B.Sc Physics Core (2017-18)

Mechanics and Properties of Mater (Physics for B.Sc (CORE)- SEM-2)

Total 36 Hrs and it will be equally shared Dr. Siby Mathew and Dr Mathew George @1 hour per week for each.

COURSE OBJECTIVES

This course would empower the student to acquire engineering skills and practical knowledge, which help the student in their everyday life. This syllabus will cater the basic requirements for their higher studies. This course will provide a theoretical basis for doing experiments in related areas also.

Basic Reference

1. Fundamentals of Physics - Halliday and Resnik (John Wiley)
2. Principles of Mechanics - John. L. Synge and Byron A Griffith (Mc- Graw Hill)
3. Advanced Physics - Materials and Mechanics - Tom Duncan (John Murray London)
4. Mechanics - D.S.Mathur (S.Chand)
5. Classical Mechanics - Goldstein
6. Classical Mechanics - K. SankaraRao (Prentice. Hall of India- N.Delhi)
7. Text Book of Sound - Brijlal and Subramaniam (S.Chand)
8. Refresher Course in Physics - Vol1- C.L.Arora
9. Vibration, Waves and Acoustics - D.Chattopadhyay (Books and Allied Pvt Ltd)
10. Properties of Matter - Brijlal and Subramaniam (S.Chand)
11. Properties of Matter - -D.S.Mathur (S.Chand)
12. Mechanics- H.S.Hans and S.P.Puri. (Tata McGraw-Hill)
13. Properties of Matter- Brijlal and N. Subrahmanyam (S. Chand and Co.)
14. Mechanics- J.C. Upadhyaya (Ram Prasad and Sons)

COURSE OUTCOMES:

At the end of the course, the student will get sufficient theoretical basis for problem solving skills related to mechanics and Properties of mater, and also understand the basic requirements for his/her higher studies.

Dr Mathew George

Sessions	Topic	Method
1	Introduction , Velocity- acceleration- force – acceleration due to gravity-weightlessness,	Lect.
2	compound pendulum (symmetric and unsymmetric) radius of gyration- kater's pendulum - centripetal acceleration and force- centrifugal force	Lect.
3	Angular velocity- angular acceleration- angular momentum- conservation-	Lect.
4	torque moment of inertia- Parallel and perpendicular axes theorem -	Lect.
5	Problem Solving Session	Group Activity
6	calculation of moment of inertia- rod, ring, MI	Lect.
7	rod, ring, MI	Lect.
8	Problem solving and revision	Class activity
9	**1st Internal**	1 Hr
10	calculation of moment of inertia- rod, ring, MI disc, cylinder, MI	Lect.
11	Sphere –MI	Lect.

12	Problem solving and revision	Class activity
13	Molecular theory of surface tension- surface energy- excess pressure in a liquid	Lect.
14	Drop transverse waves on the surface of a liquid- effect of gravity-	Lect.
15	effect of surface tension- factors affecting surface tension- applications.	Lect.

16	**2nd Internal**	2 Hrs
17	Streamline and turbulent flow- critical velocity- derivation of Poiseuille's	Lect.
18	Formula derivation of - Stoke's formula- Lubricants	
18	Problem Solving and Revision	Class activity

Dr. Siby Mathew

Sessions	Topic	Method
1	**Module II (9 Hrs)**	Lect.
2	**Oscillation and waves: 9 hrs** SHM,	Lect.
3	equation of motion to SHM-	Lect.
4	theory of damped oscillation (over, under, critical)-	Lect.
5	theory of forced oscillation- resonance- solution equation to progressive wave-	Group Activity
6	energy of progressive wave- superposition of waves- theory of beats	Lect.
7	Doppler effect	Lect.
8		Class activity
9	**1st Internal**	1 Hr
10	**Elasticity: 8 hrs** Stress- strain-	Lect.
11	Hooke's law-	Lect.
12	elastic module- Poisson's ratio- bending of Beams bending moment- Young's modulus (cantilever-mirror and telescope)-	Class activity
13		Lect.

14	Young's modulus (uniform and non uniform bending-microscope) torsional oscillations rigidity	Lect.
15	modulus- static torsion(mirror and telescope)- I section girder.	
16		
17		
18		

ASSIGNMENTS

	Date of submission/completion	**Topic of Assignment & Nature of assignment (Individual/Group – Written/Presentation – Graded or Non-graded etc)**	**Weightage/marks**
1	18-12-2018	Individual- Graded	10
2	16-01-2019	Individual- Graded	10
3	05-02-2019	Individual	10
4	06-03-2019	Presentation - Group	10

ASSIGNMENTS/EXERCISES – Details & Guidelines – Will be notified prior to the announcement of the assignment

Additional Work: Solving all the problems mentioned in the reference books

Classical and Quantum Mechanics - SEM-V

Course Coordinators: Prof. V. M. George and Prof. Alex Shinu Scaria

COURSE OBJECTIVES

The syllabus will cater into the basic requirements for his/her higher studies. The Course requires basic knowledge of Classical mechanics and..

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Basic Reference:

1. Classical Mechanics- K Sankara Rao, Prentice Hall of India (Chapter - 6)
2. Classical Mechanics- J.C. Upadhyaya (Ram Prasad and sons)
3. Classical Mechanics – 3rd Edition: Herbert Goldstein, Charles Poole & John,Pub. Pearson Education(Indian Edn)

COURSE OUTCOMES:

At the end of the course, the student will be enriched towards the field of Classical Mechanics, …

Sessions By Prof. V.M. George Covering the portions:

Sessions (1 Hr each)	**Topic**	**Method**
1	Introduction – to Classical Mechanics	Lect.
2	Constraints and degrees of freedom	Lect.

3	Generalized coordinates – Classification of a dynamical system	Class Activity in Groups
4	Principle of virtual work	Lect.
5	D'Alemberts Principle	Class Activity in Groups.
6	Lagrange's equations for general systems	Lect.

7	Problems	Lect.+ Class Activity
8	CIA - 1	1 hr Exam
9	Applications – one dimensional harmonic oscillator	Lect.
10	planetary motion	Lec
11	Hamilton's equations of motion	Lect.
12	One dimensional harmonic oscillator	Lect. + Class activity
13	Hamilton's Principle for a conservative system	Lect.
14	Principle of least action	Lect.
15	Calculus of variations	Lect.
16	Lagrange's equation from Hamilton's Principle	Lec
17	Problems	Class activity
18 19-20	Problems CIA-II	Class activity 2 hr Exam

ASSIGNMENTS

	Date of submission/completion	**Topic of Assignment & Nature of assignment (Individual/Group –**	**Marks**

		Written/Presentation – Graded or Non-graded etc)	
1	Before 1st Internal	Individual- Graded	10
2	Before 2nd Internal	Individual- Graded	10
3	Before 2nd Internal	Individual	10

ASSIGNMENTS/EXERCISES – Details & Guidelines – Will be notified prior to the announcement of the assignment

Additional Work: Solving all the problems mentioned in the basic reference book.

B.Sc: Physics (Core)

Discipline: Physics

Semester: 5

Course Name: Physical Optics and Photonics

Teaching: Three lecture class per week handled by Dr. Jimmy Sebastian (2 hr. /week.), Prof. V.M. George (1 hr. /week.),

REFERENCE

1. Optics 3 rd edition- Ajoy Ghatak, TMH

2. Optical Electronics – Ajoy Ghatak and K Thyagarajan, Cambridge

3. Optics and Atomic Physics D P Khandelwal, Himalaya Pub. House

4. Optics S K Srivastava, CBS Pub. N Delhi

5. A Text book of Optics S L Kakani, K L Bhandari, S Chand**.**

6. An introduction to lasers theory and applications.MN Avadhanulu.S.Chand

7. Optics by Subramanayam, Brijlal, MN Avadhanalu, S.Chand

OBJECTIVE

This course aims to provide necessary foundation in optics and photonics which prepare the students for an intensive study of advanced topics at a later stage.

COURSE OUTCOMES:

Knowledge of interference, diffraction, polarization, fiber optics and fundamentals understanding of holography. Capability of relating the theory predictions and measurement.

Sessions		**Topic**	**Method**	**Remarks**
1	JS	Light	Discussion	Introduction of Syllabus, understanding of light
2	JS	Review of basic ideas of interference	PPT+Lecture + question answer session.	Syllabus
3	JS	Coherent waves-Optical path and phase change-superposition of waves, condition for bright and dark fringes	Lecture + question answer session.	Syllabus
4	JS	Problem solving session	Problem solving	Syllabus
5	JS	Thin film, interference an introduction	Lecture + question answer session.	Syllabus
6	JS	Thin film, interference due in reflected light	Lecture + question answer session.	Syllabus
7	JS	Thin film, interference in transmitted light	Lecture + question answer session.	Syllabus
8	JS	Haidinger fringes and problem solving session	Lecture + question answer session.	Syllabus
9	JS	Interference in wedge shaped film, colours in thin films	Lecture + question answer session.	Syllabus
10	JS	Newtons rings	PPT+Lecture + question answer session.	Syllabus
11	JS	Michelson interferometer, construction and working	Lecture + question answer session.	Syllabus
12	JS	Fresnel Diffraction - Huygens- Fresnel theory	Lecture + question answer session.	Syllabus
13	JS	Zone plate	Lecture + question answer session.	Syllabus
14	JS	Difference between zone plate and convex lens	Lecture + question answer session.	Syllabus
15	JS	Interference and diffraction comparison	Lecture + question answer session.	Syllabus

16	JS	Problem solving session	Problem solving session	Syllabus
17	JS	diffraction pattern due to a straight edge	Lecture + question answer session.	Syllabus
18	JS	single silt diffraction	Lecture + question answer session.	Syllabus
19	JS	Revision of diffraction	Teacher student interactive session	Syllabus
20	JS	Fraunhoffer diffraction at a single slit	Lecture + question answer session.	Syllabus
21	JS	Fraunhoffer diffraction at a double slit	Lecture + question answer session.	Problem solving
22	JS	Fraunhoffer diffraction in N slits, theory of plane diffraction grating	Lecture + question answer session.	Syllabus
23	JS	Problem solving of diffraction	Discussion	Syllabus
24	JS+VMG	1st CIA	Exam	Syllabus
25	VMG	Concept of polarization – (plane of polarization)	Lecture + question answer session.	Syllabus
26	VMG	polarization by reflection-Brewster's law	Lecture + question answer session.	Syllabus
27	VMG	polarization by refraction-pile of plates	Lecture + question answer session.	Syllabus
28	VMG	Polarization by double refraction-(calcite crystal). Anisotropic crystals –optic axis	Lecture + question answer session.	Syllabus
29	VMG	Double refraction-Huygens explanation of double refraction- Positive and Negative crystals	Lecture + question answer session.	Syllabus
30	VMG	Types of polarized light-Retarders or wave plate- Quarter wave plate –Half wave plate	Lecture + question answer session.	Syllabus
31	VMG	Production and Detection of elliptically and circularly polarized light	Lecture + question answer session.	Syllabus
32	VMG	Optical Activity-Fresnels Explanation of Optical Rotation	Lecture + question answer session.	Syllabus

33	VMG	Specific Rotation-Laurents half shade polarimeter	Lecture + question answer session.	Syllabus
34	VMG	Problems	Lecture + question answer session.	Syllabus
35	VMG	Absorption and emission of light-Absorption	Lecture + question answer session.	Syllabus
36	VMG	spontaneous emission and stimulated emission-light amplification by stimulated emission	Lecture + question answer session.	Syllabus
37	VMG	Einstein's relations	Lecture + question answer session.	Syllabus
38	VMG	condition for light amplification –population inversion	Lecture + question answer session.	Syllabus
39	VMG	pumping –pumping methods –optical pumping – electrical pumping -direct conversion	Lecture + question answer session.	Syllabus
40	VMG	Active medium-metastable states	Lecture + question answer session.	Syllabus
41	VMG	pumping schemes (two level, three level and four level) Optical resonator	Lecture + question answer session.	Syllabus
42	VMG	Threshold condition. Types of lasers-ruby laser	Lecture + question answer session.	Syllabus
43	VMG	He-Ne laser	Lecture + question answer session.	Syllabus
44	VMG	semi-conductor laser	Lecture + question answer session.	Syllabus
45	VMG	Applications of lasers-Holography (principle, recording and reconstruction)	Lecture + question answer	Syllabus
46	VMG	Problems	Lecture + question answer session.	Syllabus
47	JS	Optical fibre introduction	PPT+ Lecture + question answer session.	Syllabus

