct** the **circuits** to **perform** the experiments pertaining to Engineering applications.	Understanding	L2
CO4	**Identify** the proper **instruments** or **tools** by knowing their **concepts** of working to take accurate readings.	Understanding	L2
CO5	**Apply** the **knowledge of mathematics** to calculate/ analyse the results in correlation with the theory.	Applying	L3

Text Book(s):

1. S. L. Gupta and Dr. V. Kumar, "Practical physics with viva-voce", Pragati Prakashan Publishers, Revised Edition, 2009
2. S. K. Gupta, "Engineering physics practicals", Krishna Prakashan Pvt. Ltd., 2014

Reference Book(s):

1. P. R. Sasikumar "Practical Physics", PHI Ltd., 2011.
2. C.L. Arora, Practical physics, S. Chand Publication.
3. B.L. Worsnop and H. T. Flint, Advanced Practical Physics, Asia Publishing House.

Web and Video link(s):

1. https://drive.google.com/file/d/1HRgO_thOLs8CbT9WSlW-5HHpg_64Iy5E/view?usp=sharing

COURSE ARTICULATION MATRIX [Engineering Physics Laboratory - P21PHL107 / 207]

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO-1	**2**	**1**							**1**					
CO-2	**3**	**1**							**1**					
CO-3	**3**	**1**							**1**					
CO-4	**3**	**2**							**1**					
CO-5	**3**	**2**							**1**					

3 – HIGH, **2** – MEDIUM, **1** - LOW

ENGINEERING CHEMISTRY LABORATORY

[As per Choice Based Credit System (CBCS) & OBE Scheme]

SEMESTER – I/II

Course Code	**P21CHL107 / 207**	**Credits**	**01**
Teaching Hours/Week (L:T:P)	**0:0:2**	**CIE Marks**	**50**
Total number of teaching Hours	**26**	**SEE Marks**	**50**

Course Learning objectives:

- Instrumental methods for developing experimental skills in building technical competence.
- Quantitative analysis of materials by volumetric analysis.

Sl. No.	PART- A Instrumentation Experiments
1	Potentiometric estimation of FAS using standard potassium dichromate solution.
2	Estimation of acid mixture by Conductometric method.
3	Determination of viscosity coefficient of an organic liquid using Ostwald's viscometer.
4	Determination of concentration of copper by colorimetric method.
5	Determination of pKa value of a given weak acid using pH meter.
	PART- B **Volumetric experiments**
1	Determination of Chemical Oxygen Demand (COD) of industrial waste water
2	Estimation of % of iron in the given rust solution using standard potassium dichromate solution.
3	Determination of % of copper in brass using standard sodium thiosulphate solution.
4	Estimation of Total hardness of water by EDTA complex-metric method.
5	Estimation of CaO in cement solution by rapid EDTA method.

	Demonstration Experiments
1	Flame photometric estimation of Sodium & Potassium.
2	Determination of dissolved oxygen in water by Winkler method.

Course outcomes: On completion of this course, student are able to:

CO-1 Determine the pKa value of weak acid and coefficient of Viscosity of a given organic liquid.

CO-2 Estimate the amount of substance present in the given solution using PotentiometerConductometric and Colorimetric analysis

CO-3 Determine the total hardness and chemical oxygen demand in the given water sample byvolumetric analysis method

CO-4 Determine the percentage of CaO, Copper and Iron in the given analyte solution by titration method.

CO5 Demonstrate flame photometric estimation of sodium & potassium and Determination of dissolved oxygen in water by Winkler method.

Text Books:

1. Vogel's A.I. A text book of quantitative analysis, 45th edition, 2020.
2. Willard, Merit, Dean and Settle, A text book of Instrumental analysis, 10th edition 2020.

Reference books:

1. G.H Jeffery, J Bassett, J Mendham and R.C. Denney Vogel's A.I. A text book of quantitative analysis,Dorling Kindersley (India) Pvt., Ltd. 45th edition, 2020.
2. Gary D Christian, Analytical Chemistry, Wiley India, 12th edition, 2020.

Course Learning Objectives: This course will enable students to:

- Identify the laws or principles of Chemistry on which the experiments are working relativeto engineering field.
- Setup the experiment or preparation of solutions to perform the experiments pertaining toengineering applications.
- Apply the knowledge of Chemical science to calculate the results Correlated with theory pertaining to engineering field.

