K. C. E. Society's
Moolji Jaitha College
An 'Autonomous College' Affiliated to
K.B.C. North Maharashtra University, Jalgaon.
NAAC Reaccredited Grade - A (CGPA : 3.15 - 3rd Cycle)
UGC honoured "College of Excellence" (2014-2019)
DST(FIST) Assisted College

KNOWLEDGE IS POWER
ESTD. 1945

के. सी. ई. सोसायटीचे
मूळजी जेठा महाविद्यालय
क.ब.चौ. उत्तर महाराष्ट्र विद्यापीठ, जळगाव संलग्नित
'स्वायत्त महाविद्यालय'
नॅकद्वारा पुनर्मानांकित श्रेणी – 'ए' (सी.जी.पी.ए. : ३.१५ – तिसरी फेरी)
विद्यापीठ अनुदान आयोगाद्वारा घोषित 'कॉलेज ऑफ एक्सलन्स' (२०१४-२०१९)
डी.एस.टी. (फीस्ट) अंतर्गत अर्थसहाय्य प्राप्त

Date :- 01/08/2023

NOTIFICATION

Sub :- CBCS Syllabi of B. Sc. in Physics (Sem. I & II)

Ref. :- Decision of the Academic Council at its meeting held on 26/07/2023.

The Syllabi of B. Sc. in Physics (First and Second Semesters) as per **NATIONAL EDUCATION POLICY - 2020** and approved by the Academic Council as referred above are hereby notified for implementation with effect from the academic year 2023-24.

Copy of the Syllabi Shall be downloaded from the College Website (www.kcesmjcollege.in)

Sd/-
Chairman,
Board of Studies

To :

1) The Head of the Dept., M. J. College, Jalgaon.
2) The office of the COE, M. J. College, Jalgaon.
3) The office of the Registrar, M. J. College, Jalgaon.

Near Samarth Colony, Jalgaon - 425 002. (Maharashtra, India) | Ph. : +91 257 - 2237363, 2234281 | e-mail : mjcollege@kces.in | Website : mjcollege.kces.in
समर्थ कॉलनी जवळ, जळगांव – ४२५ ००२. (महाराष्ट्र, भारत) । दूरध्वनी क्र. : +९१ २५७–२२३७३६३, २२३४२८१ । ई–मेलः mjcollege@kces.in । वेबसाईटः mjcollege.kces.in

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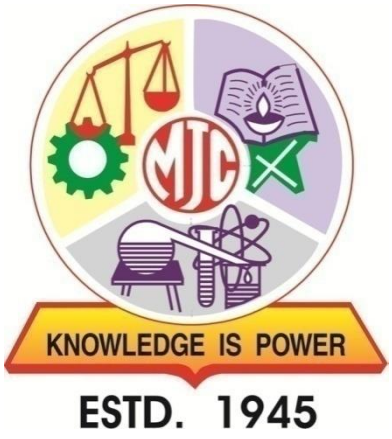
An "Autonomous College" Affiliated to
Kavayitri Bahinabai Chaudhari
North Maharashtra University,Jalgaon-425001



STRUCURE AND SYLLABUS

B.Sc. Honours

(F.Y.B.Sc. Physics)

Under Choice Based Credit System (CBCS)
and
as per NEP-2020 Guidelines

[w.e.f. academicYear:2023-24]

Preface

In present senario, manpower with skill, knowledge and talent are highly demanded. Person may be born talented but knowledge and skill acquired through learning of theoretical concept and hand-on laboratory method of subject. In order to achieve skill and knowledge, higher education system establish NEP in 2020. The MooljiJatha College (Autonomous) adopt department-specific model as per NEP-2020, guideline of UGC, and Government of Maharashtra.The syllabus is designed for first-year undergraduate of Physics by Board of Studies of Physics of college. The syllabus developed knowledge in leaner through theoretical and practical hand-on from different fields of physics. Designed syllabus include basic and fundamendal fact of different branches of physics. It may help to strong and clear based for various classical and modern branches of subject. After completion of syllabus learner able to understand various fact in environment using physics also able to apply scientific knowledge toward world. It enhancescienfic temperament of learner hence make them able to see world from frame of science.

