VI-Semester

Analog and Digital Electronics			
Course Code	**21BSP61**	CIE Marks	50
Teaching Hours/Week (L:T:P: S)	2:2:0:1	SEE Marks	50
Total Hours of Pedagogy	40	Total Marks	100
Credits	03	Exam Hours	03 Hours

Course Objectives:

- Comprehend the knowledge of different types of oscillators & flip flops
- Understand characteristics of Op -Amp
- Gain the knowledge about Combinational logic circuits and execute logical operations.
- Analysis of electronics network through various theorems.

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.
7. Inspire the students towards the studies by giving new ideas and examples.

Pedagogy	Chalk and talk, Power point presentation, Videos **Self study Component:** Brief history of Printing.

Module-1

Oscillators: **08 Hours**

Concept of Feedback Positive, negative feedback Sinusoidal oscillators: Tuned oscillators-Barkhausen criterion for oscillations, Hartley and Colpitt's oscillators. RC oscillators – Phase shift oscillator and Wien Bridge oscillator. Non-sinusoidal oscillators: Astable, Monostable and Bi- stable multivibrators.

Pedagogy	Chalk and talk, Power point presentation, Videos **Self study Component:**

Module-2

Operational Amplifiers(Op-Amp): **08 Hours**

Introduction to Op-Amp, Ideal Op-Amp and its characteristics. Practical Op-Amp and its characteristics, Block diagram of Op-Amp, Inverting and Non-inverting amplifier, Applicability of Op-Amp in Analog computation: Solution of simultaneous and differential equation, Op-Amp as voltage follower, Adder, Subtractor, Integrator, Differentiator, logarithmic amplifier, Antilog amplifier, Analog multiplier & Divider circuit, RMS circuit.

Pedagogy	Chalk and talk, Power point presentation, Videos **Self study Component:** RMS circuit

Module-3

Combinational logic circuits: **08 Hours**

Number System and Codes: Decimal, Binary, Hexadecimal and Octal Number Systems. Conversions of binary to decimal system and vice-versa. Binary addition and subtraction (1's and 2's complement methods). Representation of Signed and Unsigned Numbers, Binary Coded Decimal (BCD) Code.

Boolean Algebra & Logic gates: Basic Postulates and Fundamental Theorems of Boolean Algebra, De Morgan's theorems, Switching Equivalent Circuits of Basic Gates, Truth Tables and Symbolic Representation of OR, AND, NOT, NAND, NOR, XOR, XNOR Gates (realization using Transistor), NAND and NOR Gates as Universal Gates. Half adder and Full adder circuits.

Pedagogy	Chalk and talk, Power point presentation, Videos

	Self study Component: Boolean Algebra

Module-4

Registers & Counters: **08 Hours**

Flip flop and Timing circuit : set-reset laches, D-flipflop, R-S flipflop, J-K Flip-flop, Master slave Flip flop, edge triggered flip-flop, T flip-flop

Registers & Counters: Synchronous/Asynchronous counter operation,Up/down synchronous counter, application of counter, Serial in/Serial out shift register.

Pedagogy	Chalk and talk, Power point presentation, Videos **Self study Component:** T flip-flop

Module-5

Network Theorems: **08 Hours**

Voltage and current sources,Kirhoff's current and voltage Laws, Star and delta networks (T & π) and their conversions, Reciprocity theorem, Maximum power transfer theorem for DC only(Derivation), Superposition theorem (Derivation), Thevenin's theorem and Norton's theorem (Derivation).

Tellegens theorem, Millman's theorem, Millers theorem and dc network comprehending theorem Numericals

Pedagogy	Chalk and talk, Power point presentation, Videos **Self study Component:** Kirhoff's laws

Text Books:

1. Digital fundamentals – Thomas L.Flyod, Pearson Education; Eleventh edition.
2. Digital system –principles & application; Ronald J Tocci,
3. Modern digital electronics, R.P.Jain
4. Basic Electronics Engineering, J P Bandyopadhyay, Vikas Publishing House Ltd, New Delhi
5. Electronic Devices and Circuits, David A.Bell, Oxford University Press.
6. Electronics: Fundamentals and applications – D. Chattopadhyay and P.C.Rakshit,(New Age international.
7. Digital Principles and Applications - A.P. Malvino, D.P.Leach and Saha,Tata McGraw
8. OP-Amps and Linear Integrated Circuit, R. A. Gayakwad, 4th edition, 2000, Prentice Hall.

References :

1. Principles of Electronics – V.K.Mehta and Rohit Mehta,S.Chand Publishing
2. Hand book of electronics – Gupta Kumar, Pragati Prakashan.
3. Digital Logic and Computer design – M. Morris Mano ,Pearson.
4. Text book of Electronics – B. B. Swain , Kitab Mahal
5. Concepts of Electronics – D.C.Tayal, Himalaya Publishing house.
6. Fundamentals of Digital Circuits, A. Anand Kumar, 2nd Edition, 2009, PHI Learning Pvt. Ltd.

Course outcome (Course Skill Set)

Course outcomes: Afterasuccessfulcompletionofthecourse,thestudentwillbeableto:

1. Understand the different types of oscillators
2. Analyse the principles of oscillator and role of various oscillator electronic circuits.
3. To develop, evaluate, and execute combinational logic circuits.
4. To learn techniques of solving circuits involving different active and passive elements &to realise the significance of network functions.

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. Hand Book of Electronics, Gupta and Kumar, Pragati Prakasan, Meerut
2. Electronic Devices. Thomas L. Floyd, Prentice Hall.
3. Electronic Devices and Circuit Theory, Louis Nashelsky and Robert Boylestad,
4. Digital Principles and Applications, A.P. Malvino, D.P.Leach and Saha, Tata McGraw Hill
5. Fundamentals of Eectrical & Electronic Engineering, B L Theraja, S.Chand Publishing.

