Ranchi Women's College, Ranchi

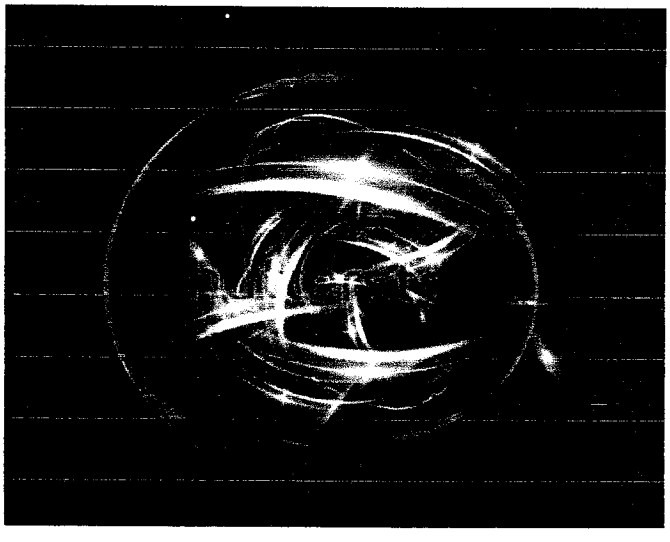
(An Autonomous Unit of Ranchi University from 2012)

Proposed Syllabus For B.Sc. (Honours) PHYSICS

UNDERCHOICEBASEDCREDITSYSTEM (CBCS)

From

Academic Session 2018-2019



COURSE STRUCTURE (PHYSICS-HONOURS)

S.no.	Course	Credits
1.	CORE COURSE (14 Papers, C1 to C14)	14×4= 56
	Core Course Practical (14 Papers, C1 Prac. To C14 Prac.)	14×2= 28
2.	ELECTIVE COURSE (8 Papers)	
	Discipline Specific Elective (4 Papers, DSE 1 to DSE 4)	4×4= 16
	Discipline Specific Elective Practical (DSE 1 Prac. To DSE 4 Prac.)	4×2= 8
3.	GENERIC ELECTIVE	
	Generic Elective (Theory) (4 Papers, GE 1 to GE 4)	5×4= 20
	Generic Elective (Tutorial) (4 Papers GE 1 Tut. to GE 4 Tut.)	1×4= 4
4.	ABILITY ENHANCEMENT COURSES (AEC)	
	Ability Enhancement Compulsory (2 Papers) Environmental Science English/MIL Communication	2×2= 4
	Ability Enhancement Elective (Skill based) (2 Papers)	2×2= 4
	TOTAL	140

PROPOSED SCHEME FOR CHOICE BASED CREDIT SYSTEM IN
B. Sc. Honours (PHYSICS)

SEM	CORECOURSE (14 Papers)	AEC Compulsory Course (AECC) (2 Papers)	AEC Elective Course (SEC) skill based (2 Papers)	Elective DSE (4 Papers)	Elective Generic (4 Papers)	Total Credits
I	Mathematical Physics-I (4+2 = 6 credits) Mechanics (4 +2= 6 credits)	*Eng./MIL Comm"/* Env. Sc. (2 credits)			GE-1 (6 credits)	20
II	Electricity& Magnetism (4+2= 6 credits) Waves andOptics (4 +2= 6 credits)	*Env. Sc./* Eng./MIL Comm" (2 credits)			GE-2 (6 credits)	20
III	Mathematical Physics–II (4+2= 6 credits) Thermal Physics (4+2 =6 credits) Digital Systems and Applications (4+2 =6 credits)		SEC-1 (2 credits)		GE-3 (6 credits)	26
IV	Mathematical Physics–III (4+2 = 6 credits) Elements of Modern Physics (4+2 = 6 credits) Analog Systems & Applications (4+2 = 6 credits)		SEC-2 (2 credits)		GE-4 (6 credits)	26
V	Quantum Mechanics and Applications (4+2 = 6 credits) Solid StatePhysics (4+2 = 6 credits)			DSE-1 (6 credits) DSE-2 (6 credits)		24
VI	Electromagnetic Theory (4+2 = 6 credits) Statistical Mechanics (4+2 = 6 credits)			DSE-3 (6 credits) DSE-4 (6 credits)		24
Credits	**84**	04	04	24	24	140