The whole curriculum of three/four years covers different types of motion, mechanics, sound and optics, thermodynamics, mathematical physics, quantum mechanics, electrodynamics, basic electronics mobile communication, solar technology, battery techonology. It also covervaccum technology and research methodology. Syllabus is designed to fullfill need from differert areas such as research, industrial sector, Enterpreneurship etc. emphasizing imparting hands-on skills. Hence, the curriculum is endowed with more experiments that shall run hand-in-hand with theory. The detailed syllabus of each paper is appended with a list of suggested readings.

Program Outcomes (PO) for B.Sc. Physics Honours/Honours with Research:

Upon successful completion of the B.Sc. program, student will be able to:

PO No.	PO
1	Graduates should have a comprehensive knowledge and understanding of the fundamental principles, theories, and concepts in their chosen field of study.
2	Graduates should possess the necessary technical skills and competencies related to their discipline, including laboratory techniques and data analysis.
3	Graduates should be able to identify, analyze, and solve complex problems using logical and critical thinking skills. They should be able to apply scientific methods and principles to investigate and find solutions.
4	Graduates should be proficient in effectively communicating scientific information, both orally and in writing.
5	Graduates should have a basic foundation in research methods and be capable of designing and conducting scientific investigations.
6	Graduates should be able to work effectively as part of a team, demonstrating the ability to collaborate with others, respect diverse perspectives, and contribute to group projects.
7	Graduates should recognize the importance of ongoing learning and professional development. They should be equipped with the skills and motivation to engage in continuous learning, adapt to new technologies and advancements in their field, and stay updated with current research.

Program Specific Outcome (PSO) for B.Sc. Physics Honours/Honours with Research:

After completion of this course, students are expected to learn/understand the:

PO No.	PSO
1	To understand the basic laws and explore the fundamental concepts of physics.
2	To understand the concepts and significance of the various physical phenomena.
3	To carry out experiments to understand the laws and concepts of physics.
4	To acquire a wide range of problem solving skills, both analytical and technical and to apply them.
5	Students may able to pursue career in research, academics, industries and in allied field.
6	Acquire knowledge and skills appropriate to their professional activities.

Credit distribution structure for Three/ Four year Honors/ Honors with Research Degree Programme with Multiple Entry and Exit

Level	Sem	Major (Core) Subjects		Minor Subjects (MIN)	GE/ OE	VSC, SEC (VESC)	AEC, VEC, IKS	CC, FP, CEP, OJT/Int, RP	Cumulative Credits/Sem	Degree/ Cumulative Cr.
		Mandatory (DSC)	Elective (DSE)							
4.5	I	DSC-1 (2T) DSC-2 (2T) DSC-3 (2P)	—	MIN-1 (2T) MIN-2 (2P)	OE-1 (2T)	SEC-1 (2T) SEC-2 (1P)	AEC-1 (2T) (ENG) VEC-1 (2T) (ES) IKS (1T)	CC-1 (2)	22	UG Certificate 44
	II	DSC-4 (2T) DSC-5 (2T) (IKS) DSC-6 (2P)	...	MIN-3 (2T) MIN-4 (2P)	OE-2 (2T)	SEC-3 (2T) SEC-4 (1P)	AEC-2 (2T) (ENG) VEC-2 (2T) (CI) IKS (1T)	CC-2 (2)	22	
	Cum. Cr	12	...	8	4	6	4+4+2	4	44	
Exit option: Award of UG Certificate in Major with 44 credits and an additional 4 credits core NSQF course/ Internship OR Continue with Major and Minor.										
5.0	III	DSC-7 (2T) DSC-8 (2T) DSC-9 (2P) DSC-10 (2P)	...	MIN-5 (2T) MIN-6 (2P)	OE-3 (2T) OE-4 (2P)		AEC-3 (2T) (MIL)	CC-3 (2) CEP (2)	22	UG Diploma 88
	IV	DSC-11 (2T) DSC-12 (2T) DSC-13 (2P) DSC-14 (2P)	...	MIN-7 (2T) MIN-8 (2P)	OE- 5 (2T) OE-6 (2P)		AEC-4 (2T) (MIL)	CC-4 (2) FP (2)	22	
	Cum. Cr	28	...	16	10	6	8+4+2	8+2+2	88	
Exit option: Award of UG Diploma in Major and Minor with 88 credits and an additional 4 credits core NSQF course/ Internship OR Continue with Major and Minor.										
5.5	V	DSC-15 (2T) DSC-16 (2T) DSC-17 (2T) DSC-18 (2P) DSC-19 (2P)	DSE-1 (2T) A/B DSE-2 (2P) A/B	MIN-9 (2T/P)	...	VSC-1 (2T) VSC-2 (2P)	...	OJT/Int(2)	22	UG Degree 132
	VI	DSC-20 (2T) DSC-21 (2T) DSC-22 (2T) DSC-23 (2P) DSC-24 (2P)	DSE-3 (2T) A/B DSE-4 (2P) A/B	MIN-10(2T/P)	—	VSC-3 (2T) VSC-4 (2P)	...	OJT/Int(2)	22	
	Cum. Cr.	48	08	20	10	8+6	8+4+2	8+2+2+4	132	
Exit option: Award of UG Degree in Major with 132 credits OR Continue with Major and Minor										
6.0	VII	DSC-25 (4T) DSC-26 (4T) DSC-28 (4T) DSC-27 (2P)	DSE-5 (2T) A/B DSE-6(2P) A/B	RM (4T)	—	...	...		22	UG Honors Degree 176
	VIII	DSC-29 (4T) DSC-30 (4T) DSC-32 (4T) DSC-31 (2P)	DSE-7 (2T) A/B DSE-8(2P) A/B		—	...	...	OJT/Int (4)	22	
	Cum. Cr.	76	16	20+4	10	8+6	8+4+2	8+2+2+8	176	
Four Year UG Honors Degree in Major and Minor with 176 credits										
6.0	VII	DSC-25 (4T) DSC-26 (4T) DSC-27 (2P)	DSE-5 (2T) A/B DSE-6 (2P) A/B	RM (4T)	...	...	...	RP (4)	22	UG Honors with Research Degree 176
	VIII	DSC-29 (4T) DSC-30 (4T) DSC-31 (2P)	DSE-7 (2T) A/B DSE-8 (2P) A/B		...	...	...	RP (8)	22	
	Cum. Cr.	68	16	20+4	10	8+6	8+4+2	8+2+2+8+12	176	
Four Year UG Honours with Research Degree in Major and Minor with 176 credits										