Course Outcomes: On completion of this course, students are able to:

COs	**Course Outcomes** with ***Action verbs*** for the Engineering Chemistry Laboratory Course – Experiments related to the theory.	**Bloom's Taxonomy Level**	**Level Indicator**
CO1:	**Recall** the Principles of Chemistry on which the Experiments are working related to engineering field.	Remember	L1
CO2:	**Develop** the practical knowledge to setup the Experiments related to Engineering field.	Understanding	L2
CO3:	**Preparation** of standard solutions to perform the experiments pertaining to Engineering applications.	Understanding	L2
CO4:	**Identify** the proper instruments or glassware's by knowing their concepts and working principles to take accurateresults.	Understanding	L2
CO5:	**Apply** the **knowledge** of Chemistry to calculate/ analyze the results in correlation with the theory.	Applying	L3

COURSE ARTICULATION MATRIX [Engineering Chemistry Laboratory - P21CHL107/ 207]

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO-1	**2**	**1**							**1**					
CO-2	**3**	**1**							**1**					
CO-3	**3**	**1**							**1**					
CO-4	**3**	**2**							**1**					
CO-5	**3**	**2**							**1**					

3 – HIGH, **2** – MEDIUM, **1** - LOW

HEALTH AND WELLNESS

[As per Choice Based Credit System (CBCS) & OBE Scheme]

SEMESTER – I/II

Course Code:	**P21AEC109A / 209A**	**Credits:**	**01**
Teaching Hours/Week (L:T:P):	**0:2:0**	**CIE Marks:**	**50**
Total Number of Teaching Hours:	**14**	**SEE Marks:**	**50**

Course Learning Objectives: This course will enable students to:

- To know about Health and wellness (and its Beliefs)
- To acquire Good Health & It's balance for positive mind-set
- To Build the healthy lifestyles for good health for their better future
- To Create of Healthy and caring relationships to meet the requirements of MNC and LPG world To learn about Avoiding risks and harmful habits in their campus and outside the campus for their bright future
- To Prevent and fight against harmful diseases for good health through positive mindset.

Teaching-Learning Process (General Instructions)

These are sample Strategies, which teacher can use to accelerate the attainment of the various course outcomes.

- Teachers shall adopt suitable pedagogy for effective teaching - learning process. The pedagogy shall involve the combination of different methodologies which suit modern technological tools and software's to meet the present requirements of the Global employment market.
  - **i.** Direct instructional method (Low /Old Technology),
  - **ii.** Flipped classrooms (High/advanced Technological tools),
  - **iii.** Blended learning (combination of both),
  - **iv.** Enquiry and evaluation based learning,
  - **v.** Personalized learning,
  - **vi.** Problems based learning through discussion,
  - **vii.** Following the method of expeditionary learning Tools and techniques,
- Apart from conventional lecture methods, various types of innovative teaching techniques through videos, animation films may be adapted so that the delivered lesson can progress the students In theoretical applied and practical skills in teaching of the concepts of Health and Wellness in general.

UNIT – I	**INTRODUCTION**	**5 Hours**

1. Meaning, Definition and dimensions of Health and Wellness (WHO/Yoga)
2. Factors affecting Fitness and Wellness
3. Role of Fitness in maintaining Health and Wellness
4. Importance of Health Education and Wellness

UNIT – II	**Methods to Maintain Health and Wellness**	**5 Hours**

1. Role of Physical Activities and Recreational Games for Health and Wellness
2. Role of Yogasanas and Meditation in maintaining Health and Wellness
3. Nutrition for Health & Wellness

UNIT – III	Anxiety, Stress and Aging	4 Hours

1. Meaning of Anxiety, Stress and Aging
2. Types and Causes of Stress
3. Stress relief through Exercise and Yoga

Course Outcomes: On completion of this course, students are able to:
CO 1: To understand Health and wellness (and its Beliefs)
CO 2: To acquire Good Health & It's balance for positive mindset
CO 3: To inculcate and develop the healthy lifestyle habits for good health.
CO 4: To adopt the innovative & positive methods to avoid risks from harmful habits in their campus & outside the campus.
CO 5: To positively fight against harmful diseases for good health through positive mindset.