48	JS	Optical fibre Critical angle of propagation	PPT+Lecture + question answer session.	Syllabus
49	JS	modes of propagation - Acceptance angle	Lecture + question answer session.	Syllabus
50	JS	Fractional refractive index change - Numerical Aperture	PPT+Lecture + question answer session.	Syllabus
51	JS	Types of Optical fibers -1	Lecture + question answer session.	Syllabus
52	JS	Types of Optical fibers -2	Lecture + question answer session.	Syllabus
53	JS	Normalized Frequency- pulse dispersion Attenuation	Lecture + question answer session.	Syllabus
54	JS	Applications	Lecture + question answer session	Syllabus
55	JS	Fibre optic Communication system - Advantages of Optical fibers.	Lecture + question answer session.	Syllabus
56	JS	Problems	Discussion	Syllabus
57	JS	Revision	Discussion	
58	JS+VMG	2nd CIA	Exam	Syllabus

Assignments and Viva

	Nature of assignment and viva	Weightage/marks
1	Viva + assignments	10
2	Viva + assignments	10
3	Viva + assignments	10
4	Presentation + viva	10

Additional Work:

Reading session in the library: Reading books related to the inventions and discoveries made in the field of Optics**.**

Digital Electronics (Physics for B.Sc (Physics)- SEM-5)

COURSE OBJECTIVES

This course is expected to provide necessary back ground for applications of electronics in mathematical computation

Basic Reference:

1. Digital design- M Morris Mano PHI

Higher References:

1. Digital logic and computer design - M Morris Mano PHI
2. Digital Electronics- William H Gothmann PHI
3. Digital principles and applications 6th Edn. Malvino, Leach and Saha TMH
4. Digital circuits and design- S Salivahanan and S Arivazhakan PHI
5. Digital Electronics- Sedha S Chand
6. Pulse, Digital and switching wave forms –Millam and Taub.
7. Digital computer electronics- Malvino, Brown TMH
8. Digital electronics- Tokheim(TMH)

COURSE OUTCOMES:

At the end of the course, the student will get sufficient in the knowledge of digital electronics and to use this knowledge to explore various applications related to topics in mathematical computation.

r. Roby Cherian is will be covering almost 1/3rd of the syllabus ie 20 Hrs of the total 54 Hrs. One theory class per week.

Sessions (1 Hr each)	**Topic**	**Method**
1	Introduction – Digital electronics	Lect.
2	Binary logic- AND,OR and NOT operators	Lect.
3	Laws of Boolean algebra- Demorgan's theorem	Class Activity in Groups
4	Duality theorem	Lect. + Group Activity
5	Boolean functions	Lect.
6	Complement of a function-Reducing Boolean expressions	Lect.
7	Group Ativity	Lect.
8	Canonical and standard form	Lect.
9	CIA-I	1 Hr exam
10	Discussing the CIA problems	Class Activity
11	Conversion between truth table,	Lect. + Class activity

12	Boolean expressions and Logic diagrams	Lect.
13	Simplification of Boolean functions using Karnauh map(Two, three and four variables)	Lect.
14	Cont. + Problems	Lect. +Group Activity
15	Fermi Dirac Statistics and its application to electron gas	Lect.
16	Problem Solving Session + NAND, NOR gates	Class Activity

17-18	CIA-II	2 Hr Exam
19	Discussing the CIA problems	Class Activity
20	XOR, XNOR gates- IC digital logic families	Lect.

ASSIGNMENTS

	Date of submission/completion	**Topic of Assignment & Nature of assignment (Individual/Group – Written/Presentation – Graded or Non-graded etc)**	**Marks**
1	Before 1st Internal	Individual- Graded	10
2	Before 2nd Internal	Individual- Graded	10
3	Before 2nd Internal	Individual	10

ASSIGNMENTS/EXERCISES – Details & Guidelines – Will be notified prior to the announcement of the assignment

Additional Work: Solving all the problems mentioned in the basic reference book.

Dr. Sumod S.G is will be covering almost 2/3rd of the syllabus ie 34 Hrs of the total 54 Hrs. Two theory class per week.

As per syllabus taking 66.66 % of the course ie 36Hrs of the total 54 Hrs. Two theory classes per week.

COURSE OBJECTIVES

We are living in a wonder world of Digital Electronics. To know the physical principles and applications of Electronics is most necessary for a Physics student. This course is intended to provide this in both theoretical as well as practical aspects

Basic Reference:

1. **Digital Design- Morris Mano**
2. **Basic Elecronics – B.L Theraja**

Higher References:

1. Electronic Principles-Sahdev (Dhanpat Rai Co.)
2. Electronic Devices and Circuit Theory-Robert L Boylestad&Louis Nashelsky, PHI
3. Electronic Principles and Applications-Schuler(McGrawHill)
4. Foundations of Electronics-D Chattopadhyay,P.C.Rakshit,B Saha,N.N.Purkait(New Age International Publishers)
5. Principles of Electronics-V.K.Mehta(S.Chand Co.)
6. Electronic Principles-A.P.Malvino 5 th Edition(Tata McGrawHill)
7. Electronic Devices and Circuits-Sajeev Gupta(Dhanpat Rai Publications)
8. Basic Electronics and Linear Circuits-N.N.Bhargava,D.C.Kulshreshtha&S.C.Gupta (Tata McGrawHill)
9. Introduction to Semiconductor Devices, Kevin, Brennan Cambridge Univ. Press
10. Art of Electronics, Thomas C Hayes, Paul Horowitz, Cambridge Univ. Press

COURSE OUTCOMES:

At the end of the course, the student will get sufficient theoretical basis for doing electronics experiments in the upcoming semesters and also understand electronics world around us in a better way.

Sessions	Topic	Method
1	Introduction	
2	Digital and analog systems	Lect.
3	Importance of Number systems	Lect.
4	Conversion of Different number systems-	Lect.

5	Decimal & binary	Lect.
6	octal and hexadecimal	Lect.
7	Addition, Subtraction	Lect.
8	1's complementary method	Lect.
9	2's complementary method	Lect.
10	BCD code, ASCII code	Lect.
11	Adders- Half Adder	Lect.
12	**1st Internal**	1 Hr exam
13	Full Adder circuits- Four bit adder	Lect.
14	Subtractor-Half Subtractor. Full subtractor	Lect.
15	Problem Solving	Class activity
16	Multiplexers -2 to 1 multiplexer	Lect.
17	Problem solving of last class portions	Class activity
18	Encoders	Lect.+Powerpoint
19	LED-7 segmented Decoder	Lect.+Powerpoint
20	Decoders	Lect.+Powerpoint
21	Multiplexer	Tutorial
22	2 to 1 Multiplexer	Lect.+Powerpoint
23	16 to 1 Multiplexer	Lect.+Powerpoint
24	Demultiplexer	Lect.+Powerpoint
25	1 to 16 Demultiplexer	Lect.+Powerpoint

26	Flip-flops, RS Flip flop	Lect.
27	Clocked RS Flip flop	Lect
28	MSJK FF	Lect
29	**2nd Internal**	1 Hr Exam
30	DFF JK, T Flip-flop,	Lect
31	Buffer registers- Shift register	Lect
32	Counters- Binary ripple counter-	Lect
33	BCD ripple counter- synchronous binary counter-	Lect
34	Decade counter. D/A converters (Ladder type),	Lect
35	A/D Converter (Counter type)	Lect
36	REVISION & Feedback	Class Activity

ASSIGNMENTS

	Topic of Assignment & Nature of assignment (Individual/Group – Written/Presentation – Graded or Non-graded etc)	**Weightage/marks**
1	Individual- Graded	10
2	Individual- Graded	10
3	Individual	10

ASSIGNMENTS/EXERCISES – Details & Guidelines – Will be notified prior to the announcement of the assignment

Additional Work: Solving all the problems mentioned in the basic reference book.

Thermal and Statistical Physics (Physics for B.Sc (Physics)- SEM-5)

COURSE OBJECTIVES

This course is to develop a working knowledge of statistical mechanic and to use this knowledge to explore various applications related to topics in material science and the physics of condensed matter

Basic Reference:

1. **Heat and thermodynamics- Brij lal, Dr. N. Subrahmanyam, P.S. Hemne**

Higher References:

1. Heat and Thermodynamics, Mark W Zemaskay and Richard H Dittman, Tata McGraw-Hill Publishing Co. (Special Indian Edition)
2. Thermodynamics and Statistical Mechanics, Greiner, Springer
3. Berkeley Physics Course Volume 5; Statistical Physics; Frederick Reif. McGraw Hill.
4. A Treatise on Heat; Saha and Srivastava, The Indian Press, Allahabad.
5. Statistical Mechanics, R.K. Pathria, Pergamon press, Oxford

COURSE OUTCOMES:

At the end of the course, the student will get sufficient in the knowledge of statistical mechanic and to use this knowledge to explore various applications related to topics in material science and the physics of condensed matter

Dr. Roby Cherian will be covering 1/3rd of the course ie 18 Hrs of the total 54 Hrs. One theory class per week.

Sessions (1 Hr each)	**Topic**	**Method**
1	Introduction – the need of statistical mechanics and its classification	Lect.
2	Micro and Macro states, statistical probability, axioms of probability,	Lect.
3	Problem Solving	Class Activity in Groups
4	Energy states, energy levels, degenerate energy levels	Lect. + Group Activity
5	degenerate gas, phase space, concept of entropy and thermodynamic probability.	Lect.
6	Maxwell-Boltzmann Distribution law	Lect.
7	Derivation continued…	Lect.
8	thermodynamics of an ideal monoatomic gas, Classical entropy	Lect.

	expression, Gibbs' paradox	
9	CIA-I	1 Hr exam
10	Discussing the CIA problems	Class Activity
11	Need of quantum statistics- In-distinguishability of particles	Lect. + Class activity
12	Spin and Statistics- Ideas of Bose Einstein distribution law	Lect.
13	BE application to black body radiation	Lect.

14	Cont. + Problems	Lect. +Group Activity
15	Fermi Dirac Statistics and its application to electron gas	Lect.
16	Problem Solving Session	Class Activity
17-18	CIA-II	2 Hr Exam
19	Recaping	Class Activity.

ASSIGNMENTS

	Date of submission/completion	**Topic of Assignment & Nature of assignment (Individual/Group – Written/Presentation – Graded or Non-graded etc)**	**Marks**
1	Before 1st Internal	Individual- Graded	10
2	Before 2nd Internal	Individual- Graded	10
3	Before 2nd Internal	Individual	10

ASSIGNMENTS/EXERCISES – Details & Guidelines – Will be notified prior to the announcement of the assignment

Additional Work: Solving all the problems mentioned in the basic reference book.

Dr. Pius Augustine will be covering 2/3rd of the course ie 36 Hrs of the total 54 Hrs. Two theory class per week.

Course Title: Thermal and Statistical Physics-Module 1 (18 hrs) and Module 2 (18 hrs).

Learning Outcomes: Students should acquire skills in problem solving, creative thinking, peer interaction and communication skills, Presentation skill and leadership qualities.

	Term – I (Before I Internal Exams) – 30 % of the syllabus		
Sl No	Topic/Module	Method of teaching *	Remarks: Books, reference etc
1	**<u>MODULE - 1</u>** Introduction- Laws of Thermodynamics: Thermodynamic system, Thermodynamic variables and equation of state, Classes of system, Heat, Thermodynamic equilibrium. Continuation from Plus-Two syllabus. (3 hrs. June first week. One additional class will be found out)	1. Lecture method to introduce. 2. Group discussion. 3. Student presentation. (Individual)	1. Heat and Thermodynamics, Mark W Zemansky and Richard H Dittman.
2.	Internal energy, First law of thermodynamics, Applications of first law, Indicator diagram, Isothermal process, isochoric process, adiabatic process – Perfect gas equations.	1. Lecture with or without PPT. 2. Students will suggest and discuss processes coming under various headings. Student presentation. (Individual)	2. Heat Thermodynamics

	(3 hrs. June second week. One additional class will be found out)		and Statistical Physics, Brij Lal, Subrahmanyam and Hemne.
3.	Work done during isothermal and adiabatic processes. Relation between isothermal and adiabatic elasticity. **Supplementary: Additional portion from JAM syllabus (Elements of Kinetic theory of gas and Equipartition of energy)** (3 hrs. June third week. One additional class will be found out)	1. Lecture method. 2. Group discussion. 3. Quiz 4. Problem solving.	
4.	Reversible and irreversible processes, Second law, Heat engines, carnots theorm and cycle. Work done by the engine per cycle, efficiency. Third law and unattainability of absolute zero.	1. Students recollect plus-two. 2. Peer discussion (buddy discussion) 3. Notes preparation and peer checking 4. Problem solving.	