Sem- Semester, **DSC**- Department Specific Course, **DSE**- Department Specific Elective, **T**- Theory, **P**- Practical, CC-Cocurricular**RM**- Research Methodology, **OJT**- On Job Training, **FP**- Field Project, **Int**- Internship, **RP**- Research Project,

Multiple Entry and Multiple Exit options:

The multiple entry and exit options with the award of UG certificate/ UG diploma/ or three-year degree depending upon the number of credits secured;

Levels	Qualification Title	Credit Requirements		Semester	Year
		Minimum	Maximum		
4.5	UG Certificate	40	44	2	1
5.0	UG Diploma	80	88	4	2
5.5	Three Year Bachelor's Degree	120	132	6	3
6.0	Bachelor's Degree- Honours **Or** Bachelor's Degree- Honours with Research	160	176	8	4

F. Y. B. Sc. Physics Structure and Syllabus

Semester	Course Module	Credit	Hours/ week	TH/ PR	Code	Title
I	DSC	2	2	TH	PHY-DSC-111	Physics of Motions
	DSC	2	2	TH	PHY -DSC-112	Mechanical Properties of Matter
	DSC	2	**4**	**PR**	PHY -DSC-113	Practical course on Motion and Mechanics
	MIN	2	2	TH	PHY -MIN-111	Thermal Physics
	MIN	2	**4**	**PR**	PHY -MIN-112	Practical course on Thermal Physics
	OE	2	2	TH	PHY -OE-111	Mobile Communication I
	SEC	2	2	TH	PHY -SEC-111	Mathematical Tools in Physics
	SEC	1	**2**	**PR**	PHY -SEC-112	Practical course on Mathematical Tools in Physics
	AEC	2	**2**	**TH**	ENGS-AEC-111	English
	VEC	2	**2**	**TH**	ES -VEC-111	Environmental studies
	IKS	1	**1**	**TH**	IKS-111	Indian knowledge system
	CC	2	**2**	**CC**	NCC-CC-111 NSS-CC-111 SPT-CC-111 CUL-CC-111	NCC NSS Sports Cultural
II	DSC	2	2	TH	PHY -DSC-121	Electrostatics
	DSC	2	2	TH	PHY -DSC-122	Magnetostatics
	DSC	2	**4**	**PR**	PHY -DSC-123	Practical course on Electrostatics and Magnetostatics
	MIN	2	2	TH	PHY -MIN-121	Applied Physics
	MIN	2	**4**	**PR**	PHY -MIN-122	Practical course on Applied Physics
	OE	2	2	TH	PHY -OE-121	Mobile Communication II
	SEC	2	2	TH	PHY -SEC-121	Fundamentals of Electronic Components
	SEC	1	**2**	**PR**	PHY -SEC-122	Practical course on Fundamentals of Electronic Components
	AEC	2	**2**	**TH**	ENGS-AEC-121	English
	VEC	2	**2**	**TH**	CI-VEC-121	Constitution of India
	IKS	1	**1**	**TH**	IKS-121	Indian knowledge system
	CC	2	**2**	**CC**	NCC-CC-121 NSS-CC-121 SPT-CC-121 CUL-CC-121	NCC NSS Sports Cultural