Text Book(s) / Reference Book(s):

1. AAPHERD "Health related Physical Fitness Test Manual." 1980 Published by Association drive Reston Virginia
2. Bucher.C.A (1979) foundation of Physical Education (5th edition Missouri CV Mosby Co.)
3. Puri .k. Chandra S.S (2005) "Health and Physical Education" New Delhi : Surjeet Publication
4. Thomas D Fahey and others. Fit and well : 6th Edition New York : McGraw Hill Publishers, 2005
5. Dixit Suresh (2006) SwasthyaShiksha sports Publications Delhi.
6. Uppal A K &Gautam G P (2008) Health and Physical Education. Friends Publication New Delhi
7. Pinto John and Roshan Kumar (2021) "Introduction to Physical Education", Louis Publication. Mangalore
8. Shanti K Y (1987) "The Science of Yogic Breathier" (Pranayama) D B Bombay
9. Ziegler E F (2007) "An Introduction to Sports and Physical Education" Philosophy Delhi
10. Pinto John and Ramachandra K (2021) Kannada Version "DahikaSikshanadaParichaya" Louis publications. Mangalore

Assessment Details (both CIE and SEE)

The weightage of Continuous Internal Evaluation (CIE) is 50% and for Semester End Exam (SEE) is 50%. The student has to obtain a minimum of 40% of maximum marks in both CIE and SEE.

Continuous Internal Evaluation:

- TWO Unit Tests each of 40 Marks (duration 01 hours) (All tests are similar to the SEE pattern i.e. question paper pattern is MCQ)
- Two assignments each of 10 Marks.
- At the end of the Semester, Two Unit Tests and assignments average marks will be considered as CIE i.e. for 50 Marks.

Semester End Exam (SEE):

- SEE is conducted for 50 marks (1-hour duration). SEE paper will be set for 25 questions of each of 02 marks. The pattern of the question paper is MCQ. The time allotted for SEE is 01 hour.

ECOLOY AND ENVIRONMENT

[As per Choice Based Credit System (CBCS) & OBE Scheme]

SEMESTER – I/II

Course Code:	**P21AEC109B / 209B**	**Credits:**	**01**
Teaching Hours/Week (L:T:P):	**0:2:0**	**CIE Marks:**	**50**
Total Number of Teaching Hours:	**15**	**SEE Marks:**	**50**

Course Learning Objectives (CLOs):

1. To identify the major challenges in environmental issues and evaluate possible solutions.
2. Develop analytical skills, critical thinking and demonstrate socio-economic skills for sustainable development.
3. To analyze an overall impact of specific issues and develop environmental management plan.

Course Content

UNIT – I	**5 Hours**

Introduction: Environment - Components of Environment Ecosystem: Types & Structure of Ecosystem, Balanced ecosystem Human Activities – Food, Shelter, Economic & Social Security.

Definition, Scope and basic principles of ecology and environment, Fundamentals of Ecology and Ecosystem – Structural and Functional Components. Food chain & Food webs. Ecological pyramids; Energy flow

UNIT – II	**5 Hours**

Air Pollution & Automobile Pollution: Definition, Effects – Global Warming, Acid rain & Ozone layer depletion, controlling measures.

Solid Waste Management, E - Waste Management & Biomedical Waste Management - Sources, Characteristics & Disposal methods.

UNIT – III	**5 Hours**

Natural Resources, Water resources – Availability & Quality aspects, Water borne diseases & water induced diseases, Fluoride problem in drinking water, Mineral resources, Forest Wealth, Material Cycles – Carbon Cycle, Nitrogen Cycle & Sulphur Cycle.

Energy – Different types of energy, Conventional sources & Non Conventional sources of energy: solar energy, Hydro electric energy, Wind Energy, Nuclear energy, Biomass & Biogas Fossil Fuels, Hydrogen as an alternative energy.

Course outcomes

1. Understand the principles of ecology and environmental issues that apply to air, land, and water issues on a global scale,
2. Develop critical thinking and/or observation skills, and apply them to the analysis of a problem or question related to the environment,

3. Demonstrate ecology knowledge of a complex relationship between biotic and abiotic components
4. Apply their ecological knowledge to illustrate and graph a problem and describe the realities that managers face when dealing with complex issues

Books and References:

Text Books

1. Fundamentals of Ecology (3rd Ed.) 2001- MC Dash, Tata - McGraw Hill, New Delhi.
2. Introduction to Environmental Engg. (1991). - GM Masters, Prentice Hall of India.
3. Benny Joseph (2005), **"Environmental Studies",** Tata McGraw – Hill Publishing Company Limited.
4. R.J.Ranjit Daniels and Jagadish Krishnaswamy, (2009), **"Environmental Studies",** Wiley India Private Ltd., New Delhi.
5. R Rajagopalan, **"Environmental Studies – From Crisis to Cure",** Oxford University Press, 2005,
6. Aloka Debi, **"Environmental Science and Engineering",** Universities Press (India) Pvt. Ltd. 2012

Assessment Details (both CIE and SEE)

The weightage of Continuous Internal Evaluation (CIE) is 50% and for Semester End Exam (SEE) is 50%. The student has to obtain a minimum of 40% of maximum marks in both CIE and SEE.

