

IV Semester

IV Semester

ENVIRONMENTAL CHEMISTRY				
Course Code		21BSC41	CIE Marks	50
Teaching Hours/Week (L:T:P: S)		2:2:0	SEE Marks	50
Total Hours of Pedagogy		40	Total Marks	100
Credits		03	Exam Hours	03
CLO 1	Understand the bio-geochemical cycles of various pollutant gases.			
CLO 2	Explain the methods of estimation of carbon monoxide, oxides of nitrogen oxides of sulfur and methods of control of these pollutants.			
CLO 3	Understanding the techniques for measuring water pollution. Impacts of water pollution on hydrological and ecosystems.			
CLO 4	Evaluate effects of air pollution on living organisms and vegetation.			
CLO 5	Use of sources of energy and nuclear waste disposal.			
Pedagogy (General Instructions) These are sample Strategies, which teacher can use to accelerate the attainment of the various course outcomes. These are sample Strategies, which teacher can use to accelerate the attainment of the various course outcomes. 1. Lecturer method (L) does not mean only traditional lecture method, but different type of teaching methods may be adopted to develop the outcomes. 2. Show Video/animation films to convince abstract concepts. 4. Encourage collaborative (Group Learning) Learning in the class 5. Ask at least three HOTS (Higher order Thinking) questions in the class, which promotes critical thinking 6. Adopt Problem Based Learning (PBL), which fosters students' Analytical skills, develop thinking skills such as the ability to evaluate, generalize, and analyse information rather than simply recall it. 7. Topics will be introduced in a multiple representation. 8. Show the different ways to solve the same problem and encourage the students to come up with their own creative ways to solve them. 9. Discuss how every concept can be applied to the real world - and when that's possible, it helps improve the students' understanding.				
Module-1				
Ecosystems, Bio-geochemical cycles of carbon, nitrogen and sulfur. Air pollution: major regions of atmosphere. Chemical and photochemical reactions in atmosphere. Air pollutants: types, sources, particle size and chemical nature: photochemical smog: its constituents and photochemistry.				
Pedagogy	Chalk and talk/power point presentation: Ecosystems, Bio-geochemical cycles of carbon, nitrogen and Sulphur. Air pollution: major regions of atmosphere. Chemical and photochemical reactions in atmosphere. Videos/Learning material: Air pollutants: types, sources, particle size and chemical nature. Self-study: London smog			
Module-2				
Environmental effects of ozone, major sources of air pollution. Pollution by sulfur dioxide, carbon dioxide, carbon monoxide, oxides of nitrogen and other foul smelling gases. Methods of estimation of carbon monoxide, oxides of nitrogen oxides of sulfur and methods of control of these pollutants. Effects of air pollution on living organisms and vegetation. Greenhouse effect and global warming, ozone depletion by oxides of nitrogen, chlorofluorocarbons and halogens come on removal of sulfur from coal. Control of particulates.				

Pedagogy	<p>Chalk and talk/power point presentation: Environmental effects of ozone, major sources of air pollution. Pollution by sulfur dioxide, carbon dioxide, carbon monoxide, oxides of nitrogen and other foul smelling gases.</p> <p>Videos/Learning material: Methods of estimation of carbon monoxide, oxides of nitrogen oxides of sulfur and methods of control of these pollutants.</p> <p>Self-study: Functioning of catalytic converter in vehicles</p>
Module-3	
<p>Water pollution: hydrological cycle, water resources, aquatic ecosystems, sources, and nature of water pollutants. Techniques for measuring water pollution. Impacts of water pollution on hydrological and ecosystems. Affluent treatment plants (primary, secondary and tertiary treatment). Sludge disposal.</p>	
Pedagogy	<p>Chalk and talk/power point presentation: Water pollution: hydrological cycle, water resources, aquatic ecosystems, sources, and nature of water pollutants.</p> <p>Videos/Learning material: Techniques for measuring water pollution. Impacts of water pollution on hydrological and ecosystems.</p> <p>Self-study: Methods adopted by industries on the river bank to treat the used water before discharge.</p>
Module-4	
<p>Industrial effluents from the following industries and their treatment: electroplating, textile, tannery, dairy, petroleum and Petro-chemicals, agro and fertilizer etc. Industrial waste management, incineration of waste. Water treatment and purification (reverse osmosis, electrodialysis and ion exchange method). Water quality parameters for wastewater, industrial water, and domestic water.</p>	
Pedagogy	<p>Chalk and talk/power point presentation: Industrial effluents from the following industries and their treatment: electroplating, textile, tannery, dairy, petroleum and Petro-chemicals, agro and fertilizer etc.</p> <p>Videos/Learning material: Water treatment and purification (reverse osmosis, electrodialysis and ion exchange method). Water quality parameters for wastewater, industrial water, and domestic water.</p> <p>Self-study: Impact of hardwater on boilers in industrial processes.</p>
Module-5	
<p>Energy & Environment: Sources of energy: coal, petrol and natural gas. Nuclear fusion/fission, solar energy, hydrogen, geothermal, tidal and hydal, etc.</p> <p>Nuclear pollution: Disposal of nuclear waste, nuclear disaster, and its management.</p>	
Pedagogy	<p>Chalk and talk/power point presentation: Energy & Environment: Sources of energy: coal, petrol and natural gas. Nuclear fusion/fission, solar energy, hydrogen, geothermal, tidal and hydal, etc.</p> <p>Videos/Learning material: Disposal of nuclear waste, nuclear disaster, and its management.</p> <p>Self-study: Nuclear fuels</p>

Course outcome (Course Skill Set)	
At the end of the course the student will be able to:	
CO 1	Discuss the bio-geochemical cycles of various pollutant gases.
CO 2	Explain the methods of estimation of carbon monoxide, oxides of nitrogen oxides of sulfur and methods of control of these pollutants.
CO 3	Interpret the effect of water pollution on hydrological and ecosystems
CO 4	Enumerate the importance of controlling of air pollution.
CO 5	Illustrate the sources of energy and nuclear waste disposal.
Assessment Details (both CIE and SEE)	
The weightage of Continuous Internal Evaluation (CIE) is 100%. The minimum passing mark for the CIE is 40% of the maximum marks (400 marks out of 100). A student shall be deemed to have satisfied the academic requirements if the student secures not less than 40% (40 Marks out of 100) in the CIE.	
SEE is similar to other 03 credit subjects (Courses)	
Continuous Internal Evaluation:	
Three Unit Tests each of 20 Marks (duration 01 hour)	
<ol style="list-style-type: none"> 1. First test at the end of 5th week of the semester 2. Second test at the end of the 10th week of the semester 3. Third test at the end of the 15th week of the semester 	
Two assignments each of 10 Marks	
<ol style="list-style-type: none"> 4. First assignment at the end of the 4th week of the semester 5. Second assignment at the end of the 9th week of the semester 	
Course Seminar suitably planned to attain the COs and POs for 20 Marks (duration 01 hours)	
<ol style="list-style-type: none"> 6. Conducting at least 05 labs sessions within the Academic Duration. 	
The sum of three tests, two assignments, and a seminar/Lab sessions will be out of 100 marks	
The student shall secure minimum 40% of marks of course to qualify and become eligible for award of degree.	
Suggested Learning Resources:	
Books	
<ul style="list-style-type: none"> • E. Stocchi: <i>Industrial Chemistry</i>, Vol-I, Ellis Horwood Ltd. UK. • R.M. Felder, R.W. Rousseau: <i>Elementary Principles of Chemical Processes</i>, Wiley Publishers, New Delhi. • J. A. Kent: <i>Riegel's Handbook of Industrial Chemistry</i>, CBS Publishers, New Delhi. • S. S. Dara: <i>A Textbook of Engineering Chemistry</i>, S. Chand & Company Ltd. New Delhi. • K. De, <i>Environmental Chemistry</i>: New Age International Pvt., Ltd, New Delhi. • S. M. Khopkar, <i>Environmental Pollution Analysis</i>: Wiley Eastern Ltd, New Delhi. • S.E. Manahan, <i>Environmental Chemistry</i>, CRC Press (2005). • G.T. Miller, <i>Environmental Science</i> 11th edition. Brooks/ Cole (2006). • A. Mishra, <i>Environmental Studies</i>. Selective and Scientific Books, New Delhi (2005). 	
Web links and Video Lectures (e-Resources):	
<ol style="list-style-type: none"> 1. https://www.youtube.com/watch?v=Ym3HyZGsOg4&list=PLLy_2iUCG87CZ8WsOQA3WWb1IqAuAlAuB 2. https://www.youtube.com/watch?v=-jlrjB_-DhI 	
Activity Based Learning (Suggested Activities in Class)/ Practical Based learning	
<ul style="list-style-type: none"> • https://www.vlab.co.in/broad-area-chemical-sciences • https://demonstrations.wolfram.com/topics.php • https://interestingengineering.com/science 	

