



Integral University, Lucknow

Effective from Session: 2022-23							
Course Code	B010101T/PY113	Title of the Course	Mathematical Physics and Newtonian Mechanics	L	T	P	C
Year	First	Semester	First	4	0	0	4
Pre-Requisite	10+2 with Physics	Co-requisite					
Course Objectives	This course aims to give students the competence in the methods and techniques of mathematical physics and Newtonian Mechanics. At the end of the course the students are expected to have hands on experience in modeling, implementation and calculation of physical quantities of relevance.						

Course Outcomes	
CO1	Recognize the difference between types of scalars and vectors, pseudo-scalars and understand the physical interpretation of gradient, divergence and curl.
CO2	Comprehend the difference and connection between different coordinate systems and know the meaning of 4-vectors, Kronecker delta and Epsilon (Levi Civita) tensors.
CO3	Study the origin of pseudo forces in rotating frame and study the response of the classical systems to external forces and their elastic deformation.
CO4	Understand the dynamics of planetary motion and the working of Global Positioning System (GPS).
CO5	Comprehend the different features of Simple Harmonic Motion (SHM) and wave propagation.

Unit No.	Title of the Unit	Content of Unit	Contact Hrs.	Mapped CO
1	Vector Algebra	Coordinate rotation, reflection and inversion as the basis for defining scalars, vectors, pseudo-scalars and pseudo-vectors (include physical examples). Component form in 2D and 3D. Geometrical and physical interpretation of addition, subtraction, dot product, wedge product, cross product and triple product of vectors. Position, separation and displacement vectors.	7	CO1
2	Vector Calculus	Geometrical and physical interpretation of vector differentiation, Gradient, Divergence and Curl and their significance. Vector integration, Line, Surface (flux) and Volume integrals of vector fields. Gradient theorem, Gauss-divergence theorem, Stoke-curl theorem, Greens theorem and Helmholtz theorem (statement only). Introduction to Dirac delta function.	8	CO2
3	Coordinate Systems	2D and 3D Cartesian, Spherical and Cylindrical coordinate systems, basis vectors, transformation equations. Expressions for displacement vector, arc length, area element, volume element, gradient, divergence and curl in different coordinate systems. Components of velocity and acceleration in different coordinate systems. Examples of non-inertial coordinate system and pseudo-acceleration.	8	CO3
4	Introduction to Tensors	Principle of invariance of physical laws w.r.t. different coordinate systems as the basis for defining tensors. Coordinate transformations for general spaces of nD, contravariant, covariant and mixed tensors and their ranks, 4-vectors. Index notation and summation convention. Symmetric and skew-symmetric tensors. Invariant tensors, Kronecker delta and Epsilon (Levi Civita) tensors. Examples of tensors in physics..	7	CO4
5	Dynamics of a System of Particles	Review of historical development of mechanics up to Newton. Background, statement and critical analysis of Newton's axioms of motion. Dynamics of a system of particles, centre of mass motion, and conservation laws and their deductions. Rotating frames of reference, general derivation of origin of pseudo forces (Euler, Coriolis and centrifugal) in rotating frame, and effects of Coriolis force.	8	CO5
6	Dynamics of a Rigid Body	Angular momentum, Torque, Rotational energy and the inertia tensor. Rotational inertia for simple bodies (ring, disk, rod, solid and hollow sphere, solid and hollow cylinder, rectangular lamina). The combined translational and rotational motion of a rigid body on horizontal and inclined planes. Elasticity, relations between elastic constants, bending of beam and torsion of cylinder.	8	CO6
7	Motion of Planets and Satellites	Two particle central force problem, reduced mass, relative and centre of mass motion. Newton's law of gravitation, gravitational field and gravitational potential. Kepler's laws of planetary motion and their deductions. Motions of geo-synchronous and geo-stationary satellites and basic idea of Global Positioning System (GPS).	7	CO7
8	Wave Motion	Differential equation of simple harmonic motion and its solution, use of complex notation, damped and forced oscillations, Quality factor. Composition of simple harmonic motion, Lissajous figures. Differential equation of wave motion. Plane progressive waves in fluid media, reflection of waves and phase change, pressure and energy distribution. Principle of superposition of waves, stationary waves, phase and group velocity.	7	CO8

Reference Books:

- Murray Spiegel, Seymour Lipschutz, Dennis Spellman, "Schaum's Outline Series: Vector Analysis", McGraw Hill, 2017, 2e
- A.W. Joshi, "Matrices and Tensors in Physics", New Age International Private Limited, 1995, 3e
- Charles Kittel, Walter D. Knight, Malvin A. Ruderman, Carl A. Helmholz, Burton J. Moyer, "Mechanics (In SI Units): Berkeley Physics Course Vol 1", McGraw Hill, 2017, 2e.
- Richard P. Feynman, Robert B. Leighton, Matthew Sands, "The Feynman Lectures on Physics - Vol. 1", Pearson Education Limited, 2012
- Hugh D. Young and Roger A. Freedman, "Sears and Zemansky's University Physics with Modern Physics", Pearson Education Limited, 2017, 14e
- D.S. Mathur, P.S. Hemne, "Mechanics", S. Chand Publishing, 1981, 3e

e-Learning Source:

- MIT Open Learning - Massachusetts Institute of Technology, <https://openlearning.mit.edu/>
- National Programme on Technology Enhanced Learning (NPTEL), <https://www.youtube.com/user/nptelhrd>
- Uttar Pradesh Higher Education Digital Library, <http://heecontent.upsdc.gov.in/SearchContent.aspx>
- Swayam Prabha - DTH Channel, https://www.swayamprabha.gov.in/index.php/program/current_he/8

Course Articulation Matrix: (Mapping of COs with POs and PSOs)											
PO-PSO CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2	PSO3	PSO4
CO1	2	-	-	-	-	-	1	2	-	1	-
CO2	3	-	-	-	-	-	2	3	-	1	-
CO3	3	-	-	-	-	-	3	3	-	2	-
CO4	3	-	-	-	-	-	3	3	-	3	-
CO5	3	-	-	-	-	-	3	3	-	3	-

1- Low Correlation; 2- Moderate Correlation; 3- Substantial Correlation

Name & Sign of Program Coordinator	Sign & Seal of HoD
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Integral University, Lucknow

Effective from Session: 2022-23							
Course Code	B010102P/PY114	Title of the Course	Mechanical Properties of Matter	L	T	P	C
Year	First	Semester	First	0	0	4	2
Pre-Requisite	10+2 with Physics	Co-requisite					
Course Objectives	The purpose of this undergraduate course is to impart practical knowledge/measurements in mechanics through different experiments related to its theoretical course.						

Course Outcomes	
CO1	Understand the Moment of Inertia and find the MI of an irregular body.
CO2	Determine elastic properties of rigid materials.
CO3	Understand the surface tension and viscosity of fluid.
CO4	Analyse waves and oscillations and understand the dynamics and gravitation
CO5	Demonstrate uses of Sextant by measuring dimensions of a given object.

Experiment No.	Title of the Experiment	Content of Unit (*Offline)	Contact Hrs.	Mapped CO
1	Flywheel	Moment of inertia of a flywheel	6	CO1
2	Inertia Table	Moment of inertia of an irregular body by inertia table	6	CO1
3	Statistical Method	Modulus of rigidity by stational method (Barton's apparatus)	6	CO2
4	Maxwell's Needle	Modulus of rigidity by dynamical method (sphere / disc / Maxwell's needle)	6	CO2
5	Flexure Method	Young's modulus by bending of beam	6	CO2
6	Searle's Method	Young's modulus and Poisson's ratio by Searle's method	6	CO2
7	Poisson's Ratio	Poisson's ratio of rubber-by-rubber tubing	6	CO2
8	Capillary Rise Method	Surface tension of water by capillary rise method	6	CO3
9	Jaeger's Method	Surface tension of water by Jaeger's method	6	CO3
10	Poiseuille's Method	Coefficient of viscosity of water by Poiseuille's method	6	CO3
11	Compound Pendulum	Acceleration due to gravity by bar pendulum	6	CO4
12	Sonometer	Frequency of AC mains by Sonometer	6	CO4
13	Sextant	Height of a building by Sextant	6	CO5
14	C.R.O.	Study the waveform of an electrically maintained tuning fork / alternating current source with the help of cathode ray oscilloscope.	6	CO4

Unit No.	Title of the Unit	Content of Unit (*Online Virtual Lab)	Contact Hrs.	Mapped CO
1	Flywheel	Torque and angular acceleration of a flywheel	6	CO1
2	Torsion	Torsional oscillations in different liquids.	6	CO4
3	Flywheel	Moment of inertia of flywheel.	6	CO1
4	Newton's Second Law	Newton's second law of motion.	6	CO4
5	Ballistic Pendulum	Ballistic pendulum.	6	CO4
6	Collision Balls	Collision balls.	6	CO2
7	Projectile Motion	Projectile motion.	6	CO4
8	Collision	Elastic and inelastic collision.	6	CO2

Reference Books:

- B.L. Worsnop, H.T. Flint, "Advanced Practical Physics for Students", Methuen & Co., Ltd., London, 1962, 9e
- S. Panigrahi, B. Mallick, "Engineering Practical Physics", Cengage Learning India Pvt. Ltd., 2015, 1e
- R.K. Agrawal, G. Jain, R. Sharma, "Practical Physics", Krishna Prakashan Media (Pvt.) Ltd., Meerut, 2019
- S.L. Gupta, V. Kumar, "Practical Physics", Pragati Prakashan, Meerut, 2014, 2e

e-Learning Source:

- Virtual Labs at Amrita Vishwa Vidyapeetham, <https://vlab.amrita.edu/?sub=1&brch=74>
- Digital Platforms /Web Links of other virtual labs may be suggested / added to this lists by individual Universities.

* A student has to perform at least 7 experiments from the Offline Experiment List and 3 from the Online Virtual Lab Experiment List / Link.