Continuous Internal Evaluation:

- TWO Unit Tests each of 40 Marks (duration 01 hours) (All tests are similar to the SEE pattern i.e. question paper pattern is MCQ)
- Two assignments each of 10 Marks.
- At the end of the Semester, Two Unit Tests and assignments average marks will be considered as CIE i.e. for 50 Marks.

Semester End Exam (SEE):

SEE is conducted for 50 marks (1-hour duration). SEE paper will be set for 25 questions of each of 02 marks. The pattern of the question paper is MCQ. The time allotted for SEE is 01 hour.

Employability Enhancement Skills (EES) - I

[As per Choice Based Credit System (CBCS) & OBE Scheme]

SEMESTER - I

Course Code:	P21HSMC108	**Credits:**	01
Teaching Hours/Week (L:T:P):	0:2:0	**CIE Marks:**	50
Total Number of Teaching Hours:	28	**SEE Marks:**	50

Course Learning Objectives: This course will enable students to:

- Get introduced to some of the concepts of soft skills and enhance communication skills
- Recognize common mistakes done by an individual in the course of his / her communication
- Write effective emails
- Identify their strengths, weakness, opportunities and threats
- Understand the basic rules of sentence structures
- Understand the correct usage of parts of speech, tenses and articles
- Explain divisibility roles, properties of various types of numbers
- Explain application of percentage in our daily life
- Describe the concepts of profit, loss, discounts
- Explain concepts behind logical reasoning modules of arrangements and blood relations

UNIT – I	**10 Hours**

Soft Skills: LSRW, Listening, communication skills (verbal and non-verbal skills), public speaking, Email writing, SWOT Analysis

Self-Study: Motivation and Time Management

UNIT – II	**10 Hours**

Verbal Ability: Parts of Speech - Prepositions, Adjectives and Adverbs ; Tenses, Articles, Idioms and Phrasal verbs, Subject verb agreement, Synonyms and Antonyms

Self-Study: Para jumbles and one word substitution

UNIT – III	**8 Hours**

Quantitative Aptitude: Number system, Percentage, Profit & Loss
Logical Reasoning: Blood Relations and Arrangements

Self-Study: Speed Maths

Course Outcomes: On completion of this course, students are able to:

CO – 1: Exhibit amplified level of confidence to express themselves in English

CO – 2: Understand the correct usage of tenses and articles

CO – 3: Increase the number of words in his/her day to day

CO – 4: Solve logical reasoning problems based on blood relations and arrangements

CO - 5: Solve the problems based on number system, percentage and profit & loss

Text Book(s):

1. Word Power Made Easy New Revised and Expanded Edition, First Edition, Norman Lewis, Goyal Publisher.
2. Essential English Grammar by Raymond Murphy, Cambridge University Press, new edition
3. The 7 habits of Highly Effective People by Stephen R. Covey
4. Quantitative aptitude by Dr. R. S Agarwal, published by S.Chand private limited.
5. Verbal reasoning by Dr. R. S Agarwal , published by S. Chand private limited.

Reference Book(s):

1. Quantitative Aptitude by Arun Sharma, McGraw Hill Education Pvt Ltd
2. CAT Mathematics by Abhijith Guha, PHI learning private limited.

Web and Video link(s):

1. Improve Your English Communication Skills Specialization https://www.coursera.org/specializations/improve-english

COURSE ARTICULATION MATRIX [Employability Enhancement Skills (EES) **- I]**

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12		
CO-1	-	-	-	-	-	-	-	-	2	3	-	2		
CO-2	-	-	-	-	-	-	-	-	-	2	-	2		
CO-3	-	-	-	-	-	-	-	-	-	2	-	2		
CO-4	2	-	-	-	-	-	-	-	-	-	-	-		
CO-5	2	-	-	-	-	-	-	-	-	-	-	-		

ENGINEERING MATHEMATICS-II

[As per Choice Based Credit System (CBCS) & OBE Scheme]

SEMESTER - II

Course Code:	P21MA201	**Credits:**	04
Teaching Hours/Week (L:T:P):	3:2:0	**CIE Marks:**	50
Total Number of Teaching Hours:	50	**SEE Marks:**	50

Course Learning Objectives:

To enable students to apply the knowledge of Mathematics in various engineering fields by making them to learn the following:

- Linear Algebra to find analytical solution of system of linear equation.
- Solution of homogeneous and non-homogeneous Linear differential equations
- Laplace transform of various function and solutions of IVP.
- Applications of Partial Differentiation.
- Vector Integration, and OCC.
- Double, triple integration and Beta-Gama functions.

