

Course Code	Course Name	Category	L	T	P	Credit	Year of Introduction
MA0U10B	VECTOR CALCULUS, DIFFERENTIAL EQUATIONS AND TRANSFORMS	BSC	3	1	0	4	2020

i) COURSE OVERVIEW:

The objective of this course is to familiarize the prospective engineers with some advanced concepts and methods in Mathematics which include the Calculus of vector valued functions, ordinary differential equations and basic transforms such as Laplace and Fourier Transforms which are invaluable for any engineer's mathematical tool box. The topics treated in this course have applications in all branches of engineering.

ii) COURSE OUTCOMES

After the completion of the course, the student will be able to:

CO 1	Compute the derivatives and line integrals of vector functions and learn their applications.	Evaluate
CO 2	Evaluate surface and volume integrals and learn their inter-relations and applications.	Evaluate
CO 3	Solve linear ordinary differential equations.	Apply
CO 4	Apply Laplace transform to solve ODEs arising in engineering.	Apply
CO 5	Apply Fourier transforms of functions to solve problems arising in engineering.	Apply

iii) SYLLABUS

Vector Calculus – Derivative of vector function, Gradient, Divergence, Curl, Line integral, conservative fields, Green's theorem, surface integral, Gauss divergence theorem, Stokes' theorem.

Ordinary Differential Equations- Homogeneous and Non-Homogeneous linear differential Equations, Euler-Cauchy equations. Method of undetermined coefficients and Method of variation of parameters.

Laplace transforms: Laplace Transform and its inverse, shifting theorems, Laplace transform of derivatives and integrals, solution of differential equations using Laplace transform, Unit step function. Dirac delta function, Convolution theorem and its applications.

Fourier Transforms: Fourier integral representation, Fourier sine and cosine integrals. Fourier transform and inverse Fourier transform. Fourier sine and cosine transforms, inverse sine and cosine transform, Convolution theorem.

iv) (a) TEXT BOOKS

- 1) H. Anton, I. Biven S. Davis, *Calculus*, Wiley, 10th Edition, 2015.
- 2) Erwin Kreyszig, *Advanced Engineering Mathematics*, John Wiley & Sons, 10th Edition, 2016.

(b) REFERENCES

- 1) George F Simmons: *Differential Equation with Applications and its historical Notes*, McGraw Hill Education India, 2nd Edition, 2002.
- 2) Hemen Dutta, *Mathematical Methods for Science and Engineering*, Cengage Learning, 1st Edition, 2020.
- 3) B.S. Grewal, *Higher Engineering Mathematics*, Khanna Publishers, 44th Edition, 2018.

v) COURSE PLAN

Module	Contents	No. of hours
I	Calculus of vector functions: Vector valued function of single variable, derivative of vector function and geometrical interpretation, motion along a curve-velocity, speed and acceleration. Concept of scalar and vector fields, Gradient and its properties, directional derivative, divergence and curl, Line integrals of vector fields, work as line integral, Conservative vector fields, independence of path and potential function (results without proof).	12
II	Vector integral theorems: Green's theorem (for simply connected domains, without proof) and applications to evaluating line integrals and finding areas. Surface integrals over surfaces of the form $z = g(x, y)$, $y = g(x, z)$ or $x = g(y, z)$, Flux integrals over surfaces of the form $z = g(x, y)$, $y = g(x, z)$ or $x = g(y, z)$, divergence theorem (without proof) and its applications to finding flux integrals, Stokes' theorem (without proof) and its applications to finding line integrals of vector fields and work done.	12
III	Ordinary differential equations: Homogenous linear differential equation of second order, superposition principle, general solution, homogenous linear ODEs with constant coefficients-general solution. Solution of Euler-Cauchy equations (second order only). Existence and uniqueness (without proof). Non homogenous linear ODEs-general solution, solution by the method of undetermined coefficients (for the right-hand side of the form x^n , e^{kx} , $\sin ax$, $\cos ax$, $e^{kx} \sin ax$, $e^{kx} \cos ax$ and their linear combinations), methods of variation of parameters. Solution of higher order equations-homogeneous and non-homogeneous with constant coefficient using method of undetermined coefficient.	12

IV	Laplace transforms: Laplace Transform and its inverse, Existence theorem (without proof), linearity, Laplace transform of basic functions, first shifting theorem, Laplace transform of derivatives and integrals, solution of differential equations using Laplace transform, Unit step function, Second shifting theorems. Dirac delta function and its Laplace transform, Solution of ordinary differential equation involving unit step function and Dirac delta functions. Convolution theorem (without proof) and its application to finding inverse Laplace transform of products of functions.	12
V	Fourier Transforms: Fourier integral representation, Fourier sine and cosine integrals. Fourier sine and cosine transforms, inverse sine and cosine transform. Fourier transform and inverse Fourier transform, basic properties. The Fourier transform of derivatives. Convolution theorem (without proof).	12
	Total hours	60

Course Code	Course Name	Category	L	T	P	Credit	Year of Introduction
PH0U10B	ENGINEERING PHYSICS B	BSC	3	1	0	4	2020

i) COURSE OVERVIEW:

The aim of the course is to develop scientific attitude in students and offer them an understanding of physical concepts behind various engineering applications. It creates an urge in students to think creatively in emerging areas of Physics.

ii) COURSE OUTCOMES

After the completion of the course, the student will be able to:

CO 1	Describe the characteristics of different types of oscillations and waves.	Remember
CO 2	Apply the principles of wave optics to explain natural physical processes and related technological advances.	Understand
CO 3	Use the principles of quantum mechanics to analyse the behaviour of matter in the atomic and subatomic level	Understand
CO 4	Apply the knowledge of ultrasonics in non-destructive testing and use the principles of acoustics to explain the nature and characterization of acoustic design	Understand
CO 5	Apply the comprehended knowledge about laser and fibre optic communication systems in various engineering applications.	Apply

iii) SYLLABUS

Oscillations and Waves: Damped oscillations, Forced oscillations, One dimensional and three- dimensional wave equations, Transverse vibrations along a stretched string.