Reference books:

1. Fundamentals of Digital Circuits, Anand Kumar, PHI Learning Pvt. Ltd.
2. Digital Circuits and systems, Venugopal, Tata McGraw Hill.
3. Physics for degree students, C L Arora and P. S. Hemme, S Chand Publications
4. Modern Digital Electronics, R P Jain, Tata McGraw Hill.
5. Principles of Electronics – V.K.Mehta and Rohit Mehta S.Chand Publishing.
6. Digital Logic and Computer design – M. Morris Mano,Pearson.
7. Text book of Electronics – B. B. Swain, Kitab Mahal
8. Concepts of Electronics – D.C.Tayal ,Himalaya Publishing house
9. Fundamentals of Digital Circuits, A. Anand Kumar, 2nd Edition, 2009, PHI Learning Pvt. Ltd
10. Basic Electronics Solid state, B.L. Theraja, S.Chand Publishing.

Web links and Video Lectures (e-Resources):

1. https://youtu.be/w8Dq8blTmSA
2. https://youtu.be/vfVVF58FtCc
3. https://youtu.be/djbJm-xWo2w
4. https://youtu.be/o56BWcHZteQ
5. https://nptel.ac.in/courses/122106025
6. https://www.youtube.com/watch?v=clTA0pONnMs
7. https://www.youtube.com/watch?v=5855yGe972M

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

1. https://youtu.be/fwTRzApMCgs
2. https://circuitverse.org/
3. https://www.youtube.com/watch?v=d-6EjtIIqVw

VI-Semester

Nuclear Physics			
Course Code	**21BSP62**	CIE Marks	50
Teaching Hours/Week (L:T:P: S)	2:2:0:1	SEE Marks	50
Total Hours of Pedagogy	40	Total Marks	100
Credits	03	Exam Hours	03 Hours

Course Objectives:

1. To understand the nuclear constituents and the associated phenomena.
2. To understand the nuclear reactions and its applications.
3. To understand the radio activity and its use in the medical field.

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.
7. Inspire the students towards the studies by giving new ideas and examples.

Module-1

Nuclear Phenomenology and Models: **08 hours.**

Nuclear Atom : Rutherford's scattering and scattering cross section (Qualitative), Nuclear Phenomenology: Properties of the nuclei, Labelling of Nuclei, Masses of Nuclei, Sizes of Nuclei, Nuclear Spins and Dipole Moments, Mass defect, Binding Energy, Stability of Nuclei, Instability of Nuclei, Nature of the Nuclear Force, Nuclear Models (Qualitative):Liquid Drop Model, Fermi-Gas Model, Shell Model and its predictions, Collective Model, Optical Model .

Pedagogy	Chalk and talk, Power point presentation, Videos **Self-study Component:** Rutherford's Scattering and properties of nucleus.

Module-2

Elementary Particles and Nuclear Radiations; **08 hours.**

Forces : Electrostatic, Gravitational, weak interaction and strong interaction, Elementary Particle interactions; basic features, types of particles and its families. Symmetries and Conservation Laws: energy and momentum, Types of Radiation, Alpha Decay, Gamow's theory of alpha decay, Barrier Penetration, Beta Decay, Yukawa's Meson theory(Qualitative),Neutrino Mass.Weak Interaction, Gamma Decay.

Pedagogy	Chalk and talk, Power point presentation, Videos **Self study Component:** Electrostatic and Gravitational forces.

Module-3

Radioactive Isotopes and Radioactivity : **08 hours**

Radio Isotopes, Existence, Isotopic masses and abundance, Stable isotopes and % abundance, Isotopes of Hydrogen Nuclei and their uses, Laws of radioactivity, The disintegration constant, Half Life and derivation of expression, Mean life and derivation of expression, Radioactive equilibrium, Natural Radioactive series, Artificial Radio activity, Units of Radioactivity, Carbon Dating.

Pedagogy	Chalk and talk, Power point presentation, Videos **Self study Component:** Radio isotopes and existance.

Module-4

Accelerators and Detectors: **08 hours**

Accelerators : The Cockcroft-Walton machine, Van de Graaff machine, Cyclotron, Expression for cyclotron frequency and Energy of the output particle, Betatron, Synchrotron, Linear Accelerator (LINAC), Gas detectors: Ionization Chamber, Proportional Counter, Geiger-Muller Counter, Photo-multiplier tubes, Scintillation counters, Semiconductor detectors, Cherenkov detectors, Particle identification.

Pedagogy	Chalk and talk, Power point presentation, Videos **Self study Component: Particle accelarators..**

Module-5

Nuclear Reactions and Applications of Nuclear Physics: **08 hours**

Types of Reactions, Conservation Laws, kinematics of reactions, Q-value, reaction rate, reaction cross section, Concept of compound and direct reaction, resonance reaction Nuclear Fission, Nuclear Fission Induced fission – fissile materials, Fission chain reactions, Nuclear power reactors, Fusion, Coulomb barrier, Stellar fusion, Fusion reaction rates, Fusion reactors, Biomedical: Radio Therapy, The Medical Imaging using radiation, Magnetic Resonance Imaging (MRI). 8 hours

Pedagogy	Chalk and talk, Power point presentation, Videos **Self study Component:**Nuclear reactions, Conservation laws and kinematics of reactions .

Course outcome (Course Skill Set)

Courseoutcomes: Afterasuccessfulcompletionofthecourse,thestudentwillbeableto:

1. Describe the composition and models of the Nucleus.
2. Distinguish various types of nuclear radiations and radioactive isotopes.
3. Illustrate the various particle detectors and Accelerators.
4. Discuss various nuclear reactions and their applications.
5. Summarize the applications of nuclear physics.

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. Introduction to Nuclear and Particle Physics, Second Edition, A. Das and T. Ferbel, World Scientific,
2. Nuclear and Particle Physics, B. R. Martin, John Wiley & Sons, Ltd
3. Nuclear Physics by Irwing Kaplan, Addison-Wesley Publishing Company.
4. Introductory Nuclear Physics, Samuel S. M. Wong, Wiley-VCH Verlag GmbH & Co. KgaA
5. Introduction to Nuclear Physics, A Harald Enge, Addison Wesley Publishing Company
6. Nuclear Physics, D C Tayal, 5th Edition, Himalaya Publishing House.