III Semester

CHEMISTRY OF S & P BLOCK ELEMENTS AND NOBLE GASES				
Course Code		21BSC42	CIE Marks	50
Teaching Hours/Week (L:T:P: S)		3:2:0	SEE Marks	50
Total Hours of Pedagogy		40	Total Marks	100
Credits		03	Exam Hours	03
CLO 1	Discuss about the ambiguity of hydrogen position in periodic table.			
CLO 2	Explain the importance of Biological significance of Na, K, Mg and Ca.			
CLO 3	Interpret the knowledge of s block elements.			
CLO 4	Evaluate the importance of p block elements.			
CLO 5	Interpret the use of noble gases in making electric bulbs and in food technology.			
Pedagogy (General Instructions) These are sample Strategies, which teacher can use to accelerate the attainment of the various course outcomes. These are sample Strategies, which teacher can use to accelerate the attainment of the various course outcomes. 1. Lecturer method (L) does not mean only traditional lecture method, but different type of teaching methods may be adopted to develop the outcomes. 2. Show Video/animation films to convince abstract concepts. 4. Encourage collaborative (Group Learning) Learning in the class 5. Ask at least three HOTS (Higher order Thinking) questions in the class, which promotes critical thinking 6. Adopt Problem Based Learning (PBL), which fosters students' Analytical skills, develop thinking skills such as the ability to evaluate, generalize, and analyse information rather than simply recall it. 7. Topics will be introduced in a multiple representation. 8. Show the different ways to solve the same problem and encourage the students to come up with their own creative ways to solve them. 9. Discuss how every concept can be applied to the real world - and when that's possible, it helps improve the students' understanding.				
Module-1 HYDROGEN				
Position of hydrogen in periodic table, isotopes, preparation, properties and uses of hydrogen; Physical and chemical properties of water and heavy water; Structure, preparation, reactions and uses of hydrogen peroxide; Classification of hydrides - ionic, covalent and interstitial; Hydrogen as a fuel.				
Pedagogy	Chalk and talk/power point presentation: Position of hydrogen in periodic table, isotopes, preparation, properties and uses of hydrogen; Physical and chemical properties of water and heavy water. Videos/Learning material: Classification of hydrides - ionic, covalent and interstitial; Hydrogen as a fuel. Self-study: Hydrogen as a fuel.			
Module-2 S - BLOCK ELEMENTS (ALKALI ANDALKALINE EARTH METALS)				
Group - 1 and 2 Elements General introduction, electronic configuration and general trends in physical and chemical properties of elements, anomalous properties of the first element of each group, diagonal relationships. Preparation and properties of some important compounds - sodium carbonate, sodium chloride, sodium hydroxide and sodium hydrogen carbonate; Industrial uses of lime, limestone, Plaster of Paris and cement; Biological significance of Na, K, Mg and Ca.				
Pedagogy	Chalk and talk/power point presentation: Group - 1 and 2 Elements General introduction, electronic configuration and general trends in physical and chemical properties of elements. Videos/Learning material: Preparation and properties of some important compounds - sodium carbonate, sodium chloride, sodium hydroxide and sodium hydrogen carbonate; Industrial uses of lime, limestone.			

	Self-study: Importance of sodium and lithium as a battery anode material.
Module-3 p BLOCK ELEMENTS GROUP 13, 14 & 15	
<p>General Introduction: Electronic configuration and general trends in physical and chemical properties of elements across the periods and down the groups; unique behavior of the first element in each group.</p> <p>p block elements Group 13 Preparation, properties and uses of boron and aluminum; Structure, properties and uses of borax, boric acid, diborane, boron trifluoride, aluminum chloride and alums.</p> <p>Group 14 Tendency for catenation; Structure, properties and uses of allotropes and oxides of carbon, silicon tetrachloride, silicates, zeolites and silicones.</p> <p>Group 15 Properties and uses of nitrogen and phosphorus; Allotropic forms of phosphorus; Preparation, properties, structure and uses of ammonia, nitric acid, phosphine and phosphorus halides, (PCl₃, PCl₅); Structures of oxides and oxoacids of nitrogen and phosphorous.</p>	
Pedagogy	<p>Chalk and talk/power point presentation: General Introduction and p block elements Group 13, 14 and 15</p> <p>Videos/Learning material: General Introduction and p block elements Group 13, 14 and 15</p> <p>Self-study: Nitrogen cycle.</p>
Module-4 p BLOCK ELEMENTS GROUP 16 & 17	
<p>Group 16 Preparation, properties, structures and uses of dioxygen and ozone; Allotropic forms of sulphur; Preparation, properties, structures and uses of sulphur dioxide, sulphuric acid (including its industrial preparation); Structures of oxoacids of sulphur.</p> <p>Group 17 Preparation, properties and uses of chlorine and hydrochloric acid; Trends in the acidic nature of hydrogen halides; Structures of Interhalogen compounds and oxides and oxoacids of halogens.</p>	
Pedagogy	<p>Chalk and talk/power point presentation: Group 16 & 17</p> <p>Videos/Learning material: Group 16 & 17</p> <p>Self-study: Bleaching action of chlorine.</p>
Module-5 Noble Gases	
Occurrence and uses, rationalization of inertness of noble gases, clathrates; preparation and properties of XeF ₂ , XeF ₄ and XeF ₆ ; Nature of bonding in noble gas compounds (Valence bond treatment and MO treatment for XeF ₂). Molecular shapes of noble gas compounds (VSEPR theory).	
Pedagogy	<p>Chalk and talk/power point presentation: Occurrence and uses, rationalization of inertness of noble gases, clathrates; preparation and properties of XeF₂, XeF₄ and XeF₆</p> <p>Videos/Learning material: Nature of bonding in noble gas compounds (Valence bond treatment and MO treatment for XeF₂).</p> <p>Self-study: Importance of noble gases in food technology.</p>

Course outcome (Course Skill Set)	
At the end of the course the student will be able to:	
CO 1	Discuss about the ambiguity of hydrogen position in periodic table.
CO 2	Explain the importance of Biological significance of Na, K, Mg and Ca.
CO 3	Interpret the knowledge of s block elements.
CO 4	Enumerate the importance of p block elements.
CO 5	Illustrate the use of noble gases in making electric bulbs and in food technology.
Assessment Details (both CIE and SEE) The weightage of Continuous Internal Evaluation (CIE) is 100%. The minimum passing mark for the CIE is 40% of the maximum marks (400 marks out of 100). A student shall be deemed to have satisfied the academic requirements if the student secures not less than 40% (40 Marks out of 100)in the CIE. SEE is similar to other 03 credit subjects (Courses) Continuous Internal Evaluation: Three Unit Tests each of 20 Marks (duration 01 hour) <ol style="list-style-type: none"> 1. First test at the end of 5th week of the semester 2. Second test at the end of the 10th week of the semester 3. Third test at the end of the 15th week of the semester Two assignments each of 10 Marks <ol style="list-style-type: none"> 4. First assignment at the end of the 4th week of the semester 5. Second assignment at the end of the 9th week of the semester Course Seminar suitably planned to attain the COs and POs for 20 Marks (duration 01 hours) <ol style="list-style-type: none"> 6. Conducting at least 05 labs sessions within the Academic Duration. The sum of three tests, two assignments, and a seminar/Lab sessions will be out of 100 marks	
Suggested Learning Resources: Books <ol style="list-style-type: none"> 1. Lee J. D., Concise Inorganic Chemistry Wiley India, 5th Edn., 2008. 2. Huheey J. E., Keiter E. A. and Keiter R. L., Inorganic Chemistry – Principles of structure and reactivity, , Pearson Education, 4th Ed. 2002. 3. Puri, Sharma, Kalia, Principles of Inorganic Chemistry, Vishal Pub. Co., 33rd ed., 2017 4. Selected Topic in Inorganic Chemistry, S. Chand, New Delhi, 17th Ed., 2010. 	
Web links and Video Lectures (e-Resources): <ol style="list-style-type: none"> 1. https://www.youtube.com/watch?v=TiOLC64_KJk&list=PLL6zz3wchKwN4uANfq6bGd8KggIp-klzG 2. https://www.youtube.com/watch?v=LC1d2P4uccY&t=111s 3. https://www.youtube.com/watch?v=NLUcEmRIhmc 4. https://www.youtube.com/watch?v=a8FJEiI5e6Q&list=PLBB52D59BE0C7B658 	
Activity Based Learning (Suggested Activities in Class)/ Practical Based learning <ul style="list-style-type: none"> • https://www.vlab.co.in/broad-area-chemical-sciences • https://demonstrations.wolfram.com/topics.php • https://interestingengineering.com/science 	

