Subject : Mathematics II
Units: 6
Weekly Hours : Theoretical : 3
Experimental: −

week	Syllabus
1-5	Coordinate systems, Cartesian, and polar • Polar coordinate system, • Polar functions and polar equations, graph. • Polar equation of conic section and other curves. • The angle between radius vector and tangent line. • Arc length and plane area in polar coordinate system.
6-10	Vector and vector analysis • Vector definition and the unit vectors (i,j and k) • Space coordinate (Cartesian cylindrical, and spherical coordinate systems) • Vector algebra (vector operation) • Equation of line and plane. • Cylinders and quadric surfaces. • Vector functions, definitions, limit, and continuity. • Derivative of a vector function. • Tangent vector, curvature, normal vector, and radius of curvature.
11-15	Partial differential equations. • Function of two or more variables. • Definition of partial derivative

	• The directional derivative • Tangent plane and normal line, • Approximate value of W, W=f(x,y) • The gradient, chain rule, total differential, exact differential. • Maximum and minimum of functions. • Lagrange multiplier. • High order derivative.
16-20	Multiple integral • Double integrals • Area and double integrals • Physical applications • Polar coordinate system • Triple integrals • Volume, physical applications of triple integral. • Cylindrical and Spherical coordinate • Surface area.
21-25	Ordinary differential equations (O.D.E's) • Definition, order, degree, solution • First order – first degree D.E. (Separable, Homogeneous, Linear, and Exact) • Special types of second order D.E. • Linear D.E. with constant coefficients • Linear 2^{nd} order non-homogeneous D.E. with constant coefficients, method of variation of parameters, method of undetermined coefficient. • High order linear D.E. with constant coefficients.
26-30	Infinite series • Sequences • Certain limits • Infinite series, definition, convergence, divergence, and the sum of the series. • Test of convergence (comparison, integral ratio, root, and other test) • Alternating series • Absolute and conditional convergence • Power series of functions • Maclaurin & Tylor series, Tylor theory.

Subject : Instrument and Measurements
Units: 4
Weekly Hours : Theoretical : 2
Experimental: −

week	Syllabus
1-4	Basic concepts of measurements • Introduction • Measurements and units. • Units obtained from SI unit system • Multiple and sub-multiples for SI units • Definitions • Systems configuration • Basic elements of measuring devices. • Classification of errors. • Random errors. • Other sources of errors. • Unit conversion.
5-7	Electrical measuring instruments • Absolute instrument • Secondary instrument • Electrical principle of operation. • Indicating instrument • Torque • Controlling torque. • Deflecting torque • Damping torque

8-9	Moving iron instrument • Source of error in moving • Iron instrument
10-13	Moving coil instrument • Extension of range • Ammeter • Voltmeter • Dynamometer type - Dynamometer as ammeter - Dynamometer as voltmeter
14-16	Resistance and measurements • Bridge method • Wheatstone bridge method • Cary – Foster (slide – wire) method • Kelvin bridge method
17-19	Ohmmeter method of resistance measurements • shunt type • series type
20-22	Mega Ohmmeter (Megger)
23-25	Measurements of inductance and capacitance by using A.C bridges
26-28	Measurement of system dynamics • Force function • Zero – order system • First – order system • Second – order system • Measurement of power (wattmeter)
29-30	• wattmeter method • wattmeter method

Subject : Electronics I
Units: 6
Weekly Hours : Theoretical : 2
Experimental: 2

week	Syllabus
1-4	• p-n junction • Introduction to p-n junction • Diode applications • Rectifiers • Clipping and clamping • Zener diode
5-10	Transistor circuits • Biasing of transistor • Configuration of transistor • Equivalent circuit of transistor • Graphical analysis • Operating point of transistor • DC & AC load line of Transistor • Bias stability • Quiescent point operation • Effect of temperature on Q-point. • Stability factor analysis • Temperature compensation using diode biasing • Thermal consideration in Tr.Amp.