Reference books:

1. **Nuclear and Elementary particle Physics by S.N Ghoshal.**
2. Nuclear Physics and Particle Physics – Sathya Prakash, Sultan Chand & Sons

Web links and Video Lectures (e-Resources):
1.https://youtu.be/-WIAoAG4SyA 2.https://youtu.be/lF-LM9CdiVk 3.https://youtu.be/quSdhgX3NB8 4.https://youtu.be/5KOJLxcaQto
Activity Based Learning (Suggested Activities in Class)/ Practical Based learning **https://youtu.be/5KOJLxcaQto** https://nptel.ac.in https://swayam.gov.in https://vlab.amrita.edu

VI - Semester

Electronics and Nuclear Physics Lab			
Course Code	**21BSPL63**	CIE Marks	50
Teaching Hours/Week(L:T:P:S)	1:0:2:0	SEE Marks	50
Credits	02	Exam Hours	3 Hours

Course Objectives :

1. To Study the electronic circuits of Power Supply, Oscillators, Op-Amps and Logic Gates and
2. To Study the radio active phenomenon, statistics and propagation through matter.

Sl.NO	Experiments
1	Generation of Sine wave using RC Phase Shift Oscillator.
2	Generation of Sine Wave using Hartley Oscillator
3	Determination of open loop gain and bandwidth of the given Op-AMP
4	Construction of OP-Amp Adder and Subtractor
5	Verification of Maximum Power Transfer Theorem
6	Realization of Logic gates using Diodes /Transistors.
7	Statistical counting of radioactivity.
8	Study of Gamma ray spectrum of Cs 137 using Scintillation counter.
9	Study of the Absorption of gamma radiation through matter.
10	Calculation of the the Half Life of Ba-137.
11	Verification of inverse Square Law.
12	Validating the Rutherford's scattering formula.

Course outcomes (Course Skill Set):

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

1. Construct the Electronic Circuits using electronic Components and Operate to get the desired output
2. Illustrate the statistical behavior of Radioactivity and the propagation of radiation through matter.

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 students): 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. Nuclear Physics Experiments, Jagadish Varma, New Age International Publications, 2001

4. B.Sc., Practical Physics, C L Arora, S Chand and Company,2010
5. Analog Electronics with Op-amps: A Source Book of Practical Circuits (Electronics Texts for Engineers and Scientists) , Anthony Peyton (Author), Vincent Walsh (Author), Cambridge University Press, 1993,.

SuggestedLearningResources:

1. https://www.arrow.com/en/research-and-events/articles/fundamentals-of-op-amp-circuits
2. https://www.tutorialspoint.com/sinusoidal_oscillators/sinusoidal_oscillator_circuit.htm
3. https://phet.colorado.edu/
4. https://www.cpp.edu/~pbsiegel/phy432/labman/manual.html
5. https://www.niser.ac.in/sps/sites/default/files/nuclear_physics_manual.pdf
6. https://www.niser.ac.in/sps/sites/default/files/nuclear_physics_manual.pdf
7. https://www.caen.it/wp-content/uploads/2018/07/Handbook_EDU_2018_r2_W.pdf
8. https://www-pub.iaea.org/MTCD/Publications/PDF/te_530_web.pdf
9. http://www.indosawedu.com/gamma-spectroscopy.php
10. http://www.indosawedu.com/radition-counter.php
11. http://www.indosawedu.com/rutherford-scattering.php

VI-Semester

Physics of Nanomaterials			
Course Code	**21BSP641**	CIE Marks	50
Teaching Hours/Week (L:T:P: S)	2:1:0:1	SEE Marks	50
Total Hours of Pedagogy	25	Total Marks	100
Credits	2	Exam Hours	03 Hours

Course Objective:

1. Understand the size dependence of physical Properties of Nano-Materials.
2. Study the Classification of Nano-Materials based on dimensions, type of material and type of composite.
3. Understand the synthesis of Nano-Materials and the associated risks, the associated risks, Toxicity and Challenges.
4. Study the applications of Nano-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.
7. Inspire the students towards the studies by giving new ideas and examples.

Module-1

Introduction to Nano-scale **5 Hours**

Feel of Nano-Dimension, Nano-System , Comparison of scales: Macro, Micro, Nano, Dimensionality and size dependent phenomena – Mesoscopic behavior, Surface to volume ratio(SA:V), Size Effect on Grain Boundaries, Length Scale and Calculations : Size effect on surface area of cubical particles, Size effect on surface atoms of cubical particles, Size effect on surface atoms on Spherical Particles,Surface energy and surface stress- surface defects

Pedagogy	Chalk and talk, Power point presentation, Videos **Self study Component:** Feel of Nano Dimension

Module - 2

Effects of Particle Sizes on Properties of Nano-Materials: **5 Hours**

Thermal Properties, Electrical Properties, Lattice Constant, Mechanical Properties, Magnetic Properties, Optical Properties, Electronic Structure and Optical Property, Dielectric Property

Pedagogy	Chalk and talk, Power point presentation, Videos **Self study Component:** Bulk physical properties of Materials

Module-3

VI-Semester

Nano-Materials : **5 Hours**

Classification of Nano-Materials : Based on Dimension: 0D, 1D, 2D and 3D Nano-Materials, , Density of States for 0D,1D,2D and 3D Nano-Materials, Inorganic-based Nano-Materials, Gold Nano-Particles, Ceramic Nano-Particles, Carbon-based Nano-Materials Fullerene, Carbon Nano-tubes and its types. Composite-based Nano-Materials: Polymer Matrix, Ceramic Matrix, Metal Matrix and examples, Zeolites, POSS.

Pedagogy	Chalk and talk, Power point presentation, Videos **Self study Component:**

Module - 4

Synthesis of Nano-Materials and Risks: **5 Hours**

Top-Down Approach : Ball Milling Method, Mechanical Alloying, Severe Plastic Deformation, Bottom up approach : PVD, Molecular Beam Epitaxy, Lithography: X-ray, Electron Beam. Self-Assembly.

Risks, Toxicity and Challenges of Nano-Materials : Introduction, Risks and Toxicity of Metallic and Oxide Nano Materials, Challenges.