IV Semester

Condensed Matter Physics			
Course Code	21BSS431	CIE Marks	50
Teaching Hours/Week (L:T:P: S)	(2L+0T+0P+1S)	SEE Marks	50
Total Hours of Pedagogy	25	Total Marks	100
Credits	02	Exam Hours	03
Course objectives: After going through the course, the student will be able 1. To study the crystal systems and Bragg's law 2. To gain knowledge on electrical, magnetic and dielectric properties of materials			
Teaching-Learning Process (General Instructions) These are sample Strategies, which teacher can use to accelerate the attainment of the various course outcomes. 1. Apart from conventional lecture methods various types of innovative teaching techniques through videos, animation films may be adopted so that the delivered lesson can progress the students in theoretical, applied and practical skills in physics. 2. Seminars and Quizzes may be arranged for students in respective subjects to develop skills. 3. Encourage the students for group learning to improve their creativity and analytical skills. 4. While teaching show how every concept can be applied to the real world. This helps the students to expand understanding level. 5. Support and guide the students for self-study. 6. Ask some higher order thinking questions in the class, which promotes critical thinking. Inspire the students towards the studies by giving new ideas and examples.			
Module-1			
Crystal Structure		05 Hours	
Space lattice, Bravais lattice - unit cell, primitive cell. Lattice parameters. Crystal systems. Direction and planes in a crystal. Miller indices. Expression for inter-planar spacing. Co-ordination number. Atomic packing factor for SC, FCC, BCC. Bragg's Law. Determination of crystal structure by Bragg's x-ray spectrometer Crystal structures of NaCl, Numericals			
Pedagogy	Chalk and talk, Power point presentation, Videos Practical Topics: Self-study Component: Crystal structures of NaCl		
Module-2			
Liquid crystals		05 Hours	
Introduction, classification of liquid crystals, Liquid crystalline phases, polymorphism in thermotropic liquid crystals, polymer liquid crystals, orders parameter, measurement of order parameters by X-ray diffraction. Mier-Saupe theory for nematic-isotropic and nematic-smectic A transitions, , the blue phases, applications of liquid crystals.			
Pedagogy	Chalk and talk, Power point presentation, Videos Practical Topics: Self-study Component: Applications of liquid crystals.		
Module-3			
Electrical Conductivity in Metals:		05 Hours	
Free-electron concept. Classical free-electron theory (Drude-Lorentz model) – Assumptions. . Failures of classical free-electron theory. Quantum free-electron theory - Assumptions. Fermi - Dirac Statistics. Fermi-energy, Fermi factor & its temperature dependence, Expression for electrical conductivity (derivation). Merits of Quantum free electron theory, Numericals.			
Pedagogy	Chalk and talk, Power point presentation, Videos Practical Topics: Self study: Drift velocity. Mean collision time and mean free path. Relaxation time.		
Module-4			

Magnetic Properties of Matter 05 Hours Dia, Para, Ferri and Ferromagnetic Materials. Quantum Mechanical Treatment of Paramagnetism. Curie's law, Weiss's Theory of Ferromagnetism and Ferromagnetic Domains. Discussion of B-H Curve. Hysteresis and Energy Loss, Numericals.	
Pedagogy	Chalk and talk, Power point presentation, Videos Practical Topics: Self-study Component: Hysteresis and Energy Loss,
Module-5	
Dielectric Properties of Materials: 05 Hours Polarization. Depolarization Field. Electric Susceptibility. Polarizability. Normal and Anomalous Dispersion. Cauchy and Sellmeier relations. Langevin-Debye equation (Qualitative). Optical Phenomena. Application: Plasma Oscillations, Plasma Frequency, Plasmons, Numericals.	
Pedagogy	Chalk and talk, Power point presentation, Videos Practical Topics: Self-study Component: Plasmons
Course outcome (Course Skill Set) At the end of the course the student will be able to : <ol style="list-style-type: none"> 1. Explain crystal systems and to calculate the APF for cubic crystal systems 2. Recognise various liquid crystalline phases required for display applications 3. Analyze the success and failure of free electron theory 4. Distinguish between different types of magnetic materials 5. Understand the mechanism of polarisation with different theories 	
Assessment Details (both CIE and SEE) The weightage of Continuous Internal Evaluation (CIE) is 50% and for Semester End Exam (SEE) is 50%. The minimum passing mark for the CIE is 40% of the maximum marks (20 marks). A student shall be deemed to have satisfied the academic requirements and earned the credits allotted to each subject/ course if the student secures not less than 35% (18 Marks out of 50)in the semester-end examination(SEE). Continuous Internal Evaluation: Three Unit Tests each of 20 Marks (duration 01 hour) <ol style="list-style-type: none"> 1. First test at the end of 5th week of the semester 2. Second test at the end of the 10th week of the semester 3. Third test at the end of the 15th week of the semester Two assignments each of 10 Marks <ol style="list-style-type: none"> 4. First assignment at the end of 4th week of the semester 5. Second assignment at the end of 9th week of the semester Group discussion/Seminar/quiz any one of three suitably planned to attain the COs and POs for 20 Marks (duration 01 hours) <ol style="list-style-type: none"> 6. At the end of the 13th week of the semester The sum of three tests, two assignments, and quiz/seminar/group discussion will be out of 100 marks and will be scaled down to 50 marks	
Suggested Learning Resources: Books <ol style="list-style-type: none"> 1. Introduction to Solid State Physics, Charles Kittel, 8th Edition, 2004, Wiley India Pvt. Ltd. 2. Solid State Physics, S.O Pillai, 9th Edition, New Age International Publishers, 2021 3. Elements of Solid State Physics, J.P. Srivastava, 2nd Ed., 2006, Prentice-Hall of India 4. Introduction to Solids, Leonid V. Azaroff, 2004, Tata Mc-Graw Hill 5. Solid State Physics, Neil W. Ashcroft and N. David Mermin, 1976, Cengage Learning 6. Solid State Physics, Rita John, 2014, McGraw Hill 7. Solid-state Physics, H. Ibach and H Luth, 2009, Springer 8. Elementary Solid State Physics, Md. Ali Omar, 1999, Pearson India 9. Solid State Physics, Structure and Properties of Materials, Third Edition M.A. Wahab, 2020, Narosa Publications. 10. Liquid Crystals by S. Chandrasekhar. 	

11. Thermotropic Liquid Crystals by Vertogen and Jeu.
12. The Physics of Liquid Crystals by de Geenes and Prost.

Reference Books

1. Elliot R. J. & Gibson A. F. – An Introduction to Solid state Physics and its Application, ELBS, Macmilan (1974)
2. Harrison W. A. – Solid State Theory, Tata McGraw Hill, India (1977)
3. Dekker A. J. – Solid State Physics, Macmillan, Students Edition (1991)
4. Luth H. and Ibach H. – Solid State Physics, Narosa Publishing House, New Delhi (1991)

Web links and Video Lectures (e-Resources):

- https://onlinecourses.nptel.ac.in/noc19_ph14/preview
- <https://www.classcentral.com/course/swayam-introduction-to-solid-state-physics-13045>
- <https://ocw.mit.edu/courses/8-02-physics-ii-electricity-and-magnetism-spring-2007/>

Activity Based Learning (Suggested Activities in Class)/ Practical Based learning

<https://nptel.ac.in>

<https://swayam.gov.in>

<https://vlab.amrita.edu>

B. Sc. (Honors) Mathematics**Choice Based Credit System (CBCS) and Outcome Based Education (OBE)
SEMESTER - IV**

Numerical Analysis and Analytical Geometry			
Course Code	21BSS433	CIE Marks	50
Teaching Hours/Week (L:T:P: S)	2:0:0:0	SEE Marks	50
Total Hours of Pedagogy	25	Total Marks	100
Credits	02	Exam Hours	3 hours
Course Learning Objectives: This course will enable the students to: <ul style="list-style-type: none">• Learn the numerical solutions of algebraic and transcendental equations.• Analyse the numerical solutions of system of linear equations and check the accuracy of the solutions.• Learn about various interpolating and extrapolating methods.• Familiarize the solution of differential equations using numerical methods.• Understand the basic concept of analytical geometry.			
Pedagogy (General Instructions): These are sample Strategies; which teachers can use to accelerate the attainment of the various course outcomes. <ul style="list-style-type: none">• In addition to the traditional lecture method, different types of innovative teaching methods may be adopted so that the delivered lesson shall develop students theoretical and applied mathematical skills.• State the need of Mathematics in Science with real-life examples.• Support and guide the students for self-study.• You will also be responsible for assigning homework, grading assignments and quizzes, and documenting students' progress.• Encourage the students for group learning to improve their creative and analytical skills.• Show short related video lectures in following ways:<ul style="list-style-type: none">• As an introduction to new topics (pre-lecture activity).• As a revision of topics (post-lecture activity).• As additional examples (post-lecture activity).• As an additional material of challenging topics (pre and post lecture activity).• As a model solution of some exercises (post-lecture activity).			
Module-1: Numerical Methods of Solving Algebraic and Transcendental Equations			
Round-off error, Bisection method, False position method, Newton Raphson method and Secant method for solving equations. (5 Hours)			
Self-study: Error analysis for the above methods.			
(RBT Levels: L1, L2 and L3)			
Teaching-Learning Process		Chalk and talk method / Power Point Presentation	
Module-2: Numerical Methods for Solving Linear System of equations			
Gauss elimination method, Lower and upper triangular (LU) decomposition of a matrix, Cholesky's method and Gauss-Seidel methods. (5 Hours)			
Self-study: Elementary row operation.			
(RBT Levels: L1, L2 and L3)			
Teaching-Learning Process		Chalk and talk method / Power Point Presentation	
Module 3: Interpolation			
Interpolation with equal intervals: Finite difference operators, Newton-Gregory forward and backward difference interpolations.			