Course Articulation Matrix: (Mapping of COs with POs and PSOs)											
PO-PSO CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2	PSO3	PSO4
CO1	2						3	3			3
CO2	2						3	3			3
CO3	3						2	3			3
CO4	2						3	3			3
CO5	3						2	3		2	3

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Name & Sign of Program Coordinator	Sign & Seal of HoD
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Integral University, Lucknow

Effective from Session: 2022-23							
Course Code	I010101V/PY117	Title of the Course	Electrician	L	T	P	C
Year	First	Semester	First	3	1	0	4
Pre-Requisite	10+2 with Physics	Co-requisite					
Course Objectives	The purpose of this undergraduate course is to impart basic and key knowledge of Mechanics and Wave Motion. By using the principles of physics and mathematics, student will be able to obtain quantitative relations which are very important for higher studies. After successful completion of course, the student will be able to explore the subject into their respective dimensions.						

Course Outcomes	
CO1	Familiarized with the occupational safety and basic physics necessary for the electrician trade.
CO2	Know the different devices, measuring instruments and electrical wiring.
CO3	Understand the power generation, transmission and control.
CO4	Learn the practical techniques of the electrical trade.

Unit No.	Title of the Unit	Content of Unit	Contact Hrs.	Mapped CO
1	Electrician Basics	Occupational Safety and Health, Conductor, semiconductors, Insulator and electric cables, Tools for an Electrician, Soldering and D.C theory, Basic Electricity, Electrical accessories, Electro-chemical effect and chemical cell, Magnetism and electromagnetism, Alternating current theory, Earthing and Basic electronics.	8	CO1
2	Electrician Theory-I	Transistor, Amplifiers, Oscillators, Specific solid-state devices, Digital electronics, Electrical wiring, Direct current generator, Direct current motor, Transformer and Electrical measuring instruments.	8	CO2
3	Electrician Theory-II	Machine control panel, Electrical instrument, Electrical power generation, Electrical power transmission, Underground cables, Power distribution, Speed control and maintenance of electric machines, Electronic theory and communication.	8	CO3
4	Electrical Practical	Trade safety and first aid, Tools, wire, and joints, Allied trades, Resistor, and capacitor, Alternating current (A.C.) circuit, Cell and battery, Magnetic field, Earthing and Semi-conductor diode.	8	CO4

Reference Books:

1. National Electrical Code 2020 Handbook (NFPA)
2. Practical Electrical Wiring: Residential, Farm, Commercial and Industrial, 2014 Edition (F.P. Hartwell, Herbert P. Richter)
3. Electrical Motor Controls for Integrated Systems, 5th Edition (Gary Rockis, Glen A. Mazur).
4. Ultimate Guide: Wiring, 8th Edition
5. Electrical Trainee Guide, Level 1 by NCCER.

e-Learning Source:

1. <https://www.youtube.com/channel/UCB3jUEyCLRbCw7QED0vnXYg>
2. <https://www.youtube.com/channel/UCpbl0bpvjxIVI-V8OIspzw>
3. <https://www.youtube.com/c/CraigMichaudElectricalInstructor/featured>
4. <https://www.youtube.com/channel/UCwf9niZNaW8mkECB6GT6raQ>

Course Articulation Matrix: (Mapping of COs with POs and PSOs)											
PO-PSO CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2	PSO3	PSO4
CO1	2	-	-	-	-	-	1	2	-	-	1
CO2	3	-	-	-	-	-	2	2	-	-	2
CO3	3	-	-	-	-	-	3	3	-	-	3
CO4	3	-	-	-	-	-	3	3	-	-	3

1- Low Correlation; 2- Moderate Correlation; 3- Substantial Correlation

Name & Sign of Program Coordinator	Sign & Seal of HoD
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Integral University, Lucknow

Effective from Session: 2022-23							
Course Code	B140101T / EC131	Title of the Course	Basic Circuit Theory and Network Analysis	L	T	P	C
Year	First	Semester	First	4	0	0	4
Pre-Requisite	10+2 with Physics and Mathematics	Co-requisite	NA				
Course Objectives	The main objective of this course is to familiarize students with theory of basic circuit and analysis of different networks using network theorems.						

Course Outcomes	
CO1	Identify the basic elements and systems used in analog and digital circuits.
CO2	Explore the fundamental law's and elements of electrical circuits.
CO3	Understand the DC circuits, theorems and networks.
CO4	Understands AC circuits and related terminologies with examples.
CO5	Understand the applications of theory of Network graph.

Unit No.	Title of the Unit	Content of Unit	Contact Hrs.	Mapped CO
1	Basic Circuit Concepts	Voltage and Current Sources, Resistors: Fixed and Variable resistors, Construction and Characteristics, Color coding of resistors, resistors in series and parallel. Inductors: Fixed and Variable inductors, Self and mutual inductance, Faraday's law and Lenz's law of electromagnetic induction, Energy stored in an inductor, Inductance in series and parallel, Testing of resistance and inductance using multimeter. Capacitors: Principles of capacitance, Parallel plate capacitor, Permittivity, Definition of Dielectric Constant, Dielectric strength.	14	CO1
2	Circuit Analysis	Kirchhoffs Current Law (KCL), Kirchhoffs Voltage Law (KVL), Node Analysis, Mesh Analysis, Star-Delta Conversion	7	CO2
3	DC Transient Analysis	RC Circuit- Charging and discharging with initial charge, RL Circuit with Initial Current, Time Constant, RL and RC Circuits with Sources, DC response of Series RLC Circuits.	7	CO2
4	AC Circuit Analysis	Sinusoidal Voltage and Current, Definition of Instantaneous, Peak, Peak to Peak, Root Mean Square and Average Values. Voltage-Current relationship in Resistor, Inductor and Capacitor, Phasor, Complex Impedance.	6	CO4
5	Power in AC Circuits	Instantaneous Power, Average Power, Reactive Power, Power Factor Sinusoidal Circuit Analysis for RL, RC and RLC Circuits. Resonance in Series and Parallel RLC Circuits, Frequency Response of Series and Parallel RLC Circuits, Quality (Q) Factor and Bandwidth. Passive Filters: Low Pass, High Pass, Band Pass and Band Stop.	6	CO4
6	Network Theorem	Principle of duality, Superposition Theorem, Thevenin Theorem, Norton's Theorem, Reciprocity Theorem, Millman's Theorem, Maximum power transfer Theorem.	10	CO3
7	Two Port Networks	Impedance parameter (Z), Admittance parameter(Y), Transmission (ABCD) parameter.	5	CO3
8	Network Graph Theory	Equivalent Graph, Incidence matrix, Tie-Set and Cut Set.	5	CO5

Reference Books:	
1.	S. A. Nasar, Electric circuits, Schaum's outline series, Tata McGraw Hill (2004).
2.	Electrical Circuits, M. Nahvi and J. Edminister, Schaum's Outline Series, Tata McGraw-Hill (2005).
3.	B.C. Sarkar and S. Sarkar, Analog Electronics: Devices and Circuits (Revised edition), Damodar Group (Publishers), Burdwan, ISBN: 978-93 -85775 -15-4 (2019).
4.	Robert L. Boylestad, Essentials of Circuit Analysis, Pearson Education (2004).
5.	W. H. Hayt, J. E. Kemmerly, S. M. Durbin, Engineering Circuit Analysis, Tata McGraw Hill (2005).
6.	Alexander and M. Sadiku, Fundamentals of Electric Circuits , McGraw Hill (2008).
7.	Bell, Electronic Circuits, Oxford University Press.
8.	Carlson, Circuits, Cengage
9.	Kuo, Network Analysis and Synthesis, Wiley.
10.	Dorf and Svoboda, Introduction to Electric Circuits, Wiley.
11.	Decarlo and Lin, Linear circuit Analysis, Oxford.
e-Learning Source:	
1.	MIT Open Learning - Massachusetts Institute of Technology https://openlearning.mit.edu/
2.	National Programme on Technology Enhanced Learning (NPTEL) https://www.youtube.com/user/nptelhrd
3.	Uttar Pradesh Higher Education Digital Library http://heecontent.upsdc.gov.in/SearchContent.aspx
4.	Swayam Prabha - DTH Channel https://www.swayamprabha.gov.in/index.php/program/current_he/8

Course Articulation Matrix: (Mapping of COs with POs and PSOs)																		
PO-PSO CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6
CO1	3	-	-	-	-	-	1						3	-	-	1	-	3
CO2	3	-	-	-	-	-	1						3	-	-	1	-	3
CO3	3	-	-	-	-	-	3						3	-	-	1	-	3
CO4	3	-	-	-	-	-	2						2	-	-	2	-	2
CO5	3	-	-	-	-	-	2						3	-	-	2	-	3

1- Low Correlation; 2- Moderate Correlation; 3- Substantial Correlation

Name & Sign of Program Coordinator	Sign & Seal of HoD
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Integral University, Lucknow

Effective from Session: 2022-23							
Course Code	B140102P/ EC132	Title of the Course	Circuits and Network Lab	L	T	P	C
Year	First	Semester	First	0	0	4	2
Pre-Requisite	10+2 with Physics and Mathematics	Co-requisite	NA				
Course Objectives	The purpose of this undergraduate course is to impart practical knowledge of the electronics circuits and their interconnection.						

Course Outcomes	
CO1	Identify the basic elements and systems used in analog and digital circuits.
CO2	Explore the fundamental law's and elements of electrical circuits.
CO3	Understand the DC circuits, theorems and networks.
CO4	Understands AC circuits and related terminologies with examples.
CO5	Students will understand the frequency response of LCR circuit.