DSC : Department-Specific Core course
DSE : Department-Specific elective
GE/OE : Generic/ Open elective
SEC : Skill Enhancement Course
MIN : Minor course
AEC : Ability Enhancement Course
VEC : Value Education Courses
ENG : English
ES : Environmental studies
CI : Constitution of India
IKS : Indian Knowledge System
CC : Co-curricular course

TH : Theory **PR** : Practical

Examination Pattern

Theory Question Paper Pattern:

- 30 (External) +20 (Internal) for 2 credits
    - External examination will be of 1½ hours duration
    - There shall be 3 questions Q1 carrying 6 marks and Q2, Q3 carrying 12 marks each. while the tentative pattern of question papers shall be as follows;
    - Q1 Attempt any 2 out of 3 sub-questions; each 3 marks
    - Q 2 and Q3 Attempt any 2 out of 3 sub-question; each 6 marks.

Rules of Continuous Internal Evaluation:

The Continuous Internal Evaluation for theory papers shall consist of two methods:

1. Continuous & Comprehensive Evaluation (CCE): CCE will carry a maximum of 30% weightage (30/15 marks) of the total marks for a course. Before the start of the academic session in each semester, the subject teacher should choose any three assessment methods from the following list, with each method carrying 10/5 marks:

i. Individual Assignments
ii. Seminars/Classroom Presentations/Quizzes
iii. Group Discussions/Class Discussion/Group Assignments
iv. Case studies/Case lets
v. Participatory & Industry-Integrated Learning/Field visits
vi. Practical activities/Problem Solving Exercises
vii. Participation in Seminars/Academic Events/Symposia, etc.
viii. Mini Projects/Capstone Projects
ix. Book review/Article review/Article preparation
x. Any other academic activity
xi. Each chosen CCE method shall be based on a particular unit of the syllabus, ensuring that three units of the syllabus are mapped to the CCEs.

2. Internal Assessment Tests (IAT): IAT will carry a maximum of 10% weightage (10/5 marks) of the total marks for a course. IAT shall be conducted at the end of the semester and will assess the remaining unit of the syllabus that was not covered by the CCEs. The subject teacher is at liberty to decide which units are to be assessed using CCEs and which unit is to be assessed on the basis of IAT.

The overall weightage of Continuous Internal Evaluation (CCE + IAT) shall be 40% of the total marks for the course. The remaining 60% of the marks shall be allocated to the semester-end examinations.

The subject teachers are required to communicate the chosen CCE methods and the corresponding syllabus units to the students at the beginning of the semester to ensure clarity and proper preparation.

Practical Examination Credit 2: Pattern (30+20)

External Practical Examination (30 marks):

- Practical examination shall be conducted by the respective department at the end of the semester.
- Practical examination will be of 3 hours duration and shall be conducted as per schedule.
- Practical examination shall be conducted for 2 consecutive days for 2 hr/ day where incubation condition is required.
- There shall be 05 marks for journal and viva-voce. Certified journal is compulsory to appear for practical examination.
- External practical examination of SEC will be of 25 marks and there will be no internal exam for SEC practical.

Internal Practical Examination (20 marks):

- Internal practical examination of 10 marks will be conducted by department as per schedule given.
- For internal practical examination student must produce the laboratory journal of practicals completed along with the completion certificate signed by the concerned teacher and the Head of the department.
- There shall be continuous assessment of 30 marks based on student performance throughout the semester. This assessment can include quizzes, group discussions, presentations and other activities assigned by the faculty during regular practicals. For details refer internal theory examination guidelines.
- Finally 40 (10+30) marks performance of student will be converted into 20 marks.