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SEM	COURSE	COURSE NAME	CREDITS
I	Ability Enhancement Compulsory Course-I	*Eng./MIL commns*/Env. Sc	2
	Core course-I	Mathematical Physics-I	4
	Core Course-I Practical/Tutorial	Mathematical Physics-I Lab	2
	Core course-II	Mechanics	4
	Core Course-II Practical/Tutorial	Mechanics Lab	2
	Generic Elective -1	GE-1	4
	Generic Elective -1 Practical/Tutorial	GE-1 Lab	2
II	Ability Enhancement CompulsoryCourse-II	*Env. Sc.*/Eng./MIL commns	2
	Core course-III	Electricity and Magnetism	4
	Core Course-III Practical/Tutorial	Electricity and Magnetism Lab	2
	Core course-IV	Waves and Optics	4
	Core Course-IV Practical/Tutorial	Waves and Optics Lab	2
	Generic Elective -2	GE-2	4
	Generic Elective -2 Practical/Tutorial	GE-2 Lab	2
III	Core course-V	Mathematical Physics-II	4
	Core Course-V Practical/Tutorial	Mathematical Physics-II Lab	2
	Core course-VI	Thermal Physics	4
	Core Course-VI Practical/Tutorial	Thermal Physics Lab	2
	Core course-VII	Digital Systems and Applications	4
	Core Course-VII Practical/Tutorial	Digital Systems & Applications Lab	2
	Skill Enhancement Course -1	SEC-1	2
	Generic Elective -3	GE-3	4
	Generic Elective -3 Practical/Tutorial	GE-3 Lab	2
IV	Core course-VIII	Mathematical Physics III	4
	Course-VIII Practical/Tutorial	Mathematical Physics-III Lab	2
	Core course-IX	Elements of Modern Physics	4
	Course-IX Practical/Tutorial	Elements of Modern Physics Lab	2
	Core course-X	Analog Systems and Applications	4
	Course- X Practical/Tutorial	Analog Systems & Applications Lab	2
	Skill Enhancement Course -2	SEC -2	2
	Generic Elective -4	GE-4	4
	Generic Elective -4 Practical	GE-4 Lab	2
V	Core course-XI	Quantum Mechanics & Applications	4
	Core Course-XI Practical/Tutorial	Quantum Mechanics Lab	2
	Core course-XII	Solid State Physics	4
	Core Course-XII Practical/Tutorial	Solid State Physics Lab	2
	Discipline Specific Elective -1	DSE-1	4
	Discipline Specific Elective -1Practical/Tutorial	DSE-1 Lab	2
	Discipline Specific Elective -2	DSE-2	4
	Discipline Specific Elective- 2Practical/Tutorial	DSE-2 Lab	2
VI	Core course-XIII	Electro-magnetic Theory	4
	Core Course-XIII Practical/Tutorial	Electro-magnetic Theory Lab	2
	Core course-XIV	Statistical Mechanics	4
	Core Course-XIV Practical/Tutorial	Statistical Mechanics Lab	2
	Discipline Specific Elective -3	DSE-3	4
	Discipline Specific Elective -3Practical/Tutorial	DSE-3 Lab	2
	Discipline Specific Elective -4	DSE-4	4
	Discipline Specific Elective -4Practical/Tutorial	DSE-4 Lab	2
Total			140

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CORE PAPERS

(Credit: 4+2 = 6 each, Lectures: Theory-60, Practical-60)
(1 period/week for tutorials or 4periods/week for practical)

C1. Mathematical Physics-I
C2. Mechanics
C3. Electricity and Magnetism
C4. Waves and Optics
C5. Mathematical Physics–II
C6. Thermal Physics
C7. Digital Systems and Applications
C8. Mathematical Physics III
C9. Elements of Modern Physics
C10. Analog Systems and Applications
C11. Quantum Mechanics and Applications
C12. Solid State Physics
C13. Electromagnetic Theory
C14. Statistical Mechanics

DISCIPLINE SPECIFIC ELECTIVE PAPERS

(Credit: 06 each, Lectures: Theory-75,Tutorial-15)
(DSE 1 to DSE 4)

Any four of the following subjects

1. Nuclear and Particle Physics (5) + Tutorials (1)
2. Classical Dynamics (5) + Tutorials (1)
3. Dissertation (6)
4. Experimental Techniques (4) + Lab (2)
5. Astronomy and Astrophysics (5) + Tutorials (1)
6. Earth Science (5) + Tutorials (1)
7. Medical Physics (4) + Lab (2)
8. Biophysics (5) + Tutorials (1)

Note: Dissertation should be a preferable choice as one of the DSE in Semester VI.