Experiment No.	Title of the Experiment	Content of Unit	Contact Hrs.	Mapped CO
1	Basic Components and Measurements	Familiarization with (a) Resistance in series, parallel and series - Parallel. (b) Capacitors & Inductors in series & Parallel. (c) Multimeter -Checking of components. (d) Voltage sources in series, parallel and series- Parallel (e) Voltage and Current dividers	4	CO1
2	CRO	Measurement of Amplitude, Frequency & Phase difference using CRO.	4	CO1
3	Kirchhoff's Law	Verification of Kirchhoff's Law.	4	CO2
4	Norton's Theorem	Verification of Norton's Theorem.	4	CO2
5	Thevenin's Theorem	Verification of Thevenin's Theorem.	4	CO2
6	Superposition Theorem	Verification of Superposition Theorem.	4	CO2
7	Maximum Power Transfer Theorem	Verification of the Maximum Power Transfer Theorem.	4	CO2
8	RC Circuits	RC Circuits: Time Constant, Differentiator, Integrator.	4	CO3, 4, 5
9	Low Pass RC Filter	Designing of a Low Pass RC Filter and study of its Frequency Response.	4	CO3, 4, 5
10	High Pass RC Filter	Designing of a High Pass RC Filter and study of its Frequency Response.	4	CO3, 4, 5
11	Series LCR Circuit	Study of the Frequency Response of a Series LCR Circuit and determination of its (a) Resonant Frequency (b) Impedance at Resonance (c) Quality Factor Q (d) Band Width.	4	CO3, 4, 5

Reference Books:

- S. A. Nasar, Electric circuits, Schaum's outline series, Tata McGraw Hill (2004).
- Electrical Circuits, M. Nahvi and J. Edminister, Schaum's Outline Series, Tata McGraw-Hill (2005).
- B.C. Sarkar and S. Sarkar, Analog Electronics: Devices and Circuits (Revised edition), Damodar Group (Publishers). Burdwan, ISBN: 978-93 -85775 -15-4 (2019).
- Robert L. Boylestad, Essentials of Circuit Analysis, Pearson Education (2004).
- W. H. Hayt, J. E. Kemmerly, S. M. Durbin, Engineering Circuit Analysis, Tata McGraw Hill (2005).
- Alexander and M. Sadiku, Fundamentals of Electric Circuits, McGraw Hill (2008).
- Bell, Electronic Circuits, Oxford University Press.
- Carlson, Circuits, Cengage
- Kuo, Network Analysis and Synthesis, Wiley.
- Dorf and Svoboda, Introduction to Electric Circuits, Wiley.
- Decarlo and Lin, Linear circuit Analysis, Oxford.

e-Learning Source:

- Virtual Labs at Amrita Vishwa Vidyapeetham, <https://vlab.amrita.edu/?sub=1&brch=74>
- MIT Open Learning - Massachusetts Institute of Technology <https://openlearning.mit.edu/>
- National Programme on Technology Enhanced Learning (NPTEL) <https://www.youtube.com/user/nptelhrd>
- Uttar Pradesh Higher Education Digital Library <http://heeccontent.upsdc.gov.in/SearchContent.aspx>
- Swayam Prabha - DTH Channel https://www.swayamprabha.gov.in/index.php/program/current_he/8

Course Articulation Matrix: (Mapping of COs with POs and PSOs)																		
PO-PSO CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6
CO1	3						1						3			1		
CO2	3						1						1			1		
CO3	3						3						3			1		
CO4	3						3						2			2		
CO5	3						3						3			3		

1- Low Correlation; 2- Moderate Correlation; 3- Substantial Correlation

Name & Sign of Program Coordinator	Sign & Seal of HoD
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Integral University, Lucknow

Effective from Session: 2022-23							
Course Code	B030101T/ MT136	Title of the Course	Differential Calculus & Integral Calculus	L	T	P	C
Year	First	Semester	First	4	0	0	4
Pre-Requisite	10+2 with Mathematics	Co-requisite					
Course Objectives	The purpose of this undergraduate course is to impart details and key knowledge of Differential Calculus & Integral Calculus. After successfully completion of course, the student will be able to explore subject into their respective dimensions.						
Course Outcomes							
CO1	The students will be able to know about Indian Ancient Mathematics and Mathematicians. The students also will be able to know about sequences and their convergences/divergences.						
CO2	The students will be able to define Limit, continuity and differentiability of function of single variable. Also, they will be able to prove some theorem e.g. Borel's theorem, boundedness theorem, Bolzano's theorem, Intermediate value theorem, extreme value theorem, Darboux's intermediate value theorem, Rolle's theorem, Lagrange and Cauchy Mean value theorems, Leibnitz theorem, Maclaurin's and Taylor's series, Partial differentiation, Euler's theorem on homogeneous function.						
CO3	The students will be able to find about Tangent and normals, Asymptotes, Curvature, Envelops and evolutes. They will be able to trace tracing of curves in Cartesian and Polar forms.						
CO4	The students will be able to solve finite integrals as limit of the sum, Riemann integral, Fundamental theorem of integral calculus, Mean value theorems of integral calculus,. Also they will be able to find Volumes and Surfaces of Solid of revolution, Pappus theorem, Multiple integrals.						
CO5	The students will be able to solve/find Vector Differentiation, Gradient, Divergence and Curl, Normal on a surface, Directional Derivative, Vector Integration, Theorems of Gauss, Green, Stokes and related problems.						

Unit No.	Title of the Unit	Content of Unit	Contact Hrs.	Mapped CO
1		Indian Ancient Mathematics and Mathematicians: Aryabhata, Brahmagupta, Mahavira Acharya, Varahmihir, Bhaskaracharya, Madhavan, Parmeshvaran, Baudhayana Definition of a sequence, theorems on limits of sequences, bounded and monotonic sequences, Cauchy's convergence criterion, Cauchy sequence, limit superior and limit inferior of a sequence, subsequence, Series of non-negative terms, convergence and divergence, Comparison tests, Cauchy's integral test, Ratio tests, Root test, Raabe's logarithmic test, de Morgan and Bertrand's tests, alternating series, Leibnitz's theorem, absolute and conditional convergence.	9	1
2		Limit, continuity and differentiability of function of single variable, Cauchy's definition, Heine's definition, equivalence of definition of Cauchy and Heine, Uniform continuity, Borel's theorem, boundedness theorem, Bolzano's theorem, Intermediate value theorem, extreme value theorem, Darboux's intermediate value theorem for derivatives, Chain rule, indeterminate forms.	7	2
3		Rolle's theorem, Lagrange and Cauchy Mean value theorems, mean value theorems of higher order, Taylor's theorem with various forms of remainders, Successive differentiation, Leibnitz theorem, Maclaurin's and Taylor's series, Partial differentiation, Euler's theorem on homogeneous function.	7	2
4		Tangent and normals, Asymptotes, Curvature, Envelops and evolutes, Tests for concavity and convexity, Points of inflexion, Multiple points, Parametric representation of curves and tracing of parametric curves, Tracing of curves in Cartesian and Polar forms.	7	3
5		Definite integrals as limit of the sum, Riemann integral, Integrability of continuous and monotonic functions, Fundamental theorem of integral calculus, Mean value theorems of integral calculus, Differentiation under the sign of Integration.	9	4
6		Improper integrals, their classification and convergence, Comparison test, μ -test, Abel's test, Dirichlet's test, quotient test, Beta and Gamma functions.	7	4
7		Rectification, Volumes and Surfaces of Solid of revolution, Pappus theorem, Multiple integrals, change of order of double integration, Dirichlet's theorem, Liouville's theorem for multiple integrals.	7	5
8		Vector Differentiation, Gradient, Divergence and Curl, Normal on a surface, Directional Derivative, Vector Integration, Theorems of Gauss, Green, Stokes and related problems.	7	5

Reference Books:

R.G. Bartle & D.R. Sherbert, Introduction to Real Analysis, John Wiley & Sons

T.M. Apostol, Calculus Vol. I, John Wiley & Sons Inc.

S. Balachandra Rao & C. K. Shantha, Differential Calculus, New Age Publication.

H. Anton, I. Birens and S. Davis, Calculus, John Wiley and Sons, Inc., 2002.

G.B. Thomas and R.L. Finney, Calculus, Pearson Education, 2007.

Bhartiya Mathematicians, Sharda Sanskrit Sansthan, Varanasi.

T.M. Apostol, Calculus Vol. II, John Wiley Publication

Shanti Narayan & Dr. P.K. Mittal, Integral Calculus, S.Chand

e-Learning Source:

Suggestive digital platforms web link/platform: NPTEL/SWAYAM/MOOCs

Course Articulation Matrix: (Mapping of COs with POs and PSOs)

PO-PSO CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	3						2	3	3	3	3	2
CO2	3						3	3	3	2	2	3
CO3	3						3	3	2	3	3	3
CO4	3						3	3	2	2	3	2
CO5	3						1	2	1	3	2	1

1- Low Correlation; 2- Moderate Correlation; 3- Substantial Correlation

Name & Sign of Program Coordinator	Sign & Seal of HoD
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Integral University, Lucknow

Effective from Session: 2022-23							
Course Code	B030102P/ MT137	Title of the Course	Practical Using Mathematica/MATLAB	L	T	P	C
Year	First	Semester	First	0	0	4	2
Pre-Requisite	10+2 with Mathematics	Co-requisite					
Course Objectives	The main objective of the course is to equip the student to plot the different graph and solve the different types of equations by plotting the graph using different computer software such as Mathematica /MATLAB /Maple /Scilab/Maxima etc.						

Course Outcomes	
CO1	The students will be able to plot the different graphs of the functions: ax , $[x]$, x^{2n} , $x = e^x$, $x^2 + 1 = e^x$, $1 - x^2 = e^x$, $x = \log_{10}(x)$, $\cos(x) = x$, $\sin(x) = x$, $\cos(y) = \cos(x)$, $\sin(y) = \sin(x)$ etc. Also they will be able to plot the graphs of polynomial of degree 2,3, 4 and 5, and their first and second derivatives and tracing of conic in Cartesian coordinates.
CO2	After completion of this course student would be able to know the convergence of sequences through plotting, verify Bolzano-Weierstrass theorem through plotting the sequence, Cauchy's root test by plotting n^{th} roots and Ratio test by plotting the ratio of n^{th} and $(n + 1)^{\text{th}}$ term.
CO3	Student would be able to plot Complex numbers and their representations, Operations like addition, subtraction, Multiplication, Division, Modulus and Graphical representation of polar form.
CO4	Student would be able to perform following task of matrix as Addition, Multiplication, Inverse, Transpose, Determinant, Rank, Eigenvectors, Eigen values, Characteristic equation and verification of the Cayley-Hamilton theorem, Solving the systems of linear equations.
CO5	The students will be able to know about study the convergence/divergence of infinite series by plotting their sequences of partial sum.