Wave Optics: Interference of light- Air wedge, Newton's rings, Antireflection coating, Diffraction -Fraunhofer diffraction at a single slit, Grating equation, Rayleigh's criterion Quantum Mechanics & Nanotechnology: Wave function, Time dependent and time independent Schrodinger wave equations, One-dimensional potential well. Introduction to nanoscience and technology, Quantum confinement, Properties of nanomaterials.

Acoustics & Ultrasonics: Acoustics, characteristics of musical sounds, absorption coefficient, reverberation time-significance- Sabine's formula (no derivation), factors affecting architectural acoustics and their remedies.

Ultrasonics-production by magnetostriction oscillator and piezoelectric oscillator, detection of ultrasonic waves - thermal and piezoelectric methods, ultrasonic diffractometer-, applications of ultrasonic waves -SONAR, NDT. Laser and Fibre optics: Properties of laser, Ruby laser and Helium neon laser, Holography-Recording and reconstruction.

Optical fibre -Principle, Numerical aperture, Types of fibres, Applications.

iv) (a) TEXT BOOKS

- 1) M.N. Avadhanulu , P.G. Kshirsagar, T.V.S Arun Murthy, A Text book of Engineering Physics, S.Chand&Co., Revised Edition, 2014
- 2) H.K. Malik, A.K. Singh, Engineering Physics, McGraw Hill Education, 2nd Edition, 2017

(b) REFERENCES

- 1) Arthur Beiser, Concepts of Modern Physics, Tata McGraw Hill Publications, 6thEdition, 2003.
- 2) Aruldas G., Engineering Physics, Prentice Hall of India Pvt. Ltd., 2015
- 3) AjoyGhatak, Optics, McGraw Hill Education, 6th Edition, 2017
- 4) David J. Griffiths, Introduction to Electrodynamics, Addison-Wesley publishing, 4th Edition, 1999.
- 5) Premlet B., Advanced Engineering Physics, Phasor Books,10th Edition, 2017.

v) COURSE PLAN

Module	Contents	No. of hours
I	Oscillations and Waves: Harmonic oscillations, damped harmonic motion- derivation of differential equation and its solution, over damped, critically damped and under damped cases, Quality factor-expression, forced oscillations-differential equation-derivation of expressions for amplitude and phase of forced oscillations, amplitude resonance-expression for resonant frequency, Quality factor and sharpness of resonance, electrical analogy of mechanical oscillators Wave motion- derivation of one-dimensional wave equation and its solution, three-dimensional wave equation and its solution (no derivation), distinction between transverse and longitudinal waves, transverse vibration in a stretched string, statement of laws of vibration	12
II	Wave Optics: Interference of light-principle of superposition of waves, theory of thin films- cosine law (Reflected system), derivation of the conditions of constructive and destructive interference, interference due to wedge shaped films -determination of thickness and test for optical planeness, Newton's rings-measurement of wavelength and refractive index, antireflection coatings. Diffraction of light, Fresnel and Fraunhofer classes of diffraction, diffraction grating-Grating equation, Rayleigh criterion for limit of resolution, resolving and dispersive power of a grating with expression (no derivation)	12

III	<p>Quantum Mechanics & Nanotechnology: Introduction for the need of Quantum mechanics, wave nature of Particles, uncertainty principle, Applications-absence of electrons inside a nucleus and natural line broadening mechanism, formulation of time dependent and independent Schrodinger wave equations-physical meaning of wave function, Particle in a one dimensional box-derivation fo rnormalised wave function and energy eigen values, Quantum mechanical tunnelling(qualitative).</p> <p>Introduction to nanoscience and technology, increase in surface to volume ratio for nanomaterials, quantum confinement in one dimension, two dimension and three dimension-nanosheets, nanowires and quantum dots, properties of nanomaterials- mechanical, electrical and optical, applications of nanotechnology (qualitative ideas)</p>	12
IV	<p>Acoustics & Ultrasonics: Acoustics, Classification of sound-Musical sound-Noise, Characteristics of Musical Sounds-Pitch or frequency-Loudness or Intensity Measurement of Intensity level-Decibel-Quality or timbre, Absorption coefficient, Reverberation-Reverberation time-Significance- Sabine's formula (no derivation).Factors affecting architectural acoustics and their remedies.</p> <p>Ultrasonics- Production- Magnetostriction effect and Piezoelectric effect, Magnetostriction oscillator and Piezoelectric oscillator –Working, Detection of ultrasonic waves - Thermal and Piezoelectric methods. Ultrasonic diffractometer- Expression for the velocity of ultrasonic waves in a liquid , Applications of ultrasonic waves -SONAR,NDT and Medical.</p>	12
V	<p>Laser and Fibre optics: Properties of laser, Absorption and emission of radiation, Spontaneous and stimulated emission, Einstein's coefficients (no derivation), Population inversion, Metastable states, basic components of laser, Active medium, Pumping mechanism, Optical resonant cavity, working principle. Construction and working of Ruby laser and Helium neon laser, Construction and working of semiconductor laser (Qualitative) Applications of laser. Holography, Difference between hologram and photograph, Recording of hologram and reconstruction of image, Applications.</p> <p>Optic fibre-Principle of propagation of light, Types of fibres-Step index and Graded index fibres, Numerical aperture –Derivation, Fibre optic communication system (block diagram), Industrial, Medical and Technological applications, Fibre optic sensors-Intensity Modulated and Phase modulated sensors</p>	12
Total hours		60

Course Code	Course Name	Category	L	T	P	Credit	Year of Introduction
ESOU10A	ENGINEERING MECHANICS	ESC	2	1	0	3	2020

i) COURSE OVERVIEW

Goal of this course is to expose the students to the fundamental concepts of mechanics and enhance their problem-solving skills. It introduces students to the influence of applied force system and the geometrical properties of the rigid bodies while stationary or in motion. After this course students will be able to recognize similar problems in real-world situations and respond accordingly.

ii) COURSE OUTCOMES

After the completion of the course, the student will be able to:

CO 1	Explain the principles and theorems related to rigid body mechanics.	Understand
CO 2	Describe the components of system of forces acting on the rigid body.	Understand
CO 3	Apply the properties of distributed areas and masses for solving problems involving rigid bodies.	Apply
CO 4	Apply the conditions of equilibrium to various practical problems involving different force systems.	Apply
CO 5	Apply appropriate principles to solve problems in rigid body mechanics.	Apply

iii) SYLLABUS

Statics of rigid bodies: Classification of force systems, Composition and resolution of forces, Resultant and equilibrium equations, Methods of projections, Varignon's Theorem of moments.