GENERIC ELECTIVE

From Other Discipline (Four papers GE 1 to GE 4, Credits: 6 each)
GE: Mathematics (Theory-5 + Tutorial-1)

Orany one of the following subjects having four papers GE 1 to GE 4

1. Chemistry (4) + Lab (2)
2. Economics (5) + Tut (1)
3. Computer Science (4) + Lab (2)

CORE COURSE (HONOURS IN PHYSICS)

SEMESTER I

PHYSICS-C I: MATHEMATICAL PHYSICS-I

(Credits: Theory-04, Practicals-02)Theory: 60 Lectures

The emphasis of course is on applications in solving problems of interest to physicists. The students are to be examined entirely on the basis of problems, seen and unseen.

Calculus:

First OrderDifferential and Integrating Factor ,Second Order Differential equations: Homogeneous Equations with constantcoefficients. Wronskian and general solution.Statement of existence and UniquenessTheorem for Initial Value Problems. Particular Integralfor typical source terms like polynomials, exponential, sine, cosine etc and their combinations. **(12+3=15 Lectures)**

Calculus of multivariablefunctions: Partial derivatives, exact and inexactdifferentials. Integrating factor, with simple illustration.Constrained Maximizationusing Lagrange Multipliers. **(6 Lectures)**

Vector Calculus:

Recapitulation of vectors: Properties of vectors under rotations. Scalar product and itsinvariance under rotations.Vectorproduct. Scalar triple product and their geometrical interpretation.Scalar and Vector fields. **(5 Lectures)**

Vector Differentiation: Directional derivatives and normal derivative.Gradient of ascalar field and its geometrical interpretation.Divergence and curl of a vector field.Deland Laplacian operators.Vector identities. **(10 Lectures)**

Vector Integration: Line, surface and volume integralsof Vector fields. Flux of a vector field, Gauss' divergence theorem, Green's and StokesTheorems and their applications (no rigorous proofs).Dirac Delta function and its properties **(14+3=17Lectures)**

Orthogonal Curvilinear Coordinates:

Orthogonal Curvilinear Coordinates.Expression for Gradient, Divergence, Curl and Laplacian in orthogonal curvilinear co-ordinates.Derivation of Gradient, Divergence, Curl andLaplacian in Cartesian, Spherical and Cylindrical Coordinate Systems.(7 Lectures)

Reference Books:

- Mathematical Methods for Physicists, G.B. Arfken, H.J. Weber, F.E. Harris, 2013,7th Edn., Elsevier.
- An introduction to ordinary differential equations, E.A. Coddington, 2009, PHI learning
- Differential Equations, George F. Simmons, 2007, McGraw Hill.
- Mathematical Tools for Physics, James Nearing, 2010, Dover Publications.
- Mathematical methods for Scientists and Engineers, D.A. McQuarrie, 2003, Viva Book
- Advanced Engineering Mathematics, D.G. Zill and W.S. Wright, 5 Ed., 2012, Jonesand Bartlett Learning
- Advanced Engineering Mathematics, Erwin Kreyszig, 2008, Wiley India.
- Essential Mathematical Methods, K.F.Riley&M.P.Hobson, 2011, Cambridge Univ. Press
- Mathematical Physics, B. D. Gupta.
- Mathematical Physics, B. S. Rajput
- Mathematical Physics, H. K. Dass.
- Mathematical methods in Physics, E. Butkov
- Mathematical methods in Physics, Potter and Goldberg

PHYSICS LAB- C I LAB
60 Lectures

The aim of this Lab is not just to teach computer programming and numerical analysisbut to emphasize its role in solving problems in Physics.