Unit No.	Title of the Unit	Content of Unit	Contact Hrs.	Mapped CO
1		Plotting the graphs of the following functions: i. ax , $[x]$ (greatest integer function), x^{2n} ; $n \in \mathbb{N}$, x^{2n-1} ; $n \in \mathbb{N}$, $x \in \mathbb{N}$, $x \in \mathbb{N}$, $ ax + b $, $c \pm ax + b $, ii. $\sin(ax + b)$, $\sin(ax + b)$, $ \sin(ax + b) $, $ \cos(ax + b) $, e^{ax+b} , $\log(ax + b)$, Observe and discuss the effect of changes in the real constants a and b on the graphs	4	1
2		By plotting the graph find the solution of the equations $x = e^x$, $x^2 + 1 = e^x$, $1 - x^2 = e^x$, $x = \log_{10}(x)$, $\cos(x) = x$, $\sin(x) = x$, $\cos(y) = \cos(x)$, $\sin(y) = \sin(x)$ etc	4	1
3		Plotting the graphs of polynomial of degree 2,3, 4 and 5, and their first and second derivatives.	4	1
4		Sketching parametric curves, e.g., Trochoid, Cycloid, Epicycloid and Hypocycloid etc.	4	1
5		Tracing of conic in Cartesian coordinates.	4	1
6		Graph of circular and hyperbolic functions.	4	1
7		Obtaining surface of revolution of curves	4	1
8		Complex numbers and their representations, Operations like addition, Multiplication, Division, Modulus. Graphical representation of polar form.	4	3
9		Find numbers between two real numbers and plotting of finite and infinite subset of R.	4	3
10		Matrix Operations: Addition, Multiplication, Inverse, Transpose, Determinant, Rank, Eigen vectors, Eigen values, Characteristic equation and verification of the Cayley-Hamilton theorem, Solving the systems of linear equations.	4	4
11		Study the convergence of sequences through plotting.	4	5
12		Verify Bolzano-Weierstrass's theorem through plotting of sequences and hence identify convergent subsequences from the plot.	4	2
13		Study the convergence/divergence of infinite series by plotting their sequences of partial sum.	4	5
14		Cauchy's root test by plotting n -th roots.	4	5
15		Ratio test by plotting the ratio of n -th and $(n + 1)$ -th term.	4	5

Reference Books:	
1.	<u>Suggested Readings: A Guide to MATLAB®: For Beginners and Experienced Users 3rd Edition, Kindle Edition by Brian R. Hunt</u>
e-Learning Source:	
<u>Teaching Calculus with MATLAB - MATLAB & Simulink (mathworks.com)</u>	

Course Articulation Matrix: (Mapping of COs with POs and PSOs)

PO-PSO CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	3						2	3	2	3	3	3
CO2	3						3	3	3	2	2	2
CO3	3						3	3	3	2	3	3
CO4	3						3	3	3	3	3	3
CO5	3						2	3	2	3	2	2

1- Low Correlation; 2- Moderate Correlation; 3- Substantial Correlation

Name & Sign of Program Coordinator	Sign & Seal of HoD
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Integral University, Lucknow

Effective from Session:							
Course Code	Z010101T	Title of the Course	Food, Nutrition and Hygiene	L	T	P	C
Year	1st	Semester	1st	2	0	0	2
Pre-Requisite	None	Co-requisite	None				
Course Objectives	To learn the basic concept of food, nutrition, hygiene, common diseases prevalent in society alongwith 1000 days nutrition concept.						

Course Outcomes	
CO1	To learn the basic concept of the Food and Nutrition, and meal planning.
CO2	To learn about macro and micro nutrients and its RDA, sources, functions, deficiency and excess.
CO3	To learn 1000 days Nutrition Concept and study the nutritive requirement during special conditions like pregnancy and lactation.
CO4	To study common health issues in the society and to learn the special requirement of food during common illness.

Unit No.	Title of the Unit	Content of Unit	Contact Hrs.	Mapped CO
1	Concept of Food and Nutrition	(a) Definition of Food, Nutrients, Nutrition, Health, balanced Diet (b) Types of Nutrition- Optimum Nutrition, under Nutrition, Over Nutrition (c) Meal planning- Concept and factors affecting Meal Planning (d) Food groups and functions of food	8	CO1
2	Nutrients: Macro and Micro RDA, Sources, Functions, Deficiency and excess of	(a) Carbohydrate (b) Fats (c) Protein (d) Minerals Major: Calcium, Phosphorus, Sodium, Potassium Trace: Iron, Iodine, Fluorine, Zinc (e) Vitamins Water soluble vitamins: Vitamin B, C Fat soluble vitamins: Vitamin A, D, E, K (f) Water (g) Dietary Fibre	7	CO2
3	1000 days Nutrition	(a) Concept, Requirement, Factors affecting growth of child (b) Prenatal Nutrition (0 - 280 days): Additional Nutrients' Requirement and risk factors during pregnancy (c) Breast / Formula Feeding (Birth – 6 months of age) Complementary and Early Diet (6 months – 2 years of age)	8	CO3
4	Community Health Concept	(a) Causes of common diseases prevalent in the society and Nutrition requirement in the following: Diabetes Hypertension (High Blood Pressure) Obesity Constipation Diarrhea Typhoid (b) National and International Program and Policies for improving Dietary Nutrition (c) Immunity Boosting Food	7	CO4

Reference Books:

Singh, Anita, "Food and Nutrition", Star Publication, Agra, India, 2018.

Sheel Sharma, Nutrition and Diet Therapy, Peepee Publishers Delhi, 2014, First Edition.

1000Days-Nutrition_Brief_Brain-Think_Babies_FINAL.pdf

<https://pediatrics.aappublications.org/content/141/2/e20173716>

<https://www.ncbi.nlm.nih.gov/pmc/articles/PMC5750909/>

e-Learning Source:

<https://www.udemy.com/course/internationally-accredited-diploma-certificate-in-nutrition>

Diploma in Human Nutrition-Revised Offered by Alison

Course Articulation Matrix: (Mapping of COs with POs and PSOs)																		
PO-PSO CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6
CO1	-	-	-	2	2	3	2						3	3	2	2		
CO2	-	-	-	3	2	3	2						3	3	2	2		
CO3	-	-	-	3	3	2	3						3	-	-	2		
CO4	-	-	3	3	3	3	3						3	3	2	3		

1- Low Correlation; 2- Moderate Correlation; 3- Substantial Correlation

Name & Sign of Program Coordinator	Sign & Seal of HoD
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Integral University, Lucknow

Effective from Session: 2022-23

Course Code	B010201T/PY115	Title of the Course	Thermal Physics and Semiconductor Devices	L	T	P	C
Year	First	Semester	Second	4	0	0	4
Pre-Requisite	10+2 with Physics	Co-requisite					
Course Objectives	The objective of this undergraduate course is to impart the knowledge of basic and advance concepts of thermodynamics, circuit fundamentals and basic electronics.						

Course Outcomes

CO1	Recognize the difference between reversible and irreversible processes and understand the physical significance of thermodynamical potentials.
CO2	Comprehend the kinetic model of gases w.r.t. various gas laws.
CO3	Study the implementations and limitations of fundamental radiation laws.
CO4	Understand the utility of AC bridges and recognize the basic components of electronic devices.
CO5	Design simple electronic circuits and understand the applications of various electronic instruments.

Unit No.	Title of the Unit	Content of Unit	Contact Hrs.	Mapped CO
1	0 th & 1 st Law of Thermodynamics	State functions and terminology of thermodynamics. Zeroth law and temperature. First law, internal energy, heat and work done. Work done in various thermodynamical processes. Enthalpy, relation between CP and CV. Carnot's engine, efficiency and Carnot's theorem. Efficiency of internal combustion engines (Otto and diesel).	8	CO1
2	2 nd & 3 rd Law of Thermodynamics	Different statements of second law, Clausius inequality, entropy and its physical significance. Entropy changes in various thermodynamical processes. Third law of thermodynamics and unattainability of absolute zero. Thermodynamical potentials, Maxwell's relations, conditions for feasibility of a process and equilibrium of a system. Clausius-Clapeyron equation, Joule-Thompson effect.	8	CO2
3	Kinetic Theory of Gases	Kinetic model and deduction of gas laws. Derivation of Maxwell's law of distribution of velocities and its experimental verification. Degrees of freedom, law of equipartition of energy (no derivation) and its application to specific heat of gases (mono, di and poly atomic).	7	CO3
4	Theory of Radiation	Blackbody radiation, spectral distribution, concept of energy density and pressure of radiation. Derivation of Planck's law, deduction of Wien's distribution law, Rayleigh-Jeans law, Stefan- Boltzmann law and Wien's displacement law from Planck's law.	7	CO4
5	DC & AC Circuits	Growth and decay of currents in RL circuit. Charging and discharging of capacitor in RC, LC and RCL circuits. Network Analysis - Superposition, Reciprocity, Thevenin's and Norton's theorems. AC Bridges - measurement of inductance (Maxwell's, Owen's and Anderson's bridges) and measurement of capacitance (Schering's, Wein's and de Sauty's bridges).	7	CO5
6	Semiconductors & Diodes	P and N type semiconductors, qualitative idea of Fermi level. Formation of depletion layer in PN junction diode, field & potential at the depletion layer. Qualitative idea of current flow mechanism in forward & reverse biased diode. Diode fabrication. PN junction diode and its characteristics, static and dynamic resistance. Principle, structure, characteristics and applications of Zener, Tunnel, Light Emitting, Point Contact and Photo diodes. Half and Full wave rectifiers, calculation of ripple factor, rectification efficiency and voltage regulation. Basic idea about filter circuits and voltage regulated power supply.	8	CO6
7	Transistors	Bipolar Junction PNP and NPN transistors. Study of CB, CE & CC configurations w.r.t. active, cutoff & saturation regions; characteristics; current, voltage & power gains; transistor currents & relations between them. Idea of base width modulation, base spreading resistance & transition time. DC Load Line analysis and Q-point stabilisation. Voltage Divider Bias circuit for CE amplifier. Qualitative discussion of RC coupled amplifier (frequency response not included).	7	CO7
8	Electronic Instrumentation	Multimeter: Principles of measurement of dc voltage, dc current, ac voltage, ac current and resistance. Specifications of a multimeter and their significance. Cathode Ray Oscilloscope: Block diagram of basic CRO. Construction of CRT, electron gun, electrostatic focusing and acceleration (no mathematical treatment). Front panel controls, special features of dual trace CRO, specifications of a CRO and their significance. Applications of CRO to study the waveform and measurement of voltage, current, frequency & phase difference.	8	CO8

