Program: B. Tech. Integrated (all branches)					Semester: II	
Course/Module: Mathematics-II					Module Code: 701BS0C008	
Teaching Scheme				**Evaluation Scheme**		
Lecture (Hours per week)	Practical (Hours per week)	Tutorial (Hours per week)	Credit	Internal Continuous Assessment (ICA) (Marks - 50)		Term End Examinations (TEE) (Marks- 100 in Question Paper)
3	0	1	4	Marks Scaled to 50		Marks Scaled to 50

Prerequisite: Mathematics-I

Course Objectives

The course aims to acquaint students with different aspects of mathematics that are used in daily life and particularly in science, engineering and technology. It further promotes a clear frame of mind to think, analyze and articulate logically so as to develop an interest in students to study mathematics as a discipline.

Course Outcomes

After completion of the course, students would be able to

1. evaluate trigonometric and inverse trigonometric functions,
2. apply differentiation to solve real-life problems and learn integration as reverse process of differentiation,
3. identify the different forms of equations of line,
4. recall the properties of determinants and apply them to find its value.

Detailed Syllabus: (per session plan)

Unit	Description	Duration
1.	**Trigonometric and inverse trigonometric functions** Factorization formulae; Defactorization formulae; Definition of inverse functions; Inverse trigonometric functions and their graphs; Elementary properties of inverse trigonometric functions.	10
2.	**Differentiation and its applications** Derivatives of inverse trigonometric functions; exponential functions; logarithmic functions; implicit functions, and parametric functions; Second order derivatives. **Applications of derivatives**: Rate of change; increasing/decreasing functions; Maxima and minima	12
3.	**Integration** Integration as inverse process of differentiation; Integrals of standard functions; Properties of integrals; Integration by parts.	8

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4.	**Straight lines** Slope of a line; Angle between two lines; Various forms of equations of a straight line; Perpendicular distance between a point and a straight line; Perpendicular distance between two straight lines.		10
5.	**Determinants** Definition; Determinants of order upto 3; Minor and Cofactor; Properties of determinants.		5
	Total		**45**

Text Books
1. Mathematics Textbook for Class XI, NCERT Publication, Edition 2019. (Unit 4)
2. Mathematics Part I and Part II Textbook for Class XII, NCERT Publication, Edition 2019. (Part I – Unit 1, Unit 2, Unit 5 , Part II – Unit 3)

Reference Books
1. H. K. Dass, "Applied Mathematics for polytechnics", CBS Publishers & Distributors Pvt. Ltd., 11th edition 2016.
2. H. R. Hass, C. E. Heil, M. D. Weir, Thomas' "Calculus", Pearson, 14th edition 2017.

Any other information

Total Marks of Internal Continuous Assessment (ICA) : 50 Marks

Distribution of ICA Marks

Description of ICA	Marks
Class Test	20
Term Work	30
Total Marks	**50**

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Program:	B. Tech. Integrated (all branches)	Semester: II	
Course/Module:	Physics-II	Module Code: 701BS0C009	

Teaching Scheme				Evaluation Scheme	
Lecture (Hours per week)	Practical (Hours per week)	Tutorial (Hours per week)	Credit	Internal Continuous Assessment (ICA) (Marks - 50)	Term End Examinations (TEE) (Marks- 100 in Question Paper)
3	2	0	4	Marks Scaled to 50	Marks Scaled to 50

Course Objectives

Physics is the science from which all technologies have evolved. Engineers deal with various technologies, materials and machines, which eventually leads to new innovations and improvements. This course is designed to impart a thorough knowledge of the basic principles along with the applied aspects of the same, which help students to understand, apply and contribute to evolving technologies more effectively and thereby improve the standard of life and the society.