Interpolation with unequal intervals: Newton divided difference interpolation, Lagrange interpolation. Self-study: Lagrange Inverse interpolation. (5 Hours)	
(RBT Levels: L1, L2 and L3)	
Teaching-Learning Process	Chalk and talk method / Power Point Presentation
Module-4: Solution of ODE by Numerical Methods and Numerical Integration	
Numerical solutions of 1 st order 1 st degree Differential Equations: Modified Euler's method. Runge-Kutta method of 4 th order. Numerical integration: Simpson's 1/3 rd and 3/8 th rules. Self-study: Trapezoidal rule. (5 Hours)	
(RBT Levels: L1, L2 and L3)	
Teaching-Learning Process	Chalk and talk method / Power Point Presentation
Module-5: Analytical Solid Geometry	
Direction Cosine of line, angle between two lines, plane, intercept form and normal form, Angle between two plane, straight line, Symmetric form and angle between line and plane. Self-study: Basic concepts of three-dimensional Geometry. (5 Hours)	
(RBT Levels: L1, L2 and L3)	
Teaching-Learning Process	Chalk and talk method / Power Point Presentation
Course outcomes: This course will enable the students to: <ul style="list-style-type: none"> • Obtain numerical solutions of algebraic and transcendental equations. • Find numerical solutions of system of linear equations and check the accuracy of the solutions. • Learn about various interpolating and extrapolating methods. • Solve the differential equations using numerical methods and Numerical integration. • Learn basic three dimensional geometry. 	
Assessment Details (both CIE and SEE) The weightage of Continuous Internal Evaluation (CIE) is 50% and for Semester End Exam (SEE) is 50%. The minimum passing mark for the CIE is 40% of the maximum marks (20 marks). A student shall be deemed to have satisfied the academic requirements and earned the credits allotted to each subject/ course if the student secures not less than 35% (18 Marks out of 50) in the semester-end examination (SEE). Continuous Internal Evaluation: Three Unit Tests each of 20 Marks (duration 01 hour) 1. First test at the end of 5th week of the semester 2. Second test at the end of the 10th week of the semester 3. Third test at the end of the 15th week of the semester Two assignments each of 10 Marks 4. First assignment at the end of 4th week of the semester 5. Second assignment at the end of 9th week of the semester Group discussion/Seminar/quiz any one of three suitably planned to attain the COs and POs for 20 Marks (duration 01 hours) 6. At the end of the 13th week of the semester The sum of three tests, two assignments, and quiz/seminar/group discussion will be out of 100 marks and will be scaled down to 50 marks (to have less stressed CIE, the portion of the syllabus should not be common /repeated for any of the methods of the CIE. Each method of CIE should have a different syllabus portion of the course).	

CIE methods /question paper is designed to attain the different levels of Bloom's taxonomy as per the outcome defined for the course.

Semester End Examination:

Theory SEE will be conducted by University as per the scheduled timetable, with common question papers for the subject (**duration 03 hours**)

1. The question paper will have ten questions. Each question is set for 20 marks.
2. There will be 2 questions from each module. Each of the two questions under a module (with a maximum of 3 sub-questions), **should have a mix of topics** under that module.

The students have to answer 5 full questions, selecting one full question from each module.

Reference Books:

1. Brian Bradie (2006), A Friendly Introduction to Numerical Analysis. Pearson.
2. C. F. Gerald & P. O. Wheatley (2008). Applied Numerical Analysis (7th edition), Pearson Education, India.
3. F. B. Hildebrand (2013). Introduction to Numerical Analysis: (2nd edition). Dover Publications.
4. M. K. Jain, S. R. K. Iyengar & R. K. Jain (2012). Numerical Methods for Scientific and Engineering Computation (6th edition). New Age International Publishers.
5. Robert J. Schilling & Sandra L. Harris (1999). Applied Numerical Methods for Engineers Using MATLAB and C. Thomson-Brooks/Cole.
6. Shanti Narayan and Dr. P K Mittal Analytical Solid Geometry, S.Chand 17th Edition

Web links and Video Lectures (e-Resources):

[http://www.class-central.com/subject/math\(MOOCs\)](http://www.class-central.com/subject/math(MOOCs))

<http://academicearth.org/>

<http://www.bookstreet.in>.

[VTU EDUSAT PROGRAMME – 20](#)

VTU e-Shikshana Program

Activity-Based Learning (Suggested Activities in Class)/ Practical Based learning

- Quiz
- Group assignment and
- Seminars

I/II Semester

Organic and Inorganic Chemistry Lab				
Course Code		21BSCL44	CIE Marks	50
Teaching Hours/Week (L:T:P: S)		1:0:2:0	/SEE Marks	50
Credits		01	Exam Hours	3 Hours
CLO 1	Understanding the concept of synthesis of organic molecules.			
CLO 2	Explain the estimation of inorganic molecules.			
Sl.NO	Experiments			
1	Determination of Chlorine in Bleaching Powder.			
2	Separation and estimation of Mg(II) and Fe(II) ions by solvent extraction.			
3	Estimation of N ₂ in an ammonium salt using NaOH solution and Oxalic acid.			
4	Estimation of Ni using standard EDTA solution by complexometric method.			
5	Preparation of Aspirin from Salicylic acid.			
6	Preparation of Paracetamol from p-aminophenol.			
7	Preparation of Acetanilide from Aniline.			
8	Determine the functional group in the given organic compound (Any alcohol compound).			
9	Determine the functional group in the given organic compound (Any aldehyde compound).			
10	Determine the functional group in the given organic compound (any amide compound).			
Course outcomes (Course Skill Set): At the end of the course the student will be able to: CO1 Determine the Chlorine content in Bleaching powder by volumetric method. CO2 Estimate Mg(II) ions, Fe(II) ions, Nitrogen and Nickel in the given analyte by solvent extraction and titration methods. CO3 Prepare various organic compounds and determine functional groups.				
Assessment Details (both CIE and SEE) Continuous Internal Evaluation (CIE): The CIE marks awarded in case of Practical shall be based on the weekly evaluation of laboratory journals/ reports after the conduction of every experiment and one practical test. Semester End Evaluation (SEE): The practical examinations to be conducted as per the time table of University in a batch wise with strength of students not more than 10-15 per batch. 1. All laboratory experiments are to be included for practical examination. 2. Breakup of marks and the instructions printed on the cover page of answer script to be strictly adhered by the examiners. 3. Students can pick one experiment from the questions lot prepared by the examiners. 4. Change of experiment is allowed only once and 15% Marks allotted to the procedure part to be made zero.				
Books: 1. Vogel's Textbook of Practical Organic Chemistry, 5th Edition, Pearson Education India, 2003. 2. Mann, F.G. & Saunders, B.C. Practical Organic Chemistry, Pearson Education (2009).				

3. Furniss, B.S.; Hannaford, A.J.; Smith, P.W.G.; Tatchell, A.R. Practical Organic Chemistry, 5th Ed., Pearson (2012).
4. Mendham, J., A. I. Vogel's Quantitative Chemical Analysis 6th Ed., Pearson, 2009.

Suggested Learning Resources:

1. <https://www.youtube.com/watch?v=n4-nvID1bpE>
2. <https://www.youtube.com/watch?v=cWzRf-ycvbs>

B. Sc Honors (Mathematics)**Choice Based Credit System (CBCS) and Outcome Based Education (OBE)****SEMESTER -IV****Mathematical Modelling**

Mathematical Modelling			
Course Code	21BSM0451	CIE	50
Teaching Hours/Week (L:T:P: S)	2:1:0:0	SEE	50
Total Hours of Pedagogy	25	Total	100
Credits	2	Exam Hours	3hrs
Course Learning objectives: The course will enable students to: <ol style="list-style-type: none">1. Interpret the real-world problems in the form of first and second order differential equations2. Familiar with some classical linear and nonlinear models3. Analyzing the solutions of the system of differential equations by phase portrait method			
Pedagogy (General Instructions) These are sample Strategies, which teachers can use to accelerate the attainment of the various course outcomes. <ol style="list-style-type: none">1. In addition to the traditional lecture method, different types of innovative teaching methods may be adopted so that the delivered lessons shall develop students’ theoretical and applied mathematical skills.2. State the need of Mathematics in Science Study and Provide real-life examples.3. Support and guide the students for self–study.4. You will also be responsible for assigning home work, grading assignments and quizzes, and documenting students’ progress.5. Encourage the students for group learning to improve their creative and analytical skills.6. Show short related video lectures in the following ways<ul style="list-style-type: none">• As an introduction to new topics (pre-lecture activity).• As a revision of topics (post-lecture activity).• As additional examples (post-lecture activity).• As an additional material of challenging topics (pre-and post-lecture activity). As a model solution of some exercises(post-lecture activity)			
Model-1:Mathematical Modelling through First Order Equations-1			
Population Dynamics, Carbon dating, Newton's law of cooling, Epidemics, Economics, Medicine, mixture problem.			
(RBT Levels: L1, L2 and L3)			5 hours
Pedagogy	Chalk and talk method/PowerPoint Presentation.		
Module-2:Mathematical Modelling through First Order Differential Equations-2			
Electric circuit problem, Chemical reactions, Terminal velocity, Continuously compounding of interest.			
RBT Levels: L1, L2 and L3)			5 hours
Pedagogy	Chalk and talk method/PowerPoint Presentation.		
Module-3: Mathematical Modelling through Second Order Differential equation-1			
The vibrations of a mass on a spring, free damped motion, forced motion.			
RBT Levels: L1, L2 and L3)			5 hours
Pedagogy	Chalk and talk method/PowerPoint Presentation.		