Reference Books:

1. M.W. Zemansky, R. Dittman, "Heat and Thermodynamics", McGraw Hill, 1997, 7e
2. F.W. Sears, G.L. Salinger, "Thermodynamics, Kinetic theory & Statistical thermodynamics", Narosa Publishing House, 1998
3. Enrico Fermi, "Thermodynamics", Dover Publications, 1956
4. S. Garg, R. Bansal, C. Ghosh, "Thermal Physics", McGraw Hill, 2012, 2e
5. Meghnad Saha, B.N. Srivastava, "A Treatise on Heat", Indian Press, 1973, 5e
6. R.L. Boylestad, L. Nashelsky, "Electronic Devices and Circuit Theory", Prentice-Hall of India Pvt. Ltd., 2015, 11e
7. J. Millman, C.C. Halkias, Satyabrata Jit, "Electronic Devices and Circuits", McGraw Hill, 2015, 4e
8. B.G. Streetman, S.K. Banerjee, "Solid State Electronic Devices", Pearson Education India, 2015, 7e
9. J.D. Ryder, "Electronic Fundamentals and Applications", Prentice-Hall of India Private Limited, 1975, 5e
10. A. Sudhakar, S.S. Palli, "Circuits and Networks: Analysis and Synthesis", McGraw Hill, 2015, 5e
11. S.L. Gupta, V. Kumar, "Hand Book of Electronics", Pragati Prakashan, Meerut, 2016, 43e

e-Learning Source:

1. Swayam - Government of India, <https://swayam.gov.in/explorer?category=Physics>
2. National Programme on Technology Enhanced Learning (NPTEL), <https://nptel.ac.in/course.html>
3. Coursera, <https://www.coursera.org/browse/physical-science-and-engineering/physics-and-astronomy>
4. edX, <https://www.edx.org/course/subject/physics>
5. MIT Open Course Ware - Massachusetts Institute of Technology, <https://ocw.mit.edu/courses/physics/>

Course Articulation Matrix: (Mapping of COs with POs and PSOs)

PO-PSO CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	3		2			2	3	3		1		
CO2	3						3	3		1		
CO3	3		2			2	3	3		1		
CO4	3		1				3	3		2		
CO5	3		2				3	3		2		

1- Low Correlation; 2- Moderate Correlation; 3- Substantial Correlation

Name & Sign of Program Coordinator	Sign & Seal of HoD
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Integral University, Lucknow

Effective from Session: 2022-23							
Course Code	B010202P/PY116	Title of the Course	Thermal Properties of Matter & Electronic Circuits	L	T	P	C
Year	First	Semester	Second	0	0	4	2
Pre-Requisite	10+2 with Physics	Co-requisite					
Course Objectives	The purpose of this undergraduate course is to impart practical knowledge/measurements in mechanics through different experiments related to its theoretical course.						

Course Outcomes	
CO1	Experimental physics has the most striking impact on the industry wherever the instruments are used to study and determine the thermal properties.
CO2	Experimental physics has the most striking impact on the industry wherever the instruments are used to study and determine the electronic properties.
CO3	Measurement precision and perfection is achieved through Lab Experiments.
CO4	Online Virtual Lab Experiments give an insight in simulation techniques and provide a basis for modeling.

Experiment No.	Title of the Unit	Content of Unit (*Offline)	Contact Hrs.	Mapped CO
1	Callender and Barne's Method	Mechanical Equivalent of Heat by Callender and Barne's method	6	CO1/3
2	Searle's Apparatus	Coefficient of thermal conductivity of copper by Searle's apparatus	6	CO1/3
3	Thermal Conductivity	Coefficient of thermal conductivity of rubber	6	CO1/3
4	Lee and Charlton's disc method	Coefficient of thermal conductivity of a bad conductor by Lee and Charlton's disc method	6	CO1/3
5	Stefan's Constant	Value of Stefan's constant	6	CO1/3
6	Stefan's Law	Verification of Stefan's law	6	CO1/3
7	Thermocouple	Variation of thermo-emf across two junctions of a thermocouple with temperature	6	CO2/3
8	Platinum Resistance Thermometer	Temperature coefficient of resistance by Platinum resistance thermometer	6	CO2/3
9	Charging and Discharging	Charging and discharging in RC and RCL circuits	6	CO2/3
10	A. C. Bridges	A.C. Bridges: Various experiments based on measurement of L and C	6	CO2/3
11	Series and Parallel Resonance	Resonance in series and parallel RCL circuit	6	CO2/3
12	Semiconductor Diodes	Characteristics of PN Junction, Zener, Tunnel, Light Emitting and Photo diode	6	CO2/3
13	Transistors	Characteristics of a transistor (PNP and NPN) in CE, CB and CC configurations	6	CO2/3
14	Half wave and Full Wave Rectifies	Half wave & full wave rectifiers and Filter circuits	6	CO2/3
15	Power Supply	Unregulated and Regulated power supply	6	CO2/3
16	CRO	Various measurements with Cathode Ray Oscilloscope (CRO)	6	CO2/3
Unit No.	Title of the Unit	Content of Unit (*Online Virtual Lab)	Contact Hrs.	Mapped CO
1	Heat transfer	Heat transfer by radiation	6	CO1/3/4
2	Heat transfer	Heat transfer by conduction	6	CO1/3/4
3	Heat transfer	Heat transfer by natural convection	6	CO1/3/4
4	Phase Change	The study of phase change	6	CO1/3/4
5	Stefan's Constant	Black body radiation: Determination of Stefan's constant	6	CO1/3/4
6	Law of Cooling	Newton's law of cooling	6	CO1/3/4
7	Lee's disc apparatus	Lee's disc apparatus	6	CO1/3/4
8	Thermocouple	Thermo-couple: Seebeck effects	6	CO1/3/4
9	Familiarisation with resistor	Familiarisation with resistor	6	CO2/3/4
10	Familiarisation with capacitor	Familiarisation with capacitor	6	CO2/3/4
11	Familiarisation with inductor	Familiarisation with inductor	6	CO2/3/4
12	Ohm's Law	Ohm's Law	6	CO2/3/4
13	RC Differentiator and integrator	RC Differentiator and integrator	6	CO2/3/4
14	Semiconductor Diodes	VI characteristics of a diode	6	CO2/3/4
15	Half wave and Full Wave Rectifies	Half & Full wave rectification	6	CO2/3/4
16	Capacitive rectification	Capacitive rectification	6	CO2/3/4
17	Zener Diode	Zener Diode voltage regulator	6	CO2/3/4
18	Common Emitter Characteristics	BJT common emitter characteristics	6	CO2/3/4
19	Common Base Characteristics	BJT common base characteristics	6	CO2/3/4
20	Common Emitter Amplifier	Studies on BJT CE amplifier	6	CO2/3/4

Reference Books:

1. B. L. Worsnop, H. T. Flint, "Advanced Practical Physics for Students", Methuen & Co. Ltd., London, 1962, 9e
2. S. Panigrahi, B. Mallick, "Engineering Practical Physics", Cengage Learning India Pvt. Ltd., 2015, 1e
3. R. L. Boylestad, L. Nashelsky, "Electronic Devices and Circuit Theory", Prentice-Hall of India Pvt. Ltd., 2015, 11e
4. A. Sudhakar, S. S. Palli, "Circuits and Networks: Analysis and Synthesis", McGraw Hill, 2015, 5e

e-Learning Source:

1. Virtual Labs at Amrita Vishwa Vidyapeetham, <https://vlab.amrita.edu/?sub=1&brch=194>
2. Virtual Labs an initiative of MHRD Govt. of India, <http://vlabs.iitkgp.ac.in/be/#>
3. Digital Platforms/Web Links of other virtual labs may be suggested/added to this list by individual Universities.

* A student has to perform at least 7 experiments from the Offline Experiment List and 3 from the Online Virtual Lab Experiment List / Link.

Course Articulation Matrix: (Mapping of COs with POs and PSOs)											
PO-PSO CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2	PSO3	PSO4
CO1	2						3	3			3
CO2	2						3	3			3
CO3	3						2	3			2
CO4	2						3	2			2

1- Low Correlation; 2- Moderate Correlation; 3- Substantial Correlation

Name & Sign of Program Coordinator	Sign & Seal of HoD
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Integral University, Lucknow

Effective from Session: 2022-23							
Course Code	B140201T/EC133	Title of the Course	Semiconductor Devices and Electronic Circuits	L	T	P	C
Year	First	Semester	Second	4	0	0	4
Pre-Requisite	10+2 with Physics and Mathematics	Co-requisite	NA				
Course Objectives	The main objective of this course is to familiarize students with basic material and properties of Semiconductors. Familiarization with basics of Thyristor family.						

Course Outcomes	
CO1	Students will be familiarized with the Explore the constructional features of basic Semiconductor Devices
CO2	Students will understand the biasing principles of Semiconductor devices like Diode and Transistors.
CO3	Students will be able to describe the JFET and MOSFET
CO4	Students will Identify the applications of JFET and Clippers and limiters.
CO5	Students will Attain knowledge of various amplifiers and their comparison. Identify the applications of JFET and MOSFET and Familiarize with amplifiers.