	(3 hrs. June fourth week. One additional class will be found out)	**<u>Assignment:</u>** Petrol Engine, Diesel Engine – Presentation of detailed description with the support of videos and PPT. Write of the data should be submitted by all the students on or before 30th July. PPT should be sent through e-mail on or before 30th July only for 50% of the students. Additional problems should be solved and submitted.	
5.	Revision - (3 hrs July first week) Topics covered in June first and second week	Students' presentation, discussion, Quiz (class test), Notes completion and Problem solving.	
6.	Revision - (3 hrs July second week) Topics covered in June third and fourth week	Students presentation, discussion, Quiz (class test), Notes completion and Problem solving.	
7.	Module: II	1. Lecture with or without PPT.	

	Thermodynamic relations – Entropy Entropy changes in reversible and irreversible processes. T-S diagrams and equations. Physical significance of entropy. (3 hrs July 3rd week)	2. Arrive at the new concept with the help of discussion on Indicator diagram. 3. Discussion.	
8.	First Internal Exam -		
9.	Clausius Clepeyron equation. Thermodynamic potentials, H, G, F and U. (2 hrs August 1st week)	1. Lecture. 2. Discussion. 3. Buddy discussion to derive the equations.	
10.	Maxwell's relations and applications. Adiabatic and isothermal Elasticity. (2 hrs August 2nd week)	1. Lecture. 2. Discussion. 3. Student presentation on the board.	
11	Revision of Thermodynamic potential and Maxwell's equations.	Peer discussion and checking Teacher facilitates.	

	2 hrs (August 3rd week)		
12	ONAM HOLIDAYS	Assignment: Submission date : Second Monday September. 1. Modes of Heat Transfer 2. Searles and Lees experiment. 3. Collection of videos and preparation of PPT.	
13.	Revision of Thermodynamic potentials and Maxwell's equations. 2 hrs. September 1st week.	Peer discussion and checking Teacher facilitates.	
14	Modes of heat transfer, Searles's and Lee's experiment. 2 hrs September 2nd week	1. Lecture. 2. Discussion. 3. Video Presentation.	
15	Black body radiation. Stefan – Boltzmann law, Wein's displacement law. Rayleigh Jeans law and Placnk's law. September 3rd week.	Assignment: Submission on first week of October. Parallally – Presentation and discussion of the topics will continue and teacher will facilitate.	

		Process will continue till first week of October – Students will give group presentation with the help of PPT.	

Discipline: Physics.
Semester: 5
Credits: 4
Course Name: Energy and Environmental Studies
Teaching: Four lecture class per week handled by Mathew George (2 hrs./week) and Guest (2Hrs/week)

Course aim: The course creates concern among the students on energy conservation and environmental protection.

session	teacher	topic	method
1	GUEST	World's reserve of energy sources	Lecture/Discussion
2	GUEST	Various forms of energy	Lecture/ discussion
3	GUEST	Non renewable energy sources	Seminar/ discussion
4	GUEST	Coal,oil, natural gas	Seminar/ discussion
5	GUEST	Merits and demerits of non renewable energy	Seminar/ discussion
6	GUEST	Renewable energy sources- introduction	Seminar/ discussion
7	GUEST	Solar energy	Seminar/ discussion
8	GUEST	Biomass energy	Seminar/ discussion
9	GUEST	Biogas energy	Seminar/ discussion
10	GUEST	Wind energy	Seminar/ discussion
11	GUEST	Wave energy	Seminar/ discussion

12	GUEST	Tidal energy	Seminar/ discussion
13	GUEST	Hydro energy	Seminar/ discussion
14	GUEST	Geothermal energy	Seminar/ discussion
15	GUEST	Fusion energy	Seminar/ discussion
16	GUEST	Hydrogen energy	Seminar/ discussion
17	GUEST	Merits and demerits of renewable energy	Seminar/ discussion
18	GUEST	Sun as a source of energy	Lecture/discussion
19	GUEST	Solar radiation	Lecture/discussion
20	GUEST	Spectral distribution	Lecture/discussion
21	GUEST	Flat plate collector	Lecture/discussion
22	GUEST	Solar water heating	Lecture/discussion
23	GUEST	Different types of solar water heaters	Lecture/discussion
24	GUEST	Solar pond - convective type	Lecture/discussion
25	GUEST	Solar pond- salt gradient type	Lecture/discussion
26	GUEST	Optical concentrators	Lecture/discussion
27	GUEST	Solar desalination	Lecture/discussion
28	GUEST	Solar dryer- direct type	Lecture/discussion
29	GUEST	Solar dryer - salt gradient type	Lecture/discussion
30	GUEST	Solar heating of buildings	Lecture/discussion
31	GUEST	Solar green houses	Lecture/discussion
32	GUEST	Solar photovoltaics	Lecture/discussion
33	GUEST	Working principle of solar cell	Lecture/discussion
34	GUEST	Revision	Lecture/discussion
36	MG	water pollution-causes	Lecture/discussion
36	MG	water pollution-control	Lecture/discussion
37	MG	soil pollution -causes	Lecture/discussion
38	MG	soil pollution -control	Lecture/discussion
39	MG	ground water pollution-causes	Lecture/discussion
40	MG	ground water pollution -control	Lecture/discussion

41	MG	marine pollution -causes	Lecture/discussion
42	MG	marine pollution -control	Lecture/discussion
43	MG	noise pollution	Lecture/discussion
44	MG	nuclear hazards -1	Lecture/discussion
45	MG	nuclear hazards -2	Lecture/discussion
46	MG	pollution, environmental hazards -1	Lecture/discussion
47	MG	pollution, environmental hazards -2	Lecture/discussion
48	MG	case study, environmental pollution	discussion
49	MG	environmental impact assesment - intro	Lecture/discussion
50	MG	environmental impact assesment - steps-1	Lecture/discussion
51	MG	environmental impact assessment - steps -2	Lecture/discussion
52	MG	environmental impact assessment - case study	discussion
53	MG	pollution control, general acts	Lecture/discussion
54	MG	water act	Lecture/discussion
55	MG	air act	Lecture/discussion
56	MG	environmental protection act	Lecture/discussion
57	MG	internal assessment	exam
58	MG	waste minimization, source reduction	Lecture/discussion
59	MG	recycling	Lecture/discussion
60	MG	conservation	Lecture/discussion
61	MG	waste minimization	Lecture/discussion
62	MG	case study	Lecture/discussion
63	MG	hazardous solid wastes	Lecture/discussion
64	MG	municipal solid waste	Lecture/discussion
65	MG	biomedical solid waste	Lecture/discussion
66	MG	waste treatment and disposal, physical methods	Lecture/discussion
67	MG	waste treatment and disposal, chemical methods	Lecture/discussion
68	MG	waste treatment and disposal, biological methods	Lecture/discussion
69	MG	moving dome type biogas plant	Lecture/discussion

70	MG	revision	discussion

Books for references

1. Essential Environmental Studies S.P Misra, S.N Pandey (Ane Books Pvt Ltd)
2. Environmental Science G Tyler Miller (Cengage Learning)
3. Introduction to Environmental Science Y Anjaneyulu (B S Publications)
4. Introduction to Environmental engineering and science- G.M. Masters and W.P. Ela(PHI Pvt. Ltd)
5. Environmental management- B. Krishnamoorthy (PHI Pvt. Ltd)6. Solar energy- fundamentals and applications- H.P. Garg and J. Prakash (Tata Mc Graw Hill).
7. Solar energy-fundamentals, design, modeling and applications- G.N. Tiwari (Narosa Pub. House).

Computational Physics (Physics for B.Sc (Physics)- SEM6)

Course Coordinator: Dr. Roby Cherian

Dr. Roby Cherian will be taking 34 Lecture Hrs while Dr. Siby Mathew will be taking 20 Hrs of the total 54 Hrs.

COURSE OBJECTIVES

This course is intended to give an insight to computer hardware and computer applications.

Basic Reference:

9. Object oriented programming in Turbo C++ - Robert Lafore (Galgotia Pub.)
10. Numerical method- V. Rajaram (PHI Pub.)

Other References:

6. Programming with C++ - John R. Hubbard (Mc Graw Hill Pub.)

7. Introductory methods of Numerical methods -S.S .Sastry (PHI Pub.)
8. Numerical method with computer programming in C++ - Ghosh (PHI Pub.)
9. Fundamentals of microprocessor by B. Ram
10. Microprocessor Architecture – Ramesh S.

COURSE OUTCOMES:

At the end of the course, the student will get sufficient ideas on microprocessor basics, 8085 architecture, various numerical methods that's used in solving various physics problems computationally. Also a good knowledge on basic C++ programming.

SESSIONS BY DR. ROBY CHERIAN

Sessions **(1 Hr each)**	**Topic**	**Method**
Sessions	**Topic**	**Method**
1	Introduction – Why C++?	Lect.
2	programming basics+ Hands on session	Lect.+Live Demo
3	programming basics+ Hands on session	Lect.+Live Demo
4	programming basics+ Hands on session	Lect.+Live Demo
5	programming basics + Hands on session	Lect.+Live Demo
6	basic ideas of structures	Lect.+Live Demo
7	loops	Lect.+Live Demo
8	decisions	Lect.+Live Demo
9	arrays	Lect.+Live Demo
10	arrays	Lect.+Live Demo
11	functions	Lect.+Live Demo
12	functions	Lect.+Live Demo
13	objects	Lect.+Live Demo
14	classes	Lect.+Live Demo
15	CIA-I	1 hr

16	Programing examples	Class Activity.
17	Programing examples	Class Activity
18	How to solve physics numerical computationally	Lect.
19	Difference between algebraic and transcendental	Lect.
	equations	
20	Graphical solving , bisection	Lect.
21	false position	Lect.
22	Examples	Class Activity
23	Newton-Raphson methods	Lect.
24	Examples	Class Activity
25,26	CIA-II	2 hrs
27	algorithms - numerical integration trapezoidal rule	Lect.
28	Simpson's 1/3 rule - algorithm	Lect.
29	differential equation- Euler's method	Lect.
30	second order Runge-Kutta method algorithm	Lect.
31	Examples	Class Activity
32	Examples	Class Activity
33,34	Recap	Class Activity

ASSIGNMENTS

	Date of submission/completion	Topic of Assignment & Nature of assignment (Individual/Group – Written/Presentation – Graded or Non-graded etc)	Marks
1	After 1st Internal	Individual- Graded	10
2	Before 2nd Internal	Individual- Graded	10

ASSIGNMENTS/EXERCISES – Details & Guidelines – Will be notified prior to the announcement of the assignment. Assignment and Class Activity marks will be clubbed and scaled to 5 marks that will be part of the internal assessment.

Additional Work: Solving all the problems mentioned in the basic reference book.

SESSIONS BY DR. SIBY MATHEW

Sessions **(1 Hr each)**	**Topic**	**Method**
Sessions	**Topic**	**Method**
1	Introduction – Microprocessors	Lect.
2	8085 bus organization-address bus	Lect
3	data bus	Lect
4	control bus	Lect
5	internal data operations	Lect
6	8085 registers	Lect
7	accumulator- flags	Lect
8	program counter-stack pointer, externally initiated operations	Lect
9	microprocessor architecture	Lect
10	internal architecture of 8085 microprocessor	Lect
11	Machine language	Lect
12	- assembly language- high level language	Lect
13	Instruction cycle, machine cycle and T state	Lect
14	instruction format	Lect

15	addressing modes. The 8085 instruction set- simple programmes for data transfer	Lect
16	addition and subtraction.	Lect
17	Programing examples	Lect
18	Computer hardware	Lect
19	RAM ROM	Lect
20	Primary and Secondary memory	Lect

Condensed Matter Physics (Physics for B.Sc (Physics)- SEM-6)

As per syllabus taking 66.66% of the course ie 36 Hrs of the total 54 Hrs is handled by Dr. sumod SG and re 33.33% (17 hours) by Dr. Siby Mathew. Two theory classes per week for Dr Sumod and One class per week for Dr. Siby Mathew.