Friction: Analysis of single and connected bodies. Parallel coplanar forces, couple. Beam reactions.

Properties of surfaces: Centroid of composite areas, Moment of inertia of areas, Polar moment of inertia, Theorem of Pappus-Guldinus, Forces in space.

Dynamics: D'Alembert's principle, Motion on horizontal and inclined surfaces, Motion of connected bodies. Impulse momentum and work energy relation. Curvilinear translation.

Rotation: Kinematics of rotation. Plane motion of rigid body: Instantaneous centre. Simple harmonic motion: Mechanical vibrations.

iv) (a) TEXTBOOKS

- 1) Timoshenko, S., Young, D. H., Rao, J. V. and Pati, S., *Engineering Mechanics*, McGraw Hill Publishers, 2017.

- 2) Beer, F. P. and Johnston, R., *Vector Mechanics for Engineers: Statics and Dynamics*, Tata Mc-Graw Hill Publishing Company Limited, New Delhi, 12th Edition, 2005.
- 3) Bansal, R. K., *A Textbook of Engineering Mechanics*, Laxmi Publications, 8th Edition, 2016.
- 4) Sharma, D. P., Hibbeler, R. C. and Shames, I. H., *Engineering Mechanics*, Pearson Publishers, 2011.

(b) REFERENCES

- 1) Bhavikkatti, S. S., *Engineering Mechanics*, New Age International Publishers, 2016.
- 2) Merriam, J. L. and Kraige, L. G., *Engineering Mechanics - Vols. 1 and 2*, John Wiley, 7th Edition, 2006.
- 3) Hibbeler, R. C. and Gupta, A., *Engineering Mechanics*, Vol. I Statics, Vol II Dynamics, Pearson Education, 2009.
- 4) Shames, I. H., *Engineering Mechanics - Statics and Dynamics*, Prentice Hall of India, 4th Edition 2005.

v) COURSE PLAN

Module	Contents	No. of hours
I	Introduction to engineering mechanics - Introduction on statics and dynamics - Basic principles of statics - Parallelogram law, Equilibrium law - Superposition and transmissibility, Law of action and reaction. Free body diagrams - Degree of freedom-Types of supports and nature of reactions -Exercises for free body diagram preparation - Composition and resolution of forces, Resultant and equilibrium equations. Concurrent coplanar forces - Analysis of concurrent forces - Methods of projections - Methods of moment - Varignon's Theorem of Moments.	9
II	Friction - Sliding friction - Coulomb's laws of friction - Analysis of single bodies - Analysis of connected bodies. Parallel coplanar forces - Couple - Resultant of parallel forces - Centre of parallel forces - Equilibrium of parallel forces - Simple beam subject to concentrated vertical loads. General coplanar force system - Resultant and equilibrium equations.	9
III	Centroid of regular geometrical shapes - Centroid of Composite areas. Moment of inertia- Parallel axis theorem - Perpendicular axis theorem - Polar moment of inertia, Radius of gyration. Mass moment of inertia of ring, cylinder and uniform disc. Theorem of PappusGuldinus. Introduction to forces in space -Vectorial representation of forces, moments and couples - Resultant and equilibrium equations for concurrent forces in space - Concurrent forces in space.	9

IV	<p>Introduction to dynamics - Rectilinear translation - Equations of kinematics.</p> <p>Introduction to kinetics - Equation of motion - D'Alembert's principle - Motion on horizontal and inclined surfaces - Motion of connected bodies.</p> <p>Curvilinear translation - Projectile motion - Introduction to kinetics - equation of motion. Impulse momentum equation and work energy equation. Moment of momentum and work energy equation (Curvilinear translation).</p>	9
V	<p>Rotation - Kinematics of rotation- Equation of motion for a rigid body rotating about a fixed axis - Rotation under a constant moment.</p> <p>Plane motion of rigid body- Instantaneous centre of rotation (concept only).</p> <p>Introduction to harmonic oscillation - Free vibrations - Simple harmonic motion – Differential equation and solution. Degree of freedom - Examples of single degree of freedom (SDOF) systems -Idealisation of mechanical systems as spring-mass systems (concept only).</p> <p>SDOF spring mass system - Equation of motion -Undamped free vibration response - Concept of natural frequency. Effect of damping on free vibration response (concept only).</p>	9
	Total hours	45

Course Code	Course Name	Category	L	T	P	Credit	Year of Introduction
ES0U10C	BASICS OF CIVIL AND MECHANICAL ENGINEERING	ESC	4	0	0	4	2020

i) COURSE OVERVIEW

The goal of this course is to provide an insight on the essentials of Civil and Mechanical Engineering discipline to the students of all branches of Engineering and to provide the students an illustration of the significance of the Civil and Mechanical Engineering Profession in satisfying the societal needs.

ii) COURSE OUTCOMES

After the completion of the course, the student will be able to:

CO 1	Explain different types of buildings, their components, materials, construction techniques and basic infrastructure services.	Understand
CO 2	Describe the importance, objectives and principles of surveying.	Understand
CO 3	Apply the principles of levelling to find the level difference between points.	Apply
CO 4	Summarise the different materials and systems in the context of green buildings.	Understand
CO 5	Analyse thermodynamic cycles and Illustrate the working and features of IC Engines	Apply
CO 6	Explain the basic principles of Refrigeration and Air Conditioning and working of hydraulic machines	Understand
CO 7	Explain the working of power transmission elements, basic manufacturing, metal joining and machining processes	Understand

iii) SYLLABUS

Introduction to Civil Engineering: Relevance and major disciplines of Civil Engineering, Introduction to buildings: Types and different components of buildings, Building rules and regulations, Building area.