Module- 5

Applications of Nano Materials: **5 Hours**

Applications of Nano-Materials : Nano-Fluids, Hydrogen storage, Solar Energy, Antimicrobial Coating, Single Electron Transistor, Nano-Textiles, Self-Cleaning Coatings, Giant Magentoresistance, Automotive sector, Construction Industry, Nano-Diamond.

Course outcome (Course Skill Set)

At the end of the course the student will be enable to

1. Explain the Size Dependence of size of Physical Properties of Nano-Materials
2. Discuss the Classification of Nanomaterials based dimension and type of material.
3. Elucidate the Synthesis of Nanomaterials and the risks and Toxicity associated.
4. Describe the applications of Nano-Materials.

VI-Semester

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. Nanomaterials and Nanocomposites : Synthesis, Properties,Characterization Techniques and Applications, Rajendra Kumar Goyal, CRC Press (Tylor and Francis Group)
2. Nano Materials , A K Bandhopadhyaya, New Age International.
3. Introduction to Nano : Basics to Nanoscience and Nanotechnology, Editors : Amretashis Sengupta Chandan Kumar Sarkar, Springer
4. Nanomaterials :An Introduction to Synthesis, Properties, and Applications, Second Edition, Dieter Vollath, Willey-VCH
5. Nano Structures and Nano Materials, Guozhong Gao, Imperial College Press.

Web links and Video Lectures (e-Resources):

1. https://nptel.ac.in/courses/118104008
2. https://nptel.ac.in/courses/118102003

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

Self Assembly Demonstration using different shaped magnets affixed on thermocol and allowed to Float on water surface.

VI-Semester

Photonics			
Course Code	**21BSP642**	CIE Marks	50
Teaching Hours/Week (L:T:P: S)	2:1:0:1	SEE Marks	50
Total Hours of Pedagogy	25	Total Marks	100
Credits	02	Exam Hours	03 Hours

Course Objectives :

1. To understand the sources of light, the properties and interaction light with the matter.
2. To understand the different types of LED light sources and various photonic components

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.
7. Inspire the students towards the studies by giving new ideas and examples.

Module-1

Sources of Light — 05 Hours.

Classical radiation processes: radiation from an accelerated charge; the Hertzian dipole. Free– free radiation. Cyclotron and synchrotron radiation. Free electron lasers. Cerenkov radiation. Light from the Sun and Stars. Thermal sources. Fluorescent lights. Luminescence sources. Electroluminescence.

Pedagogy	Chalk and talk, Power point presentation, Videos **Self-study Component:** The sources of light and the formation of spectral lines.

Module-2

Interaction of Light with Matter — 05 Hours

The classical resonator. Rayleigh scattering. Polarization and refractive index in dielectrics. Faraday rotation in a plasma. Resonant atoms in gases. The refractive index of dense gases, liquids and solids. Anisotropic refraction. Brillouin scattering. Raman scattering. Thomson and Compton scattering by electrons.

Pedagogy	Chalk and talk, Power point presentation, Videos **Self study Component: Rayleigh Scattering.**

Module-3

Nature of light and Detection: — 05 Hours.

The nature of light, Waves and rays. Total internal reflection. Electromagnetic waves. The electromagnetic spectrum. Stimulated emission, Photons and material particles. Photo emissive detectors. Semiconductor detectors. Semiconductor junction photo diodes. Imaging detectors. Photography. Thermal detectors.

Pedagogy	Chalk and talk, Power point presentation, Videos **Self-study Component: Total internal reflection**

Module-4

LED Photonics: **05 Hours.**

LED, Homojunction and Hetero-structure high intensity LEDs, LED output spectrum, Quantum Well High Intensity LEDs, LED Materials and Structures, LED Efficiencies and Luminous Flux, LEDs for Optical fiber communications, Phosphors and White LEDs. Superluminescent and Resonant Cavity LEDs: SLD and RCLED.

Pedagogy	Chalk and talk, Power point presentation, Videos **Self study Component: LED,**

Module-5

Photonic Components: **05 Hours.**

Micro-optic Lenses, Mirrors, Prisms, Polarizers Diffraction Gratings, Optical isolators, Graded Index Rod lenses, Wave-guide Couplers, Wave-guide Electro-optic Devices: Pockel's Effect Devices, Phase Modulators, Amplitude Modulators, Polarization Control,

Pedagogy	Chalk and talk, Power point presentation, Videos **Self study Component:**

Course Outcomes

After the completion of this course the student will be able to

1. Summarize the various origin of light qualitatively.
2. Describe the types of interaction of radiation with matter.
3. Apprehend the wave, ray and particle nature of light and the detection mechanisms.
4. Illustrate the types of LED sources used in photonics.
5. Demonstrate the principles of essential photonic components.

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:

Textbooks:

1. Applied Photonics by Chai Yeh, ACADEMIC PRESS
2. Optoelectronics and Photonics: Principles and Practices, S.O. Kasap, PEARSON
3. Optics and Photonics : An Introduction, F Graham Smith, Terry A King, Dan Wilkins, WILEY
4. Fundamentals of Photonics : B E A Saleh, M C Teich, Wiley Series in Pure and Applied Optics, WILEY.

Web links and Video Lectures (e-Resources):

1. https://youtu.be/Ug7UpitvczU
2. https://youtu.be/7Wq83fRDHOk
3. https://youtu.be/L-cA4gBCxHs
4. https://youtu.be/ZD7QayuwkQU

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

http://nptel.ac.in

https://swayam.gov.in

Course Code	21BSS652	CIE Marks	50
Teaching Hours/Week (L:T:P:S)	2:1:0	SEE Marks	50
Total Hours of Pedagogy	25	Total Marks	100
Credits	2	Exam Hours	3

Course Learning objectives:

CLO 1	The course will cover the basic principles of Industrial chemistry.
CLO 2	The class will cover the fundamentals principles of the various purification techniques used in industries like distillation, absorption, adsorption and solvent extraction.
CLO 3	It provides a selective understanding on the production, storage and handling of important gases like-oxygen, argon, helium, hydrogen and acetylene
CLO 4	This course provides information on the surface coatings, Pharmaceuticals and agrochemicals.