COURSE OBJECTIVES

To know the physical principles and applications of Solid state Physics. This course is intended to provide this in both theoretical as well as practical aspects

Basic Reference:

1. Kittel, C. Introduction to Solid State Physics, 8th edition (Wiley)
2. Ashcroft, N.W. & Mermin, N.D. Solid State Physics, TMH

3. Blakemore, J.S. Solid State Physics, 2nd edition (Cambridge)
4 C.L. Arora, Solid State Physics. S Chand.
3. S.O.Pillai, Solid State Physics. New Age International Pub.
4. Superconductivity, Superfluids and Condensate James F Annett Oxford

COURSE OUTCOMES:

This course is intended to provide an introduction to the physics of Condensed Matter. This study attempts to explain various types of phenomena like electro-magnetic properties, super-conductivity and super fluidity.

Sessions	**Topic**	**Method**
1	Crystal Structure -	Lect.
2	Crystalline Matter - Bravias Lattice -	Lect.
3	Crystal Systems – Crystal Planes -	Lect.
4	Miller Indices -	Lect.
5	. Lattice Constants - Reciprocal Lattice -	Lect.
6	Crystal Structures - sc, bcc, fcc and hcp -	Lect.
7	Bragg's Law -Derivaion	Lect.

8	Experimental Methods of X-Ray	Lect.
9	diffraction -	Lect.
10	Problems-discussion	Class activity
11	Powder method. Bonding in Solids -	Lect.
12	Ionic, Covalent, Van der Waal and Metallic Bonding (qualitative) -	Lect.
13	**1st Internal**	1 Hr
14	Binding Energy in Crystals - Madelung Constant	Lect.
15	Classification of Magnetic Materials-	Lect.
16	Langevin's theory - Paramagmetism - Curie-Weiss Law- Curie temperature -	Lect.
17	Langevin's theory-Diamagnetism	Lect.
18	Antiferromagnetism and Ferrimagnetism –	Lect.
19	Magnetisation - Magnetic Domain	Lect.
20	Structure – Spintronics - Spin Waves.	Lect.
21	Free Electron theory in one dimension-	Lect.
22	Formation of Energy Bands-Bloch Theorem (Statement) - Kronig Penney Model –	Lect.
23	Brillouin Zones (qualitative) –	Lect.
24	Effective Mass-Carriers in Solids-	Lect.
25	Metals, Insulators and Semiconductors-	Lect.

26	Band Structure-Intrinsic and Extrinsic Semiconductors-	Lect.
27	Electric Conductivity-Temperature Dependence-	Lect.
28	Hall effect.	Lect.
29	Review of Basic Equations -	Lect.
30	Dielectric Constant -	Lect.
31	Dipole Moment-Polarizability-	Lect.

32	Clausius-Mosotti Relation-	Lect.
33	**2nd Internal**	2 Hrs
34	Ferrroelectricity	Lect.
35	Origin of Magnetism in substances	Lect.
36	Problem solving and revision	Class activity

37	Superconductivity (10 hrs) History of superconductivity- Super conducting phenomena-	Lect.
38	Meissner effect-	Lect.
39	Penetration depth, critical field and critical temperature-	Lect.
40	Type I& II Superconductors- Josephson Effect –	Lect.
41	SQUID, Theorems of Super conductivity	Lect.
42	- London equation-BCS theory-	Lect.
43	High Tc superconductors and applications. .	Lect.
44	Materials Science and Technology	Lect.
45	Amorphous Semiconductors	Lect.
46	- Liquid Crystals –	Lect.
47	Polymers - Thin films - Properties-	Lect.
48	Crystalline Materials	Lect.
49	Applications Crystalline materials	Lect.
50	nanostructures	Lect.
51	Nanometerials-	Lect.
52	Applications of nanomaterials	Lect.
53	Revision	Lect.
54	Problem session	Class activitiy

ASSIGNMENTS

	of	Topic of Assignment & Nature of assignment (Individual/Group – Written/Presentation – Graded or Non-graded etc)	Weightage/marks
1		Individual- Graded	10
2		Individual- Graded	10
3		Individual	10
4		Presentation - Group	10

ASSIGNMENTS/EXERCISES – Details & Guidelines – Will be notified prior to the announcement of the assignment

Additional Work: Solving all the problems mentioned in the basic reference book.

B.Sc: Physics (Core)

Discipline: Physics

Semester: 6

Course Name: Nuclear and Particle Physics

Teaching: Three lecture class per week handled by Prof. V.M. George (1 hr. /week.), Dr. Jimmy Sebastian (2 hr. /week.),

REFERENCE

1. Nuclear Physics Principles and Applications. Lilley, Pub. John. Wiley

2. Nuclear and Particle Physics S L Kakani and Subhra Kakani -Viva Books 2008

OBJECTIVE

Student gets acquainted with basic laws of nuclear and particle physics

COURSE OUTCOMES:

Basic knowledge of nuclear and particle physics. Knowledge and understanding of the elementary particle interactions.

Sessions		Topic	Method	Remarks
1	JS	Introduction to nuclear physics	Discussion + PPT presentation	Introduction of Syllabus, Concepts in atomic and nuclear physics
2	JS	Classification of nuclei – Isotopes, Isobars, Isomers, Mirror nuclei.	Lecture + question answer session.	Syllabus
3	JS	General properties of nucleus – size, nuclear mass, density.	Lecture + question answer session.	Syllabus
4	JS	Charge, angular momentum, nuclear magnetic dipole moments.	Lecture + question answer session.	Syllabus
5	JS	Electric quadrupole moment, Mass defect.	Lecture + question answer session.	Syllabus
6	JS	B.E, B.E. curve.	Lecture + question answer session.	Syllabus
7	JS	Packing fraction, nuclear stability.	Lecture + question answer session.	Syllabus
8	JS	Theories of nuclear composition	PPT + Lecture + question answer session.	Syllabus
9	JS	Proton-electron hypothesis – proton-neutron hypothesis.	Lecture + question answer session.	Syllabus
10	JS	Properties of Nuclear forces	Lecture + question answer session.	Syllabus

11	JS	Meson theory of nuclear forces.	Lecture + question answer session.	Syllabus
12	JS	Nuclear shell model.	Lecture + question answer session.	Syllabus
13	JS	Determination of nuclear mass by Bainbridge's mass spectrograph.	Lecture + question answer session.	Syllabus
14	JS	Detectors of nuclear radiations – Ionisation chamber.	Lecture + question answer session.	Syllabus
15	JS	G.M Counter.	Lecture + question answer session.	Syllabus
16	JS	Problem Solving	Problem solving session	Syllabus
17	JS	Natural radioactivity – Radioactive disintegration law	Lecture + question answer session.	Syllabus
18	JS	Half life – Mean life	Lecture + question answer session.	Syllabus
19	JS	Radioactive series.	Teacher student interactive session	Syllabus
20	JS	Radioactive dating – Uranium dating & Carbon dating	Lecture + question answer session.	Syllabus
21	JS	Range of α particles – range – energy relationship.	Lecture + question answer session.	Problem solving
22	JS	Geiger – Nuttal law	Lecture + question answer session.	Syllabus

23	JS	Alpha particle disintegration energy	Lecture + question answer session.	Syllabus
24	JS	Theory of α - delay	Lecture + question answer session.	Syllabus
25	JS	Gamow's theory β- decay	Lecture + question answer session.	Syllabus
26	JS	β ray energy spectrum	Lecture + question answer session.	Syllabus
27	JS	Neutrino hypothesis Positron emission.	Lecture + question answer session.	Syllabus
28	JS	orbital electron capture (Basic ideas only)	Lecture + question answer session.	Syllabus
29	JS	γ decay	Lecture + question answer session.	Syllabus
30	JS	Internal conversion	Lecture + question answer session.	Syllabus
31	JS	Electron positron pair production by γ rays.	Lecture + question answer session.	Syllabus
32	JS	Electron positron annihilation.	Lecture + question answer session.	Syllabus

33	JS	Artificial radioactivity & Transuranic elements. (Basic ideas only)	Lecture + question answer session.	Syllabus
34	VMG	Discovery of nuclear fission.	Lecture + question answer session.	Syllabus
35	VMG	Fission products. Neutron emission in fission. Energy release in fission.	Lecture + question answer session.	Syllabus
36	VMG	Nuclear fission on the basis of liquid drop model chain reaction	Lecture + question answer session.	Syllabus
37	VMG	Nuclear reactor	Lecture + question answer session.	Syllabus
38	VMG	Breeder reactor Nuclear fusion Energy production in stars.	Lecture + question answer session.	Syllabus
39	VMG	Proton-Proton cycle and Carbon Nitrogen cycle.	Lecture + question answer session.	Syllabus
40	VMG	Peaceful utilization of fusion power	Lecture + question answer session.	Syllabus
41	VMG	Controlled thermo nuclear reactions	Lecture + question answer session.	Syllabus
42	VMG	Toroidal confinement - Tokamak	Lecture + question answer session.	Syllabus

43	VMG	Nuclear waste disposal. radiation hazards from nuclear explosion – radiation dosage	Lecture + question answer session.	Syllabus
44	VMG	Problem Solving Session.	Lecture + question answer session.	Syllabus
45	VMG	Particles and antiparticles	Lecture + question answer	Syllabus
46	VMG	Fundamental interactions in nature.	Lecture + question answer session.	Syllabus
47	VMG	Classification of elementary particles according to nuclear interactions.	Lecture + question answer session.	Syllabus
48	VMG	Resonance particles Elementary particle quantum numbers and conservation laws.	Lecture + question answer session.	Syllabus
49	VMG	The quark model.	Lecture + question answer session.	Syllabus
50	VMG	Compositions of hadron according to quark model.	Lecture + question answer session.	Syllabus
51	VMG	Cosmic rays - Primary and secondary	Lecture + question answer session.	Syllabus
52	VMG	Cosmic rays - Primary and secondary	Lecture + question answer session.	Syllabus
53	VMG	latitude effect- altitude effect- east west effect	Lecture + question answer session.	Syllabus
54	VMG	Problem solving	Problem solving session.	Syllabus

55	VMG+JS	CIA -1	EXAM	Syllabus
56	VMG+JS	CIA -2	EXAM	Syllabus
57	VMG, JS,	Discussing problems, the question paper of CIA-II and	Discussion	Syllabus

Assignments and Viva

	Nature of assignment and viva	**Weightage/marks**
1	Viva + assignments	10
2	Viva + assignments	10
3	Viva + assignments	10
4	Presentation + viva	10

Additional Work:
Reading session in the library: Reading books related to the discoveries made in nuclear and particle physics in recent years**.**

B.Sc:

Discipline: Physics.

Semester: 6

Course Name: Optoelectronics

Teaching: Five lecture class per week handled by Dr. Pius Augustine (3 hr./week) and Mathew George (2 hrs./week).