- *Highlights the use of computational methods to solve physical problems*
- *The course will consist of lectures (both theory and practical) in the Lab*
- *Evaluation done not on the programming but on the basis of formulating the problem*
- *Aim at teaching students to construct the computational problem to be solved*
- *Students can use any one operating system Linux or Microsoft Windows*

Topics	Description with Applications
Introduction and Overview	Computer architecture and organization, memory andInput/output devices
Basics of scientific computing	Binary and decimal arithmetic, Floating point numbers,algorithms, Sequence, Selection and Repetition, singleand double precision arithmetic, underflow &overflowemphasizethe importance of making equations in termsof dimensionless variables, Iterative methods
Errors and error Analysis	Truncation and round off errors, Absolute and relativeerrors, Floating point computations.
Review of C & C++ Programmingfundamentals	Introduction to Programming, constants, variables anddata types, operators and Expressions, I/O statements,scanf and printf, c in and c out, Manipulators for dataformatting, Control statements (decision making andlooping statements) (*If-statement, If-else Statement,Nested if Structure, Else-if Statement, Ternary Operator,Goto Statement, Switch Statement, Unconditional andConditional Looping, While Loop, Do-While Loop, FORLoop, Break and Continue Statements, Nested Loops*),Arrays (*1D & 2D*) and strings, user defined functions,Structures and Unions, Idea of classes and objects
Programs:	Sum & average of a list of numbers, largest of a givenlist of numbers and its location in the list, sorting ofnumbers in ascending descending order, Binary search
Random number generation	Area of circle, area of square, volume of sphere, valueof π
Solution of Algebraic and Transcendentalequations by Bisection, Newton Raphsonand Secant methods	Solution of linear and quadratic equation, solving$\alpha = \tan\alpha$; $I = Io\,[(\sin\alpha)/\alpha]^2$ in optics
Interpolation by Newton Gregory Forwardand Backward difference formula, Errorestimation.	Evaluation of trigonometric functions e.g. $\sin\theta$, $\cos\theta$,$\tan\theta$, *etc.*

Also attempt some problems on differential equations like:

1. Solve the coupled first order differential equations

$$\frac{dx}{dt} = y + x - \frac{x^3}{3}$$

$$\frac{dy}{dt} = -x$$

for four initial conditions x(0) = 0, y(0) = -1, -2, -3, -4. Plot x vs y for each of the four initial conditions on the same screen for $0 \le t \le 15$.

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2. The ordinary differential equation describing the motion of a pendulum is

$$\vartheta'' = -\sin(\vartheta)$$

The pendulum is released from rest at an angular displacement α i.e. $\vartheta(0) = \alpha$, $\vartheta'(0) = 0$. Use the RK4 method to solve the equation for $\alpha = 0.1$, 0.5 and 1.0 and plot ϑ as a function of time in the range $0 \leq t \leq 8\pi$. Also, plot the analytic solution valid in the small ϑ ($sin\vartheta \approx \vartheta$).

3. Solve the differential equation:

$$x^2 \frac{d^2y}{dx^2} - 4x(1+x)\frac{dy}{dx} + 2(1+x)y = x^3$$

with the boundary conditions:at $x = 1$, $y = (1/2)e^2$, $dy/dx = -(3/2)e^2 - 0.5$, in the range $1 \leq x \leq 3$. Plot y and dy/dxagainst x in the given range. Both should appear on the same graph.

Referred Books:

- Introduction to Numerical Analysis, S.S. Sastry, 5th Edn. , 2012, PHI Learning Pvt. Ltd.
- Schaum's Outline of Programming with C++, J. Hubbard, 2000, McGrawHill Pub.
- Numerical Recipes in C: The Art of Scientific Computing, W.H. Pressetal, 3rd Edn., 2007, Cambridge University Press.
- A first course in Numerical Methods, U.M. Ascher& C. Greif, 2012, PHI Learning.
- Elementary Numerical Analysis, K.E. Atkinson, 3 r d Edn. , 2 0 0 7 . Wiley India Edition.
- Numerical Methods for Scientists & Engineers, R.W. Hamming, 1973, Courier Dover Pub.
- An Introduction to computational Physics, T.Pang, 2nd Edn. , 2006,Cambridge Univ. Press

PHYSICS-C II: MECHANICS
(Credits: Theory-04, Practicals-02)
Theory: 60 Lectures

Rotational Dynamics: Angular momentum of a particle and system of particles.Torque.Principle of conservation of angular momentum.Moment of Inertia.Calculation of moment of inertia for rectangular, cylindrical andspherical bodies.Kinetic energy of rotation.Motion involving both translation androtation. **(12 Lectures)**

Elasticity: Elastic constants and interrelation between them.**Searle's Method** ,Twisting torque on a Cylinder or Wire and twisting couple. **(5+2=7 Lectures)**