UNIT – I	**10 Hours**

Linear Algebra: Introduction - Rank of matrix by elementary row operations - Echelon form of a matrix. Consistency of system of linear equations: Gauss elimination method, Gauss-Jordan method and L-U decomposition method. Eigen values and Eigen vectors of square matrices. Similarity of matrices and diagonlisation of matrices (For 2×2 real matrices only). Quadratic forms: Reduction to canonical form by orthogonal transformation.

Self-study component- Review of elementary properties of matrices.

UNIT – II	**10 Hours**

Linear differential equations of higher order: Linear differential equations of second and higher order with constant coefficients. Homogeneous / non-homogeneous equations. Inverse differential operators. $f(D)y=R(x)$ Where $R(x)=e^{ax}, \sin ax / \cos ax$ and polynomial in x and $e^{ax}\sin ax / \cos ax$. $e^{ax}\sin ax / \cos ax$. Solution of initial value problems, method of variation of parameters. Solution of Cauchy's and Legendre's linear differential equations.

Self-study component-Review of linear differential equation $f(D)y=R(x)$ where $(x)=e^{ax}V(x)$.

UNIT – III	**10 Hours**

Laplace Transforms: Definition – Transforms of elementary functions. Properties of Laplace transforms, Transforms of periodic function, unit step function (All results without proof)-Problems only.

Inverse Laplace transforms: Definition – Evaluation of inverse transforms by standard methods. Convolution theorem - Problems only. Solutions of second order linear differential equations using Laplace transforms method.

Self-study component-Problems on unit impulse function. Solution of Simultaneous ODE by Laplace method.

UNIT – IV	**10 Hours**

Applications of Partial Differentiatial Calculus: Jacobians, Taylor's Theorem for a function of two variables (without proof). Maxima and Minima for a function of two variables. Illustrative examples with applications. Lagrange's' method of undetermined multipliers with one subsidiary condition.

Vector integration- Integration of vector functions. Line integrals, surface and volume integrals. Green's, Stoke's and Gauss's divergence theorem/s (without proof)-Illustrated examples. Orthogonal curvilinear coordinates (OCC).

Self study component-Errors and approximations Expressions for grad ϕ , div $\vec{A}$, curl $\vec{A}$ and Laplacian of ϕ in OCC.

UNIT – V	**11 Hours**

Integral Calculus-I: Double and triple integrals-region of integration. Evaluation of double integrals by change of order of integration. Application of multiple integrals: Change of variables and applications to area and volume. Beta and Gamma functions – Definition. Relationship between Beta and Gamma function (No derivation)-Simple problems only.

Self study component - Computation of mass, centre of gravity, centre of pressure and moment of inertia, by using multiple integrals.

Course Outcomes: On completion of this course, students are able to:

CO-1: Explain linear system of equations, Eigen values/vectors similarity and diagonalisation of matrices.

CO-2: Solve linear second order differential equations. Evaluate Laplace transforms and inverse Laplace transforms.

CO-3: Evaluate the Jacobians, and the Taylors series expansion and find the extreme value.

CO-4: Analyse the vector integration to use in the study of line integrals.

CO-5: Evaluate the multiple integrals and Evaluate application oriented problems.

Text Book(s):

1. B. S. Grewal, **Higher Engineering Mathematics**, 43rd Edition, Khanna Publishers, New Delhi, 2015.
2. N. P. Bali and Manish Goyal, **Engineering Mathematics**, Lakshmi Publications, 7th Edition, 2007.

Reference Book(s):

1. E. Kreyszig, **Advanced Engineering Mathematics**, John Wiley and Sons, 9th Edition, 2011.
2. G. B. Thomas and R. L. Finney, **Calculus and Analytical geometry**, 9th Edition, Pearson reprint, 2002.
3. J. Stewart, **Calculus-Early Transcendentals**, 7th Edition, Cengage, 2017.