REFERENCE

1. Optoelectronic Engineering S.N. Biswass, DhanpatRai Publications
2. A Text book of Optics- Brijlal, Subramoniam, S Chand & Co
3. Photonics Elements and Devices, V. V. Rampal , Wheeler Publishing Co
4. Photonics, Ralf Menzel, Springer
5. Semiconductor optoelectronic devices – Pallab Bhattacharya PHI
6. Optoelectronics Wilson and Hawkes
7. Optoelectronics Jasprit Singh
8. Semiconductor Physics and Devices – Donald A Neamen, Tata McGraw-Hill
9. Optical communication system- John Gowar , Prentice Hall of India
10. Optical Electronics – AjoyGhatak and K Thyagarajan Cambridge
11. Optical fibres and fibre optic communication systems, Subir Kumar Sarkar,

S.Chand& Co

12. Semiconductor Physics and Optoelectronis, V. Rajendran et al, Vikas

Publishing House

13. Fibre Optic Communication, D.C.Agarwal, Wheeler Publishing

14. Physics of Semiconductor devices, Dilip K Roy, University Press.

15. Physics of Semiconductor devices, S M Sze, Wiley Eastern Limited

Sessions	**Teacher**	**Topic**	**Method**
1	PA	Photodetectors: Introduction	Lecture cum discussion
2	PA	Classification of detectors	Lecture cum discussion
3	PA	Classification of detectors	Lecture cum discussion
4	PA	Qualitative idea of each type- Photo detector parameters (Continue..)	Lecture cum discussion
5	PA	Qualitative idea of each type- Photo	Lecture cum discussion

		detector parameters	
6	PA	Noise mechanisms	Lecture cum discussion
7	PA	Principle and operation of Photodiode	Lecture cum discussion
8	PA	APD	Lecture cum discussion Lecture cum discussion
9	PA	Phototransistor	Lecture cum discussion
10	PA	PIN photodiode –opto-isolators	Lecture cum discussion
11	PA	Revision/Exercise	Student discussion
12	PA	Problem solving/Presentation	Student Activity
13	PA	Solar Cells: Principle	Lecture cum discussion
14	PA	V-I characteristics	Lecture cum discussion
15	PA	Fill factor	Lecture cum discussion
16	PA	Maximum power and conversion efficiency	Lecture cum discussion
17	PA	Hetero junction solar cells (Qualitative study)	Lecture cum discussion
18	PA	Exercise/Problem solving	Student Activity

19	PA	Optical communication:Introduction to Optical communication- Historical perspective	Lecture cum discussion
20	PA	Advantages and disadvantages of optical communication links in comparison with radio and microwave system and with guided systems	Lecture cum discussion
21	PA	measurement of information and the capacity of telecommunication channel- Communication system architecture	Lecture cum discussion
22	PA	basic optical communication system – Definition of attenuation, pulse duration and band width	Lecture cum discussion
23	PA	Exercise/Problem solving	Student Activity
24	PA	Optical Modulation: Direct modulation of LED and diode laser.	Lecture cum discussion
25	PA	Digital and analog modulation of LED and diode laser.	Lecture cum discussion
26	PA	External modulation.	Lecture cum discussion

27	PA	Birefringence	Lecture cum discussion
28	PA	Pockeleffect continue…	Lecture cum discussion
29	PA	Pockel Effect	Lecture cum discussion
30	PA	Phase modulation.	Lecture cum discussion
31	PA	Wave guide modulators .	Lecture cum discussion
32	PA	Electro-optic Modulators	Lecture cum discussion
33	PA	Magneto- optic modulators	Lecture cum discussion
34	PA	Acousto- optic modulators.	Lecture cum discussion
35	PA	Bipolar controller modulator.	Lecture cum discussion
	PA	Phase modulation.	Lecture cum discussion
36	PA	Wave guide modulators .	Lecture cum discussion
37	PA	Exercise/Assignment discussion	Student Activity
38	PA	Problem solving.	Student Activity
39	PA	Fibre optic communication: Introduction to Optical fibres and fibre optic communication	Lecture cum discussion

40	PA	Types of optical fibres	Lecture cum discussion
41	PA	Numerical aperture	Lecture cum discussion
42	PA	Fibre bundles, cables- strength	Lecture cum discussion
43	PA	fibre optical properties	Lecture cum discussion
44	PA	Fibre materials	Lecture cum discussion
45	PA	Classification of fibres – Step index and graded index	Lecture cum discussion
46	PA	mono mode and multi modefibres	Lecture cum discussion
47	PA	plastic fibreslatest developed fibres	Lecture cum discussion
48	PA	Fibre loses.	Lecture cum discussion
49	PA	Exercise/ Revision/ Assignment	Student Activity
50	PA	Problem Solving/Presentation	Student Activity
51	MG	Introduction, Optical radiation and light	Lecture cum discussion
52	MG	Luminescence and Radiation	Lecture cum discussion
53	MG	Photometric and Radiometric terms and units	Lecture cum discussion
54	MG	Inverse square law – verification by photometer	Lecture cum discussion
55	MG	Demo of Inverse square law	Lecture cum discussion

56	MG	comparison of efficiency of lightsources available in the market	Lecture cum discussion
57	MG	recommended values of illumination for various activities (General awareness)	Lecture cum discussion
58	MG	Revision/Problems	Student activity
59	MG	Introduction to Photonics – electrons Vs photons – Electronics Vs Optics, Photonics - Photonics and light technology and applications	Lecture cum discussion
60	MG	Properties of Photons,Gaussian beams – beam characteristics and parameters(Qualitative ideas only)	Lecture cum discussion
61	MG	Demo of Gaussian beam	Lecture cum discussion
62	MG	Semiconductors – Intro	Lecture cum discussion
63	MG	Direct and indirect bandgap semiconductors	Lecture cum discussion
64	MG	Electron hole pair formation and recombination	Lecture cum discussion
65	MG	Demonstration of e-h pair formation/recombination	Lecture cum discussion
66	MG	Radiative and nonradiative recombination and recombination rates	Lecture cum discussion
67	MG	Absorption in semiconductors – indirect transitions	Lecture cum discussion
68	MG	exciton absorption	Lecture cum discussion
69	MG	donor- acceptor band impurity band absorption	Lecture cum discussion
70	MG	Long wavelength absorption	Lecture cum discussion
71	MG	Franz Keldysh effect	Lecture cum discussion

72	MG	Stark effect	Lecture cum discussion
73	MG	Radiation in semiconductors	Lecture cum discussion
74	MG	Stokesshift in optical transitions	Lecture cum discussion
75	MG	Revision/Problems	Student activity
76	MG	Demonstration of Stoke's shift	Lecture cum discussion
77	MG	Frank – Condon shift	Lecture cum discussion
78	MG	Auger recombination	Lecture cum discussion
79	MG	LED –Principle	Lecture cum discussion
80	MG	characteristics (V-I & light – current)	Lecture cum discussion
81	MG	Demo of characteristics	Lecture cum discussion
82	MG	Materials, efficiencies	Lecture cum discussion
83	MG	LED structures- hetero junction	Lecture cum discussion
84	MG	edge emitting LED	Lecture cum discussion
85	MG	Applications	Lecture cum discussion
86	MG	Advantages	Lecture cum discussion
87	MG	Semiconductor lasers – Homo junction	Lecture cum discussion
88	MG	Hetero junction lasers	Lecture cum discussion
89	MG	Quantum well lasers wave guiding and index guiding Optical and carrier confinement	Lecture cum discussion
90	MG	Revision/Problems	Student activity

Assignments and Viva

	Nature of assignment and viva	**Weightage/marks**
1	Viva + assignments	10
2	Viva + assignments	10
3	Viva + assignments	10
4	Presentation + viva	10

Additional Work:
Reading session in the library: .

Course Plan 2017-18 for Physics (B.Sc Chemistry)

Properties of Matter, Mechanics and Particle Physics- SEM-1

Course Coordinators: Prof. V.M George and Guest

COURSE OBJECTIVES

The syllabus will cater into the basic requirements for his/her higher studies. The Course requires basic knowledge of mechanics, electricity, magnetism, properties of matter and mathematical tools.

Basic Reference:

1. Mechanics- H.S.Hans and S.P.Puri. (Tata McGraw-Hill)
2. Properties of Matter- Brijlal and N. Subrahmanyam (S. Chand and Co.)
3. Mechanics- J.C. Upadhyaya (Ram Prasad and sons)

COURSE OUTCOMES:

At the end of the course, the student will be enriched towards the field of Ealsticity, Rotational dynamics, Oscillations and Fourier Series.

Sessions By Prof. V.M George Covering ½ the portions:

Sessions (1 Hr each)	**Topic**	**Method**
1	Introduction – to Elasticity	Lect.
2	Elastic moduli	Lect.
3	Poissons ratio and class activity	Class Activity in Groups
4	Twisting couple	Lect.
5	Determination of rigidity modulus	Lect.
6	Determination of rigidity modulus Contd	Lect.

7	Problems	Lect.+ Class Activity
8	CIA-I	1 Hr exam.
9	Static torsion	Lect.
10	Torsion pendulum	Class Activity
11	Bending of beams	Lect. + Class activity
12	Cantilever	Lect.
13	Uniform Bending	Lect.
14	Non-Uniform bending	Lect.
15-16	Fundamental interactions in nature- gauge particles- classification of particlesantiparticles	Lect.
17-18	elementary particle quantum numbers	Class activity
19	conservation laws- quark model (qualitative)	Class Activity.

ASSIGNMENTS

	Date of submission/completion	**Topic of Assignment & Nature of assignment (Individual/Group – Written/Presentation – Graded or Non-graded etc)**	**Marks**
1	Before 1st Internal	Individual- Graded	10
2	Before 2nd Internal	Individual- Graded	10
3	Before 2nd Internal	Individual	10

ASSIGNMENTS/EXERCISES – Details & Guidelines – Will be notified prior to the announcement of the assignment

Additional Work: Solving all the problems mentioned in the basic reference book.

Sessions By Guest Covering ½ the portions:

No of Sessions (1 Hr each)	Topic	Method
6	Angular velocity- angular momentum- torque- conservation of angular momentum- angular acceleration- moment of inertia- parallel and perpendicular axes theorems-	Lect.
4	moment of inertia of rod, ring, disc, cylinder and sphere- flywheel	Lect.
6	Periodic and oscillatory motion- simple harmonic motion- differential equation- expression for displacement, velocity and acceleration- graphical representation-	Class Activity in Groups
3	energy of a particle executing simple harmonic motiondamped oscillation- forced oscillation and resonance	Lect.

CH2C01U – Electric and Magnetic Phenomena, Thermodynamics and Elementary Solid State Physics

Course Coordinator: Prof. V.M George

Prof. V. M George and Guest will be taking 18 Hrs each for the course having a total of 36 Hrs (3 credit course) - 2hrs per week.

COURSE OBJECTIVES

This course will provide a theoretical basis for doing experiments in related areas and also understand the basic requirements for his/her higher studies.

Basic Reference

1. Introduction to Modern Physics- H.S. Mani and G.K. Mehta (Affiliated East West press Pvt. Ltd)
2. Concepts of Modern Physics- A. Beiser (Tata McGraw-Hill, 5th Edn.)
3. Modern Physics- R. Murugeshan (S. Chand and Co.)
4. Introduction of Electrodynamics- D.J. Griffiths (PHI Pvt. Ltd)
5. Modern Physics- G.Aruldas and P.Rajagopal (PHI Pub)
6. Thermodynamics- Zemansky and Dittmann (Tata McGraw-Hill)
7. Heat and Thermodynamics- Brijlal and Subrahmanyam (S. Chand &Co)

COURSE OUTCOMES:

At the end of the course, the student will get sufficient theoretical basis for doing experiments in the upcoming semesters in related areas and also understand the basic requirements for his/her higher studies.

SESSIONS BY Prof. V.M. George– 1 hr per week

Sessions **(1 Hr each)**	**Topic**	**Method**
Sessions	**Topic**	**Method**
1	Thermodynamic systems- thermodynamic equilibrium	Lect
2	- thermodynamic processes- isothermal process- adiabatic process	Lect
3	zeroth law of thermodynamics	Lect
4	first law of thermodynamics	Lect
5	heat engine	Lect
6	heat engine	Lect
7	the Carnot engine	Lect
8	the Carnot engine + Problem solving	Lect + Group Activity
9	refrigerator concept of entropy-	Lect
10	second law of thermodynamics	Lect
11	- third law of thermodynami	Lect
12	Maxwell's thermodynamic relations.	Lect
13	Maxwell's thermodynamic relations.	Lect
14	Dielectrics- polar and non-polar dielectrics	Lect

15	polarization- sources of polarization	Lect
16	Gauss's law in dielectrics + Problem solving	Lect + Group Activity
17	permittivity	Lect
18	dielectric displacement vector- dielectric constant	Lect
19	susceptibility- ferroelectricity	Lect

SESSIONS BY Guest – 1 hr per week

Sessions **(1 Hr each)**	**Topic**	**Method**
Sessions	**Topic**	**Method**
1	Crystalline and amorphous solids	Lect.
2	Crystal lattice- basis- unit cell	Lect
3	Lattice parameters	Lect
4	Crystal systems	Lect
5	Crystal planes and directions	Lect
6	Miller indices	Lect
7	Simple cubic- fcc structures	Lect
8	bcc hcp structures	Lect
9	Packing fraction- NaCl structure	Lect
10	Crystal diffraction-Bragg's law	Lect
11	Problem solving and revision	Lect
12	Magnetization in materials	Lect
13	Linear and non-linear materials-	Lect
14	Diamagnetism paramagnetism	Lect
15	Ferromagnetism- hysteresis	Lect
16	Ferromagnetic Domains antiferromagnetism	Lect

17	Ferrimagnetism + Problems	Lect + Group Activity

ASSIGNMENTS

	Date of submission/completion	Topic of Assignment & Nature of assignment (Individual/Group – Written/Presentation – Graded or Non-graded etc)	Marks
1	Before 1st Internal	Individual- Graded	10
2	Before 2nd Internal	Individual- Graded	10

ASSIGNMENTS/EXERCISES – Details & Guidelines – Will be notified prior to the announcement of the assignment. Assignment marks will be scaled to 5.