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 Chemical Technology

Basic principles of distillation, solvent extraction, solid-liquid leaching and liquid-liquid extraction, separation by absorption and adsorption. An introduction into the scope of different types of equipment needed in chemical technology, including reactors, distillation columns, extruders, pumps, mills, emulgators. Scaling up operations in chemical industry.

Pedagogy	**Chalk and talk/power point presentation:** Basic principles of distillation, solvent extraction, solid-liquid leaching and liquid-liquid extraction, separation by absorption and adsorption. **Videos/Learning material:** An introduction into the scope of different types of equipment needed in chemical technology, including reactors, distillation columns, extruders, pumps, mills, emulgators. **Self-study:** Scaling up operations in chemical industry.

Module-2 Industrial Gases & Inorganic Chemicals

Large scale production, uses, storage and hazards in handling of the following gases: oxygen, nitrogen, argon, acetylene, carbon monoxide, chlorine, sulphur dioxide and phosgene.

Inorganic Chemicals: Industrial preparation with the help of flowchart, application, analysis and hazards in handling the following chemicals: hydrochloric acid, nitric acid, sulphuric acid, borax, bleaching powder, hydrogen peroxide, potash alum, potassium dichromate and potassium permanganate.

Pedagogy	**Chalk and talk/power point presentation:** Large scale production, uses, storage and hazards in handling of the following gases: oxygen, nitrogen, argon, acetylene, carbon

	monoxide, chlorine, sulphur dioxide and phosgene. **Videos/Learning material: Inorganic Chemicals:** Industrial preparation with the help of flowchart, application, analysis and hazards in handling the following chemicals: hydrochloric acid, nitric acid, sulphuric acid, borax, bleaching powder, hydrogen peroxide, potash alum, potassium dichromate and potassium permanganate. **Self-study:** Hazards in handling of the following gases: oxygen, nitrogen.
Module-3 Surface Coatings	
Objectives of surface coatings, preliminary treatment of surface and classification of surface coatings.Paints and pigments - formulation, composition and related properties. Oil paint, Pigments, toners and lakes pigments, fillers, thinners, enamels, emulsifying agents. Special paints (heat retardant, fire retardant, eco- friendly and plastic paint), wax polish, water paints, additives. Metallic coatings (electrolytic and electroless), metal spraying and anodizing.	
Pedagogy	**Chalk and talk/power point presentation:** Objectives of surface coatings, preliminary treatment of surface and classification of surface coatings. Paints and pigments - formulation, composition and related properties. Oil paint, Pigments, toners and lakes pigments, fillers, thinners, enamels, emulsifying agents. **Videos/Learning material:** Special paints (heat retardant, fire retardant, eco- friendly and plastic paint), wax polish, water paints, additives. **Self-study:** Metallic coatings (electrolytic and electroless), metal spraying and anodizing.
Module-4 Fertilizers & Pesticides	
Fertilizers: Different types of fertilizers (N, P and K). Importance of fertilizers, chemistry involved in the manufacture of the following fertilizers: urea, ammonium nitrate, calcium ammonium nitrate, ammonium phosphates, superphosphate of lime, potassium chloride and potassium nitrate. **Pesticides**: Introduction to pesticides (natural and synthetic), benefits and adverse effects, changing concepts of pesticides. Synthesis and uses of representative pesticides in the following classes: Organochlorines (DDT, Gammaxene), Organophosphates (Malathion, Parathion), Carbamates (Carbofuran and carbaryl), Quinones (Chloranil), Anilides (Alachlor and Butachlor).	
Pedagogy	**Chalk and talk/power point presentation: Fertilizers**: Different types of fertilizers (N, P and K). Importance of fertilizers, chemistry involved in the manufacture of the following fertilizers: urea, ammonium nitrate, calcium ammonium nitrate, ammonium phosphates, superphosphate of lime, potassium chloride and potassium nitrate. **Videos/Learning material: Pesticides**: Introduction to pesticides (natural and synthetic), Synthesis and uses of representative pesticides in the following classes: Organochlorines (DDT, Gammaxene), Organophosphates (Malathion, Parathion), Carbamates (Carbofuran and carbaryl), Quinones (Chloranil), Anilides (Alachlor and Butachlor). **Self-study:** Benefits and adverse effects, changing concepts of pesticides.
Module-5 Drugs and Pharmaceuticals	
Drug discovery, design and development; Retrosynthetic approach (with any two examples). Synthesis of the representative drugs of the following classes: analgesics, antipyretics, anti-inflammatory agents (Aspirin), antibiotics (Chloramphenicol); antibacterial and antifungal agents (Sulphonamides); Cardiovascular drugs (Glyceryltrinitrate).	

Pedagogy	**Chalk and talk/power point presentation:** Drug discovery, design and development; Retrosynthetic approach (with any two examples). Synthesis of the representative drugs of the following classes: analgesics, antipyretics, anti-inflammatory agents (Aspirin), antibiotics (Chloramphenicol); **Videos/Learning material:** Antibacterial and antifungal agents (Sulphonamides); **Self-study:** Cardiovascular drugs (Glyceryltrinitrate).

Course outcome (Course Skill Set)

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

CO1	Explain the various procedures used in separation of chemicals
CO2	Illustrate the industrial production of a number of important gases and inorganic chemicals.
CO3	Identify the coating techniques for various applications
CO4	Differentiate the chemicals used in Fertilizers, Pesticides and Pharmaceuticals

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 5thweek of the semester
2. Second test at the end of the 10thweek 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 13thweek 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:

Books:

1. Vermani, O. P.; Narula, A. K. (2004), Industrial Chemistry, Galgotia Publications Pvt. Ltd., New Delhi.
2. Gupta, P.K.; Gupta, S.K.(2011),Pharmaceutics and Cosmetics, PragatiPrakashan

3. Bhatia, S. C. (2004), Chemical Process Industries, Vol. I & II, CBS Publishers, New Delhi.
4. Jain, P. C.; Jain, M. (2013), Engineering Chemistry, DhanpatRai& Sons, Delhi.
5. Kent, J. A. (ed) (1997), Riegel's Handbook of Industrial Chemistry, CBS Publishers, New Delhi.
6. Stocchi, E.(1990), Industrial Chemistry, Vol -I, Ellis Horwood Ltd. UK
7. Benvenuto, M. A. (2017) Industrial Organic Chemistry,DE GRUYTER, Germany.
8. Benvenuto, M. A. (2015) Industrial Inorganic Chemistry, DE GRUYTER, Germany.