Module-4: Mathematical Modelling through Second Order Differential equation-2	
Resonance phenomena, electric circuit problem, Nonlinear Pendulum	
RBT Levels: L1, L2 and L3) 5 hours	
Pedagogy	Chalk and talk method/PowerPoint Presentation.
Module-5: Mathematical Modeling through system of linear Differential Equations	
Phase plane analysis, Predator prey model, Combat model, Epidemics, Economics- SIR model, mixture Problems	
RBT Levels: L1, L2 and L3) 5 hours	
Pedagogy	Chalk and talk method/PowerPoint Presentation.
Course outcome (Course Skill Set) At the end of the course the student will be able to: <ol style="list-style-type: none"> 1. Demonstrate a working knowledge of differential equations in other branches of sciences, commerce, medicine, etc., 2. Become familiar with some of the classical mathematical models . 3. Validate the results of the calculations 4. Demonstrate competence with a wide variety of mathematical tools and techniques 5. Take an analytical approach to problems in their future endeavours 	
Assessment Details (both CIE and SEE) (Methods of CIE need to define topic wise i.e.- MCQ, Quizzes, Open book test or Seminar) The weightage of Continuous Internal Evaluation (CIE) is 50% and for Semester End Exam (SEE) is 50%. The student has to obtain a minimum of 40% marks individually both in CIE and SEE to pass. Theory Semester End Exam (SEE) is conducted for 100 marks (3 Hours duration) and then it is reduced to 50. Based on this grading will be awarded. Continuous Internal Evaluation: <ol style="list-style-type: none"> 1. Methods suggested: Test, Open Book test, Written Quiz, Seminar, Assignment, Report writing etc. 2. The class teacher has to decide the topic for the closed book test, open-book test, Written Quiz and Seminar. In the beginning, only the teacher has to announce the methods of CIE for the subject. 3. 10 marks weightage has to be given for Self-Study component (Via assignment / seminar / test). Semester End Examination: Theory SEE will be conducted by University as per the scheduled timetable, with common question papers for the subject <ol style="list-style-type: none"> 1. The question paper will have ten questions. Each question is set for 20 marks. 2. There will be 2 questions from each module. Each of the two questions under a module (with a maximum of 3 sub-questions), should have a mix of topics under that module. The students have to answer 5 full questions, selecting one full question from each module.	

Text Books And Reference Books:

1. D. G. Zill, W. S. Wright, *Advanced Engineering Mathematics*, 4th ed., Jones and Bartlett Publishers, 2010.
2. J. R. Brannan and W. E. Boyce, *Differential equations with boundary value problems: modern methods and applications*. Wiley, 2011.
3. C. H. Edwards, D. E. Penney, and D. Calvis, *Differential equations and boundary value problems: computing and modeling*. 3rd ed., Pearson Education Limited, 2010.
4. D. G. Zill, *Differential Equations with Boundary-Value Problems, I 7th ed.*, Cengage Learning, 2008.

Web links and Video Lectures (e-Resources):

<https://people.maths.bris.ac>
<https://link.springer.com>
<https://www.mmmmp-journal.org>
<https://www.lshtm.ac.uk>

Activity Based Learning (Suggested Activities in Class)/ Practical Based learning

- Quiz
- Group assignment
- Seminars

Semester

SOLAR ENERGY UTILIZATION			
Course Code	21BS0452	CIE Marks	50
Teaching Hours/Week (L:T:P: S)	2:10:0	SEE Marks	50
Total Hours of Pedagogy	25	Total Marks	100
Credits	02	Exam Hours	03 Hours
Course objectives: <ul style="list-style-type: none">To introduce the concept of Solar Energy, its radiation, Collection, Storage and Application..To explore Society's Present needs and future energy demandTo get exposed to energy Conservation methods.			
Teaching-Learning Process (General Instructions) <p>These are sample Strategies, which teacher can use to accelerate the attainment of the various course outcomes.</p> <ol style="list-style-type: none">Apart from conventional lecture methods various types of innovative teaching techniques through videos, animation films may be adopted so that the delivered lesson can progress the students in theoretical, applied and practical skills in physics.State the necessity of Solar energy.Seminars and Quizzes may be arranged for students in respective subjects to develop skills.Encourage the students for group learning to improve their creativity and analytical skills.While teaching show how every concept can be applied to the real world. This helps the students to expand understanding level.Support and guide the students for self-study.Ask some higher order thinking questions in the class, which promotes critical thinking.Inspire the students towards the studies by giving new ideas and examples.			
Module-1			
Solar Energy Basic Concepts:		05 Hours	
Introduction, The Sun as Source of Energy, The Earth, Sun. Earth radiation spectrum, Extraterrestrial and Terrestrial radiations, Solar Constant, Solar Radiation at the earth's Surface, Spectral power Distribution of solar radiation, Depletion of Solar radiation. Solar radiation data.			
Pedagogy	Chalk and talk, Power point presentation, Videos Self study Component: Introduction to energy sources need of nonconventional energy Sources.		
Module-2			
Solar Radiation Geometry;		05 Hours	
Flux on a plane surface, Latitude, Declination angle, Surface Azimuth angle, Hour angle, Zenith angle, Solar altitude angle, Expression for the angle between the incident beam and normal to a plane surface, Local apparent time, Apparent motion of sun, day length, Radiation Flux on a tilted Surface; beam, diffuse and reflected radiation, Expression for flux on a tilted surface, Numerical examples.			
Pedagogy	Chalk and talk, Power point presentation, Videos Self study Component: Flux on plane surfaces, Latitude, Declination angle,		
Module-3			
Measurement of Solar radiation;		05 hours	
Solar radiation Data, Solar time, Solar radiation geometry, Solar day length, Extra-terrestrial radiation on horizontal surface, Empirical Equations for Estimating Terrestrial Solar radiation on horizontal Surface, Solar radiation on inclined plane surface Temperature of the sun by radiation Pyrometer, Shading ring Pyrheliometer, Sun shine recorder, Schematic diagrams and Principle of working,			
Pedagogy	Chalk and talk, Power point presentation, Videos Self study Component: Solar radiation data.		

Module-4	
Solar Thermal systems: 05 hours Thermal Collection devices, Liquid flat plate Collectors, Solar air heaters (Cylindrical, parabolic, paraboloid) sensible heat storage latent heat storage, application of Solar energy , Solar water heaters Solar Passive space heating and cooling Systems, Solar industrial heating systems, Solar refrigeration and air conditioning systems, Solar cookers	
Pedagogy	Chalk and talk, Power point presentation, Video. Self study Component: Thermal collection devices,
Module-5	
Solar Photovoltaic Systems: 05 Hours. . Introduction, Solar cells Fundamentals, Solar cell Characteristics, Solar cell Classification solar cell Technologies, Solar cell module and array construction, Maximizing the solar PV Out put and load matching, Maximum power point tracker, Balance of system components, Solar PV Systems and solar PV applications	
Pedagogy	Chalk and talk, Power point presentation, Videos Practical Topics: Self study Component: Solar cell fundamentals and Characteristics..
Course outcome (Course Skill Set) At the end of the course the student will be able to : <ol style="list-style-type: none"> 1) Discuss the importance of the role of renewable energy the concept of energy storage, principles of energy storage devices, 2) Discuss the concept of solar radiation data and solar PV system fabrication operation of solar cell sizing and design of PV System 3) Describe the process of harnessing solar energy and its applications in heating and cooling. 	

Assessment Details (both CIE and SEE)

The weightage of Continuous Internal Evaluation (CIE) is 50% and for Semester End Exam (SEE) is 50%. The minimum passing mark for the CIE is 40% of the maximum marks (20 marks). A student shall be deemed to have satisfied the academic requirements and earned the credits allotted to each subject/ course if the student secures not less than 35% (18 Marks out of 50)in the semester-end examination(SEE).

Continuous Internal Evaluation:

Three Unit Tests each of **20 Marks (duration 01 hour)**

1. First test at the end of 5th week of the semester
2. Second test at the end of the 10th week of the semester
3. Third test at the end of the 15th week of the semester

Two assignments each of **10 Marks**

4. First assignment at the end of 4th week of the semester
5. Second assignment at the end of 9th week of the semester

Group discussion/Seminar/quiz any one of three suitably planned to attain the COs and POs for **20 Marks (duration 01 hours)**

6. At the end of the 13th week of the semester

The sum of three tests, two assignments, and quiz/seminar/group discussion will be out of 100 marks and will be **scaled down to 50 marks**

(to have less stressed CIE, the portion of the syllabus should not be common /repeated for any of the methods of the CIE. Each method of CIE should have a different syllabus portion of the course).

CIE methods /question paper is designed to attain the different levels of Bloom's taxonomy as per the outcome defined for the course.