Course Outcomes

After completion of the course, students would be able to

1. demonstrate basic laws and related formulae for understanding the relationship between nature and matter on scientific basis, (level, I II)
2. explain material properties and their utilization in engineering applications. (level II and IV)
3. interpret and apply concepts of physics in daily life with reasoning while decision-making and solving engineering problems, (Level II and III)
4. analyze the concepts of Physics related to various natural phenomena and demonstrate them by handing tools and instruments in the lab, (level II and V)

Detailed Syllabus: (per session plan)

Unit	Description	Duration
1.	**Properties of Bulk material** Mechanical Properties of Solids: Elastic behaviour, Stress-strain relationship, Hooke's law, Young's modulus, bulk modulus, shear modulus of rigidity, Poisson's ratio; elastic energy. Mechanical Properties of Fluids: Pressure due to a fluid column; Pascal's law and its applications (hydraulic lift and hydraulic brakes), the effect of gravity on fluid pressure. Viscosity, Stokes' law, terminal velocity, streamline and turbulent flow, critical velocity, Bernoulli's theorem and its applications. Surface energy and surface tension, angle of contact, excess of pressure across a curved surface, application of surface tension ideas to drops, bubbles and capillary rise.Thermal properties of Matter: Heat, temperature, thermal expansion; thermal expansion of solids, liquids and gases, anomalous expansion of water; specific heat capacity; Cp, Cv – calorimetry; change of state – latent heat capacity.	11

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2.	**Behavior of perfect gases and kinetic theory of gases** Equation of state of a perfect gas, work done in compressing a gas. Kinetic theory of gases – assumptions, the concept of pressure. Kinetic interpretation of temperature; rms speed of gas molecules; degrees of freedom, the law of equipartition of energy (statement only) and application to specific heat capacities of gases; the concept of the mean free path, Avogadro's number.		7
3.	**Oscillation and waves** Periodic motion – time period, frequency, displacement as a function of time, periodic functions. Simple harmonic motion (S.H.M) and its equation; phase; oscillations of a loaded spring restoring force and force constant; energy in S.H.M. Kinetic and potential energies; simple pendulum derivation of expression for its time period. Free, forced and damped oscillations (qualitative ideas only), resonance. Wave motion: Transverse and longitudinal waves, speed of wave motion, displacement relation for a progressive wave, principle of superposition of waves, reflection of waves, standing waves in strings and organ pipes, fundamental mode and harmonics, Beats, Doppler effect.		9
4.	**Electrostatics** Electric Charges and Fields: Electric Charges; Conservation of charge, Coulomb's law, force between two-point charges, forces between multiple charges; superposition principle and continuous charge distribution. Electric field, electric field due to a point charge, electric field lines, electric dipole, electric field due to a dipole, torque on a dipole in uniform electric field. Electric flux, statement of Gauss's theorem and its applications to find field due to infinitely long straight wire, uniformly charged infinite plane sheet and uniformly charged thin spherical shell (field inside and outside). Electrostatic Potential and Capacitance: Electric potential, potential difference, electric potential due to a point charge, a dipole and system of charges; equipotential surfaces, electrical potential energy of a system of two-point charges and electric dipole in an electrostatic field. conductors and insulators, free charges and bound charges inside a conductor. Dielectrics and electric polarization, capacitors and capacitance, combination of capacitors in series and in parallel, capacitance of a parallel plate capacitor with and without dielectric medium between the plates, energy stored in a capacitor.		9

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5.	**Current Electricity**	9
	Electric current, flow of electric charges in a metallic conductor, drift velocity, mobility and their relation with electric current; Ohm's law, electrical resistance, V-I characteristics (linear and non-linear), electrical energy and power, electrical resistivity and conductivity, Carbon resistors, colour code for carbon resistors; series and parallel combinations of resistors; temperature dependence of resistance. The internal resistance of a cell, potential difference and emf of a cell, combination of cells in series and in parallel, Kirchhoff's laws and simple applications, Wheatstone bridge, meter bridge., Potentiometer - principle and its applications to measure potential difference and for comparing EMF of two cells; measurement of internal resistance of a cell.	
	Total	**45**

Text Books

1. Text Book of Physics for Class XI& XII (Part-I, Part-II); N.C.E.R.T., Delhi. Class XI (Unit 9, Unit 10, Unit 11, Unit 14, Unit 15), class XII (Unit 2 and Unit 5)
2. Principles of Physics by P.V. Naik, Pearson Education Pvt. Ltd, New Delhi, 5th edition 2012. (Unit 5, Unit 6, Unit 13, Unit 15).