Additional Work: Solving all the problems mentioned in the basic reference book.

CH2C01U – Electric and Magnetic Phenomena, Thermodynamics and Elementary Solid State Physics

(Physics for B.Sc (CHEMISTRY)- SEM-2)

As per syllabus taking 50 % of the course i.e., 18 Hrs of the total 36 Hrs. One theory class per week.

COURSE OBJECTIVES

This course will provide a theoretical basis for doing experiments in related areas and also understand the basic requirements for his/her higher studies.

Basic Reference

8. Introduction of Electrodynamics- D.J. Griffiths (PHI Pvt. Ltd)
9. Modern Physics- G.Aruldas and P.Rajagopal (PHI Pub)
10. Thermodynamics- Zemansky and Dittmann (Tata McGraw-Hill)
11. Heat and Thermodynamics- Brijlal and Subrahmanyam (S. Chand &Co)
12. Solid State Physics- R. K. Puri and V.K. Babbar (S. Chand and Co.)
13. Introduction to Solid State Physics- C. Kittel (John Wiley & Sons, 7th Edn.)

COURSE OUTCOMES:

At the end of the course, the student will get sufficient theoretical basis for doing experiments in the upcoming semesters in related areas and also understand the basic requirements for his/her higher studies.

Sessions	Topic	Method	Remarks/Reference
1	Crystalline and amorphous solids	Lect.	
2	Crystal lattice- basis- unit cell	Lect.	
3	Lattice parameters	Lect.	
4	Crystal systems	Lect.	
5	Crystal planes and directions	Lect.	
6	Miller indices	Lect.	
7	Simple cubic- fcc structures	Lect.	
8	bcc hcp structures	Lect.	

9	**1st Internal**	1 Hr	
10	Packing fraction NaCl structure	Lect.	
11	Crystal diffraction-Bragg's law	Lect.	
12	Problem solving and revision	Class activity	
13	Dielectrics- polar and non-polar dielectrics-	Lect.	
14	polarization- sources of polarization- Gauss's law in dielectrics	Lect.	
15	permittivity- dielectric displacement	Lect.	

	vector		
16	**2nd Internal**	2 Hrs	
17	dielectric constant-susceptibility- ferroelectricity	Lect.	
18	Problem Solving and Revision	Class activity	

ASSIGNMENTS

	Date of submission/completion	**Topic of Assignment & Nature of assignment (Individual/Group – Written/Presentation – Graded or Non-graded etc)**	**Weightage/marks**
1	BEFORE CIA-1	Individual- Graded	10
2	BEFORE CIA-2	Individual- Graded	10

ASSIGNMENTS/EXERCISES – Details & Guidelines – Will be notified prior to the announcement of the assignment

Additional Work: Solving all the problems mentioned in the reference books

B.Sc: Chemistry

Discipline: Complementary Physics.

Semester: 3

Course Name: Quantum Mechanics, Spectroscopy, Nuclear Physics and Electronics

Teaching: Three lecture class per week handled by Dr. Pius Augustine (1 hr. /week.), and Guest (2 hr. /week).

REFERENCE

1. Introduction to Modern Physics- H.S. Mani and G.K. Mehta (Affiliated

East West press Pvt. Ltd)

2. Concepts of Modern Physics- A. Beiser (Tata McGraw-Hill, 5th Edn.)

3. Modern Physics- R. Murugeshan (S. Chand and Co.)

4. Quantum Physics- S. Gasiorowicz (John Wiley & Sons)

5. Basic electronics- B. L. Theraja (S. Chand and Co.)

6. Elements of electronics- M.K. Bagde, S.P. Sngh and K. Singh (S. Chand andCo.)

7. Modern Physics- G.Aruldas and P.Rajagopal (PHI Pub)

OBJECTIVE

To introduce the students to the field of Quantum mechanics, spectroscopy and nuclear physics, electronics.

OUTCOMES:

As the course completes an understanding in quantum mechanics, spectroscopy and Nuclear physics is attained by the students. Students gets a basic introduction of electronics. His concepts are assessed and graded.

Sessions	Teacher	Topic	Method	Remarks
1	Guest	The need for quantum mechanics(QM)	Discussion	Introduction of Syllabus, Why classical mechanics is inadequate?
2	Guest	Introduction to QM	Lecture + question answer session.	Syllabus
3	Guest	Black body radiation	Lecture + question answer session.	Syllabus
4	Guest	Black body radiation (planks quantum hypothesis)	Lecture + question answer session.	Syllabus
5	Guest	Photoelectric effect.	Lecture + question answer session.	Syllabus
6	Guest	de Broglie hypothesis - matter wave	Lecture + question answer session.	Syllabus
7	Guest	Davisson - Germer experiment	Lecture + question answer session.	Syllabus

8	Guest	uncertainty principle	Lecture + question answer session.	Syllabus
9	Guest	Wave function – properties and normalization	Lecture + question answer session.	Syllabus
10	Guest	Schrodinger equation stationary states	Lecture + question answer session.	Syllabus
11	Guest	non-normalizable wavefunctions + problems	Lecture + question answer session. + problem solving session	Syllabus
12	Guest	box normalization – particle in a box problem	Lecture + question answer session.	Syllabus
13	Guest	Concept of an atom	Discussion	Syllabus
14	Guest	Thomson's model-Rutherford's nuclear atom model	Discussion and demonstration	Syllabus
15	Guest	Bohr atom model description	Lecture + question answer session.	Syllabus
16	Guest	Bohr atom model derivation of r and E	Lecture + question answer session.	Syllabus
17	Guest	Somerfield's relativistic atom model	Lecture + question answer session.	Syllabus

18	Guest	Problem solving session	Lecture + question answer session.	Syllabus
19	Guest	vector atom model	Teacher student interactive session	Syllabus
20	Guest	Fine structure of Hydrogen atom	Lecture + question answer session.	Syllabus
21	Guest	Rotational spectra of rigid diatomic molecules	Lecture + question answer session.	Syllabus
22	Guest	Vibrational spectra of rigid diatomic molecules	Lecture + question answer session.	Syllabus
23	Guest	Raman effect-quantum theory	Lecture + question answer session.	Syllabus
24	Guest	Problem Solving Session	Activity.	Syllabus
25	PA	Introduction of nucleus. Nuclear constituents, different nuclear types	1. Lecture method to introduce. 2. Discussion and recall the previous information they had on the topic.	Syllabus
26	PA	Properties of nuclei – size, mass, charge, density	1. Lecture method to introduce. 2. .Discussion and recall the previous information they had on the topic.	Syllabus

27	PA	Binding energy, packing fraction, nuclear stability, spin and magnetic dipole moment, electric quadrupole moment.	1. Group discussion. 2. Quiz 3. Problem solving.	Syllabus
28	PA	Properties of nuclear forces, radioactivity, radiations and laws of radioactive decay.	1. Group discussion. 2. Quiz 3. Problem solving.	Syllabus
29	PA	Revision	1. Group discussion. 2. Quiz 3. Problem solving.	Syllabus
30	PA	Half-life, mean life, radioactivity units, radioactive series, radioactive dating, carbon dating and artificial radioactivity	Student's presentation, discussion, Quiz (class test), Notes completion and Problem solving.	Syllabus
31	PA	Revision for first unit	Class Activity.	Syllabus
32	PA	Nuclear fission – Energy release in fission reactions.	1. Lecture. 2. Discussion.	syllabus

		(2 hrs August 1st week)	3. Buddy discussion to derive the equations.	
33	PA	Liquid drop model of fission chain reaction. Nculear reactor (1 hrs August 2nd week)	1. Lecture. 2. Discussion. 3. Student presentation on the board.	Syllabus
34	PA	Atom bomb and nuclear fusion 1 hr (August 3rd week)	Peer discussion and checking Teacher facilitates.	syllabus
35	PA	Liquid drop model of fission chain reaction. Nculear reactor (1 hrs August 2nd week)	4. Lecture. 5. Discussion. 6. Student presentation on the board.	Syllabus
36	PA	Atom bomb and nuclear fusion	Peer discussion and checking	Syllabus

		1 hr (August 3rd week)	Teacher facilitates.	
37	PA	Group distribution for revision of Fission and Fusion. 1 hr. September 1st week.	Peer discussion and checking Teacher facilitates.	Syllabus
38	PA	Energy production in stars – thermonuclear reaction in sun p-p and CN cycles. 1 hr September 2nd week	1. Lecture. 2. Discussion. 3. Video Presentation.	Syllabus
39	PA	Seminar Presentation.		Syllabus
40	PA	Group distribution for revision of Fission and Fusion. 1 hr. September 1st week.	Peer discussion and checking Teacher facilitates.	Syllabus
41	Guest	Semiconductors- doping- band structure	Lect.	Syllabus
42	Guest	PN junction	Lect.	Syllabus
43	Guest	biasing	Lect.	Syllabus

44	Guest	Diode equation (derivation not expected)	Lect.	Syllabus
45	Guest	diode characteristics	Assignment, Class activity	Syllabus
46	Guest	Zener diode	Lect	Syllabus
47	Guest	Zener diode - voltage regulation	Lect.	Syllabus
48	Guest	diode circuits	Lecture	Syllabus
49	Guest	rectification- half wave	Lecture	Syllabus
50	Guest	full wave and bridge rectifiers	Lect.	Syllabus
51	Guest	transistors- different configurations	Lect.	Syllabus
52	Guest	Transistor characteristics	Lect.	
53	Guest	biasing transistor	Lecture + question answer session.	Syllabus
54	Guest	amplifiers- feedback in amplifiers	Lecture + question answer session.	Syllabus
53	PA+Guest	40 percent of portion	1st CIA	Internal exam
54	PA+Guest	100 percent of portion	2nd CIA	Internal exam

Assignments and Viva

	Nature of assignment and viva	Weightage/marks
1	Viva + assignments	10
2	Viva + assignments	10
3	Viva + assignments	10
4	Seminar + viva	10

Additional Work:

Reading session in the library: Reading books related to the works of scientists in the field of quantum physics.

Nuclear Power in India

Elementary particle physics and research.

B.Sc: Chemistry

Discipline: Complementary Physics.

Semester: 4

Course Name: Physical Optics, Laser Physics and superconductivity.

Teaching: Three lecture class per week handled by Dr. Pius Augustine (1 hr. /week.), and Celine Miss (Guest) (2 hr. /week).

REFERENCE

1. Introduction to Modern Physics- H.S. Mani and G.K. Mehta (Affiliated

East West press Pvt. Ltd)

2. Concepts of Modern Physics- A. Beiser (Tata McGraw-Hill, 5th Edn.)

3. Modern Physics- R. Murugeshan (S. Chand and Co.)

4. Quantum Physics- S. Gasiorowicz (John Wiley & Sons)

5. Modern Physics- G.Aruldas and P.Rajagopal (PHI Pub)

OBJECTIVE

To revise the concept of Interference, Diffraction, Polarization and to establish a sound base in these topics. Also, detailed study on Laser Physics and Super conductivity are expected through this course.

OUTCOMES:

As the course completes a thorough understanding in the properties/behavior of light would be attained by the students. Also, students will be able to appreciate the importance of super conductivity and latest research in science particularly the importance of Lasers in the advance scientific research.