Web and Video link(s):

1. https://nptel.ac.in/courses/111/106/111106051/, https://nptel.ac.in/courses/111/108/111108098/,
2. https://nptel.ac.in/courses/111/106/111106100/, https://nptel.ac.in/courses/111/107/111107111/, https://nptel.ac.in/courses/111/108/111108081/, https://nptel.ac.in/courses/111/104/111104031/, https://nptel.ac.in/courses/122/107/122107037/
3. https://nptel.ac.in/courses/111/106/111106139/, https://nptel.ac.in/courses/111/105/111105123/
4. https://nptel.ac.in/courses/111/107/111107108/
5. https://nptel.ac.in/courses/111/105/111105122/, https://nptel.ac.in/noc/courses/noc20/SEM1/noc20-ma07/
6. https://nptel.ac.in/courses/111/104/111104125/

COURSE ARTICULATION MATRIX [Engineering Mathematics-II P21MA201]

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO-1	3	2												
CO-2	3	2												
CO-3	3	2												
CO-4	3	1												
CO-5	2	3												

Employability Enhancement Skills (EES) - II
[As per Choice Based Credit System (CBCS) & OBE Scheme]
SEMESTER – II

Course Code:	P21HSMC208	**Credits:**	01
Teaching Hours/Week (L:T:P):	0:2:0	**CIE Marks:**	50
Total Number of Teaching Hours:	28	**SEE Marks:**	50

Course Learning Objectives: This course will enable students to:

- Get introduced to the concepts of teamwork and leadership
- Understand the importance of professional etiquettes
- Describe the reading with comprehension
- Explain the purpose, plan and ways to identify specific details in a paragraph for better comprehension
- Form grammatically correct sentences
- Explain the basic concepts in calculating simple interest and compound interest
- Explain concepts behind logical reasoning modules of direction sense, coding & decoding, series and visual reasoning

UNIT – I	**10 Hours**

Soft Skills: Etiquette, Presentation Skills, Introduction to Body Language, Interpersonal and Intrapersonal Skills, Team work, Leadership skills, Extempore

Self-Study: Concepts of Sympathy and Empathy

UNIT – II	**10 Hours**

Verbal Ability: Verbal Analogies, Sentence completion & correction, Reading comprehension

Self-Study: Paragraph sequencing

UNIT – III	**8 Hours**

Quantitative Aptitude: Simple & Compound Interest, Ratio & Proportion, Time & Work
Logical Reasoning: Direction Sense, Coding and Decoding, Series, Visual reasoning

Self-Study: Directions and Pythagoras Theorem, differences between mirror and water images

Course Outcomes: On completion of this course, students are able to:

CO – 1: Exhibit amplified level of confidence to express themselves in English

CO – 2: Critical awareness of the importance of teamwork and development of the skills for building effective teams

CO – 3: Solve the questions under reading comprehension confidently with higher accuracy

CO – 4: Solve the problems based on interest, ratio & proportion, time & work

CO – 5: Solve logical reasoning problems based on direction sense, coding & decoding and series

Text Book(s):

1. Word Power Made Easy New Revised and Expanded Edition, First Edition, Norman Lewis, Goyal Publisher.
2. Essential English Grammar by Raymond Murphy, Cambridge University Press, new edition
3. The 7 habits of Highly Effective People by Stephen R. Covey
4. Quantitative aptitude by Dr. R. S Agarwal, published by S.Chand private limited.
5. Verbal reasoning by Dr. R. S Agarwal , published by S. Chand private limited.

Reference Book(s):

1. Quantitative Aptitude by Arun Sharma, McGraw Hill Education Pvt Ltd
2. CAT Mathematics by Abhijith Guha, PHI learning private limited.

Web and Video link(s):

1. Teamwork Skills: Communicating Effectively in Groups
https://www.coursera.org/learn/teamwork-skills-effective-communication

COURSE ARTICULATION MATRIX [Employability Enhancement Skills (EES) - II**]**

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12		
CO-1	-	-	-	-	-	-	-	-	2	3	-	2		
CO-2	-	-	-	-	-	-	-	-	3	1	2	2		
CO-3	-	-	-	-	-	-	-	-	-	2	-	1		
CO-4	2	-	-	-	-	-	-	-	-	-	-	-		
CO-5	2	-	-	-	-	-	-	-	-	-	-	-		