11-15	Transistor amplifier • Common – Base transistor amplifier • Common emitter transistor amplifier • Common collector transistor amplifier.
16-20	h-parameter of transistor • Common – base transistor • Common – emitter transistor • Common – collector transistor
21-25	Classes of Amplifiers • Class A amplifier • Class B amplifier • Class C amplifier • Class D amplifier
26-30	The Field effect transistor: • Theory of JFET & MOSFET • P-channel FET • FET amplifier • FET switch

Subject : Geometrical Optics
Units: 6
Weekly Hours : Theoretical : 2
Experimental: 2

week	Syllabus
1-10	GEOMETRICAL OPTICS • Introduction • Paraxial Approximation • Ray Matrix Approach to Gaussian Optics • The Lens Matrix • Ray Transformation between Principal Planes • Image Formation • Ray Tracing • Ray Matrix for Reflection • Apertures and Stops • Two-Lens Optical Systems • Optics of a Laser Cavity • Optics of the Human Eye • Defects of the Human Eye • Cylindrical Lens
11-15	LENS ABERRATIONS • Stigmatic Image • Aplanatic Points • Image Formation with Non-paraxial Rays • Wave front Aberration Function

	• Ray Deviations • Focusing Errors
16-20	INTERFERENCE OF LIGHT WAVES • Interference • Two-Wave Interference • Interference by Division of Wavefront • Interference by Division of Amplitude • Testing Flatness of Surfaces • Interference with Extended Sources
21-30	FRINGES & INTERFEROMETER • Haidinger Fringes • Fizeau Fringes • Newton's Rings • Straight Fringes • Two-Wave Interferometers • Michelson Interferometer • Mach–Zehnder Interferometer • Multi-wave Interference • Fabry–Perot Interferometer • Widths of Transmission Peaks • Fabry–Perot Interferometer as a Spectrometer • Free Spectral Range • Spectral Resolution • Thin Optical Coatings • Interference filter

Subject : Thermodynamics
Units: 4
Weekly Hours : Theoretical : 2
Experimental: −

week	Syllabus
1-2	Definitions: force, pressure, systems, atmospheric pressure, absolute pressure, pressure units.
3-5	Temperature: units, conversion, methods of temperature measuring, zero law, energy definition, types of energy: potential energy, kinetic energy, work, power, and pressure diagram.
6-7	Internal energy, Enthalpy, first law of thermodynamics. Systems energy equation: open systems, close systems, applications.
8-10	Ideal gas, Boil's law, Charles's law, equation of state. Specific heat at constant pressure, specific heat at constant temperature. Processes of closed systems, volume constant and pressure constant.
11-15	(T-V) diagram, Polytropic process (P-V & P-T) diagrams. Open system procedures. Vapor, matter and phase changing and phase changing on (P-V) diagram.
16-20	Volume fraction – liquid line – vapor line – wet vapor. Saturated vapor, second law of thermodynamics, thermal machine and thermal pump.
21-24	Carnot's cycle and inverse Carnot's cycle, Reverse and inverse procedures. Definition of 2^{nd} law in thermodynamics, Entropy and gas entropy calculations, T-S diagram.
25-28	Entropy computation of vapors. Entropy of system and its surrounding environment. Adiabatic efficiency.
29-30	Standard air cycles, Auto-Cycle, Diesel cycle, Diol Cycle.

Subject : Wave Propagations

Units: 4

Weekly Hours : Theoretical : 2

Experimental: −

week	Syllabus
1-2	Definitions: force, pressure, systems, atmospheric pressure, absolute pressure, pressure units.
3-4	Standing wave, Energy of standing waves and Wave propagation in free space
5-8	Wave propagation in dielectrics, the pointing vector and power considerations.
9-11	Propagation in good conductors: skin effect.
12-15	Polarization, wave polarization
16-20	Radio wave propagation, Light wave propagation.
21-23	Radio wave propagation in vacuum and in matter, attenuations and damping factors.
24-27	Electromagnetic wave propagation in vacuum and matters, reflections, refractions, and scattering. Riely Scattering, Raman scattering.
28-30	Light wave propagation in free space, Laser light propagation in free space and in matter, gain, losses, reflection, refraction, and scattering.

