Group Theory

1. Name of the Course: Group Theory
2. LTP structure of the course: 2-0-0
3. Objective of the course: To have the knowledge of groups and their properties.
4. Outcome of the course: Upon successful of this course, one will be able to understand the structure of finite abelian group, analyze examples of subgroups, normal subgroups and quotient groups, and use of the concepts of homomorphism and isomorphism.
5. **Course Plan:**

Component	Unit	Topics for Coverage
C1	Unit 1	Group, subgroup, Lagrange's theorem, homomorphism, normal subgroup, quotient group, cyclic group
	Unit 2	Cayley's theorem, group action, Sylow's theorem, direct product, structure theorem of finite abelian group
C2	Unit 3	Simple group, solvable group, nilpotent group, composition series, Jordan Holder theorem,
	Unit 4	Semi-direct product, free group, frees abelian group.

6. **Text Book:**

1. D. S. Dummit and R. M. Foote, Abstract Algebra, John Wiley & Sons, Inc., 2004.

7. References Books:

1) I. N. Herstein, Topics in Algebra, John Wiley & Sons, Pte. Ltd., 2006..

2) Ramji Lal, Algebra 1 (Groups, Rings, Fields and Arithmetic), Springer International Publishing AG.,2017.

Physics of Solar Cells

1. Name of the Course: Physics of Solar Cells.
2. LTP structure of the course: 1-1-0.
3. Objective of the course: To expose the B. Tech./M. Tech/ PhD students to physics of solar cell, materials (green technology).
4. Outcome of the course: Students will be able to understand use of green energy and application of semiconducting materials.
5. **Course Plan:**

Component	Unit	Topics for Coverage
C1	Unit 1	Problems of the Energy Economy, Photons, Semiconductors,
	Unit 2	Conversion of Thermal Radiation into Chemical Energy, Conversion of Chemical Energy into Electrical Energy
C2	Unit 3	Basic Structure of Solar Cells, Limitations on Energy Conversion in Solar Cells
	Unit 4	Concepts for Improving the Efficiency of Solar Cells, Prospects for the Future

6. **Text Book:**

1. Physics of Solar Cells: From Basic Principles to Advanced Concepts, 2nd Edition by Peter Würfel (ISBN: 978-3-527-40857-3).

2. Solar Energy: The physics and engineering of photovoltaic conversion, technologies and systems by by Arno Smets, Klaus Jager, Olindo Isabella , Rene van Swaaij.

Electrical Equivalent Circuit Model of Biological Cell

1. Name of the Course: Electrical Equivalent Circuit Model of Biological Cell
2. LTP structure of the course: 1-1-0
3. Objective of the course: The aim of the course is to study the electrical activity of biological cells.
4. Outcome of the course: The students will learn about the structure of biological cell membrane and its electrical activity. The complex membrane structures that help in the generation and propagation of electrical signal to the regions of interest. Also, students will learn about the biological cell is a 'living circuits' that might act as model systems for studying various biological behaviors including nerve impulses.
5. **Course Plan:**

Component	Unit	Topics or Coverage
C1	Unit 1	Membrane structure, Ion channels, Different type of ion channels.
	Unit2	Nernst equation, Resting potential, Depolarization.
C2	Unit 3	Action potential, End point potential.
	Unit 4	Refractory period, Hodgkin–Huxley model.

Text Books: Will be provided at the starting of the course

Genetic Engineering

1. Name of the Course: Genetic engineering
2. LTP structure of the course: 1-1-0
3. Objective of the course: The aim is to provide the students with the essential knowledge about the structure & function of genome and different methods used for its manipulation for wide spread applications.
4. Outcome of the course: Genetic engineering is one of the sophisticated and complicated branches of science in 21st century. Different techniques have been developed to modify the genome of an organism which has wide applications in Medical industry, Agriculture sector, Pharmaceuticals and Biotechnology industry. This course will provide an overview of the structures and functions of the genetic materials and discuss the different methods used for their manipulation. The study will be extended further to understand the applications of Genetic engineering.
5. Course Plan:

Component	Unit	Topics or Coverage
C1	Unit 1	Structure & function of genetic materials, Cloning Vectors, Enzymes
	Unit 2	Restriction enzymes, Types of Restriction Enzymes, Cutting sites.
C2	Unit 3	Techniques used in genetic engineering, Mutagenesis, Knock-in, Knock-out, conditional knock-outs, Regulation of gene expression,
	Unit 4	Recombinant DNA technology and its application.

6.Text Book:

1. Biochemistry by Jeremy M. Berg, John L. Tymoczko, and Lubert Stryer.

2. Lehninger Principles of Biochemistry by Albert L. Lehninger, David L. Nelson and Michael M.Cox.

3.Molecular Biology of the Gene by James D. Watson, Tania A. Baker, Stephen P. Bell, Alexander Gann, Michael Levine, and Richard Losick.

Workshop on Physics Principles -1

1. Name of the Course: Workshop on Physics principles-1.
2. LTP structure of the course: 0-0-2.
3. Objective of the course: All the students will get hand on experience on Physics Law's.
4. Outcome of the course: All the students will get better understanding about physics.
5. **Course Plan:**

Component	Unit	Topics or Coverage
C1	Unit 1	Total Internal reflection of Light, Bending of Light, Centre of mass.
	Unit 2	Magnetic field lines, Surface Tension, Energy salt water, Conductivity, Induction cooker
C2	Unit 3	Air track [Inverse square law's, Shape of potential], Bernoulli's Principle, Distance measurement using ultrasonic waves.
	Unit 4	Conservation of energy, Standing wave, Magnetic effect of current

6. **Text Books:** Manuals will be provided at the workshop.