Unit No.	Title of the Unit	Content of Unit	Contact Hrs.	Mapped CO
1	Semiconductor Basics	Introduction to Semiconductor materials, Intrinsic Semiconductors and Extrinsic Semiconductor, n-type Semiconductors ,p-type Semiconductors with reference to Energy levels, Donors and Acceptors, Concept of Fermi level .	7	CO1
2	Diode	Symbols, pins, unbiased diode , Depletion layer, barrier potential , working in forward bias and reverse bias , concept of breakdown , I-V Characteristics, knee voltage, breakdown voltage, bulk resistance, Zener diode, light emitting diode, photo diode and solar cell.	8	CO2
3	Bipolar Junction Transistor (BJT)	Symbols. Pins , Basic types PNP and NPN , unbiased transistor, Biased transistor, transistor currents, concept of current gain α of BJT , CE,CB and CC Configurations with respect to CE Configurations, I-V characteristics – base curve and collector curves, load line , operating point , Biasing Techniques – voltage divider bias, emitter bias , collector feedback bias and base bias.	8	CO2
4	FET and MOSFET	Symbol, type's construction, working principles, I-V characteristics. Specification parameters of Uni junction transistor (UJT), Junction Field Effect Transistor (JFET). Symbol, type's construction, working principles, I-V characteristics. Specification parameters of Metal Oxide Field Effect Transistor (MOSFET).	7	CO3
5	JFET and Rectifiers	Comparison of JFET, MOSFET and BJT. Half wave rectifier, transformer Full Wave rectifier, Bridge Rectifier, Choke input filter, capacitor input filter, peak inverse voltage and surge current.	8	CO3
6	Circuits	Block diagram of power supply, Zener regulator, Clippers and limiters, Clampers and Voltage Multipliers.	7	CO4
7	Biasing of JFET and MOSFET	JFET Biasing in ohmic /active region, MOSFET in digital switching. Transistor as a switch, transistor as an amplifier, class A operation , class B operation.	7	CO5
8	Amplifiers	Emitter follower, class B Push Pull emitter follower, Class C operation single stage RC Coupled CE amplifier, voltage gain concept of frequency response and bandwidth.	8	CO5

Reference Books:	
1.	Electronic Principles- Albert Malvino, David J. Bates, 7 th Edition (2016).
2.	Basic Electronics – B, Grob, Mitchel E. Schultz, 11 th Edition (2007).
3.	Solid State Electronic Devices, B. G . Streetman and S. Baneerjee, Pearson Education (2006).
4.	Electronic Principles, Albert Malvino, David J. Bates, 7 th Edition (2016).
5.	Basic Electronics- B, Grob, Mitchel E.Schultz, 11 th Edition, (2007).
6.	Basic Electronics and Linear Circuits, N. N. Bhargava, D.C. Kulsheshtha, S. C . Gupat, Tata McGraw Hill (2008).
7.	Semiconductor Devices, Kanaan Kano, Pearson Education (2004).

e-Learning Source:	
1.	You tube link: https://www.youtube.com/watch?v=9FJJre-HG_0
2.	Swayam Prabha - DTH Channel https://www.swayamprabha.gov.in/index.php/program/current_he/8

Course Articulation Matrix: (Mapping of COs with POs and PSOs)																		
PO-PSO CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6
CO1	3	3	2	3	-	1	1						1	-	1			
CO2	3	3	3	3		1							2	1				
CO3	3	3	2	3		1							1		2			
CO4	3	3	2	2			1						1					
CO5	3	3	3	3									2					

1- Low Correlation; 2- Moderate Correlation; 3- Substantial Correlation

Name & Sign of Program Coordinator	Sign & Seal of HoD
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Integral University, Lucknow

Effective from Session: 2022-23							
Course Code	B140202P/ EC134	Title of the Course	Semiconductor devices and Circuits Lab	L	T	P	C
Year	First	Semester	Second	0	0	4	2
Pre-Requisite	10+2 with Physics and Mathematics	Co-requisite	NA				
Course Objectives	The main objective of this course is to familiarize students with basic material and properties of Semiconductors and Familiarization with basics of Thyristor family						

Course Outcomes	
CO1	Students will understand the I-V Characteristics of Diode-ordinary and zener diode. Students will understand the I-V Characteristics of CE Configuration of BJT and obtain r_i, r_o and β .
CO2	Students will be familiarized with the Common Base Configuration of BJT and obtain r_i, r_o and α . Students will understand the I-V Characteristics of the Common Collector Configuration of BJT and obtain voltage gain, r_i, r_o .
CO3	Students will understand the I-V Characteristics of JFET and SCR Students will be able to Understand the Half wave Rectifier and Full Wave Rectifier.
CO4	Students will Attain knowledge of Hall effect. Students will understand the Clipping and Clamping Circuits.
CO5	Students will understand the Designing of Single stage CE amplifier. Students will understand the Colpitts oscillator and Hartley Oscillator.

Experiment No.	Title of the Experiment	Content of Unit	Contact Hrs.	Mapped CO
1	P-N Junction and Zener Diode	Study of the I-V Characteristics of Diode-ordinary and zener diode.	4	CO1
2	Characteristics of Common Emitter (CE) Configuration	Study of the I-V Characteristics of Common Emitter (CE) Configuration of BJT and obtain r_i, r_o and β .	4	CO1
3	Characteristics of the Common Base Configuration	Study of the I-V Characteristics of the Common Base (CB) Configuration of BJT and obtain r_i, r_o and α .	4	CO2
4	Characteristics of the Common Collector (CC)	Study of the I-V Characteristics of the Common Collector (CC) Configuration of BJT and obtain voltage gain, r_i, r_o .	4	CO2
5	Characteristics of JFET and SCR	Study of the I-V Characteristics of JFET and SCR	4	CO3
6	Half wave Rectifier and Full Wave Rectifier	Study of Half wave Rectifier and Full Wave Rectifier.	4	CO3
7	Hall effect	Study of Hall effect.	4	CO4
8	Clipping and Clamping Circuits	Study of Clipping and Clamping Circuits.	4	CO4
9	Design of Single stage CE amplifier	Designing of Single stage CE amplifier.	4	CO5
10	Colpitts oscillator and Hartley Oscillator	Study of the Colpitts oscillator and Hartley Oscillator.	4	CO5

Reference Books:

1. Electronic Principles- Albert Malvino, David J. Bates, 7th Edition (2016).
2. Basic Electronics – B, Grob, Mitchel E. Schultz, 11th Edition (2007).
3. Solid State Electronic Devices, B. G . Streetman and S. Banerjee, Pearson Education (2006).
4. Electronic Principles, Albert Malvino, David J. Bates, 7th Edition (2016).
5. Basic Electronics- B, Grob, Mitchel E.Schultz, 11th Edition, (2007).
6. Basic Electronics and Linear Circuits, N. N. Bhargava, D.C. Kulsheshtha, S. C . Gupat, Tata McGraw Hill (2008).
7. Semiconductor Devices, Kanaan Kano, Pearson Education (2004).

e-Learning Source:

1. You tube link: https://www.youtube.com/watch?v=9FJJre-HG_0
2. Swayam Prabha - DTH Channel https://www.swayamprabha.gov.in/index.php/program/current_he/8

PO-PSO CO	Course Articulation Matrix: (Mapping of COs with POs and PSOs)																	
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6
CO1	3	3	2	3		1	1						1			3		
CO2	3	3	3	3		1							2	1		3		
CO3	3	3	2	3		1							1		2	3		
CO4	3	3	2	2			1						1			3		
CO5	3	3	3	3									2			3		

1- Low Correlation; 2- Moderate Correlation; 3- Substantial Correlation

Name & Sign of Program Coordinator	Sign & Seal of HoD
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Integral University, Lucknow

Effective from Session: 2022-23							
Course Code	B030201T/MT138	Title of the Course	Matrices and Differential Equations & Geometry	L	T	P	C
Year	First	Semester	First	6	0	0	6
Pre-Requisite	10+2 with Mathematics	Co-requisite					
Course Objectives	The purpose of this undergraduate course is to impart details and key knowledge of Matrices and Differential Equations & Geometry. After successfully completion of course, the student will able to explore subject into their respective dimensions.						

Course Outcomes	
CO1	The students will be able to define types of Matrices, Rank of a Matrix, System of linear homogeneous and non-homogeneous equations, Theorems on consistency of a system of linear equations. Also, students will be able to find Eigen values, Eigen vectors , Cayley-Hamilton theorem, real and imaginary parts, Exponential and Logarithmic functions Inverse trigonometric and hyperbolic functions.
CO2	The student will be able to learn and visualize the fundamental ideas about formation of differential equations, Geometrical meaning of a differential equation
CO3	The students will be to learn and visualize first order higher degree equations solvable for x, y, p, Clairaut's equation and singular solutions, orthogonal trajectories, Linear differential equation of order greater than one with constant coefficients.
CO4	On successful completion of the course students have gained knowledge about to trace of conics, Confocal conics, Polar equation of conics and its properties, Three-Dimensional Coordinates system.
CO5	The student will be able to describe Sphere, Cone and Cylinder, Central conicoids, Paraboloids, lines, Confocal conicoids, Reduction of second degree equations.