Flexure of beam: Bending of beam, Cantilever. **(5Lectures)**

Surface Tension: Ripplesand Gravity waves, Determination of Surface Tension by Jaeger's and Quinke's methods. Temperature dependance of Surface Tension. **(6 Lectures)**
Fluid Motion: Kinematics of Moving Fluids, velocity profile: Poiseuille's Equation for Flow of a Liquidthrough a Capillary Tube and the corrections. **(4Lectures)**

Central Force Motion: Motion of a particle under a central force field. Two-body problem and its reduction toone-body problem and its solution..Kepler'sLaws.Satellite in circular orbit and applications. Geosynchronous orbits.Weightlessness.Basic idea of global positioning system (GPS).Physiological effects onastronauts. **(6 Lectures)**

Oscillations: Simple Harmonic Oscillations. Differential equation of SHM and itssolution.Kinetic energy, potential energy, total energy and their time-average values.Damped oscillation. Forced oscillations: Transient and steady states; Resonance,sharpness of resonance; power dissipation and Quality Factor.
(8 Lectures)

Special Theory of Relativity: Galilean transformations; Galilean invariance.Michelson-Morley Experiment and its outcome.Postulates of Special Theory of Relativity.Lorentz Transformations.Lorentz contraction.Time dilation.Relativistic transformation ofvelocity, frequency and wave number.Relativistic addition of velocities.Variation ofmass with velocity.Massless Particles.Mass-energy Equivalence. Relativistic Dopplereffect. Relativistic Kinematics.Transformation of Energy and Momentum.Energy-Momentum Minkowski space and Four Vector. **(12 Lectures)**

Reference Books:

- An introduction to mechanics, D. Kleppner, R.J. Kolenkow, 1973, McGraw-Hill.
- Mechanics, Berkeley Physics, vol.1, C.Kittel, W.Knight, et.al. 2007, Tata McGraw-Hill.
- Physics, Resnick, Halliday and Walker 8/e, 2008, Wiley.
- Analytical Mechanics, G.R. Fowles and G.L. Cassiday, 2005, Cengage Learning.
- Feynman Lectures, Vol. I, R.P.Feynman, R.B.Leighton, M.Sands, 2008, Pearson Education
- Introduction to Special Relativity, R. Resnick, 2005, John Wiley and Sons.
- University Physics, Ronald Lane Reese, 2003, Thomson Brooks/Cole.

Additional Books for Reference

- Mechanics, D.S. Mathur, S. Chand and Company Limited, 2000
- University Physics, F.W Sears, M.W Zemansky, H.D Young 13/e, 1986, Addison Wesley
- Physics for scientists and Engineers with Modern Phys., J.W. Jewett, R.A. Serway 2010, Cengage Learning
- Theoretical Mechanics, M.R. Spiegel, 2006, Tata McGraw Hill.

- A textbook of General Physics, Edser
- Fluid mechanics, Kaufmann
- A treatise of hydromechanics, Basant and Ramsay.
- Oscillations and waves, Satya Prakash.
- A textbook of oscillation, waves and Acoustics, M. Ghosh and D. Bhattacharya

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PHYSICS LAB-C II LAB

60 Lectures

1. Measurements of length (or diameter) using verniercaliper, screw gaugeand Travelling Microscope
2. To determine Coefficient of Viscosity of water by Capillary Flow Method(Poiseuille's method).
3. To determine the Modulus of Rigidity of a bar by method of bending.
4. To determine the elastic Constants of a wire by Searle's method.
5. To determine the value of g using Bar Pendulum.
6. To determine the value of g using Kater's Pendulum.

Reference Books

• Advanced Practical Physics for students, B. L. Flint and H.T. Worsnop, 1971, Asia Publishing House

• Advanced level Physics Practicals, Michael Nelson and Jon M. Ogborn, 4th Edition, reprinted 1985, Heinemann Educational Publishers

• A Text Book of Practical Physics, I.Prakash& Ramakrishna, 11th Edn, 2011, Kitab Mahal.