Reference Books

1. Halliday and Resnick, ''Fundamentals of Physics'', Wiley India, 8th edition 2008.
2. **H.C. Verma, ''Concepts in Physics'', Vol. I & II, Bharti Bhawan Ltd., New Delhi, 2011.**

Any other information

Total Marks of Internal Continuous Assessment (ICA) : 50 Marks

Distribution of ICA Marks

Description of ICA	Marks
Class Test	20
Term Work	30
Total Marks	**50**

Signature
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Program: B. Tech. Integrated (all branches)				Semester : II	
Course/Module: Introduction to Electrical and Electronics Engineering				Module Code : 701EX0C002	
Teaching Scheme				Evaluation Scheme	
Lecture (Hours per week)	Practical (Hours per week)	Tutorial (Hours per week)	Credit	Internal Continuous Assessment (ICA) (Marks-50)	Term End Examinations (TEE) (Marks -100 in Question Paper)
2	2	0	3	Marks Scaled to 50	Marks Scaled to 50

Pre-requisite: NIL

Course Objectives

To introduce the fundamental concepts of DC and AC circuits, and primary electrical equipment such as transformers and motors. Further, the course imparts knowledge about the diodes, transistors, digital logic circuits and operational amplifiers. After this course students should have

a strong insight of the dynamics of electrical and electronics components which can be further used to design practical circuits.

Course Outcomes

After completion of the course, students would be able to

1. identify and use active and passive electrical components in circuits for various applications,
2. evaluate AC and DC circuit parameters using network theorems,
3. understand the construction and functionality of transformers and different types of motors,
4. explain the construction, working principle and applications of electronics devices, logic circuits and operational amplifiers.

Detailed Syllabus: (per session plan)

Unit	Description	Duration
1.	**Circuit Elements and Network Theorems** **Ohm's Law:** Ohm's law, resistance, resistivity, variation of resistance with temperature **Network Analysis:** Kirchhoff's laws (voltage and current law) **Network Theorems:** Thevenin's theorem, Norton's theorem. **Self and Mutual Inductances:** Self-inductance, inductors, mutual inductance, dot convention, coupled coils in series, coupled coils in parallel	6

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	Capacitors: Parallel plate capacitor, capacitance, permittivity, capacitors in series, capacitors in parallel	
2.	**Alternating voltage and current** **Single Phase Circuits:** Introduction, sinusoidal functions –terminology, concept of phasors, algebraic operation on phasors, power and power factor with respect to single phase circuit. **Three Phase Circuits and Systems:** Introduction, double subscript notation, concept of three phase voltages, generation of three phase voltages	6
3.	**Transformers and Motors** **Transformers:** Introduction, principle of operation, construction of transformer **Motors: DC Machines:** Importance, construction of a DC machine, DC motors **Induction Motors:** Construction, principle of working, Fractional Horse Power Motors: (construction, principle of working and applications only, no mathematical treatment) Universal motor, stepper motors, servo motors, brushless DC motors	5
4.	**Diodes and Transistors** **Semiconductor Diodes:** Semiconductor diode, resistance of crystal diode, important terms, crystal diode rectifiers – half wave rectifier, full wave rectifier, center tap full wave rectifier, full wave bridge rectifier, filter circuits, types of filter circuits, Zener diode, Zener diode as a voltage stabilizer, **Bipolar Junction Transistor:** Transistors, naming the transistor terminals, transistor action, transistor symbols, transistor as an amplifier, transistor connections, common base connection, common emitter connection, common collector connection, transistor as an amplifier in CE arrangement, transistor as a switch in CE arrangement	6
5.	**Digital Electronics** Analog and digital signal, binary number system, logic gates, three basic logic gates - NOT, AND, OR, combination of basic logic gates, NAND and NOR as universal gates, EXOR Gates, Boolean algebra, Boolean theorems, DeMorgan's Theorems, developing logic circuit from Boolean expression.	3
6.	**Operational Amplifiers** Operational amplifier, schematic symbol of op-amp, output voltage from op-amp, applications of op-amp – inverting amplifier, non-inverting amplifier, summing amplifier and comparators.	4