Unit No.	Title of the Unit	Content of Unit	Contact Hrs.	Mapped CO
1		Types of Matrices, Elementary operations on Matrices, Rank of a Matrix, Echelon form of a Matrix, Normal form of a Matrix, Inverse of a Matrix by elementary operations, System of linear homogeneous and non-homogeneous equations, Theorems on consistency of a system of linear equations.	12	1
2		Eigen values, Eigen vectors and characteristic equation of a matrix, Cayley-Hamilton theorem and its use in finding inverse of a matrix, Complex functions and separation into real and imaginary parts, Exponential and Logarithmic functions Inverse trigonometric and hyperbolic functions.	11	1
3		Formation of differential equations, Geometrical meaning of a differential equation, Equation of first order and first degree, Equation in which the variables are separable, Homogeneous equations, Exact differential equations and equations reducible to the exact form, Linear equations.	11	2
4		First order higher degree equations solvable for x, y, p, Clairaut's equation and singular solutions, orthogonal trajectories, Linear differential equation of order greater than one with constant coefficients, Cauchy- Euler form.	11	3
5		General equation of second degree, System of conics, Tracing of conics, Confocal conics, Polar equation of conics and its properties.	12	4
6		Three-Dimensional Coordinates, Projection and Direction Cosine, Plane (Cartesian and vector form), Straight line in three dimension (Cartesian and vector form).	11	4
7		Sphere, Cone and Cylinder.	11	5
8		Central conicoids, Paraboloids, Plane section of conicoids, Generating lines, Confocal conicoids, Reduction of second degree equations.	11	5

Reference Books:	
1.	Stephen H. Friedberg, A.J Insel & L.E. Spence, Linear Algebra, Person
2.	B. Rai, D.P. Choudhary & H. J. Freedman, A Course in Differential Equations, Narosa
3.	D.A. Murray, Introductory Course in Differential Equations, Orient Longman
4.	Robert J.T Bell, Elementary Treatise on Coordinate Geometry of three dimensions, Macmillan India Ltd.
5.	P.R. Vittal, Analytical Geometry 2d & 3D, Pearson.
6.	S.L. Loney, The Elements of Coordinate Geometry, McMillan and Company, London.
7.	R.J.T. Bill, Elementary Treatise on Coordinate Geometry of Three Dimensions, McMillan India Ltd., 1994.
e-Learning Source:	
Suggestive digital platforms web links/platform: NPTEL/SWAYAM/MOOCs	

Course Articulation Matrix: (Mapping of COs with POs and PSOs)

PO-PSO CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	3						2	3	3	2	3	3
CO2	3						3	3	2	3	3	2
CO3	3						3	2	2	3	3	2
CO4	3						3	3	3	2	3	3
CO5	3						2	3	2	2	2	3

1- Low Correlation; 2- Moderate Correlation; 3- Substantial Correlation

Name & Sign of Program Coordinator	Sign & Seal of HoD
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Integral University, Lucknow

Effective from Session: 2022-2023							
Course Code	B150101T/ES125	Title of the Course	Basics of Environmental Science	L	T	P	C
Year	First	Semester	First/Second	3	1	0	4
Pre-Requisite	10+2 with Physics, Chemistry & (Maths/ Biology)	Co-requisite					
Course Objectives	This course provides students with a working knowledge of concept of environment and the relation between human and its relation with the environment.						

Course Outcomes	
CO1	Gain knowledge about origin of life and related theories.
CO2	Learn fundamental concept of environmental science.
CO3	Develop the understanding about environmental education and able to understand the relationship between human and environment.
CO4	Understand the concept of sustainable development and SDG and also able to understand the current scenario of environmental degradation.
CO5	Learn the significance and importance of environmental management and have the practical knowledge about the affected areas of environment.

Unit No.	Title of the Unit	Content of Unit	Contact Hrs.	Mapped CO
1	Evolution	Origin of life and speciation, Darwinism and modern synthetic theory of evolution, Natural Selection; Biochemical basis of origin of life; Hardy Weinberg Equilibrium; Genetic drift.	8	CO1
2	Concept of Environment	Definition, Principles and Scope of Environmental Science; Environment, its components and segments; Moral and Aesthetic Nature of Environmental Science; Objectives and Historic roots of the subject; for Public Awareness.	8	CO2
3	Environmental	Goals of environmental education; Environmental Literacy, Environmental Careers, Environmental Justice, Individual Organisms, Environmentalism, Environmental Education at Primary, Secondary level.	6	CO3
4	Man and Environment	Man-Environment relationships; Impacts of human activity on environment (Agriculture, transportation, mining, urbanization, industrialization); Environmental Degradation and Conservation Issues, Modern concept of environmental conservation	8	CO3
5	Sustainable development	Concept and Significance of sustainable development, Core elements of sustainable development, Overview of SDG (Sustainable Development Goals).	6	CO4
6	Current Environmental Issues	Ill effects of fireworks and environmental degradation, Climate change and its effects on human health, Deforestation and its impacts on human communities and flora and fauna of the Environment.	8	CO4
7	Environmental Management	Significance of Environment Management, Resettlement and rehabilitation of project affected areas, Environmental ethics: Role of Indian's religions and cultures in environmental conservation, Communication and public awareness programs for environment management.	8	CO5
8	Field Survey	Assessment of impacts of anthropogenic activities in the surrounding environment; Evaluation of the consequences rising from agricultural and commercial logging practices to preserve environment, case study, Reclamation and monitoring of the affected area by developmental activities: case study.	8	CO5

Reference Books:

1. Environmental Science by William P. Cunningham and Mary Ann Cunningham; McGraw-Hill Publications.
2. Environmental Science: Earth as a Living Planet by Botkin and Keller; JOHN WILEY & SONS, INC
3. A text Book of Environment Studies, Asthana, D. K. and Asthana, M. 2006, S. Chand & Co.
4. Environmental Encyclopedia, Jaico Publ. House, Mumabai, 1196p
5. Atmosphere, Weather and Climate, Barry, R. G. 2003, Routledge Press, UK.
6. Environmental Science: S. C. Santra, New Central Book Agency.

e-Learning Source:

1. Environmental Science, Dr. Y. K. Singh, <https://www.hzu.edu.in/bed/E%20V%20S.pdf>
2. Textbook for Environmental Studies, Erach Bharucha, <https://www.ugc.ac.in/oldpdf/modelcurriculum/env.pdf>
3. Fundamentals of Environmental Studies, <https://www.jkcprl.ac.in/download/11567250727.pdf>

Course Articulation Matrix: (Mapping of COs with POs and PSOs)																		
PO-PSO CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6
CO1	3	2	-	-	-	-	-	-	-	-	-	-	2	2	-	-	-	-
CO2	3	3	-	-	-	-	-	-	-	-	-	-	3	2	-	-	-	-
CO3	2	2	-	-	-	-	-	-	-	-	-	-	2	3	-	-	-	-
CO4	3	3	-	-	-	-	-	-	-	-	-	-	2	2	-	-	-	-
CO5	2	1	-	-	-	-	-	-	-	-	-	-	3	2	-	-	-	-

1- Low Correlation; 2- Moderate Correlation; 3- Substantial Correlation

Name & Sign of Program Coordinator	Sign & Seal of HoD
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Integral University, Lucknow

Effective from Session: 2022-23							
Course Code	I010201V/MEVC201	Title of the Course	Refrigeration and Air conditioning	L	T	P	C
Year	First	Semester	First	3	0	1	4
Pre-Requisite	10+2 with Physics	Co-requisite					
Course Objectives	The main objective of this course is to familiarize students with the basic concept of refrigeration and conditioning and to gain knowledge about the methods of refrigeration and air conditioning system with the elementary idea about the refrigerants.						

Course Outcomes	
CO1	Students will be familiarized with the refrigeration and air conditioning and the methods used for refrigeration.
CO2	Students will know about the refrigerants and their types and also aware about their impacts on environment.
CO3	Students will understand the working of vapour absorption refrigeration system and its components.
CO4	Students will understand the concept of air-conditioning and the working of different air-conditioning equipments.

Unit No.	Title of the Unit	Content of Unit	Contact Hrs.	Mapped CO
1	Introduction to Refrigeration	Definition of refrigeration, necessity of refrigeration, Methods of refrigeration, Carnot refrigeration cycle, Unit of refrigeration, Refrigeration effect and C.O.P. Simple vapor compression refrigeration system. Study of different types of evaporators, compressors, condenser and expansion valve and their types, Visit of a cold storage plant.	10	CO1
2	Refrigerants and its Types	Components of vapour compression refrigeration system, condenser and expansion valve and their types. Analysis of vapour compression cycle, use of T-S and P-H charts. Experiment on the refrigeration test-rig and calculation of various performance parameters. Working of a domestic refrigerator and deep freezer.	12	CO2
3	Vapour Compression Refrigeration System	History of refrigerants, Refrigerants, definition, classification, nomenclature, methane and ethane series. Desirable properties of refrigerants- physical, chemical, safety. Ozone depletion potential and Global warming potential of the refrigerants. Charging of refrigerants in the compressor, Working of Water coolers and Ice plant. Visit of centralized air conditioning plant.	12	CO3
4	Air conditioning system	Introduction to air conditioning, Psychometric properties and their definitions, Psychometric chart, Different Psychometric processes, working and servicing of split and window air-conditioning systems, air washers and cooling towers. Experiment on air-conditioning test-rig and calculation of various performance parameters.	11	CO4

Reference Books:	
1.	Arora CP, Refrigeration and air conditioning, Tata Mcgraw Hill.
2.	Manohar Prasad, Refrigeration and air conditioning, New Age Publication.
3.	Andrew D. Althouse, Carl H. Turnquist, Alfred F. Bracciano. Modern Refrigeration and Air Conditioning. Goodheart-Willcox Co.
4.	Shan K. Wang, Handbook of Air Conditioning and Refrigeration, Mcgraw Hill.
e-Learning Source:	
1.	Refrigeration and Airconditioning - Course (nptel.ac.in)

PO-PSO CO	Course Articulation Matrix: (Mapping of COs with POs and PSOs)										
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2	PSO3	PSO4
CO1	3	2				2	3	2		3	1
CO2	3	3			2	3	2	1		2	1
CO3	3	1			2	3	3	2		3	3
CO4	3	3				3	2	2		3	2

1- Low Correlation; 2- Moderate Correlation; 3- Substantial Correlation

Name & Sign of Program Coordinator	Sign & Seal of HoD
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Integral University, Lucknow

Effective from Session: 2020-21							
Course Code	ME131	Title of the Course	Fundamentals of Mechanical Engineering	L	T	P	C
Year	First	Semester	First	3	0	0	3
Pre-Requisite	10+2 with Physics	Co-requisite					
Course Objectives	The primary goals of this course are to emphasize the basic concepts of thermal sciences and to apply first and second law of thermodynamics to various processes and real systems. Students are able to model the problem using free-body diagrams and to reach the solution by using equilibrium equations and the knowledge of strength of material.						

Course Outcomes	
CO1	Explain basic concepts of thermal sciences and temperature measurement on the basis of zeroth law of thermodynamics.
CO2	Understand and apply first and second law of thermodynamics to various processes and real systems.
CO3	Model the problem using free-body diagrams and reach to solution by using equilibrium equations.
CO4	Draw Shear Force Diagram (SFD) and Bending Moment Diagrams (BMD) for statically determinate beams.
CO5	Design simple components on the basis of knowledge of stress, strain and strength of material.