F. Y. B. Sc
Semester-I
PHY-DSC-111: Physics of Motions

Total Hours: 30 **Credits: 2**

Course objectives	• To impart knowledge of physics in Vedas and Ancient Physicists in India. • To impart knowledge of basic concepts in motions. • To understand basic principle behind different type of motions. • To provide the knowledge and methodology necessary for solving problems in Physics. • To acquire the practical knowledge based on the theory.	
Course outcomes	After successful completion of this course, students are expected to: • understand different concept of motion in their surroundings. • to distinguish between different types of motion. • apply the concept anduse of knowledge of motions to real life problems. • understanding of the course will create scientific temperament.	
Unit	**Contents**	**Hours**
Unit I	**History of Physics in India:** • Physics in Vedas: Atomic Theory from Bhagvatgita, • Generation of Electricity in ancient period, • Law of motion, • Classical mechanics, • State of matters, • Gravitation, Light and Sound in vedic science, • Type of fuel, • Sting theory • Indian Scientist in Physics: Bhaskaracharya, Aryabhatta , Kanad, C.V. Raman, SatyendraNath Bose, HomiBhabha, Subrahmanyan Chandrasekhar, Vikram Sarabhai, MeghnadSaha	**8**
Unit II	**Oscillation:** • Oscillations: simple harmonic motion, • Differential equation of SHM and its solutions, • Equation of displacement, • velocity and acceleration, • SHM is projectile of UCM along its diameter, • Kinetic Energy, Potential Energy, • Total Energy and their time averages, • Natural oscillation and its type, • Equation for damp harmonic oscillator and its solution, Three different cases in damp oscillation	**7**
Unit III	**Rotational motion and Circular motion:** • Angular velocity and its relation with linear velocity, • Torque and angular momentum, Torque of a force about the axis of rotation, • Conservation of angular momentum, • angular impulse, • Equilibrium of rigid body, • moment of inertia, • Theorem of moment of inertia, • kinematics of rotational motion,	**8**

	• about a fixed axis, • Dynamics of rotational motion about a fixed axis, • Angular momentum in case of rotation about a fixed axis, • Angular variables, • unit vectors along the radius and the tangent, • Acceleration in circular motion, • dynamics of circular motion, circular turning and banking of roads • Centripetal and Centrifugal force	
Unit IV	**Gravitation** • Kepler's laws, Universal law of gravitation, • Gravitational constant, • acceleration due to gravity of the earth, • Acceleration due to gravity below and above the surface of earth • Gravitational potential, • gravitational potential energy, • Escape speed, • planet and earth satellites, • Weightlessness in a satellite, • gravitational binding energy, • Energy of an orbiting satellite.	**7**
Study Resources	• Roy, R. R. M. (2015). VEDIC PHYSICS: Scientific Origin of Hinduism. Mount Meru publication. • Sears, F.W., ZemanskyM.W., YoungH.D.,13/e, (1986). University Physics. Addison Wesley. • Charles Kittel, et. al. (2007). Mechanics Berkeley Physics course. V-1, Tata McGraw Hill • Resnick, Halliday & Walker 9/e (2010). Wiley • Bhattacharya, B. (2015). Engineering Mechanics. 2nd edn, Oxford University Press 6 • Ronald L. R. (2003). University Physics. Thomson Brooks/Cole • Mathur D. S. (2008). Elements of properties of matter. S. Chand Publishing.	