Introduction to surveying: Objectives, Principle, Classification, Levelling, Introduction to modern surveying instrument- Total Station.

Construction materials: Bricks, Stones, Sand, Timber, Cement, Cement mortar, Concrete, Steel, Modern construction materials.

Building construction: Foundations, Brick masonry, Roofs and floors, Basic infrastructure services, Green buildings.

Basics of Mechanical Engineering: Fundamental of thermodynamics. Analysis of thermodynamic cycles and working of internal combustion engines. CRDI, MPFI and concept of hybrid vehicles.

Refrigeration and power transmission systems - Analysis of reversed Carnot cycle and vapour compression cycle. Introduction to psychrometry. Layout of unit and central air conditioner.

Description and basic analysis of hydraulic pump and turbine. Working of different power transmission devices.

Manufacturing methods and machine tools - Description of various manufacturing, metal joining process and basic machining operations.

Working of different machines tools and CNC machine. Introduction to CAD/CAM, additive and rapid manufacturing.

iv) (a) **TEXT BOOKS**

- 1) Mamlouk, M. S., and Zaniewski, J. P., *Materials for Civil and Construction Engineering*, Pearson Publishers, 4th Edition, 2017.
- 2) Rangwala, S. C., *Essentials of Civil Engineering*, Charotar Publishing House, 1st Edition, 2012.
- 3) Clifford, M., Simmons, K. and Shipway, P., *An Introduction to Mechanical Engineering Part I - CRC Press*, 2009.
- 4) Kumar, P., *Basic Mechanical Engineering*, Pearson India, 2013.

(b) **REFERENCES**

- 1) Chen, W. F. and Liew, J. Y. R. (Eds), *The Civil Engineering Handbook*, CRC Press (Taylor and Francis), 2nd Edition, 2002
- 2) Punmia, B. C., Ashok, K. J. and Arun, K. J., *Surveying*, Vol. I, Laxmi Publications (P) Ltd., New Delhi, 17th Edition, 2016
- 3) *Kerala Municipal Building Rules*, LSGD, Govt. of Kerala, 2019
- 4) SP 7: 2016, *National Building Code of India*, BIS, New Delhi, 2016.
- 5) Wylen, G. J. V., Sonntag, R. and Borgnakke, C., *Fundamentals of Classical Thermodynamics*, John Wiley & Sons, 2012.
- 6) Sawhney, G. S., *Fundamentals of Mechanical Engineering*, PHI Learning; 3rd Revised Edition, 2015.

v) **COURSE PLAN**

Module	Contents	No. of hours
I	<p>General Introduction to Civil Engineering: Relevance of Civil Engineering in the overall infrastructure development of the Country. Responsibility of an engineer in ensuring the safety of built environment. Brief introduction to major disciplines of Civil Engineering like Structural Engineering, Transportation Engineering, Geotechnical Engineering, Water Resources Engineering and Environmental Engineering.</p> <p>Introduction to buildings: Types of buildings, selection of site for buildings, components of a residential building and their functions.</p> <p>Building rules and regulations: Relevance of NBC, KBR & CRZ norms (brief discussion only).</p>	10

	<p>Building area: Plinth area, built up area, floor area, carpet area and floor area ratio for a building as per KBR.</p> <p>Surveying: Importance, classification, objectives and principles, instruments used. Levelling- principles, dumpy level, simple levelling, differential levelling- problems. Introduction to modern surveying instruments-Total Station.</p>	
II	<p>Construction materials: Conventional construction materials: types, properties and uses of building materials: bricks, stones, cement, sand and timber.</p> <p>Cement Mortar: Materials and properties.</p> <p>Cement concrete: Constituent materials, properties and types.</p> <p>Steel: Steel sections and steel reinforcements, types and uses.</p> <p>Modern construction materials: Architectural glass, ceramics, plastics, composite materials, thermal and acoustic insulating materials, decorative panels, waterproofing materials. Modern uses of gypsum, pre-fabricated building components (brief discussion only).</p>	10
III	<p>Building Construction: Foundations: Bearing capacity of soil (definition only), functions of foundations, types – shallow and deep (brief discussion only). Load bearing and framed structures (concept only).</p> <p>Brick masonry: Header and stretcher bond, English bond and Flemish bond.</p> <p>Roofs and floors: Functions, types; flooring materials (brief discussion only).</p> <p>Basic infrastructure services: MEP, HVAC, elevators, escalators and ramps (Civil Engineering aspects only), fire safety for buildings.</p> <p>Green buildings: Materials, energy systems and water management and environment for green buildings (brief discussion only).</p>	10
IV	<p>Fundamentals of thermodynamics: Review of basics of thermodynamics- system, surroundings, process, cycle- quasistatic process, laws of thermodynamics.</p> <p>Analysis of thermodynamic cycles: Carnot, Otto, Diesel cycles, Derivation of efficiency of these cycles, Problems to calculate heat added, heat rejected, net-work and efficiency.</p> <p>IC Engines: CI, SI, 2- Stroke, 4-Stroke engines. Listing the parts of different types of IC Engines. Efficiencies of IC Engines (Definitions only), Air, Fuel, cooling and lubricating systems in SI and CI Engines, CRDI, MPFI. Concept of hybrid engines.</p>	10
V	<p>Refrigeration: Unit of refrigeration, reversed Carnot cycle, COP, vapour compression cycle (only description and no problems); Definitions of dry, wet & dew point temperatures, specific humidity and relative humidity, Cooling and dehumidification, Layout of unit and central air conditioners.</p>	10

	<p>Hydraulic machines: Working principle of Reciprocating pump, Centrifugal pump, Pelton turbine, Francis turbine and Kaplan turbine. Overall efficiency, Problems on calculation of input and output power of pumps and turbines (No velocity triangles)</p> <p>Power Transmission Devices: Belt and Chain drives, Gear and Gear trains, Single plate clutches.</p>	
VI	<p>Manufacturing Process: Basic description of the manufacturing processes – Sand Casting, Forging, Rolling, Extrusion and their applications. Metal Joining Processes: List types of welding, Description with sketches of Arc Welding, Soldering and Brazing and their applications.</p> <p>Basic Machining Operations: Turning, Drilling, Milling and Grinding. Lathe, Drilling machine, Milling machine.</p> <p>Computer Aided Machining: CNC Machine. Principle of CAD/CAM, Rapid and Additive manufacturing.</p>	10
	Total hours	60