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Total	30

Text Books:

1. D. C. Kulshreshtha, "Basic Electrical Engineering", McGraw Hill Education, 1st edition, 2017.
2. V. K. Mehta, Rohit Mehta, "Principles of Electronics", S. Chand & Co., 15th edition, 2014.

Reference Books:

1. B. L. Theraja, "Fundamentals of Electrical Engineering and Electronics", S. Chand & Co, 24th edition, 2012.

Any other information

Total Marks of Internal Continuous Assessment (ICA) : 50 Marks

Distribution of ICA Marks

Description of ICA	Marks
Class Test	20
Term Work	30
Total Marks	**50**

Details of Term Work

Term work should consist of the following

1. At least ten laboratory experiments based on the entire syllabus duly recorded and graded.
2. Presentation/Application based experiment and Quiz/Practical exam/Viva/Any other mode of evaluation.

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Program: B.Tech. Integrated (all branches)				Semester: II	
Course/Module: Fundamentals of Mechanics-Statics				Module Code: 701ME0C005	
Teaching Scheme				Evaluation Scheme	
Lecture (Hours per week)	Practical (Hours per week)	Tutorial (Hours per week)	Credit	Internal Continuous Assessment (ICA) (Marks - 50)	Term End Examinations (TEE) (Marks - 100 in Question Paper)
3	2	0	4	Marks Scaled to 50	Marks Scaled to 50

Course Objectives

The course is aimed at developing thorough understanding of physical and mathematical principles used in mechanics - statics. This course will help students get acquainted with the various systems of forces, effects of friction on equilibrium, analysis of forces in trusses and the importance of center of gravity. It is designed for the students to master the concept of static equilibrium and its applications. The topics covered are tailored to suit the requirements of an intermediate undergraduate level in engineering.

Course Outcomes

After completion of the course, students would be able to

1. determine centroid of irregular shape areas,
2. determine the resultant / equilibrant of various coplanar force systems,
3. analyse the system of forces in equilibrium with and without friction,
4. conduct experiments for better understanding of various principles.

Detailed Syllabus: (per session plan)

Unit	Description	Duration
1.	**Mechanics and force system** Significance and relevance: Mechanics, statics, dynamics, space, time, mass, particle, body, rigid body. Scalar and vector quantity, Units of measurement (SI units) - Fundamental units and derived units. **Force:** Unit, characteristics and effects of a force, Principle of transmissibility of force, Force system and its classification.	6
2.	**Resolution and composition of Forces** Orthogonal and non-orthogonal components of a force, Moment of a force, Varignon's theorem. Resultant of forces, analytical method of determination of resultant for concurrent, non-concurrent and parallel co-planar force systems, Law of triangle, parallelogram and polygon of forces.	6

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3.	**Equilibrium**	8
	Meaning of equilibrium, free body diagrams, Conditions of Equilibrium, Analytical and graphical methods of analysing equilibrium. Lami's Theorem – statement and explanation, Types of beam, supports, determination of reactions at supports for various types of determinate beams.	
4.	**Friction**	8
	Friction and its relevance in engineering, Laws of friction, angle of friction, angle of repose, cone of friction, Equilibrium of bodies on rough horizontal and inclined plane, Simple problems of friction involving blocks.	
5.	**Introduction to trusses**	8
	Introduction, Analysis of pin jointed plane trusses: Perfect truss and Truss analysis using method of joints.	
6.	**Centroid and moment of inertia**	9
	Centroid, Centroid of geometrical plane figures (square, rectangle, triangle, circle, semi-circle, quarter circle), Centroid of composite figures composed of not more than three geometrical figures, moment of inertia, polar moment of inertia, and parallel & perpendicular axis theorem.	
	Total	**45**

Text Book

1. Beer & Johnston, "Engineering Mechanics", Tata McGraw Hill, 2011.
2. R. C. Hibbler, ''Engineering Mechanics'', McMillan Publishers, 2004.
3. S. S. Bhavikatti, "Engineering Mechanics", New Age International Publications, 2012.