SEMESTER II

PHYSICS-C III: ELECTRICITY AND MAGNETISM
(Credits: Theory-04, Practicals-02)
Theory: 60 Lectures

Electric Field and Electric Potential
Electric field: Electric field lines. Electric flux.Gauss' Law with applications to charge distributions with spherical, cylindrical and planar symmetry.**(6Lectures)**

Conservative nature of Electrostatic Field.Electrostatic Potential. Laplace's and PoissonEquations and their solutions .The Uniqueness Theorem. Potential and Electric Field due to a dipole. Force and Torque on a dipole. **(6 Lectures)**

Electrostatic energy of system of charges.Conductors in an electrostatic Field. Surface charge and force on a conductor. Parallel-plate capacitor.Capacitance of an isolated conductor.
(10 Lectures)

Dielectric Properties of Matter: Electric Field in matter. Polarization, Polarization Charges.Electrical Susceptibility and Dielectric Constant. Capacitor (parallel plate, spherical, cylindrical) filled with dielectric. Displacement vector **D**. Relations between **E**, **P** and **D**. Gauss' Law in dielectrics. **(8 Lectures)**

Magnetic Field: Magnetic force between current elements and definition of Magnetic Field**B**. Biot-Savart's Law and its simple applications: straight wire and circular loop. Current Loop as a Magnetic Dipole and its Dipole Moment (Analogy with Electric Dipole). Ampere's Circuital Law and its application to (1) Solenoid and (2) Toroid. Properties of **B**: curl and divergence. Vector Potential.Magnetic Force on (1) on point charge (2) oncurrent carrying wire (3) between current elements.Torque on a current loop in a uniform Magnetic Field.
(11 Lectures)

Magnetic Properties of Matter: Magnetization vector **(M).** Magnetic Intensity**(H).** Magnetic Susceptibility and permeability.Relation between **B, H, M**. Ferromagnetism.B-H curve and hysteresis. **(4 Lectures)**

Electromagnetic Induction: Recapitulation ofFaraday's Law. Lenz's Law.Self Inductance and Mutual Inductance. Superposition Theorem.Reciprocity Theorem. Energy stored in a Magnetic Field. Introduction to Maxwell's Equations. Charge Conservation and Displacement current. **(6 Lectures)**

Electrical Circuits: AC Circuits: Kirchhoff's laws for AC circuits. Complex Reactance and Impedance. Series LCR Circuit: (1) Resonance, (2) Power Dissipation and (3) Quality Factor, and (4) Band Width. Parallel LCR Circuit. **(7 Lectures)**

Ballistic Galvanometer: Torque on a current Loop. Ballistic Galvanometer: Current and Charge Sensitivity. Electromagnetic damping.Logarithmic damping.CDR.**(4 Lectures)**

Reference Books:

- Electricity, Tayal D. C.
- Electricity, Magnetism & Electromagnetic Theory, S. Mahajan and Choudhury,2012, Tata McGraw
- Electricity and Magnetism, Edward M. Purcell, 1986 McGraw-Hill Education

- Introduction to Electrodynamics, D.J. Griffiths, 3rd Edn., 1998, Benjamin Cummings.
- Feynman Lectures Vol.2, R.P.Feynman, R.B.Leighton, M. Sands, 2008, Pearson Education
- Elements of Electromagnetics, M.N.O. Sadiku, 2010, Oxford University Press.
- Electricity and Magnetism, J.H.Fewkes&J.Yarwood. Vol. I, 1991, Oxford Univ. Press.
- Electricity and Magnetism, Chattopadhyaya and Rakshit
- Electricity and Magnetism, Mahajan and Rangwala
- Electricity and Magnetism, K. K. Tewary.

PHYSICS LAB-C III LAB
60 Lectures

1. Use a Multimeter for measuring (a) Resistances, (b) AC and DC Voltages, (c) DCCurrent, (d) Capacitances, and (e) Checking electrical fuses.
2. To study the characteristics of a series RC Circuit.
3. To compare capacitances using De'Sauty's bridge.
4. To determine self inductance of a coil by Anderson's bridge.
5. To study response curve of a Series LCR circuit and determine its (a) Resonantfrequency, (b) Impedance at resonance, (c) Quality factor Q, and (d) Band width.
6. To study the response curve of a parallel LCR circuit and determine its (a) Antiresonantfrequency and (b) Quality factor Q.
7. Measurement of charge and current sensitivity and CDR of BallisticGalvanometer

Reference Books

- Advanced Practical Physics for students, B.L. Flint and H.T. Worsnop, 1971, AsiaPublishing House
- A Text Book of Practical Physics, I.Prakash& Ramakrishna, 11th Ed., 2011, Kitab Mahal
- Advanced level Physics Practicals, Michael Nelson and Jon M. Ogborn, 4th Edition,reprinted 1985, Heinemann Educational Publishers
- A Laboratory Manual of Physics for undergraduate classes, D.P.Khandelwal, 1985, Vani Pub.