Course Code	Course Name	Category	L	T	P	Credit	Year of Introduction
HS0U10B	PROFESSIONAL COMMUNICATION	HSC	2	0	2	--	2020

i) COURSE OVERVIEW:

The objective of this course is to equip students with the necessary skills to listen, read, write, and speak so as to comprehend and successfully convey any idea, technical or otherwise, as well as give them the necessary polish to become persuasive communicators. The course aims to enhance the employability and career Skills of students and orient the students towards grooming as a professional.

ii) COURSE OUTCOMES

After the completion of the course, the student will be able to:

CO 1	Develop effective language skills relevant to Engineering as a profession and demonstrate these through writing and making presentations.	Create
CO 2	Analyze, interpret and effectively summarize a variety of textual and audio content for specific needs	Analyse
CO 3	Apply appropriate thinking and problem solving techniques to solve new case studies.	Apply
CO 4	Present and analyse a given technical/non-technical topic in a group setting and arrive at generalizations/consensus.	Analyse
CO 5	Create professional and technical documents that are clear and adhering to all the necessary conventions.	Create
CO 6	Manage and apply interviewing skills.	Apply

iii) SYLLABUS

Communication Skills: Introducing yourself and others professionally, elevator pitch, recommendation letter, e-mails, netiquettes, telephone etiquettes, demi-official letters.

Business Communication and Technical writing: Product description, narrating an incident, report writing, agenda and minutes, memo, Asking for information and giving information, explaining processes and products, giving instructions, planning a course of action.

Creative Thinking, Critical Thinking Skills and problem solving: Expressing opinion, GD, Arguing, Reading critical texts (general and academic) and summarizing, listening and responding, Negotiation strategies and decision making skills.

Presentation Skills: Oral Presentation Skills (Proposal presentation), Power point presentation (Projects).

Interviews: CVs and Resumes, Job application, Types of interviews, successful interviews,

interview etiquette, dress code, body language, telephone/online (Skype) interviews, one-to-one interview & panel interview, FAQs related to job interviews.

iv) (a) TEXT BOOKS

- 1) Meenakshi Raman and Sangeetha Sharma (2018). *Professional Communication*, Oxford University Press, 3rd Edition, 2018.
- 2) Meenakshi Raman and Sangeetha Sharma, *Technical Communication: Principles and Practice*, Oxford University Press, 2nd Edition, 2011.
- 3) Ashraf Rizvi M., *Effective Technical Communication*. New Delhi: Tata McGraw Hill Publications, 2007.

(b) REFERENCES

- 1) *English for Engineers and Technologists* (Combined edition, Vol. 1 and 2, Orient Blackswan, 2010.
- 2) Stephen E. Lucas, *The Art of Public Speaking*, 10th Edition; McGraw Hill Education, 2012.
- 3) William Strunk Jr. & E.B. White, *The Elements of Style*, 4th Edition, Pearson, 1999.
- 4) David F. Beer and David, *Guide to writing as an Engineer*, John Willey. New York, 2004.
- 5) Goodheart-Willcox, *Professional Communication*, 1st Edition, 2017.
- 6) *Training in Interpersonal Skills: Tips for Managing People at Work*, Pearson Education, India, 6th Edition, 2015.
- 7) *The Ace of Soft Skills: Attitude, Communication and Etiquette for Success*, Pearson Education; 1st Edition, 2013.
- 8) AnandGanguly, *Success in Interview*, RPH, 5th Edition, 2016.
- 9) Raman Sharma, *Technical Communications*, Oxford Publication, London, 2004.

v) COURSE PLAN

Module	Contents	No. of hours
I	Use of language in communication: Significance of technical communication Vocabulary Development: technical vocabulary, vocabulary used in formal letters/emails and reports, sequence words, misspelled words, compound words, finding suitable synonyms, paraphrasing, verbal analogies. Language Development: subject-verb agreement, personal passive voice, numerical adjectives, embedded sentences, clauses, conditionals, reported speech, active/passive voice. Technology-based communication: Effective email messages, slide presentations, editing skills using software. Modern day research and study skills: search engines, repositories, forums such as GitHub, Stack Exchange, OSS communities (MOOC, SWAYAM, NPTEL), and Quora; Plagiarism	6

II	<p>Reading, Comprehension, and Summarizing: Reading styles, speed, valuation, critical reading, reading and comprehending shorter and longer technical articles from journals, newspapers, identifying the various transitions in a text, SQ3R method, PQRS method, speed reading.</p> <p>Comprehension: techniques, understanding textbooks, marking and underlining, Note-taking: recognizing non-verbal cues.</p>	6
III	<p>Oral Presentation: Voice modulation, tone, describing a process, Presentation Skills: Oral presentation and public speaking skills, business presentations, Preparation: organizing the material, self-introduction, introducing the topic, answering questions, individual presentation practice, presenting visuals effectively.</p> <p>Debate and Group Discussions: introduction to Group Discussion (GD), differences between GD and debate; participating GD, understanding GD, brainstorming the topic, questioning and clarifying, GD strategies, activities to improve GD skills.</p>	6
IV	<p>Listening and Interview Skills Listening: Active and Passive listening, listening: for general content, to fill up information, intensive listening, for specific information, to answer, and to understand.</p> <p>Developing effective listening skills, barriers to effective listening, listening to longer technical talks, listening to classroom lectures, talks on engineering /technology, listening to documentaries and making notes, TED talks.</p> <p>Interview Skills: types of interviews, successful interviews, interview etiquette, dress code, body language, telephone/online (skype) interviews, one-to-one interview & panel interview, FAQs related to job interviews</p>	6
V	<p>Formal writing: Technical Writing: differences between technical and literary style. Letter Writing (formal, informal and semi formal), Job applications, Minute preparation, CV preparation (differences between Bio-Data, CV and Resume), and Reports. Elements of style, Common Errors in Writing: describing a process, use of sequence words, Statements of Purpose, Instructions, Checklists.</p> <p>Analytical and issue-based Essays and Report Writing: basics of report writing; Referencing Style (IEEE Format), structure of a report; types of reports, references, bibliography</p>	6
	Total Hours	30

Lab Activities-Total hours 30

Written: Letter writing, CV writing, Attending a meeting and Minute Preparation, Vocabulary Building

Spoken: Phonetics, MMFS (Multimedia Feedback System), Mirroring, Elevator Pitch, telephone etiquette, qualities of a good presentation with emphasis on body language and use of visual aids.