Unit No.	Title of the Unit	Content of Unit	Contact Hrs.	Mapped CO
1	Basic Concepts and Definitions	Basic Concepts and Definitions: Definition of Thermodynamics, System, surrounding and universe, Phase, Concept of continuum, Macroscopic & microscopic point of view. Density, Specific volume, Pressure, temperature. Thermodynamic equilibrium, Property, State, Path, process, Cyclic process, Energy and its form, Work and heat, Enthalpy. Laws of thermodynamics: Zeroth law: Concepts of Temperature, Zeroth law.	8	CO1
2	First law of thermodynamics	First law of thermodynamics: First law of thermodynamics. Concept of processes, Flow processes and control volume, Flow work, Steady flow energy equation, Mechanical work in a steady flow of process.	8	CO2
3	Second law of thermodynamics	Second law of thermodynamics: Essence of second law, Thermal reservoir, Heat engines, COP of heat pump and refrigerator. Statements of second law, Carnot cycle, Clausius inequality, Concept of entropy	8	CO3
4	Structure analysis	Structure analysis Beams: Introduction, Types of beams, supports and loading, Shear force and bending moment, Shear and bending moment diagram for statically determinate beams.	8	CO4
5	Analysis of stress and strain	Analysis of stress and strain: Simple Stress and strain: Introduction, Normal, shear stresses, Stress-strain diagrams for ductile and brittle materials. Pure Bending of Beams: Introduction, Simple bending theory, Bending equation.	8	CO5

Reference Books:

1. Wylen G.J. & Sonnlog R.E. Fundamentals of Classical Thermodynamics, John Wiley & Sons, Inc. NY.
2. Wenneth: Thermodynamics (2nd edition) Mc Graw Hill Book Co. NY.
3. Cengel: Thermodynamics Mc Graw Hill Book Co. NY.
4. Sadhu Singh: Strength of Material: Khanna Publisher
5. P.K. Bharti: Engineering Mechanics, Kataria and Sons.

e-Learning Source:

1. https://onlinecourses.nptel.ac.in/noc20_me20/preview

Course Articulation Matrix: (Mapping of COs with POs and PSOs)

PO-PSO CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2	PSO3	PSO4
CO1	3	2	2			3	3	3	2	3	
CO2	3	2	3			3	3	3	3	3	1
CO3	3	1	3			3	3	3	3	2	
CO4	3	1	3			2	3	3	2	2	
CO5	3	1	2			2	3	3	2	3	1

1- Low Correlation; 2- Moderate Correlation; 3- Substantial Correlation

Name & Sign of Program Coordinator	Sign & Seal of HoD
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Department of Higher Education

U.P. Government, Lucknow

National Education Policy-2020

Common Minimum Syllabus for all U.P. State Universities

Co-curricular course: Semester-2

Course Title: First Aid and Health

Name	Designation	Affiliation
Steering Committee		
Mrs. Monika S. Garg, (I.A.S.), Chairperson Steering Committee	Additional Chief Secretary	Dept. of Higher Education U.P., Lucknow
Prof. Poonam Tandan	Professor, Dept. of Physics	Lucknow University, U.P.
Prof. Hare Krishna	Professor, Dept. of Statistics	CCS University Meerut, U.P.
Dr. Dinesh C. Sharma	Associate Professor	K.M. Govt. Girls P.G. College Badalpur, G.B. Nagar, U.P.

Syllabus Developed by:

S. No.	Name	Designation	Department	College/ University
1	Dr. Monisha Banerjee	Professor & Dean, Research	Zoology	University of Lucknow, Lucknow
2	Dr. Dinesh C. Sharma	Associate Professor	Zoology	K.M. Govt. Girls P.G. College Badalpur, G.B. Nagar, U.P.

Co-curricular course

Programme/Class: Certificate	Year: First	Semester: Second
Co-Curricular Course		
Course Code: Z020201	Course Title: First Aid and First Aid and Health	
Course outcomes:		
<ul style="list-style-type: none"> Learn the skill needed to assess the ill or injured person. Learn the skills to provide CPR to infants, children and adults. Learn the skills to handle emergency child birth Learn the Basic sex education help young people navigate thorny questions responsibly and with confidence. Learn the Basic sex education help youth to understand Sex is normal. It's a deep, powerful instinct at the core of our survival as a species. Sexual desire is a healthy drive. Help to understand natural changes of adolescence Learn the skill to identify Mental Health status and Psychological First Aid 		
Credits: 2 (1Theory+1 Practical)		Compulsory
Max. Marks: 25+75		Min. Passing Marks:
Total No. of Lectures-Tutorials-Practical (in hours per week): L-T-P: 2-0-0		
Unit	Topics	No. of Lectures Total= 15 Theory+ 30 Practical
I	<p>A. Basic First Aid</p> <ul style="list-style-type: none"> Aims of first aid & First aid and the law. Dealing with an emergency, Resuscitation (basic CPR). Recovery position, Initial top to toe assessment. Hand washing and Hygiene Types and Content of a First aid Kit <p>B. First AID Technique</p> <ul style="list-style-type: none"> Dressings and Bandages. Fast evacuation techniques (single rescuer). Transport techniques. <p>C. First aid related with respiratory system</p> <ul style="list-style-type: none"> Basics of Respiration. 	<p>2 (Theory) 10 (Practical)</p>

	<ul style="list-style-type: none"> No breathing or difficult breathing, Drowning, Choking, Strangulation and hanging, Swelling within the throat, Suffocation by smoke or gases and Asthma. <p>D. First aid related with Heart, Blood and Circulation</p> <ul style="list-style-type: none"> Basics of The heart and the blood circulation. Chest discomfort, bleeding. <p>D. First aid related with Wounds and Injuries</p> <ul style="list-style-type: none"> Type of wounds, Small cuts and abrasions Head, Chest, Abdominal injuries Amputation, Crush injuries, Shock <p>E. First aid related with Bones, Joints Muscle related injuries</p> <ul style="list-style-type: none"> Basics of The skeleton, Joints and Muscles. Fractures (injuries to bones). 	
II	<p>F. First aid related with Nervous system and Unconsciousness</p> <ul style="list-style-type: none"> Basics of the nervous system. Unconsciousness, Stroke, Fits – convulsions – seizures, Epilepsy. <p>G. First aid related with Gastrointestinal Tract</p> <ul style="list-style-type: none"> Basics of The gastrointestinal system. Diarrhea, Food poisoning. <p>H. First aid related with Skin, Burns</p> <ul style="list-style-type: none"> Basics of The skin. Burn wounds, Dry burns and scalds (burns from fire, heat and steam). Electrical and Chemical burns, Sun burns, heat exhaustion and heatstroke. Frost bites (cold burns), Prevention of burns, Fever and Hypothermia. <p>I. First aid related with Poisoning</p> <ul style="list-style-type: none"> Poisoning by swallowing, Gases, Injection, Skin <p>J. First aid related with Bites and Stings</p> <ul style="list-style-type: none"> Animal bites, Snake bites, Insect stings and bites <p>K. First aid related with Sense organs</p> <ul style="list-style-type: none"> Basic of Sense organ. Foreign objects in the eye, ear, nose or skin. Swallowed foreign objects. <p>L. Specific emergency satiation and disaster management</p> <ul style="list-style-type: none"> Emergencies at educational institutes and work Road and traffic accidents. Emergencies in rural areas. Disasters and multiple casualty accidents. Triage. <p>M. Emergency Child birth</p>	2 (Theory) 10 (Practical)
III	<p>Basic Sex Education</p> <ul style="list-style-type: none"> Overview, ground rules, and a pre-test Basics of Urinary system and Reproductive system. Male puberty — physical and emotional changes Female puberty — physical and emotional changes Male-female similarities and differences Sexual intercourse, pregnancy, and childbirth Facts, attitudes, and myths about LGBTQ+ issues and identities Birth control and abortion Sex without love — harassment, sexual abuse, and rape Prevention of sexually transmitted diseases. 	9 (Theory)
IV	<p>Mental Health and Psychological First Aid</p> <ul style="list-style-type: none"> What is Mental Health First Aid? Mental Health Problems in the India The Mental Health First Aid Action Plan Understanding Depression and Anxiety Disorders Crisis First Aid for Suicidal Behavior & Depressive symptoms What is Non-Suicidal Self-Injury? Non-crisis First Aid for Depression and Anxiety Crisis First Aid for Panic Attacks, Traumatic events Understanding Disorders in Which Psychosis may Occur Crisis First Aid for Acute Psychosis 	2 (Theory) 10 (Practical)

	<ul style="list-style-type: none"> • Understanding Substance Use Disorder • Crisis First Aid for Overdose, Withdrawal • Using Mental Health First Aid 	
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Suggested Readings:

- Indian First Aid Manual-<https://www.indianredcross.org/publications/FA-manual.pdf>
- Red Cross First Aid/CPR/AED Instructor Manual
- <https://mhfa.com.au/courses/public/types/youthedition4>
- Finkelhor, D. (2009). The prevention of childhood sexual abuse. Durham, NH: Crimes Against Children Research Center. www.unh.edu/ccrc/pdf/CV192.pdf
- Kantor L. & Levitz N. (2017). Parents' views on sex education in schools: How much do Democrats and Republicans agree? PLoS ONE, 12 (7): e0180250.
- Orenstein, P. (2016). Girls and sex: Navigating the complicated new landscape. New York, NY: Harper.
- Schwiengershausen, E. (2015, May 28). The Cut. www.thecut.com/2015/05/most-women-are-catcalled-before-they-turn-17.html
- Wiggins, G. & McTighe, J. (2008). Understanding by design. Alexandria, VA: ASCD.
- <https://marshallmemo.com/marshall-publications.php#8>

Suggested Continuous Evaluation Methods:
 Assignments, Presentation, Group Discussion, and MCQ

Suggested equivalent online courses:

- <https://www.redcross.org/take-a-class/first-aid/first-aid-training/first-aid-online>
- <https://www.firstaidforfree.com/>
- <https://www.coursera.org/learn/psychological-first-aid>
- <https://www.coursera.org/learn/mental-health>

Further Suggestions:.....