F. Y. B. Sc
Semester-I
PHY-DSC-112: Mechanical Properties of Matter

Total Hours: 30 **Credits: 2**

Course objectives	• To introduce term matter as word describe to use materials. • To study basic conversation law in physics. • To study basic mechanical properties of solids and fluids.	
Course outcomes	After successful completion of this course, students are expected to: • understand conservation laws and apply them in calculations of the simple systems. • understand the concepts of elasticity, fluid mechanics and be able to perform calculations using them. • understand the concepts of system of particle. • apply the laws of mechanics to formulate the relations necessary to analysed a mechanical process. • demonstrate quantitative problem-solving skills in all the topics covered.	
Unit	**Contents**	**Hours**
Unit I	**Conservation laws** • Work, power, conservative force, kinetic energy, potential energy • Work energy theorem, law of conservation of energy • Linear restoring force, potential energy curve • Gravitation potential energy • Conservation of momentum • Different forms of energy: mass energy equivalence	**8**
Unit II	**System of Particle** • Centre of mass, motion of centre of mass • Collision, impulse and momentum • Moment of inertia, expression for moment of inertia • Radius of gyration, torque, angular momentum • Relation between torque and angular acceleration • Angular momentum and angular velocity • Theorems of moment of inertia	**7**
Unit III	**Mechanical Properties of Solid** • Introduction of elasticity • Stress, strain and its types, hooks law • Modulus of elasticity: young's modulus, Bulk modulus, modulus of rigidity • Poisons ratio, friction, kinetic friction • Static friction, laws of friction	**8**
Unit IV	**Mechanical Properties of Fluids** • Molecular forces • Surface tension, surface energy • Angle of contact • Pressure difference across liquid surfaces, Excess pressure inside liquid drop, Excess pressure inside soap bubble • Viscosity and co-effiucient of viscosity • Streamline and Turbulent flow, Reynolds number • Stokes law and terminal velocity • Equation of continuity, Bernouli's principle, andPoiseuilles equation	**7**

Study Resources	• Mathur, D. S. (2008). Elements of properties of matter. S. Chand Publishing. • Avadhanulu, M. N. (2008). A textbook of engineering physics. S. Chand Publishing. • Gaur, R. K., & Gupta, S. L. (1987). Engineering physics. DhanpatRai and Sons. • Verma, H. C. (2008). Concepts Of Physics by HC Verama: Volume 1. BHARATHI BHAVAN. • Halliday, D., Resnick, R., & Walker, J. (2010). Fundamentals of physics. chapters 33-37. John Wiley & Sons.	

F. Y. B. Sc
Semester-I
PHY-DSC-113: Practical course on Motion and Mechanics

Total Hours: 60 **Credits: 2**

Course Objectives	• To determine practically acceleration due to gravity using different types of pendulum • To find different modulus of elasticity experimentally. • To study surface tension and viscosity by doing experiment • To know moment of intertia of various objects practically	
Course Outcomes	After successful completion of this course, students are expected to: • understand and practice the skills while doing physics practical. • understand different mechanical properties of solid and liquid practically. • correlate their physics theory concepts through practical. • enlight subject theoretical background doing hand-on practicals.	
Sr. No.	**Contents**	**Hours**
1	To find the downward force, along an inclined plane, acting on a roller due to gravity and study its relationship with the angle of inclination by plotting graph between force and sin θ.	4
2	To determine Young's modulus of the material of a given wire by using Searle's apparatus.	4
3	To verify Archimedes' Principle	4
4	To calculate the spring constant for a spring.	4
5	To determine the surface tension of water by capillary rise method.	4
6	To determine acceleration due to gravity using Bar pendulum.	4
7	To determine acceleration due to gravity using Kater's pendulum.	4
8	To determine modulus of rigidity by using Torsional Pendulum.	4
9	To determine the coefficient of viscocity using Stoke's method.	4
10	To determine Moment of Inertia of disc.	4
11	To determine Poisson's Ratio of rubber by using rubber cord/tube.	4
12	Determination of coefficient of viscosity of water by Poiseuille's method.	4
13	Verification of Bernoulli's theorem.	4
14	To determine Y by vibrational cantilever.	4
15	To determine Y of a rectangular beam by bending.	4
Study Resources	• Worsnop, B. L., & Flint, H. T. (1927). Advanced practical physics for students. Methuen. • Nelson, M. and OgbornJon, M. (1985). Advanced level Physics Practicals, 4thEdition, reprinted, Heinemann Educational Publishers. • InduPrakash and Ramakrishna (2011). A Text Book of Practical Physics, 11th Edition, KitabMahal, New Delhi.	