Listening: Exercises based on audio materials like radio and podcasts. Listening to Song practice and exercises.

Reading: Speed Reading, Reading with the help of Audio Visual Aids, Reading Comprehension Skills

Mock interview and Debate/Group Discussion: concepts, types, Do's and don'ts- intensive practice

vi) CONTINUOUS ASSESSMENT EVALUATION PATTERN

Continuous Internal Evaluation

Total Marks : 50 marks

Attendance : 10 marks

Regular assessment : 25 marks

Series test (one test only, should include verbal aptitude for placement and higher studies, this test will be conducted for 50 marks and reduced to 15) : 15 marks

Regular assessment

Project report presentation and Technical presentation through PPT : 7.5 marks

Listening Test : 5 marks

Group discussion/mock job interview : 7.5 marks

Resume submission : 5 marks

Mark distribution

Total Marks	CIE	ESE	ESE Duration
100	50	50	2 hrs

Continuous Internal Evaluation : 50 marks

End term evaluation : 50 marks

REGULAR ASSESSMENT

Group Discussion (Marks:7.5)

Create groups of about 6 students each and engage them in a GD on a suitable topic for about 20 minutes. Parameters to be used for evaluation are as follows:

- Communication Skills : 3 marks
- Subject Clarity : 3marks
- Group Dynamics : 0.5 marks
- Behaviours &Mannerisms : 1 mark

Presentation Skills and project report writing (Marks: 7.5)

Students will submit a technical report and make a power point presentation.

- Communication Skills : 2 marks
- Platform Skills : 1 mark
- Team player flexibility : 1 mark
- Subject Clarity/Knowledge (Report writing) : 3.5 marks

Project Report writing

Writing report of Project undertaken following the guidelines and procedures. These marks Parameters to be used for evaluation are as follows:

- Usage of English and Grammar : 0.5 mark
- Following the format : 1 mark
- Content clarity : 2 marks

Listening and summarizing (Marks: 5 marks)

Listening to a clipping and writing the summary. Parameters to be used for evaluation are as follows:

- Identification of key ideas : 2 marks
- Usage of English and Grammar : 1.5 marks
- Cohesion and coherence : 1.5 marks

Interviews (Marks: 7.5 marks)

Students will participate in a mock interview with a panel of interviewers. Parameters to be used for evaluation are as follows:

- Communication Skills : 2 marks
- Subject Clarity : 2 marks
- Body language: : 1.5 marks
- Resume : 2 marks

vii) END SEMESTER EXAMINATION PATTERN

Evaluation

Total Marks: 50

Time: 2hrs

Course Code	Course Name	Category	L	T	P	Credit	Year of Introduction
ES0U10E	PROGRAMMING IN C	ESC	2	1	2	4	2020

i) COURSE OVERVIEW:

This course aims to introduce the concepts of structured programming. It covers basic concepts of C programming language including arrays, functions, pointers and files. This course involves a lab component which equips the learner to solve computational problems through programming.

ii) COURSE OUTCOMES

After the completion of the course, the student will be able to:

CO 1	Explain the fundamentals of computer architecture and types of software.	Understand
CO 2	Develop a solution using algorithm /flowchart to a computational problem.	Apply
CO 3	Construct programs with control statements and arrays.	Apply
CO4	Make use of user defined data types or functions to solve computational problems.	Apply
CO5	Develop programs using files and pointers.	Apply

iii) SYLLABUS

Computer architecture & Programming Languages – Basics of Computer architecture, Types of Programming Languages, System Software, Application Software, Introduction to structured programming, Algorithms, Flowcharts and Pseudo-codes

C Programming Language – Data Types, variables, keywords, Constants, Operators and Expressions, Control Flow Statements- Conditional statements, Iterative statements, programs

Arrays and Strings– Multidimensional arrays and matrices, String processing, searching and sorting in 1D array.

Functions – Scope of variable, Pass by reference and value methods, Recursive functions. Structures and union, Storage Classes

Pointers and Files- File Operations, Sequential access and random access, programs covering pointers and files, Introduction to data structures – Types of data structure, Singly linked list.

iv) (a) TEXT BOOKS

- 1) Byron Gottfried, *Programming with C* (Schaum's Outlines Series), Mcgraw Hill Education, 3rd Edition, 2017.
- 2) H. M. Deitel, P. J. Deitel, *C: How to program*, 7th Edition, Pearson Education, 2010.
- 3) Anita Goel, *Computer Fundamentals*, Pearson, 1st Edition, 2010.

- 4) Ellis Horowitz, Sartaj Sahini, Susan Anderson Freed, *Fundamentals of Data Structures in C*, 2nd Edition, 2008.