PHYSICS-C IV: WAVES AND OPTICS
(Credits: Theory-04, Practicals-02)
Theory: 60 Lectures

Wave Motion: Plane and Spherical Waves. Longitudinal and Transverse Waves.Plane Progressive (Travelling) Waves.Wave Equation.Particle and Wave Velocities.Differential Equation.Pressure of a Longitudinal Wave.Energy Transport.Intensity of Wave. Water Waves: Ripple and Gravity Waves. **(6 Lectures)**

Velocity of Waves: Velocity of Transverse Vibrations of Stretched Strings. Velocity of Longitudinal Waves in a Fluid in a Pipe.Newton's Formula for Velocity of Sound.Laplace's Correction. **(6 Lectures)**

Wave Optics: Electromagnetic nature of light.Definition and properties of wave front.Huygens Principle.Temporal and Spatial Coherence.**(5 Lectures)**

Interference: Division of amplitude and wavefront. Young's double slit experiment. Lloyd's Mirror and Fresnel's Biprism. Phase change on reflection: Stokes' treatment. Interference in Thin Films: parallel and wedge-shaped films. Fringes of equal inclination (Haidinger Fringes); Fringes of equal thickness (Fizeau Fringes). Newton's Rings: Measurement of wavelength and refractive index. **(12 Lectures)**

Interferometer: Michelson Interferometer-(1) Idea of form of fringes (No theory required), (2) Determination of Wavelength, (3) Wavelength Difference, (4) Refractive Index, and (5) Visibility of Fringes. Fabry-Perot interferometer– theory and applications.**(6 Lectures)**

Diffraction: Kirchhoff's Integral Theorem, Fresnel-Kirchhoff's Integral formula and its application to rectangular slit. **(6 Lectures)**

Fraunhofer diffraction: Single slit.Circular aperture, Resolving Power of a telescope. Single slit. Double slit. Multiple slits. Diffraction grating.Resolving power of grating. **(10 Lectures)**

Fresnel Diffraction: Fresnel's Assumptions. Fresnel's Half-Period Zones for Plane Wave. Explanation of Rectilinear Propagation of Light. Theory of a Zone Plate: Multiple Foci of a Zone Plate. Fresnel's Integral, Fresnel diffraction pattern of a straight edge, a slit and a wire. **(9 Lectures)**

Reference Books

- Waves and Acoustics, P. K. Chakraborty and Satyabrata Chowdhury.
- Introduction to Geometrical and Physical Optics, B. K. Mathur.
- Optics, Singh and Agarwal.
- Geometrical and Physical Optics, P. K. Chakraborty.
- Waves: Berkeley Physics Course, vol. 3, Francis Crawford, 2007, Tata McGraw-Hill.
- Fundamentals of Optics, F.A. Jenkins and H.E. White, 1981, McGraw-Hill
- Principles of Optics, Max Born and Emil Wolf, 7th Edn., 1999, Pergamon Press.
- Optics, AjoyGhatak, 2008, Tata McGraw Hill
- The Physics of Vibrations and Waves, H. J. Pain, 2013, John Wiley and Sons.
- The Physics of Waves and Oscillations, N.K. Bajaj, 1998, Tata McGraw Hill.

PHYSICS LAB- C IV LAB
60 Lectures

1. Familiarization with: Schuster's focusing; determination of angle of prism.
2. To determine refractive index of the Material of a prism using sodium source.
3. To determine the dispersive power and Cauchy constants of the material of aprism using merc.
4. To determine wavelength of sodium light using Newton's Rings.
5. To determine wavelength of (1) Na source and (2) spectral lines of Hg sourceusing plane diffraction grating.
6. To determine dispersive power and resolving power of a plane diffraction grating.

Reference Books

- Advanced Practical Physics for students, B.L. Flint and H.T. Worsnop, 1971, AsiaPublishing House
- A Text Book of Practical Physics, I. Prakash & Ramakrishna, 11th Ed., 2011, KitabMahal
- Advanced level Physics Practicals, Michael Nelson and Jon M. Ogborn, 4th Edition,reprinted 1985, Heinemann Educational Publishers
- A Laboratory Manual of Physics for undergraduate classes, D.P.Khandelwal, 1985, Vani Pub.