Semester End Examination:

Theory SEE will be conducted by University as per the scheduled timetable, with common question papers for the subject (**duration 03 hours**)

1. The question paper will have ten questions. Each question is set for 20 marks.
2. There will be 2 questions from each module. Each of the two questions under a module (with a maximum of 3 sub-questions), **should have a mix of topics** under that module.

The students have to answer 5 full questions, selecting one full question from each module.

Suggested Learning Resources:**Text books:**

1. Non-Conventional Energy Resources by B.H.Khan. McGraw Hill , 2nd Edition 2017
2. Non-Conventional Sources of Energy by G.D.Rai, Khanna Publishers, 4th Edition, 2009.
3. Solar Energy by Subhas P Sukhatme, Tata Mc,Graw Hill, 2nd Edition 1996;
4. Solar Energy-Principles of Thermal Collections and Storage by S.P.Sukhatme, J.K.Nayak, Mc.Graw Hill, 2008.

Reference books:

1. Non-Conventional Energy Resources by ShobhNath Singh, Pearson 1st Edition 2015.
2. Renewable Energy Sources and Conversion Technology by Bansal, Manfred Kleeman & Mechael Meliss Tata McGraw Hill 2004

Web links and Video Lectures (e-Resources):

1. <https://youtu.be/8nIXN6kwyqA>
2. <https://youtu.be/XkpKsBIW7tI>
3. <https://youtu.be/iZyzvDj6Y3c>
4. <https://youtu.be/iZyzvDj6Y3c>

Activity Based Learning (Suggested Activities in Class)/ Practical Based learning

1. <https://youtu.be/DZ30tWPO01I>

Module-4	
Screen Printing: 05 Hours. Introduction, Stencils, their kinds and methods of preparations, Screen materials, Screen fabric mono filaments, multifilament, Stretching screen fabric to frame, screen preparation, screen reclamation,. Trouble shooting clogged screens, Care and storage of screens, Image transfer, Squeegee Considerations, squeegee preparations, hardness categories of squeegee blades, Screen ink-its kinds and uses for different substrates and drying methods.	
Pedagogy	Chalk and talk, Power point presentation, Videos Self study Component: Introduction to Screen Printing.
Module-5	
Screen Printing Machines: 05 Hours. Kinds of Screen printing machines, principles, Method of halftone preparation for Screen printing, Drying equipment; Drying racks, Wicket dryers, jet dryers, infrared and UV Dryers ,Flocking process.	
Pedagogy	Chalk and talk, Power point presentation, Videos Practical Topics: Self study Component: Various types of Screen-printing Machines.
Course outcome (Course Skill Set) At the end of the course the student will be able to : 1)Distinguish the various printing techniques like Planography. intaglio etc. 2)Explain the basic principles of printing process 3) Familiarize with different process of printing Industry. 4)Recognize various Materials used in printing operations and distinguish printing finishing.. 4) Choose an appropriate printing process for any given printing job.	
Assessment Details (both CIE and SEE) The weightage of Continuous Internal Evaluation (CIE) is 50% and for Semester End Exam (SEE) is 50%. The minimum passing mark for the CIE is 40% of the maximum marks (20 marks). A student shall be deemed to have satisfied the academic requirements and earned the credits allotted to each subject/ course if the student secures not less than 35% (18 Marks out of 50)in the semester-end examination(SEE). Continuous Internal Evaluation: Three Unit Tests each of 20 Marks (duration 01 hour) 1. First test at the end of 5th week of the semester 2. Second test at the end of the 10th week of the semester 3. Third test at the end of the 15th week of the semester Two assignments each of 10 Marks 4. First assignment at the end of 4th week of the semester 5. Second assignment at the end of 9th week of the semester Group discussion/Seminar/quiz any one of three suitably planned to attain the COs and POs for 20 Marks (duration 01 hours) 6. At the end of the 13th week of the semester The sum of three tests, two assignments, and quiz/seminar/group discussion will be out of 100 marks and will be scaled down to 50 marks (to have less stressed CIE, the portion of the syllabus should not be common /repeated for any of the methods of the CIE. Each method of CIE should have a different syllabus portion of the course). CIE methods /question paper is designed to attain the different levels of Bloom's taxonomy as per the outcome defined for the course. Semester End Examination: Theory SEE will be conducted by University as per the scheduled timetable, with common question papers for the subject (duration 03 hours) 1. The question paper will have ten questions. Each question is set for 20 marks. 2. There will be 2 questions from each module. Each of the two questions under a module (with a maximum of 3 sub-questions), should have a mix of topics under that module. The students have to answer 5 full questions, selecting one full question from each module.	

Suggested Learning Resources:**Text books:**

1. Letterpress Printing part 1&2 by Chandra Shekar Mishra.
2. Printing Technology 5th Edition by Michale Adams.
3. Printing Material Science& Technology.Vol.24 by Anthony Bristow.
4. Hand book of Print and Production by Michale Bernard John Peacock..
5. Screen Printing by John Stephens.

Reference books:

1. Hand book of Topography by Kailas Tahle.
2. The Print and Production Manual by PIRA.

Web links and Video Lectures (e-Resources):

1. <https://youtu.be/7L42aRs68WI>
2. <https://youtu.be/UKtue--8-s>
3. <https://youtu.be/t7yv4gSnNkE>
4. <https://youtu.be/rxN8Iuo28oQ>

Activity Based Learning (Suggested Activities in Class)/ Practical Based learning

https://youtu.be/UhV_XrHZj3c

IV Semester

Scientific Foundations of Health			
Course Code	21SFH46	CIE Marks	50
Teaching Hours/Week (L:T:P: S)	2:0:0:0	SEE Marks	50
Total Hours of Pedagogy	02 Hours/Week	Total Marks	100
Credits	02	Exam Hours	60 Minutes / 01 Hour
Course objectives: The course 21SFH46 will enable the students: <ul style="list-style-type: none">• To know about Health and wellness (and its Beliefs)• To acquire Good Health & It's balance for positive mind-set• To Build the healthy lifestyles for good health for their better future• To Create of Healthy and caring relationships to meet the requirements of MNC and LPG world• To learn about Avoiding risks and harmful habits in their campus and outside the campus for their brightfuture• To Prevent and fight against harmful diseases for good health through positive mindset			
Teaching-Learning Process (General Instructions) These are sample Strategies, which teacher can use to accelerate the attainment of the various course outcomes. Teachers shall adopt suitable pedagogy for effective teaching - learning process. The pedagogy shall involve the combination of different methodologies which suit modern technological tools and software'sto meet the present requirements of the Global employment market. <ul style="list-style-type: none">(i) Direct instructional method (Low /Old Technology),(ii) Flipped classrooms (High/advanced Technological tools),(iii) Blended learning (combination of both),(iv) Enquiry and evaluation based learning,(v) Personalized learning,(vi) Problems based learning through discussion,(vii) Following the method of expeditionary learning Tools and techniques, Apart from conventional lecture methods, various types of innovative teaching techniques through videos,animation films may be adapted so that the delivered lesson can progress the students In theoretical applied and practical skills in teaching of the concepts of Health and Wellness in general.			
Module-1			
<u>Good Health and It's balance for positive mindset:</u> What is Health, Why Health is very important Now? – What influences your Health?, Health and Behaviour,Health beliefs and advertisements, Advantages of good health (Short term and long term benefits), Health and Society, Health and family, Health and Personality - Profession. Health and behaviour, Disparities of health in different vulnerable groups. Health and psychology, Methods to improve good psychological health. Psychological disorders (Stress and Health - Stress management), how to maintain good health, Mindfulness for Spiritual and Intellectual health, Changing health habits for good health. Health and personality.			
Teaching-Learning Process	Chalk and talk method, Power Point presentation and YouTube videos, Animation videos methods. creating real time stations in classroom discussions. Giving activities &assignments.		
Module-2			

Building of healthy lifestyles for better future:

Developing a healthy diet for good health, Food and health, Nutritional guidelines for good health and well beingness, Obesity and overweight disorders and its management, Eating disorders - proper exercises for its maintenance (Physical activities for health), Fitness components for health, Wellness and physical function,

Teaching-Learning Process

Chalk and talk method, PowerPoint presentation and YouTube videos, Animation videos methods. creating real time stations in classroom discussions. Giving activities&assignments.

Module-3**Creation of Healthy and caring relationships :**

Building communication skills (Listening and speaking), Friends and friendship - education, the value of relationships and communication, Relationships for Better or worsening of life, understanding of basic instincts of life (more than a biology), Changing health behaviors through social engineering,

Teaching-Learning Process

Chalk and talk method, PowerPoint presentation and Animation videos methods. Creating real time stations in classroom discussions. Giving activities and assignments.

Module-4**Avoiding risks and harmful habits :**

Characteristics of health compromising behaviors, Recognizing and avoiding of addictions, How addiction develops and addictive behaviors, Types of addictions, influencing factors for addictions, Differences between addictive people and non addictive people and their behavior with society, Effects and health hazards from addictions Such as..., how to recovery from addictions.