(b) REFERENCES

- 1) Brian W. Kernighan and Dennis M. Ritchie, *C Programming Language*, Pearson, 2nd Edition, 2015.
- 2) Rajaraman V, PHI, *Computer Basics and Programming in C*, 1st Edition, 2007.
- 3) Anita Goel and Ajay Mittal, *Computer fundamentals and Programming in C*, 1st Edition, 2013.

v) COURSE PLAN

Module	Contents	No. of hours
I	Basics of Computer architecture -Von-Neumann Architecture- Processor, Memory, Input and Output devices. Types of Programming Languages, System Software, Application Software: Compilers, Interpreters, high level and low-level languages Introduction to structured programming, Algorithm, flowcharts and Pseudo-code -Examples	8
II	Basic structure of C program: Character set, Tokens, Identifiers in C, Variables and Data Types, Constants, Console IO Operations, printf and scanf, Operators and Expressions: Expressions and Arithmetic Operators, Relational and Logical Operators, Conditional operator, size of operator, Assignment operators and Bitwise Operators. Operators Precedence. Control Flow Statements: If Statement, Switch Statement, Unconditional Branching using goto statement, While Loop, Do While Loop, For Loop, Break and Continue statements.	9
III	Arrays. Strings-string handling functions. Multidimensional arrays and matrices. Linear search and Bubble Sort in array. String processing: In built string handling functions Simple programs covering arrays and strings	9
IV	Functions: The prototype declaration, Function definition. Function call: Passing arguments to a function, by value, by reference. Scope of variable names. Recursive function calls. Storage Classes. Structure and union in C, Array of structures	8
V	Pointers: Pointer variables. Declaring and dereferencing pointer variables. Accessing arrays through pointers. File Operations: open, close, read, write, append Sequential access and random access to files: In built file handling functions (rewind(), fseek(), ftell(), feof(), fread(), fwrite()), simple programs covering pointers and files. Introduction to Data Structures: Linear and Non-linear data structures, Singly Linked list and its operations.	11
	Total hours	45

C PROGRAMMING LAB (Practical Part of ES0U10E) - Total hours 15

1. Familiarization of console I/O and operators in C
 - i) Display “Hello World”
 - ii) Read two numbers, add them and display their sum
 - iii) Read the radius of a circle, calculate its area and display it
 - iv) Area of triangle after reading its sides
2. Read 3 integer values and find largest of three numbers.
3. Check whether given year is leap year.
4. Display the grade of a student after reading his mark for a subject. (Use switch)
5. Read a Natural Number and check whether the number is prime or not
6. Read a Natural Number and check whether the number is Armstrong or not
7. Display second largest number after reading n numbers from user. (Without array).
8. Read n integers, store them in an array and find their sum and average
9. Read n integers, store them in an array and search for an element in the array using an algorithm for Linear Search
10. Read n integers, store them in an array and sort the elements in the array using Bubble Sort algorithm
11. Write a menu driven program for performing matrix addition, multiplication and finding the transpose. Use functions to (i) read a matrix, (ii) find the sum of two matrices, (iii) find the product of two matrices, (iv) find the transpose of a matrix and (v) display a matrix.
12. Display sum of diagonal elements of a matrix
13. Read a string (word), store it in an array and check whether it is a palindrome word or not.
14. Read a string (ending with a \$ symbol), store it in an array and count the number of vowels, consonants and spaces in it.
15. Display first n prime numbers using Function.
16. Program to find the sum of digits of a number using recursion
17. Using structure, read and print data of n employees (Name, Employee Id and Salary)
18. Read the marks of three subjects for n students of a class and display their names in the order of rank. (Use array of structure)
19. Input and Print the sum of elements of an array using pointers
20. Create a file and perform the following
 - i) Write data to the file
 - ii) Read the data in a given file & display the file content on console
 - iii) append new data and display on console
21. Open a text input file and count number of characters, words and lines in it; and store the results in an output file.
22. Implementation of Singly Linked List.

Course Code	Course Name	Category	L	T	P	Credit	Year of Introduction
PH0U18A	ENGINEERING PHYSICS LAB	BSC	0	0	2	1	2020

i) COURSE OVERVIEW:

The aim of this course is to enable the students to gain practical knowledge in Physics to correlate with the theoretical studies. It equips the students to utilize the acquired skills in an appropriate way to explore the prospects of modern technology. It brings more confidence in students and develop the ability to fabricate engineering and technical tools.

ii) COURSE OUTCOMES

After the completion of the course, the student will be able to:

CO 1	Determine the frequency of tuning fork using a Melde's string apparatus by setting up wave pattern in a stretched string.	Understand
CO 2	Examine wave patterns using CRO to measure basic physical quantities viz. frequency and amplitude.	Remember
CO 3	Determine the wavelength of a monochromatic beam of light and thickness of thin wire using principle of interference	Apply
CO 4	Demonstrate diffraction of light using plane transmission grating.	Understand
CO 5	Draw the I-V characteristics of non ohmic devices.	Remember

iii) SYLLABUS

1. Melde's string apparatus- Measurement of frequency in the transverse mode.
2. Wave length measurement of a monochromatic source of light using Newton's Rings method.
3. Determination of diameter of a thin wire or thickness of a thin strip of paper using air wedge method.
4. Measurement of wavelength of a source of light using grating.
5. Determination of dispersive power and resolving power of a plane transmission grating.
6. Determination of the wavelength of any standard laser using diffraction grating
7. I-V characteristics of solar cell.
8. CRO-Measurement of frequency and amplitude of wave forms.

iv) REFERENCES

- 1) S.L. Gupta and V. Kumar, *Practical physics with viva voce*, PragatiPrakashan Publishers, Revised Edition, 2009.
- 2) M.N. Avadhanulu, A.A. Dani and Pokely P.M., *Experiments in Engineering Physics*, S. Chand &Co, 2008.
- 3) S. K. Gupta, *Engineering Physics practicals*, Krishna PrakashanPvt. Ltd., 2014
- 4) P. R. Sasikumar, *Practical Physics*, PHI Ltd., 2011.

Course Code	Course Name	Category	L	T	P	Credit	Year of Introduction
ES0U18A	CIVIL AND MECHANICAL WORKSHOP	ESC	0	0	2	1	2020

i) COURSE OVERVIEW

The course is designed to train the students to identify and manage the tools, materials and methods required to execute basic Civil and Mechanical Engineering activities. Students will be introduced to a team working environment where they develop the necessary skills for planning, preparing and executing a basic Engineering activity. It also enables the student to familiarize various tools, measuring devices, practices and different methods of manufacturing processes employed in industry for fabricating components.

ii) COURSE OUTCOMES

After the completion of the course, the student will be able to:

CO 1	Name different devices and tools used for Civil Engineering measurements.	Remember
CO 2	Explain the use of various techniques and devices used in Civil Engineering measurements.	Understand
CO 3	Choose materials and methods required for basic Civil Engineering activities like field measurements, masonry work and plumbing.	Apply
CO 4	Demonstrate the steps involved in basic Civil Engineering activities like plot measurement, setting out operation, evaluating the natural profile of land, plumbing and undertaking simple construction work.	Apply
CO 5	Identify the tools and equipment used in fitting, carpentry, sheet metal, foundry, welding and smithy and various machine tools.	Remember
CO 6	Prepare simple models in fitting, carpentry, sheet metal, foundry, welding and smithy trades.	Apply
CO 7	Demonstrate general safety precautions in different mechanical workshop trades.	Understand

iii) SYLLABUS

A) CIVIL WORKSHOP

- 1) Set out a one room building of given plan using tape only method and using tape and cross staff.
- 2) a) Use screw gauge and vernier calliper to measure the diameter of a steel rod and thickness of a flat bar.
- b) Calculate the area of a built-up space and a small piece of land- Use standard measuring tape and digital distance measuring devices.