Subject : Laser Principles

Units: 6

Weekly Hours : Theoretical : 2

Experimental: 2

week	Syllabus
1-3	Light and Blackbody Emission • Emission of Thermal Light • Electromagnetic Spectrum • Blackbody Radiation and the Stefan –Boltzmann Law • Wein's Law • Cavity Radiation and Cavity Modes • Quantum Nature of Light • Absorption and Emission Processes • Boltzmann Distribution and Thermal Equilibrium
4-7	Atomic Emission • Line Spectra • Spectroscope • Einstein and Planck: $E = h\vartheta$ • Photoelectric Effect • Atomic Models and Light Emission • Franck –Hertz Experiment • Spontaneous Emission and Level Lifetime • Fluorescence

	• Semiconductor Devices • Light-Emitting Diodes
8-15	Lasing Processes • Characteristics of Coherent and incoherent Light • Boltzmann Distribution and Thermal Equilibrium • Creating an Inversion • Stimulated Emission • Rate Equations and Criteria for Lasing • Laser Gain • Linewidth • Thresholds for Lasing • Calculating Threshold Gain • Selective Pumping • Three- and Four-Level Lasers • CW Lasing Action • Thermal Population Effects
16- 18	Population inversion and depopulation of low energy level in three and four level systems. Rate Equation Analysis for Atomic Transitions, Rate Equation Analysis for Three- and Four-Level Lasers, Gain, Saturation. Required Pump Power and Efficiency. Output power.
19-25	Cavity Optics • Requirements for a Resonator • Gain and Loss in a Cavity • Resonator as an Interferometer • Longitudinal Modes • Wavelength Selection in Multiline Lasers • Single-Frequency Operation • Characterization of a Resonator • Gaussian Beam • Resonator Stability • Common Cavity Configurations • Spatial Energy Distributions: Transverse Modes

	• Limiting Modes • Resonator Alignment: A Practical Approach
26-30	Fast-Pulse Production • Concept of Q-Switching • Intracavity Switches • Energy Storage in Laser Media • Pulse Power and Energy • Electro-optic Modulators • Acousto-optic Modulators • Cavity Dumping • Mode locking • Mode locking in the Frequency Domain

Subject : Electromagnetic Fields
Units: 4
Weekly Hours : Theoretical : 2
Experimental: −

week	Syllabus
1-4	Vector analysis • Scalar and vector • Vector algebra • The Cartesian coordinate system • Vector components and unit vector • Vector field • The Dot product • The cross product • Polar coordinate system
5-15	Electric Field • Coulomb’s law • The experimental law of coulomb • Electric field intensity • Field of line charge • Field of a sheet charge • Stream lines and sketches of field • Electric flux density • Gauss’s law

	• Integral form of Gauss's law • Differential form of Gauss's law • Divergence theorem • Stock's theorem • Maxwell's first equation • The vector operator V and the divergence theorem
16-30	• The Line integral • Potential and potential difference • Potential field of a point charge • Potential field of a system of charges: conservative property • Potential gradient • The dipole • Energy density in the electrostatic field • Poisson's and Laplace's equations • The magnetic field. • Steady magnetic field • Biot – Savart law • Ampere's Circuital law • Curl • Stocke's theorem • Magnetic flux and magnetic flux density • Scalar and vector magnetic potential. • Other Maxwell's equations

Subject : Visual Basic

Units: 4

Weekly Hours : Theoretical : 1

Experimental: 2

week	Syllabus
1	• Introduction to visual basic: Integrated development Environment.
2-3	• Basic definition: Application, Code, Controls, Declaration, Procedure, Object, Property • Event procedure, method, form, Class, modules.
4-8	• Common properties: name, position, size. Font, container font, color, other properties. • common method: move, et foucs, z order, refresh • examples with command button, text and label • common events mouse events, keyboard events and Examples and application • code
9-19	• Variables • a) Use variables for input box • b) Use variables for msg box • c) Data type Constants • Basic and advance mathematical parameters • Mathematical functions • Convert the mathematical equations to code • Examples

	• Arrays and their declaration with application • if then procedure with application on checkbox and option Buttons
20-30	• procedure of for~ next, do~ loop, do~ while, do~ until, While ~ wend • timer tools and examples • subroutine, functions, sub and their calling • V-scrollbar and H-scrollbar with application • Examples of scrollbar and sub, subroutine, function • drawing in visual basic, pset, line, circle, print, Cls, Scale • line chart, bar chart and Examples