Sessions	Teacher	Topic	Method	Remarks
1	GUEST	Interference of light –	Discussion	Introduction of Syllabus, Why classical mechanics is inadequate?
2	GUEST	Principle of superposition- conditions for maximum and minimum intensities, coherent sources	Lecture + question answer session.	Syllabus
3	GUEST	Principle of superposition- conditions for maximum and minimum intensities, coherent sources	Lecture + question answer session.	Syllabus
4	GUEST	Problems	Lecture + question answer session.	Syllabus
5	GUEST	Student discussion to solve	Lecture + question answer session.	Syllabus
6	GUEST	interference by division of wave front and division of amplitude	Lecture + question answer session.	Syllabus
7	GUEST	Problems	Lecture + question answer session.	Syllabus
8	GUEST	Young's double slit experiment (division of wavefront), Expression for fringe width,	Lecture + question answer session.	Syllabus

9	GUEST	Probles on double slit experiment	Lecture + question answer session.	Syllabus
10	GUEST	Newton's rings by reflected light (division of amplitude)	Lecture + question answer session.	Syllabus
11	GUEST	Measurement of wavelength of sodium light by Newton's rings interference in thin films.	Lecture + question answer session. + problem solving session	Syllabus
12	GUEST	Revision	Lecture + question answer session.	Syllabus
13	GUEST	Diffraction	Discussion	Syllabus
14	GUEST	Difference between interference and diffraction Fresnel and Fraunhofer diffraction	Discussion and demonstration	Syllabus
15	GUEST	Discussion continue	Lecture + question answer session.	Syllabus
16	GUEST	Fresnel diffraction at a straight edge Theory of plane transmission grating	Lecture + question answer session.	Syllabus
17	GUEST	Problem solving	Problem solving	Syllabus
18	GUEST	Determination of wavelength (Normal incidence)	Lecture + question answer session.	Syllabus
19	GUEST	Problem solving	Teacher student interactive session	Syllabus
20	GUEST	resolving power dispersive power	Lecture + question answer session.	Syllabus

21	GUEST	Revision	Lecture + question answer session.	Syllabus
22	GUEST	Polarization	Lecture + question answer session.	Syllabus
23	GUEST	polarized and unpolarized light	Lecture + question answer session.	Syllabus
24	GUEST	polarized and unpolarized light	Activity.	Syllabus
25	GUEST	plane of vibration plane of polarization	3. Discussion and recall the previous information they had on the topic.	Syllabus
26	GUEST	polarization by reflection Brewster's law	3. Lecture method to introduce. 4. .Discussion and recall the previous information they had on the topic.	Syllabus
27	GUEST	polarization by refracton through pile of plates law of Malus	4. Group discussion. 5. Quiz	Syllabus
28	GUEST	uni axial and biaxial crystals	4. Group discussion. 5. Quiz 6. Problem solving.	Syllabus
29	GUEST	double refracton principla plane	4. Group discussion. 5. Quiz	Syllabus

			6. Problem solving.	
30	GUEST	polarization by double refration polarization by slelctive absorption polaroid	Student's presentation, discussion, Quiz (class test), Notes completion and Problem solving.	Syllabus
31	GUEST	polarization by double refration polarization by slelctive absorption polaroid	Class Activity.	Syllabus
32	GUEST	polarization by scattering elliptically and circularly polarized light half wave and quarter wave plates.	4. Lecture. 5. Discussion.	syllabus
33	GUEST	polarization by scattering elliptically and circularly polarized light half wave and quarter wave plates.	7. Lecture. 8. Discussion. 9. Student presentation on the board.	Syllabus
34	GUEST	Revision	Peer discussion and checking Teacher facilitates.	syllabus
35	PA	Laser Physics Introduction	10. Lecture. 11. Discussion.	Syllabus
36	PA	Interaction of electromagnetic radiation with matter	Peer discussion and checking	Syllabus

			Teacher facilitates.	
37	PA	Stimulated absorption spontaneous emission	Peer discussion and checking Teacher facilitates.	Syllabus
38	PA	Stimulated emission principle of laser population inversion	4. Lecture. 5. Discussion. 6. Video Presentation.	Syllabus
39	PA	Einstein's coefficients	Lecure	Syllabus
40	PA	Types of lasers Ruby laser	Lecture + video presentation	Syllabus
41	PA	Continue	Lect.	Syllabus
42	PA	Neodymium-YAG laser	Lect.	Syllabus
43	PA	He-Ne laser	Lect.	Syllabus
44	PA	Properties of laser beams	Lect.	Syllabus
45	PA	Application of laser beams	Assignment, Class activity	Syllabus
46	PA	Superconductivity introduction	Lect	Syllabus

47	PA	continue	Lect.	Syllabus
48	PA	Super conducting phenomenon Occurrence BCS theory(qualitative)	Lecture	Syllabus
49	PA	continue	Lecture	Syllabus
50	PA	Meissner effect	Lect.	Syllabus
51	PA	continue	Lect.	Syllabus
52	PA	Type I and Type II	Lect.	
53	PA	superconductors Josphson effects High temperature superconductors	Lecture + question answer session.	Syllabus
54	PA	Application of superconductivity.	Lecture + question answer session.	Syllabus
53	PA+Guest	40 percent of portion	1st CIA	Internal exam
54	PA+Guest	100 percent of portion	2nd CIA	Internal exam

Assignments and Viva

	Nature of assignment and viva	**Weightage/marks**
1	Viva + assignments	10
2	Viva + assignments	10
3	Viva + assignments	10
4	Seminar + viva	10

Additional Work:

Reading session in the library: Reading books related to the works of scientists in the field of light. Seminar on LASRS and Super conductivity.

Course Plan for the Year 2017-18

Properties of Matter, Mechanics and Fourier Analysis (B.Sc Maths)- SEM-1

Course Coordinators: Dr. Roby Cherian and Dr. Sumod S.G

COURSE OBJECTIVES

The syllabus will cater into the basic requirements for his/her higher studies. The Course requires basic knowledge of mechanics, electricity, magnetism, properties of matter and mathematical tools.

Basic Reference:

1. Mechanics- H.S.Hans and S.P.Puri. (Tata McGraw-Hill)
2. Properties of Matter- Brijlal and N. Subrahmanyam (S. Chand and Co.)
3. Mechanics- J.C. Upadhyaya (Ram Prasad and sons)

COURSE OUTCOMES:

At the end of the course, the student will be enriched towards the field of Ealsticity, Rotational dynamics, Oscillations and Fourier Series.

Sessions By Dr. Roby Cherian Covering ½ the portions:

Sessions (1 Hr each)	**Topic**	**Method**
1	Introduction – to Elasticity	Lect.
2	Elastic moduli	Lect.
3	Poissons ratio and class activity	Class Activity in Groups
4	Twisting couple	Lect.
5	Determination of rigidity modulus	Lect.
6	Determination of rigidity modulus Contd	Lect.

7	Problems	Lect.+ Class Activity
8	CIA-I	1 Hr exam.
9	Static torsion	Lect.
10	Torsion pendulum	Class Activity
11	Bending of beams	Lect. + Class activity
12	Cantilever	Lect.
13	Uniform Bending	Lect.
14	Non-Uniform bending	Lect.
15	Fourier Series Introduction	Lect.
16-17	CIA-II	2 Hr Exam
18	Group activity to analyze various wave forms	Class activity
19	Group activity to analyze various wave forms	Class Activity.

ASSIGNMENTS

	Date of submission/completion	**Topic of Assignment & Nature of assignment (Individual/Group – Written/Presentation – Graded or Non-graded etc)**	**Marks**
1	Before 1st Internal	Individual- Graded	10
2	Before 2nd Internal	Individual- Graded	10
3	Before 2nd Internal	Individual	10

ASSIGNMENTS/EXERCISES – Details & Guidelines – Will be notified prior to the announcement of the assignment

Additional Work: Solving all the problems mentioned in the basic reference book.

Sessions By Dr. Sumod S.G Covering ½ the portions:

No of Sessions (1 Hr each)	Topic	Method
6	Angular velocity- angular momentum- torque- conservation of angular momentum- angular acceleration- moment of inertia- parallel and perpendicular axes theorems-	Lect.
4	moment of inertia of rod, ring, disc, cylinder and sphere- flywheel	Lect.
6	Periodic and oscillatory motion- simple harmonic motion- differential equation- expression for displacement, velocity and acceleration- graphical representation-	Class Activity in Groups
3	energy of a particle executing simple harmonic motiondamped oscillation- forced oscillation and resonance	Lect.

Electric and Magnetic phenomena, Thermodynamics and Special theory of Relativity (Physics for B.Sc (MATHEMATICS)- SEM-2)

Course Coordinator: Dr Roby Cherian

Dr. Roby Cherian and Dr. Sumod S.G will be taking 18 Hrs each for the course having a total of 36 Hrs (3 credit course) - 2hrs per week.

COURSE OBJECTIVES

This course will provide a theoretical basis for doing experiments in related areas and also understand the basic requirements for his/her higher studies.

Basic Reference

1. Introduction to Modern Physics- H.S. Mani and G.K. Mehta (Affiliated East West press Pvt. Ltd)
2. Concepts of Modern Physics- A. Beiser (Tata McGraw-Hill, 5th Edn.)
3. Modern Physics- R. Murugeshan (S. Chand and Co.)
4. Introduction of Electrodynamics- D.J. Griffiths (PHI Pvt. Ltd)
5. Modern Physics- G.Aruldas and P.Rajagopal (PHI Pub)
6. Thermodynamics- Zemansky and Dittmann (Tata McGraw-Hill)
7. Heat and Thermodynamics- Brijlal and Subrahmanyam (S. Chand &Co)

COURSE OUTCOMES:

At the end of the course, the student will get sufficient theoretical basis for doing experiments in the upcoming semesters in related areas and also understand the basic requirements for his/her higher studies.

SESSIONS BY DR. ROBY CHERIAN – 1 hr per week

Sessions (1 Hr each)	Topic	Method
Sessions	**Topic**	**Method**
1	Thermodynamic systems- thermodynamic equilibrium	Lect
2	- thermodynamic processes- isothermal process- adiabatic process	Lect
3	zeroth law of thermodynamics	Lect
4	first law of thermodynamics	Lect
5	heat engine	Lect
6	heat engine	Lect
7	the Carnot engine	Lect
8	the Carnot engine + Problem solving	Lect + Group Activity
9	refrigerator concept of entropy-	Lect
10	second law of thermodynamics	Lect
11	- third law of thermodynami	Lect
12	Maxwell's thermodynamic relations.	Lect
13	Maxwell's thermodynamic relations.	Lect
14	Dielectrics- polar and non-polar dielectrics	Lect
15	polarization- sources of polarization	Lect
16	Gauss's law in dielectrics + Problem solving	Lect + Group Activity
17	permittivity	Lect
18	dielectric displacement vector- dielectric constant	Lect
19	susceptibility- ferroelectricity	Lect

SESSIONS BY DR. SUMOD S G – 1 hr per week

Sessions (1 Hr each)	Topic	Method
Sessions	**Topic**	**Method**
1	Special theory of relativity Introduction	Lect.
2	Galilean transformation	Lect
3	Newtonian principle of relativity	Lect
4	Special theory of Relativity-Conceptual Description	Lect
5	postulates: Explanation with discussion on its implications	Lect
6	Lorentz transformation- Derivation, Length Contraction	Lect
7	Time dilation –Concept and derivation	Lect
8	relativity of simultaneity, addition of velocities-	Lect
9	relativistic mass transformations	Lect
10	mass energy relation	Lect
11	Problem solving and revision	Lect
12	Magnetization in materials	Lect
13	linear and non-linear materials-	Lect
14	Diamagnetism paramagnetism	Lect
15	ferromagnetism- hysteresis	Lect
16	ferromagnetic Domains antiferromagnetism	Lect
17	Ferrimagnetism + Problems	Lect + Group Activity

ASSIGNMENTS

	Date of submission/completion	Topic of Assignment & Nature of assignment (Individual/Group – Written/Presentation – Graded or Non-graded etc)	Marks
1	Before 1st Internal	Individual- Graded	10
2	Before 2nd Internal	Individual- Graded	10

ASSIGNMENTS/EXERCISES – Details & Guidelines – Will be notified prior to the announcement of the assignment. Assignment marks will be scaled to 5.

Additional Work: Solving all the problems mentioned in the basic reference book.

B.Sc: Mathematics

Discipline: Complementary Physics.

Semester: 3

Course Name: Quantum Mechanics, Spectroscopy, Nuclear Physics, Basic Electronics and Digital Electronics

Teaching: Three lecture class per week handled by Dr. Jimmy Sebastian (1 hr. /week.), Dr.Pius Augustine (1 hr. /week) and (Guest) (1 hr. /week).