- 3) a) Construct a wall using currently used building blocks such as bricks (1 ½ thick brick wall using English bond), hollow blocks, solid blocks, etc. Use spirit level to assess the tilt of walls.
- b) Estimate the number of different types of building blocks required to construct a wall of given dimensions.
- c) Transfer the level from one point to another point using a water level.
- 4) Find the level difference between any two points using dumpy level (differential levelling).
- 5) a) Introduce the students to plumbing tools, different types of pipes, types of connections, traps, valves, fixtures and sanitary fittings.
- b) Study of installation of rain water harvesting system in an educational campus.
- 6) Introduce students to the principle and working of Total Station.
- 7) Demonstration of a simple construction work using concrete.

B) MECHANICAL WORKSHOP

- 1) General: Introduction to workshop practice, Safety precautions, Shop floor ethics, Basic First Aid knowledge, Study of mechanical tools
- 2) Carpentry: Understanding of carpentry tools and making minimum one model.
- 3) Foundry: Understanding of foundry tools and making minimum one model.
- 4) Sheet metal: Understanding of sheet metal working and making minimum one model.
- 5) Fitting: Understanding of fitting tools and making minimum one model.
- 6) Welding: Understanding of fitting tools and making minimum one model.
- 7) Smithy: Understanding of smithy tools and making minimum one model.
- 8) Machine Tools: Demonstration of various machines like shaping and slotting machine, Milling machine, Grinding Machine, Lathe, Drilling Machine, CNC Machines, Power Tools.
Demonstration of 3D Printer.

iv) REFERENCES

- 1) Khanna, P. N., *Indian Practical Civil Engineering Handbook*, Engineers Publishers, 2012.
- 2) Punmia, B. C., Ashok, K. J. and Arun, K.J., *Surveying*, Vol. I, Laxmi Publications (P) Ltd., New Delhi, 17th Edition, 2016.
- 3) Arora, S. P. and Bindra, S. P., *Building Construction*, DhanpatRai Publications, 43rd Edition, 2019.
- 4) Rangwala, S. C., *Engineering Materials*, Charotar Publishing House, Anand, 43rd Edition, 2019.
- 5) Sawhney, G.S., *Mechanical Experiments and Workshop Practice*, Dream tech Press, 2019.
- 6) Varun, B., *Engineering Workshop: Civil and Mechanical Engineering Practice*, Notion Press, 1st Edition, 2020.

v) COURSE PLAN

Experiment No.	List of exercises/experiments	No. of hours
A) CIVIL WORKSHOP		
I	Set out a one room building of given plan using tape only method and using tape and cross staff.	2
II	a) Use screw gauge and vernier calliper to measure the diameter of a steel rod and thickness of a flat bar.	2
	b) Calculate the area of a built-up space and a small piece of land- Use standard measuring tape and digital distance measuring devices.	
III	a) Construct a wall using currently used building blocks such as bricks (1 ½ thick brick wall using English bond), hollow blocks, solid blocks, etc. Use spirit level to assess the tilt of walls.	2
	b) Estimate the number of different types of building blocks required to construct a wall of given dimensions.	
	c) Transfer the level from one point to another point using a water level.	
IV	Find the level difference between any two points using dumpy level (differential levelling).	3
V	a) Introduce the students to plumbing tools, different types of pipes, types of connections, traps, valves, fixtures and sanitary fittings.	2
	b) Study of installation of rain water harvesting system in an educational campus.	
VI	Introduce students to the principle and working of Total Station.	2
VII	Demonstration of a simple construction work using concrete.	2
	Total hours	15
B) MECHANICAL WORKSHOP		
I	Workshop practice, shop floor precautions, ethics and First Aid knowledge. Studies of mechanical tools, components and their applications: (a) Tools: Screw drivers, spanners, Allen keys, cutting pliers etc. and (b) Accessories: Bearings, seals, O-rings, circlips, keys etc.	1
II	Carpentry - Understanding of carpentry tools and making minimum one model. <ul style="list-style-type: none"> • Lap joint • Cross lap joint • Dovetail joint • Mortise joints 	2
III	Foundry - Understanding of foundry tools and making minimum one model.	2

	<ul style="list-style-type: none"> • Bench Moulding • Floor Moulding • Core making • Pattern making 	
IV	Sheet metal - Understanding of sheet metal working and making minimum one model. <ul style="list-style-type: none"> • Cylindrical shape • Conical shape • Prismatic shaped job from sheet metal 	2
V	Fitting - Understanding of fitting tools and making minimum one model. <ul style="list-style-type: none"> • Square Joint • V- Joint • Male and female fitting 	2
VI	Welding - Understanding of welding equipment's and making minimum one model. <ul style="list-style-type: none"> • Minimum any one welding practice • Making Joints using electric arc welding 	2
VII	Smithy - Understanding of smithy tools and making minimum one model. <ul style="list-style-type: none"> • Square prism • Hexagonal headed bolt • Hexagonal prism • Octagonal prism 	2
VIII	Machine tools – Demonstration of various machine tools like <ul style="list-style-type: none"> • Shaping and slotting machine • Milling machine • Grinding Machine • Lathe • Drilling Machine • CNC Machines • Power Tools Demonstration of 3D Printer	2
	Total hours	15