Reference Books

1. F. F. L. Singer, "Engineering Mechanics", Harper & Raw Publication, 1954.
2. Beer & Johnson, "Engineering Mechanics", Tata McGraw Hill, 2011.
3. D. S. Kumar, ''Engineering Mechanics'', Tata McGraw Hill, 2009.
4. Macklin & Nelson, ''Engineering Mechanics'', Tata McGraw Hill, 2012.
5. A. K. Tayal, ''Engineering Mechanics'', Umesh Publication, 2008.
6. E. W. Nelson, Charles L. Best, W.G. Mclean, Merle Potter, "Schaum's outlines on Engineering Mechanics -Statics", Tata McGraw Hill, 2010.

Any other information

Total Marks of Internal Continuous Assessment (ICA) : 50 Marks

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Distribution of ICA Marks

Description of ICA	Marks
Class Test	20
Term Work	30
Total Marks	**50**

Details of Term Work

1. Minimum five assignments covering the prescribed syllabus.
2. Report of minimum six experiments performed from the list given below.

List of Experiments

1. To find reactions of simply supported beam (Parallel force system)
2. To verify polygon law of forces (Concurrent & non-concurrent force system)
3. To verify Lami's theorem using simple jib crane
4. Equilibrium of non-concurrent non parallel force system
5. To verify moment equilibrium condition using bell crank lever
6. To determine coefficient of friction using friction plane
7. To determine coefficient of friction using angle of repose method
8. Simple Screw Jack
9. To determine efficiency of fly wheel

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Program: B.Tech. Integrated (all branches)		Semester: II	
Course/Module: Introduction to IT Systems		Module Code: 701CO0C002	

Teaching Scheme				Evaluation Scheme	
Lecture (Hours per week)	Practical (Hours per week)	Tutorial (Hours per week)	Credit	Internal Continuous Assessment (ICA) (Marks - 50)	Term End Examinations (TEE) (Marks - 100 in Question Paper)
1	2	0	2	Marks Scaled to 50	--

Pre-requisite: NIL

Course Objectives

To introduce basic computer skills, basic application software tools, Computer Hardware and Software features. The syllabus focuses on skill development among students.

Course Outcomes

After completion of the course, students would be able to
1. use internet and web services,
2. install and configure operating system,
3. create static web pages,
4. create documents using Open Office Tools.

Detailed Syllabus: (per session plan)

Unit	Description	Duration
1.	Introduction to internet, browser features, Using various search engines, writing search queries.	2
2.	Introduction to various e-governance / Digital India portals, Understand their features, services offered	2
3.	Introduction to various computer hardware components – motherboard, hard disk, memory, various ports/interfaces and related cables, adapters, peripherals (Printers and Scanners), their features, and device drivers	3
4.	Introduction to Operating system – Linux and Windows operating system, Security features and tools	3
5.	Introduction to HTML, creation of a static web page	3
6.	Introduction to open office tools and creation of documents/worksheets using them	2
	Total	**15**

Text Books

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1. R. S. Salaria, "Computer Fundamentals", Khanna Publishing House, 1st edition 2017.