Web links and Video Lectures(e-Resources):

1. NPK Fertilizershttps://youtu.be/rKzt9BvvEeQ
2. Pesticide chemistry, Classification of Pesticides based on Origin & Source. Part-02 https://youtu.be/QN_B2P6bxzs
3. Pesticide Chemistry https://youtu.be/D6t_Ikfn4GI
4. Pharmaceutical chemistry https://youtu.be/L9Ms2hiGJyU
5. Liquid liquid extraction: https://youtu.be/1tmqUVSVPo4
6. Surface Coatings: https://youtu.be/Aoo4iMUPee8

Skill Development Activities Suggested

- Assignments
- Quizes
- Seminars

B.Sc. Honors (Physics/Chemistry)

Choice Based Credit System (CBCS) and Outcome Based Education (OBE)

SEMESTER - VI

Linear Programming, Probability and Statistics			
Course Code	**21BSS653**	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:

- Provide graphical solution of linear programming problems with two variables, and illustrate the concept of convex set and extreme points.
- Solve linear programming problems using simplex method.
- Familiar with correlation of bi-Variate data
- Understand the basic concepts of probability theory

Pedagogy (General Instructions)

These are sample Strategies; which teachers can use to accelerate the attainment of the various course outcomes.

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 for Mathematical Science Studies and Provide real-life examples.
3. Support and guide the students for self–study.
4. You will also be responsible for assigning homework, 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
   - 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:	
Linear Programming Problem: Convexity and Basic Feasible Solutions. Formulation and examples, Graphical Solution, Convex and polyhedral sets, Extreme points, Basic solutions, Basic feasible solutions, Correspondence between basic feasible solutions and extreme points. **Self-study:** Definition of OR, steps (phases) in OR study, characteristics and limitations of OR, models used in OR,	
(RBT Levels: L1, L2 and L3)	**5 hours**
Pedagogy	Chalk and talk method/PowerPoint Presentation.
Module-2: Simplex Method	

Canonical and Standard form of LP problem, Optimality criterion, slack and surplus variables, Solutions to LPP by Simplex method, Artificial Variable, Big-M Method and Two-Phase Simplex Method.

Self-study: Degeneracy in LPP.

(RBT Levels: L1, L2 and L3) **5 hours**

Pedagogy	Chalk and talk method/PowerPoint Presentation.

Module-3: Curve fitting and Regression Analysis

Curve fitting: $y = ax + b, y = ax^2 + bx + c$

Karl-Pearson's Correlation coefficient, Rank correlation, Lines of Regressions.

Self-study: Curve fitting - $y = ax^b$

(RBT Levels: L1, L2 and L3) **5 hours**

Pedagogy	Chalk and talk method/PowerPoint Presentation.

Module-4: Probability

Introduction, Sample space, Events, Mutually exclusive events, Exhaustive events, Independent events, Definition of probability, Axioms of Probability, Conditional probability, Baye's Theorem.

Self-study: Permutation and combinations.

(RBT Levels: L1, L2 and L3) **5 hours**

Pedagogy	Chalk and talk method/PowerPoint Presentation.

Module-5: Random variable

Random Variable, Discrete and Continuous random variables, Probability distribution and density functions, Mean, Variance and standard deviation. Binomial and Poisson distribution. Normal distribution.

Self-study: Uniform and Exponential distribution.

(RBT Levels: L1, L2 and L3) **5 hours**

Pedagogy	Chalk and talk method/PowerPoint Presentation.

Course outcome:

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

- Formulate as L.P.P and derive optimal solutions to linear programming problems.
- Solving LPP by graphical method, Simplex method, Big-M method.
- Analyse and design various statistical problems.
- To understand the scenarios to apply suitable probability distribution models.

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

Books Recommended:

1. Operations Research, An Introduction, Seventh Edition, Hamdy A. Taha, PHI Private Limited, 2006.
2. Operations Research, S D Sharma Kedarnath Ramnath & Company.
3. Operations Research, Theory and Applications, Sixth Edition, J K Sharma, Trinity Press, Laxmi Publications Pvt. Ltd. 2016.
4. S C Gupta and V K Kapoor, "Fundamentals of Mathematical Statistics", S Chand and Company, Latest edition.
5. B S Grewal (2021). Higher Engineering Mathematics, 44th Edition, Khanna Publishers.

Web links and Video Lectures (e-Resources):

- http://ocw.mit.edu/courses/mathematics/
- http://www.foureir-series.com/
- http://mathworld.wolfram.com/

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

- Quiz
- Group assignment
- Seminars

B.Sc. Honors (Physics/Chemistry/Mathematics)

Choice Based Credit System (CBCS) and Outcome Based Education (OBE)

SEMESTER - VI

Subject Name: FINANCE & BANKING			
Course Code	**21BSO662**	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:

CO1. To explain fundamental banking concepts.
CO2. To explain and use the banking system.
CO3. To develop and implement new ideas and innovations in banking service operations and procedures.
CO4. To improve organisational effectiveness.
CO5. To proper utilization of financial resources.

Pedagogy (General Instructions)

Teaching-Learning Process (General Instructions) These are sample Strategies; which teachers can use to accelerate the attainment of the various course outcomes.

1. Lecturer methods (L) need not be only the traditional lecture methods, but alternative effective teaching methods could be adopted to attain the outcomes.
2. Use of Video to explain various concepts.
3. Encourage collaborative (Group Learning) Learning in the class.
4. Ask at least three HOT (Higher Order Thinking) questions in the class, which promotes critical thinking.
5. Introduce Topics in manifold representations.
6. Show the different ways to analyze the research problem and encourage the students to come up with their own creative ways to solve them.
7. Discuss how every concept can be applied to the real world - and when that's possible, it helps Improve the students' understanding.

Module-1

Banking System in India

Meaning, Definitions, Features of a bank – Meaning, definition and features of banking – Features of Indian Banking System – Reserve Bank Of India – Role and Functions, Commercial Banks – Role and Functions.