Teaching-Learning Process

Chalk and talk method, PowerPoint presentation and Animation videos methods. Creating real time stations in classroom discussions. Giving activities and assignments.

Module-5**Preventing and fighting against diseases for good health :**

Process of infections and reasons for it, How to protect from different types of transmitted infections suchas...,
Current trends of socio economic impact of reducing your risk of disease, How to reduce risks for goodhealth,
Reducing risks and coping with chronic conditions, Management of chronic illness for Quality of life,
Health and Wellness of youth : a challenge for the upcoming future Measuring of health and wealth status.

Teaching-Learning Process

Chalk and talk method, PowerPoint presentation and YouTube videos, Animation videos methods. creating real time stations in classroom discussions. Giving activities & assignments.

Course outcome (Course Skill Set)

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

CO 1: To understand Health and wellness (and its Beliefs)

CO 2: To acquire Good Health & It's balance for positive mindset

CO 3: To inculcate and develop the healthy lifestyle habits for good health.

CO 4: To Create of Healthy and caring relationships to meet the requirements of MNC and LPG world

CO 5: To adopt the innovative & positive methods to avoid risks from harmful habits in their campus & outside the campus.

CO 6: To positively fight against harmful diseases for good health through positive mindset.

Assessment Details (both CIE and SEE)

methods of CIE need to be defined topic wise i.e.- Tests, MCQ, Quizzes, Seminar or micro project/Course Project, Term Paper)

The weightage of Continuous Internal Evaluation (CIE) is 50% and for Semester End Exam (SEE) is 50%. The student has to obtain a minimum of 35% of maximum marks in SEE and a minimum of 40% of maximum marks in CIE. Semester End Exam (SEE) is conducted for 50 marks (1 hours' duration). Based on this grading will be awarded.

The student has to score a minimum of 40% (40 marks out of 100) in the sum total of the CIE (Continuous Internal Evaluation) and SEE (Semester End Examination) taken together.

Continuous Internal Evaluation:

Three Unit Tests each of **20 Marks (duration 01 hour)**

1. First test at the end of 5th week of the semester
2. Second test at the end of the 10th week of the semester
3. Third test at the end of the 15th week of the semester

(All tests are similar to the SEE pattern i.e question paper pattern is MCQ)

Two assignments each of **10 Marks**

4. First assignment at the end of 4th week of the semester
5. Second assignment at the end of 9th week of the semester

Report writing /Group discussion/Seminar any one of three suitably planned to attain the COs and POs for **20 Marks (duration 01 hours)**

6. At the end of the 13th week of the semester

The sum of three tests, two assignments, and quiz/seminar/group discussion will be out of 100 marks and will be **scaled down to 50 marks**

CIE methods /question paper is designed to attain the different levels of Bloom's taxonomy as per the outcome defined for the course.

Semester End Examination:

Theory SEE will be conducted by University as per the scheduled timetable, with common question papers for subject

SEE paper will be set for 50 questions of each of 01 marks. The pattern of the question paper is MCQ. The time allotted for SEE is **01 hours**

Suggested Learning Resources:

1. **Health Psychology** (Second edition) by Charles Abraham, Mark Conner, Fiona Jones and Daryl O'Connor –Published by Routledge 711 Third Avenue, New York, NY 10017.
 2. **Health Psychology - A Textbook**, FOURTH EDITION by Jane Ogden McGraw Hill Education (India) Private Limited - Open University Press
 3. **HEALTH PSYCHOLOGY (Ninth Edition)** by SHELLEY E. TAYLOR - University of California, Los Angeles, McGraw Hill Education (India) Private Limited - Open University Press
 4. **Scientific Foundations of Health (Health & Wellness) - General Books** published for university and colleges references by popular authors and published by the reputed publisher.
- 1) **SWAYAM / NPTEL/ MOOCS/ We blinks/ Internet sources/ YouTube videos** and other materials / notes

Activity Based Learning (Suggested Activities in Class)/ Practical Based learning

- ✓ Contents related activities (Activity-based discussions)
- ✓ For active participation of students, instruct the students to prepare Flowcharts and Handouts
- ✓ Organizing Group wise discussions and Health issues based activities
- ✓ Quizzes and Discussions
- ✓ Seminars and assignments

IV Semester

IV Semester

Concepts of Biochemistry				
Course Code		21BSC47	CIE Marks	50
Teaching Hours/Week (L:T:P: S)		2:1:0:0	SEE Marks	50
Total Hours of Pedagogy		25	Total Marks	100
Credits		02	Exam Hours	03
CLO 1	Explain properties and functions of biomolecules.			
CLO 2	Evaluate the chemical structure and biological functions of amino acids.			
CLO 3	Significance of various biomolecules necessary to maintain the living organisms.			
CLO 4	Understand the various methods of food preservation.			
CLO 5	Understanding the concepts of enzymes – structure, properties and their role in biological functions.			
Pedagogy (General Instructions) These are sample Strategies, which teacher can use to accelerate the attainment of the various course outcomes. These are sample Strategies, which teacher can use to accelerate the attainment of the various course outcomes. 1. Lecturer method (L) does not mean only traditional lecture method, but different type of teaching methods may be adopted to develop the outcomes. 2. Show Video/animation films to convince abstract concepts. 4. Encourage collaborative (Group Learning) Learning in the class 5. Ask at least three HOTS (Higher order Thinking) questions in the class, which promotes critical thinking 6. Adopt Problem Based Learning (PBL), which fosters students’ Analytical skills, develop thinking skills such as the ability to evaluate, generalize, and analyse information rather than simply recall it. 7. Topics will be introduced in a multiple representation. 8. Show the different ways to solve the same problem and encourage the students to come up with their own creative ways to solve them. 9. Discuss how every concept can be applied to the real world - and when that's possible, it helps improve the students' understanding.				
Module-1				
Classification and biological functions of carbohydrates, structure and properties of monosaccharaides (Glucose and Fructose). Disaccharides (sucrose, maltose, lactose), polysaccharides (starch, cellulose and chitin). Glycosaminoglycans (chondroitin sulfate and Hyaluronic acid).				
Pedagogy	Chalk and talk/power point presentation: Classification and biological functions of carbohydrates, structure and properties of monosaccharaides (Glucose and Fructose). Disaccharides (sucrose, maltose, lactose), polysaccharides (starch, cellulose and chitin). Videos/Learning material: Biological functions and structure of monosaccharaides, Disaccharides and Polysaccharides. Self-study: Glycosaminoglycans (chondroitin sulfate and Hyaluronic acid)			
Module-2				
Classification, structure and properties of amino acids, Primary structure of protein- determination of amino acid composition and sequence. Secondary structure- α -helix, β -pleated sheet, collagen triple helix. Tertiary and quaternary structures. Solid phase peptide synthesis. Glycoproteins.				
Pedagogy	Chalk and talk/power point presentation: Classification, structure and properties of amino acids, Primary structure of protein- determination of amino acid composition and sequence. Secondary structure- α -helix, β -pleated sheet, collagen triple helix. Tertiary and quaternary structures. Videos/Learning material: Structure and properties of amino acids, Primary structure of protein.			

	Self-study: Solid phase peptide synthesis. Glycoproteins.
Module-3	
Classification, structure, properties and functions of fatty acids, triglycerides, phospholipids, sphingolipids. Cholesterol, Eicosanoids. Structure and functions of vitamins (A,D,E,K, B complex and C).	
Pedagogy	<p>Chalk and talk/power point presentation: Classification, structure, properties and functions of fatty acids, triglycerides, phospholipids, Cholesterol.</p> <p>Videos/Learning material: Structure and functions of vitamins (A,D,E,K, B complex and C).</p> <p>Self-study: Structure, properties and functions of sphingolipids and Eicosanoids.</p>
Module-4	
Chemical methods of food preservation: salt, sugar, organic acids, SO ₂ , nitrite and nitrates, ethylene oxide, antibiotics and bacteriocins. Milk composition. Dairy starter cultures, fermented dairy products: yogurt, acidophilus milk, dahi and cheese, other fermented foods, Probiotics: Health benefits, types of microorganisms used, probiotic foods available in market.	
Pedagogy	<p>Chalk and talk/power point presentation: Milk composition. Dairy starter cultures, fermented dairy products: yogurt, acidophilus milk, dahi and cheese, other fermented foods.</p> <p>Videos/Learning material: Chemical methods of food preservation: salt, sugar, organic acids, SO₂, nitrite and nitrates, ethylene oxide, antibiotics and bacteriocins.</p> <p>Self-study: Probiotics: Health benefits, types of microorganisms used, probiotic foods available in market.</p>
Module-5	
Enzymes: Introduction, classification and remarkable properties of enzymes; coenzymes and cofactors and their role in biological functions. Salient features of active site of enzymes; factors affecting enzyme action, Enzyme inhibitors – Reversible and irreversible; Allosteric regulation of enzymes.	
Pedagogy	<p>Chalk and talk/power point presentation: Introduction, classification and remarkable properties of enzymes; coenzymes and cofactors and their role in biological functions.</p> <p>Videos/Learning material: Salient features of active site of enzymes; factors affecting enzyme action, Enzyme inhibitors – Reversible and irreversible;</p> <p>Self-study: Allosteric regulation of enzymes.</p>
Course outcome (Course Skill Set)	
At the end of the course the student will be able to:	
CO 1	Discuss the properties and functions of carbohydrates.
CO 2	Explain the chemical structure and biological functions of amino acids.
CO 3	Interpret the knowledge of various biomolecules like fatty acids, cholesterol and vitamins for living organisms.
CO 4	Enumerate the importance of chemistry in food preservation.
CO 5	Illustrate the structure, properties and role of enzymes in biological functions.