Reference Books:

1. Kate J. Chase, "PC Hardware and A+ Handbook", Microsoft Press, 2004.

Any other information

Total Marks of Internal Continuous Assessment (ICA) : 50 Marks

Distribution of ICA Marks

Description of ICA	Marks
Class Test	NA
Term Work	50
Total Marks	**50**

Details of Term work

As per Internal Continuous Assessment (ICA) norms of the institute

1. At least 10 experiments based on the syllabus.
2. Two class tests.

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Program: B.Tech. Integrated (all branches)				Semester: II	
Course/Module: Electrical and Computer Workshop				Module Code: 701CO0C003	
Teaching Scheme				**Evaluation Scheme**	
Lecture (Hours per week)	**Practical (Hours per week)**	**Tutorial (Hours per week)**	**Credit**	**Internal Continuous Assessment (ICA) (Marks - 50)**	**Term End Examinations (TEE) (Marks - 100 in Question Paper)**
0	2	0	1	Marks Scaled to 50	--

Prerequisite: Nil

Course Objectives

To introduce basic concepts of electrical and electronic instruments and its applications. The syllabus impart training on assembling, maintenance and troubleshooting of computer system.

Course Outcomes

After completion of the course, students would be able to

1. demonstrate electrical wiring and develop PCB layout,
2. develop the skills required to assemble and configure a personal computer system,
3. develop skills required for maintenance of computer systems, identify the network components, and perform basic networking.

Detailed Syllabus: (per session plan)

Unit	Description	Duration
1.	**Wiring** Study of cables used in electrical and electronic transmissions. Study of electrical fittings – Switches, Plugs, Holders, Connectors, Earthing. Electrical wiring for lighting and appliances, series and parallel connections	6
2.	**PCB Laboratory Exercise** Layout drawing, positive and negative film making, PCB etching and drilling, tinning and soldering techniques	6
3.	**Mini project** Assembling of simple electronic circuit/system for day-to-day application, test and show the functioning	4

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4.	**Assembling and Configuring Personal Computer:**	6
	Introduction: Dismantling of a Personal Computer (PC), Identification of Components of a PC such as power supply, motherboard, processor, hard disk, memory (RAM, ROM), CMOS battery, CD drive, monitor, keyboard, mouse, printer, scanner, pen drives, disk drives etc	
	Assembling of PC -CPU installation: Installation of power supply unit installation, heat sink and cooling fan, memory module, hard disk, optical drive, mounting motherboard, connecting motherboard power supply cables, connecting to front panel, Connecting mouse, keyboard and monitor.	
	Power on of computer, Configuring BIOS.	
	Installation of Operating System (Anyone) and Device drivers, Boot-up sequence. Installation of application software (at least one)	
5.	**Networking**	4
	Identification of network components: LAN card, wireless card, switch, hub, router, different types of network cables (straight cables, crossover cables, rollover cables) Basic networking and crimping.	
6.	**Troubleshooting & Maintenance:**	4
	Safety precautions, Configuring using BIOS parameters, Power on self-test, devices and drivers, working with windows registry, Performance improving steps, Overclocking the system, diagnosing general problems, Computer system: common problems and solutions, Preventive maintenance, Replacing CMOS battery, Clearing BIOS password	
	Total	30

Text Books

1. R. S. Khandpur, "Printed Circuit Boards: Design, Fabrication, Assembly and Testing", First Edition, Tata McGraw Hill, 2005.
2. K. L. Jame, "Computer Hardware: Installation, Interfacing, Troubleshooting and Maintenance", PHI Publication, 2013.

Reference Books

1. R. P. Singh, "Electrical Workshop: Safety, Commissioning, Maintenance and Testing of Electrical Equipment", IK International Publishing House Pvt. Ltd., 3rd Edition 2012.
2. Anita Goel, "Computer Fundamentals", Pearson Publication 1st Edition, 2010.

Any other information

Total Marks of Internal Continuous Assessment (ICA) : 50 Marks

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Distribution of ICA Marks

Description of ICA	Marks
Class Test	NA
Term Work	50
Total Marks	**50**

Details of Term work

As per Internal Continuous Assessment (ICA) norms of the institute
1. At least 10 experiments based on the syllabus.
2. Two class tests

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