Teaching- Learning Process: Chalk and talk method / PowerPoint Presentation.

(RBT Levels: L1, L2 and L3) **5 hours**

Module-2

Banking Products

Bank Accounts – Saving Bank Accounts, Current Accounts, Recurring deposit accounts, fixed deposit accounts, NRI accounts, pigmy accounts, and other special accounts. – Procedures and docs involved in opening bank accounts (offline and online).

Teaching-Learning Process: Chalk and talk method / PowerPoint Presentation

(RBT Levels: L1, L2 and L3) **5 hours**

Module-3

Recent Innovations in Banking

E-Banking, Telebanking, Internet banking, Mobile banking, NEFT, RTGS, EFT, UPI, IMPS, ATM, Debit card, credit card, MICR Cheques, Crypto Currency, Central bank digital currency.

Teaching-Learning Process: Chalk and talk method / PowerPoint Presentation

(RBT Levels: L1, L2 and L3) **5 hours**

Module-4

Financial Management

Meaning of finance – Business finance, Importance of business finance - Financial requirements-working Capital requirements and fixed capital requirements

Teaching-Learning Process: Chalk and talk method / PowerPoint Presentation

(RBT Levels: L1, L2 and L3) **5 hours**

Module-5:

Sources of finance

Methods of rising finance- Equity and preference shares, Debentures, and bonds, retained earnings, public deposits, loan from commercial banks, financial institutions, trade credits.

Teaching-Learning Process: Chalk and talk method / PowerPoint Presentation

(RBT Levels: L1, L2 and L3) **5 hours**

Course outcome:

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

CO 1. Understand the fundamental function of banking
CO 2. Analyze the banking products and decision making.
CO 3. Comprehend emerging trends in banking.
CO 4. Understand the basic financial concepts
CO 5. Estimate the working capital & fixed capital requirements

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 hour**)

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

Books Recommended:

1. Dr. Guruprasad B G & Udaykumar C. (2022) **"Banking Innovations",** Sapna Book House
2. Verma J C (1997) **"Venture Capital Financing"** , SAGE Publications
3. H R Machiraju (2019) **"Indian Financial System",** Vikas Publishing House
4. B S Raman (Recent Edition) **"Business Studies"** , United Publishers

Web links and Video Lectures (e-Resources):

https://irjhis.com/paper/IRJHIS2111015.pdf
https://www.capitalone.com/bank/money-management/banking-basics/banking-products-and-services

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

- Quiz
- Group assignment
- Seminars

B.Sc. Honors (Physics/Chemistry/Mathematics)

Choice Based Credit System (CBCS) and Outcome Based Education (OBE)

SEMESTER - VI

Subject Name: Sociology			
Course Code	**21……**	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:

1. To understand the nature of sociology
2. To know about culture and socialization
3. To know the Social change and its research in the society
4. To understand Indian society and its unity and diversity
5. To know about social movements and its impact on the society in general

Pedagogy (General Instructions)

These are sample Strategies; which teachers can use to accelerate the attainment of the various course outcomes.

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 for Mathematical Science Studies and Provide real-life examples.
3. Support and guide the students for self–study.
4. You will also be responsible for assigning homework, 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
   - 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: Nature of sociology

Introdution, Meaning and definition of sociology, Basic Concepts of Sociology, Social Process - Meaning, definition and types. Culture and Socialization.

(RBT Levels: L1, L2) **5 hours**

Pedagogy	Chalk and talk method/PowerPoint Presentation.

Module-2: Culture and Socialization

Culture : Meaning, definition and Characteristics. Types of Culture : Material and Non-material Culture. : culture lag. Socialization : Meaning and Definition. Stages of : Oral, anal, oedipal, adolescence and adulthood. Agencies of Socialization : (Family, peer groups, schools, mass media and state) The Role of culture in socialization.

(RBT Levels: L1, L2) **5 hours**

Pedagogy	Chalk and talk method/PowerPoint Presentation.

Module-3: Social Change & Social Research

Social change : Meaning, definition and characteristics of social Change - Forms of Social change. Factors for social change. Social Research : Meaning, definition, Sources of Data. Society and Environment : Meaning, Definition and Types.	
(RBT Levels: L1, L2 and L3)	**5 hours**
Pedagogy	Chalk and talk method/PowerPoint Presentation.
Module-4: Indian society	
Unity in diversity: Nature of diversity, regional, linguistics, cultural & ethnic, Nature of Unity in India. National integration: meaning and definitions, Challenges to national integration. Social inequality: meaning and definitions, Exclusion and inclusion concept.	
(RBT Levels: L1, L2 and L3)	**5 hours**
Pedagogy	Chalk and talk method/PowerPoint Presentation.
Module-5: Social movements and social changes in India	
Social movements in India: Meaning, definitions of social movements, components of social movements, types of social movements. Westernization and its effects, modernisation and its impact, Globalization, Concept of Global Outlook.	
(RBT Levels: L1, L2 and L3)	**5 hours**
Pedagogy	Chalk and talk method/PowerPoint Presentation.

Course outcome:

At the end of the course, the student will be able to analyse and understand about:

- The nature of sociology and its area
- Indian culture and socialization in different perspectives
- Social change and its research in the society
- Indian society and its unity and diversity
- social movements and its impact on the society in general

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 hour**)

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

Books Recommended:

Text Books:

1. **Introduction to Sociology**, Prescribed textbook for first PUC, 2021-2022, Published by Department of Pre University education, Government of Karnataka
2. **Sociology of Indian society,** Prescribed textbook for Second PUC, 2021-2022, Published by Department of Pre University education, Government of Karnataka
3. Handbook on Sociology, VTU study material

Reference Books:

1. **NATURE AND SCOPE OF SOCIOLOGY** by **MSC. Asutosh** (Author), Publisher : Asutosh (10 March 2022).
2. **Essential Sociology** Second Edition by Nitin Sangwan (Author), Seema (Author), Shruti Jakhar (Author), Publisher : EduGali; Second Edition (1 January 2022).