Assessment Details (both CIE and SEE)

The weightage of Continuous Internal Evaluation (CIE) is 100%. The minimum passing mark for the CIE is 40% of the maximum marks (400 marks out of 100). A student shall be deemed to have satisfied the academic requirements if the student secures not less than 40% (40 Marks out of 100)in the CIE.

SEE is similar to other 03 credit subjects (Courses)

Continuous Internal Evaluation:

Three Unit Tests each of 20 Marks (duration 01 hour)

1. First test at the end of 5th week of the semester
2. Second test at the end of the 10th week of the semester
3. Third test at the end of the 15th week of the semester

Two assignments each of 10 Marks

4. First assignment at the end of the 4th week of the semester
5. Second assignment at the end of the 9th week of the semester

Course Seminar suitably planned to attain the COs and POs for 20 Marks (duration 01 hours)

6. Conducting at least 05 labs sessions within the Academic Duration.

The sum of three tests, two assignments, and a seminar/Lab sessions will be out of 100 marks

Suggested Learning Resources:**Books**

1. Food Microbiology: An Introduction (2017) by Thomas J. Montville et al., 4 th Edition, ASM Press
2. Food Microbiology (2015) by Martin R Adams, Royal Society of Chemistry; 4th Edition.
3. S.P. Bhutani, Chemistry of Biomolecules, Ane book Pvt. Ltd. 2009.
4. Nelson, D.L., Cox, M.M.& Lehninger, A.L. (2009) Principles of Biochemistry. IV Edition. W.H. Freeman and Co.

Web links and Video Lectures (e-Resources):

<https://www.youtube.com/watch?v=FoswKE7tUH8>
<https://www.youtube.com/watch?v=hrWSShx-bJY>
<https://www.youtube.com/watch?v=dtCvYfhzPQ0>
<https://www.youtube.com/watch?v=2pd3-hOFhRg>
<https://www.youtube.com/watch?v=LKiXfqaWNHI>

Activity Based Learning (Suggested Activities in Class)/ Practical Based learning

- <https://www.britannica.com/science/carbohydrate>
- https://onlinecourses.swayam2.ac.in/cec19_ag01/preview
- <https://dth.ac.in/medical/course-inner.php?id=75>

IV Semester

CONSTITUTION OF INDIA, PROFESSIONAL ETHICS AND CYBER LAW (CPC)			
Course Code	21CIP48	CIE Marks	50
Teaching Hours/Week (L:T:P: S)	2:0:0:0	SEE Marks	50
Total Hours of Pedagogy	25	Total Marks	100
Credits	02	Exam Hours	03 Hours
Course Learning Objectives: To <ul style="list-style-type: none">• know the fundamental political codes, structure, procedures, powers, and duties of Indian government institutions, fundamental rights, directive principles, and the duties of citizens• Understand engineering ethics and their responsibilities; identify their individual roles and ethical responsibilities towards society.• Know about the cybercrimes and cyber laws for cyber safety measures.			
Teaching-Learning Process (General Instructions) <p>These are sample Strategies, which teacher can use to accelerate the attainment of the various course outcomes.</p> <ol style="list-style-type: none">1. Apart from conventional lecture methods various types of innovative teaching techniques through videos, animation films may be adopted so that the delivered lesson can progress the students in theoretical, applied and practical skills in physics2. Seminars and Quizzes may be arranged for students in respective subjects to develop skills.3. Encourage the students for group learning to improve their creativity and analytical skills.4. While teaching show how every concept can be applied to the real world. This helps the students to expand understanding level.5. Support and guide the students for self-study.6. Ask some higher order thinking questions in the class, which promotes critical thinking.7. Inspire the students towards the studies by giving new ideas and examples.			
Module-1			
Introduction to Indian Constitution: The Necessity of the Constitution, The Societies before and after the Constitution adoption. Introduction to the Indian constitution, The Making of the Constitution, The Role of the Constituent Assembly - Preamble and Salient features of the Constitution of India. Fundamental Rights and its Restriction and limitations in different Complex Situations. Directive Principles of State Policy (DPSP) and its present relevance in our society with examples. Fundamental Duties and its Scope and significance in Nation building.			
Pedagogy	Chalk and talk, Power point presentation, Videos		
Module-2			
Union Executive and State Executive: Parliamentary System, Federal System, Centre-State Relations. Union Executive – President, Prime Minister, Union Cabinet, Parliament - LS and RS, Parliamentary Committees, Important Parliamentary Terminologies. Supreme Court of India, Judicial Reviews and			
Pedagogy	Chalk and talk, Power point presentation, Videos		
Module-3			
Elections, Amendments and Emergency Provisions: Elections, Electoral Process, and Election Commission of India, Election Laws. Amendments - Methods in Constitutional Amendments (How and Why) and Important Constitutional Amendments. Amendments – 7,9,10,12,42,44, 61, 73,74, ,75, 86, and 91,94,95,100,101,118 and some important Case Studies. Emergency Provisions, types of Emergencies and its consequences. Constitutional special provisions: Special Provisions for SC and ST, OBC, Women, Children and Backward Classes.			
Pedagogy	Chalk and talk, Power point presentation, Videos		
Module-4			
Professional / Engineering Ethics: Scope & Aims of Engineering & Professional Ethics - Business Ethics, Corporate Ethics, Personal Ethics. Engineering and Professionalism, Positive and Negative			

Faces of Engineering Ethics, Code of Ethics as defined in the website of Institution of Engineers (India): Profession, Professionalism, and Professional Responsibility. Clash of Ethics, Conflicts of Interest. Responsibilities in Engineering Responsibilities in Engineering and Engineering Standards, the impediments to Responsibility. Trust and Reliability in Engineering, IPRs (Intellectual Property Rights), Risks, Safety and liability in Engineering	
Pedagogy	Chalk and talk, Power point presentation, Videos
Module-5	
Internet Laws, Cyber Crimes and Cyber Laws: Internet and Need for Cyber Laws, Modes of Regulation of Internet, Types of cyber terror capability, Net neutrality, Types of Cyber Crimes, India and cyber law, Cyber Crimes and the information Technology Act 2000, Internet Censorship. Cybercrimes and enforcement agencies.	
Pedagogy	Chalk and talk, Power point presentation, Videos
Course outcome (Course Skill Set) Course outcomes: <ol style="list-style-type: none"> 1. Have constitutional knowledge and legal literacy. 2. Understand Engineering and Professional ethics and responsibilities of Engineers. 3. Understand the the cybercrimes and cyber laws for cyber safety measures. 	
Assessment Details (both CIE and SEE) The weightage of Continuous Internal Evaluation (CIE) is 50% and for Semester End Exam (SEE) is 50%. The minimum passing mark for the CIE is 40% of the maximum marks (20 marks). A student shall be deemed to have satisfied the academic requirements and earned the credits allotted to each subject/ course if the student secures not less than 35% (18 Marks out of 50)in the semester-end examination(SEE). Continuous Internal Evaluation: Three Unit Tests each of 20 Marks (duration 01 hour) <ol style="list-style-type: none"> 1. First test at the end of 5th week of the semester 2. Second test at the end of the 10th week of the semester 3. Third test at the end of the 15th week of the semester Two assignments each of 10 Marks <ol style="list-style-type: none"> 4. First assignment at the end of 4th week of the semester 5. Second assignment at the end of 9th week of the semester Group discussion/Seminar/quiz any one of three suitably planned to attain the COs and POs for 20 Marks (duration 01 hours) <ol style="list-style-type: none"> 6. At the end of the 13th week of the semester The sum of three tests, two assignments, and quiz/seminar/group discussion will be out of 100 marks and will be scaled down to 50 marks (to have less stressed CIE, the portion of the syllabus should not be common /repeated for any of the methods of the CIE. Each method of CIE should have a different syllabus portion of the course). CIE methods /question paper is designed to attain the different levels of Bloom's taxonomy as per the outcome defined for the course. Semester End Examination: Theory SEE will be conducted by University as per the scheduled timetable, with common question papers for the subject. SEE paper will be set for 50 questions of each of 01 marks. The pattern of the question paper is MCQ. The time allotted for SEE is 01 hours .	

Suggested Learning Resources:**Text books:****Reference books:**

1. Constitution of India, Professional Ethics and Human Rights Shubham Singles, Charles E. Haries, and et al Cengage Learning India 2018
2. Cyber Security and Cyber Laws Alfred Basta and et al Cengage Learning India 2018
Reference Books
3. Introduction to the Constitution of India Durga Das Basu Prentice –Hall, 2008.
4. Engineering Ethics M. Govindarajan, S. Natarajan, V. S. Senthilkumar Prentice –Hal