REFERENCE

1. Introduction to Modern Physics- H.S. Mani and G.K. Mehta (Affiliated East West press Pvt. Ltd)
2. Concepts of Modern Physics- A. Beiser (Tata McGraw-Hill, 5th Edn.)
3. Modern Physics- R. Murugeshan (S. Chand and Co.)
4. Quantum Physics- S. Gasiorowicz (John Wiley & Sons)
5. Basic electronics- B. L. Theraja (S. Chand and Co.)
6. Elements of electronics- M.K. Bagde, S.P. Sngh and K. Singh (S. Chand andCo.)
7. Modern Physics- G.Aruldas and P.Rajagopal (PHI Pub)
8. Digital principles and applications- A. P. Malvino and P.Leach

OBJECTIVE

To introduce the students to the field of Quantum mechanics, spectroscopy and nuclear physics, basic electronics and digital electronics.

OUTCOMES:

As the course completes an understanding in quantum mechanics, spectroscopy and Nuclear physics is attained by the students. Students gets a basic introduction of electronics and digital electronics as well. His concepts are assessed and graded.

Sessions	Teacher	Topic	Method	Remarks
1	JS	The need for quantum mechanics(QM)	Discussion	Introduction of Syllabus, Why classical mechanics is inadequate?

2	JS	Introduction to QM	Lecture + question answer session.	Syllabus
3	JS	Black body radiation	Lecture + question answer session.	Syllabus
4	JS	Black body radiation (planks quantum hypothesis)	Lecture + question answer session.	Syllabus
5	JS	Photoelectric effect.	Lecture + question answer session.	Syllabus
6	JS	de Broglie hypothesis - matter wave	Lecture + question answer session.	Syllabus
7	JS	Davisson - Germer experiment	Lecture + question answer session.	Syllabus
8	JS	uncertainty principle	Lecture + question answer session.	Syllabus
9	JS	Wave function – properties and normalization	Lecture + question answer session.	Syllabus
10	JS	Schrodinger equation stationary states	Lecture + question answer session.	Syllabus
11	JS	non-normalizable wavefunctions + problems	Lecture + question answer session. + problem solving session	Syllabus
12	JS	box normalization – particle in a box problem	Lecture + question answer session.	Syllabus
13	JS	Concept of an atom	Discussion	Syllabus
14	JS	Thomson's model-Rutherford's nuclear atom model	Discussion and demonstration	Syllabus
15	JS	Bohr atom model description	Lecture + question answer session.	Syllabus
16	JS	Bohr atom model derivation of r and E	Lecture + question answer session.	Syllabus
17	JS	Somerfield's relativistic atom model	Lecture + question answer session.	Syllabus
18	JS	Problem solving session	Lecture + question answer session.	Syllabus
19	Guest	vector atom model	Teacher student interactive session	Syllabus
20	Guest	Fine structure of Hydrogen atom	Lecture + question answer session.	Syllabus
21	Guest	Rotational spectra of rigid diatomic molecules	Lecture + question answer session.	Syllabus

22	Guest	Vibrational spectra of rigid diatomic molecules	Lecture + question answer session.	Syllabus
23	Guest	Raman effect-quantum theory	Lecture + question answer session.	Syllabus
24	PA	Introduction of nucleus. Nuclear constituents, different nuclear types	1. Lecture method to introduce. 2. Discussion and recall the previous information they had on the topic.	Syllabus
25	PA	Properties of nuclei – size, mass, charge, density	1. Lecture method to introduce. 2. .Discussion and recall the previous information they had on the topic.	Syllabus
26	PA	Binding energy, packing fraction, nuclear stability, spin and magnetic dipole moment, electric quadrupole moment.	1. Group discussion. 2. Quiz 3. Problem solving.	Syllabus
27	PA	Properties of nuclear forces, radioactivity, radiations and laws of radioactive decay.	1. Group discussion. 2. Quiz 3. Problem solving.	Syllabus
28	PA	Revision	1. Group discussion. 2. Quiz 3. Problem solving.	Syllabus
29	PA	Half-life, mean life, radioactivity units, radioactive series, radioactive dating, carbon dating and artificial radioactivity	Student's presentation, discussion, Quiz (class test), Notes completion and Problem solving.	Syllabus
30	PA	Revision for first unit	Class Activity.	Syllabus

31	Guest	Semiconductors- doping- band structure	Lecture	Syllabus
32	Guest	PN junction	Lecture	Syllabus
33	Guest	biasing	Lecture	Syllabus
34	Guest	Diode equation (derivation not expected)	Lecture	Syllabus
35	Guest	diode characteristics	Lecture	Syllabus
36	Guest	Zener diode	Lecture	Syllabus
37	Guest	Zener diode - voltage regulation	Lecture	Syllabus
38	Guest	diode circuits	Lecture	Syllabus
39	Guest	rectification- half wave	Lecture	Syllabus
40	Guest	full wave and bridge rectifiers	Lecture	Syllabus
41	Guest	transistors- different configurations	Lecture	Syllabus
42	Guest	Transistor characteristics	Lecture	
43	Guest	biasing transistor	Lecture	Syllabus
44	Guest	amplifiers- feedback in amplifiers	Lecture	Syllabus
45	PA	Digital Electronics – Decimal, Binary	1. Lecture. 2. Discussion. 3. Buddy discussion to derive the equations.	Syllabus
46	PA	Octal, Hexa decimal number systems	1. Lecture. 2. Discussion. 3. Student presentation on the board.	Syllabus

47	PA	Conversion between different number systems	1. Lecture. 2. Discussion. 3. Student presentation on the board.	Syllabus
48	PA	Revision	Syllabus	Syllabus
49	PA	Binary mathematics – addition and subtraction.	Peer discussion and checking Teacher facilitates.	Syllabus
50	PA	Basic theorems of Boolean algebra	Peer discussion and checking Teacher facilitates.	Syllabus
51	PA	DeMorgan's theorems, AND, OR, NOT, NAND gates.	Peer discussion and checking Teacher facilitates.	Syllabus
52	JS	Recap of quantum mechanics	Discussion	Syllabus
53	JS+PA+ Guest	40 percent of portion	1st CIA	Internal exam
54	JS+PA+ Guest	100 percent of portion	2nd CIA	Internal exam

Assignments and Viva

	Nature of assignment and viva	**Weightage/marks**
1	Viva + assignments	10
2	Viva + assignments	10
3	Viva + assignments	10
4	Seminar + viva	10

Additional Work:

Reading session in the library: Reading books related to the works of scientists in the field of quantum physics.

B.Sc: Mathematics

Discipline: Complementary Physics.

Semester: 4

Course Name: Physical optics, Laser Physics and Astrophysics

Teaching: Three lecture class per week handled by Dr. Jimmy Sebastian (1 hr. /week.), Dr.Pius Augustine (1 hr. /week) and Guest (1 hr. /week).

REFERENCE

1. A text book of optics- N. Subrahmanyam, Brijlal and M.N.Avadhanulu (S.Chand and Co.)
2. Fundamentals of Physics - Halliday and Resnik (John Wiley)
3. An introduction to Astrophysics- Baidyanath Basu
4. Modern Physics- R. Murugeshan (S. Chand and Co.)
5. Concepts of Modern Physics- A. Beiser (Tata McGraw-Hill, 5th Edn.)

OBJECTIVE

To introduce the students to the field of optics, Laser physics and astrophysics. Revision of basics of Mechanics from senior secondary schools syllabus.

OUTCOMES:

As the course completes an understanding in the concepts of optics, laser physics and astronomy is attained by the students. His concepts are assessed and graded.

Sessions	Teacher	Topic	Method	Remarks
1	JS	Introduction to light	Discussion	Introduction of Syllabus, Concepts in wave optics
2	JS	Interference of light	PPT+Lecture + question answer session.	Syllabus
3	JS	Principle of superposition	Lecture + question answer session.	Syllabus
4	JS	Conditions for maximum and minimum intensities	Lecture + question answer session.	Syllabus
5	JS	Coherent sources, Interference by division of wave front and	Lecture + question answer	Syllabus

		division of amplitude	session.	
6	JS	Young's double slit experiment (division of wave front)	Lecture + question answer session.	Syllabus
7	JS	Expression for fringe width	Lecture + question answer session.	Syllabus
8	JS	Newton's rings by reflected light division of amplitude	PPT+Lecture + question answer session.	Syllabus
9	JS	measurement of wavelength of sodium light by Newton's rings	Lecture + question answer session.	Syllabus
10	JS	Interference in thin films - 1	Lecture + question answer session.	Syllabus
11	JS	Interference in thin films - 2	Lecture + question answer session.	Syllabus
12	JS	Problem solving session	Problem solving session	Syllabus
13	MA	Introduction to astronomy	PPT+Discussion	Syllabus
14	MA	Spectral classification of stars	Teacher student interactive session	Syllabus
15	MA	Hertzsprung – Russel Diagram.	Lecture + question answer session.	Syllabus
16	MA	Luminosity of Star, Stellar Evolution.	Lecture + question answer session.	Syllabus
17	JS	White Dwarfs	Lecture + question answer session.	Syllabus
18	JS	Electrons in a White Dwarf Star	Lecture + question answer session.	Syllabus
19	JS	Chandrasekhar Limit – Neutron Stars	Teacher student interactive session	Syllabus
20	JS	Black Holes	Lecture + question answer session.	Syllabus
21	JS	Supernova Explosion.	Lecture + question answer session.	Problem solving
22	JS	Problem Solving session	Problem solving session	Problem solving
23	PA	Introductory Session-	Lecture + Activity	Syllabus
24	PA	Bridging role of the present syllabus	Activity.	Syllabus
25	PA	Introduction to diffraction	Lect.	Syllabus

26	PA	Interference vs diffraction	Lect.	Syllabus
27	PA	Fresnels diffraction	Lect.	Syllabus
28	PA	Fresnels diffraction	Lect. + Activity	Syllabus
29	PA	Fraunhofer diffraction- straight edge	Lect.	Syllabus
30	PA	Grating and Normal incidence	Lect. + Activity at LAB	Syllabus
31	PA	Resolving Power and Dispersive power and Problem solving	Class Activity.	Syllabus
32	PA	Laser Introduction , Interaction of electromagnetic radiation with matter	Lect.	Syllabus
33	PA	Stimulated absorption , spontaneous emission- stimulated emission	Lect.	Syllabus
34	PA	principle of laser-population inversion- Einstein's coefficients	Lect.	Syllabus
35	PA	Types of lasers- Ruby laser - Neodymium	Lect.	Syllabus
36	PA	Neodymium YAG and laser- He-Ne laser	Assignment, Class activity	Syllabus
37	PA	Properties of laser beams	Lect	Syllabus
38	PA	Application of laser beams	Lect.	Syllabus
39	Guest	Introduction to polarization	Lecture	Syllabus
40	Guest	Polarized and unpolarized light, Plane of polarization and vibration	Lecture	Syllabus
41	Guest	Brewster's law	Lect.	Syllabus
42	Guest	Polarization by reflection	Lect.	Syllabus
43	Guest	Law of Malus, Polarization by refraction through pile of plates	Lect.	
44	Guest	Polarization by refraction through pile of plates	Lecture + question answer session.	Syllabus
45	Guest	Uni-axial and biaxial crystals, Double refraction	Lecture + question answer session.	Syllabus
46	Guest	Principal plane, polarization by double refraction	Lecture + question answer session.	Syllabus
47	Guest	Polarization by selective absorption	Lecture + question answer session.	Syllabus
48	Guest	Polaroids, Problems	Lecture + problem solving session.	Syllabus
49	Guest	Polarization by scattering	Lecture + question answer session.	Syllabus
50	Guest	Polarization by scattering	Lecture + question answer session.	Syllabus
51	Guest	Elliptically and circularly polarized light	Lecture + question answer session.	Syllabus
52	Guest	Elliptically and circularly polarized light	Lecture + question answer session.	Syllabus

53	Guest	Half wave and quarter wave plate	Lecture + question answer session.	Syllabus
54	Guest	Problem solving session	Problem solving session	Syllabus
55	JS+PA+Guest	CIA -1	Exam	Syllabus
56	JS+PA+Guest	CIA -2	Exam	Syllabus
57	JS,Guest,PA	Discussing problems, the question paper of CIA-II and	Lecture + question answer session.	Syllabus

Assignments and Viva

	Nature of assignment and viva	**Weightage/marks**
1	Viva + assignments	10
2	Viva + assignments	10
3	Viva + assignments	10
4	Presentation + viva	10

Additional Work:

Reading session in the library: Reading books related to the works of scientists in the field of optics and astronomy.