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

- Quiz
- Group assignment
- Seminars

B.Sc. Honors (Physics/Chemistry/Mathematics)

Choice Based Credit System (CBCS) and Outcome Based Education (OBE)

SEMESTER - VI

Subject Name: INTELLECTUAL PROPERTY RIGHTS			
Course Code	**21IPR67**	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:

CO1. To understand the basic concepts of IPR.
CO2. To know the types of IPRs and drafting procedure.
CO3. To know the emerging Issues and Challenges.
CO4. To analyze the future aspects of Intellectual Property Rights

Pedagogy (General Instructions)

Teaching-Learning Process (General Instructions) These are sample Strategies; which teachers can use to accelerate the attainment of the various course outcomes.

1. Lecturer methods (L) need not be only the traditional lecture methods, but alternative effective teaching methods could be adopted to attain the outcomes.
2. Use of Video to explain various concepts on IPR.
3. Encourage collaborative (Group Learning) Learning in the class.
4. Ask at least three HOT (Higher Order Thinking) questions in the class, which promotes critical thinking.
5. Introduce Topics in manifold representations.
6. Show the different ways to analyze the research problem and encourage the students to come up with their own creative ways to solve them.
7. Discuss how every concept can be applied to the real world - and when that's possible, it helps Improve the students' understanding.

Module-1:

Introduction: Introduction to Intellectual Property Rights Concept and Theories Kinds of Intellectual Property Rights Economic analysis of Intellectual Property Rights Need for Private Rights versus Public Interests Advantages and Disadvantages of IPR.

Criticisms of Intellectual Property Rights, Politics of Intellectual Property Rights, Third World Criticisms and Marxist Criticisms.

Teaching- Learning Process: Chalk and talk method / PowerPoint Presentation.

(RBT Levels: L1, L2 and L3) **5 hours**

Module-2:

Introduction to Patents: An Overview Historical development Concepts, Novelty, Utility Inventiveness/Non-obviousness. Patent Act 1970 – amendments of 1999, 2000, 2002 and 2005 Patentable subject matter, Patentability criteria, non-patentable inventions Pharmaceutical products and process and patent protection Software Patents Patenting of Micro-organism. Rights of patentee Procedure for granting a patent and obtaining patents Grounds for opposition Working of Patents, Compulsory License Acquisition, Surrender, Revocation, restoration Transfer of patent rights. Infringement and its effects and management.

Case Studies on Patents. Case study of Curcuma (Turmeric) Patent, Case study of Neem Patent, Case study of Basmati patent, Case study of Apple Inc. v. Samsung Electronics Co., Ltd.

Teaching-Learning Process Chalk and talk method / PowerPoint Presentation

(RBT Levels: L1, L2 and L3) **5 hours**

Module-3:

Copyright and Neighbouring Rights Concept and Principles: Historical background and Development of Copyright Law Leading International Instruments, Berne Convention, Universal Copyright Convention, International Copyright under Copyright Act WIPO Phonograms and Performances treaty. Copyright Act, 1957 Terms of Copyright conditions for grant of copyright, extent of rights exception to copyright protection, fair use provision, assignment and licensing, Copyright in Literary, Dramatic and Musical ,Works, Sound Recording, Cinematograph Films, Copyright in Computer Programme, Author Special Rights, Right of Broadcasting and performers. Copy rights registrations and infringements.

Teaching-Learning Process :Chalk and talk method / PowerPoint Presentation

(RBT Levels: L1, L2 and L3) **5 hours**

Module-4:

Basic Principles of Design Rights - Justification for Protecting Designs - Historical Perspective - Features of Shape, configuration, Pattern or Ornament - or Composition of lines or colour - New or Original - Applied to an Article, Excluded Subject - Matter - Method or Principle of Construction - Features Dictated Solely by Function - Mechanical Device - Trademark, or Property Mark, or Artistic Work - immoral Designs and Designs Contrary to Public order–Rights of the Owner of Designs and Tests for Infringement. Assignment of Design Rights, Infringement of Designs.

Teaching-Learning Process :Chalk and talk method / PowerPoint Presentation

(RBT Levels: L1, L2 and L3) **5 hours**

Module-5:

Historical development of the concept of trademarks, trade secrets, Geographical integrated products, machine designs, lay out and topographical designs, and other IPRs.

Emerging issues and challenges in IPR; Public health and Intellectual Property Rights Case study—Novartis Pharmaceuticals and Bayer Pharmaceuticals. TRIPS Flexibilities and access to medicine IPR and Climate change Patents and Biotechnology. Traditional knowledge and IPR Bio piracy Domain Name, Disputes and Cyber squatting

Teaching-Learning Process :Chalk and talk method / PowerPoint Presentation

(RBT Levels: L1, L2 and L3) **5 hours**

Course outcome:

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

CO 1. To know the basic concepts of IPR.
CO 2. To know the fundamentals of Patent laws and drafting procedure.
CO 3. To know the fundamentals of Copy Rights.
CO 4. To understand basic principles of design rights
CO 5. To understand emerging issues and challenges in IPR.

Assessment Details (both CIE and SEE)

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

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

Books Recommended:

Fundamentals of Intellectual Property Rights by Ramakrishna B , Anil Kumar H.S **ISBN 13** 9781946556318, Notion Press: Edition 2016.

D.P. Mittal (Taxman Publication), Indian Patents Law and Procedure

•B.L. Wadera, Patents, trademarks, copyright, Designs and Geographical Judications.

• P. Narayanan (Eastern Law House), Intellectual Property Law

• N.S. Gopalakrishnan & T.G. Agitha, Principles of Intellectual Property (2009), Eastern Book Company, Lucknow

References:

Laws relating to Intellectual Property Rights by V K Ahuja Publisher Code: 9788131251652, Lexis Nexis: Edition 2017

Web links and Video Lectures (e-Resources):

https://www.google.com/search?rlz=1C1ASVC_enIN953IN954&q=%22weblinks%22+for+Research+methodology+and+IPR&sa=X&ved=2ahUKEwirt8XRhZiAAxVQb2wGHW9SB6QQ5t4CegQIOhAB

https://www.dolphininstitute.in/workshops-seminars-conducted-on-research-methodology-ipr-and-entrepreneurship/

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

- Quiz
- Group assignment
- Seminars