	• Opadhye V.Y. R., Purohit , V. L., and Deshpande, A. S., A text Book of Experimental Physics, Continental Prakashan, Poona-30 • Shukla, R. K., SrivastavaAnchal (2006). Practical Physics, New Age International • Singh, S. P. (1976). Advance Practical Physics, Pragati Prakashan • Gupta and Kumar (2017). Practical Physics, Pragati Prakashan, Meerut	

F. Y. B. Sc
Semester-I
PHY-MIN-111: Thermal Physics

Total Hours: 30 **Credits: 2**

Course objectives	• To understand different phenomenon of heat and its measurement using different measuring instrument. • To understand different laws for gaseous state and its applications. • To understand phenomenon of expansion and compression in gases.	
Course outcomes	After successful completion of this course, students are expected to: • understand working and use of different type of thermometer. • understand the phenomenon of calorimetry. • understand gaseous state energy and its unsalability. • it may help in enhance scientific fact and principle in heat and calorimetry.	
Unit	**Contents**	**Hours**
Unit I	**Temperature and its Measurement (Thermometer)** • Heat, temperature • temperature measurement • Thermometric scale • conversion of temperature Types of thermometer: • Liquid thermometer (liquid, mercury thermometer) • Merits and demerits of liquid, mercury thermometer • Gas thermometer, merits and demerits of gas thermometer • Bimetallic thermometer, Platinum resistance thermometer • Thermoelectric thermometer • Pyrometer and its type • Factor for selection for a thermometer for a particular use, temperature range.	**8**
Unit II	**Calorimetry** • Heat energy and its units • Specific heat, heat gain or heat loss by body • Principle of calorimetry • Thermal capacity, water equivalent • Determination of water equivalent of calorimeter • Determination of specific heat by bunsen's ice calorimeter method • Newton law of cooling • Specific heat of liquid by method of cooling.	**7**
Unit III	**Change in State and Gases Laws** • Change in state • Fusion and latent heat of fusion, law of fusion • Determination of latent heat of ice • Specific latent heat of vaporization • Law of equilibrium or boiling • Determination of specific latent heat of vaporization • Effect of pressure on boiling point • Boyle law and its verification • Charles's law and its verification • Gay-Lussac's law or Pressure law, verification of pressure law • Absolute temperature, standard pressure and temperature	**8**

	• derivation of general gas equation, Molar constant, Universal gas equation.	
Unit IV	**Expansion and Compression of Gases** • Expansion of gases • Isothermal expansion of a gas • Adiabatic expansion of gas • Change in isothermal energy of a gas (General gas energy equation) • Derivation of adiabatic equation of gas • Relation between pressure and volume under adiabatic transformation • Different form of adiabatic equation • Adiabatic curves are steeper than isothermal curve • Work done by gas in isothermal expansion • Work done by gas during adiabatic expansion • Compressibility of gas	**7**
Study Resources	• Maxwell J. Clerk (1872). Theory of Heat, Third Edition, Longman Green, and Co., London. • Van Ness, H. C. (Hendrick C.) (1983). Understanding thermodynamics, New York: Dover. • VermaH. C., Concepts Of Physics [Volume 2], BharatiBhawan, India • Bahl, B. S., Bahl, A. and Tuli, G. D., S., (2005).Essentials of Physical Chemistry, Chand and Co Ltd., New Delhi • Maron, S. H. and Prutton C. F., (2012). Principles of Physical Chemistry (4th Edition), Oxford and IBH Publishing Co. Pvt. Ltd., New Delhi.	

F. Y. B. Sc
Semester-I
PHY-MIN-112: Practical course on Thermal Physics

Total Hours: 60 **Credits: 2**

Course Objectives	• To understand practically different phenomenon of heat using thermometer • To determine specific heat, latent heat, enthalpy of reaction practically. • To understand practical working of thermistor, thermos-couple and calorimeter.	
Course Outcomes	After successful completion of this course, students are expected to: • understand the concept of heat and temperature. • know the absolute scale of temperature. • understand thermal energy and thermal equilibrium. • know fundamental laws of gases. • identify the relationship and correct usage of work, heat capacity and latent heat practically.	
Sr. No.	**Contents**	**Hours**
1	Study of thermocouple.	4
2	To study various temperature measuring instruments and to estimate their responses times: Mercury in glass thermometer, Thermocouple, Electrical resistance thermometer.	4
3	Study of dynamic characteristics of thermometer.	4
4	Response of first order thermometer system to step input.	4
5	Calibration of Thermistor.	4
6	Determination of Calorimeter Constant.	4
7	Determination of Reaction Enthalpy.	4
8	To study the relationship between the temperature of a hot body and time by plotting a cooling curve.	4
9	Determination of specific heat capacity of a liquid using the method of cooling.	4
10	To determine the latent heat of fusion of ice using the method of mixtures.	4
11	Measurement of the specific latent heat of vaporisation of water.	4
12	Determination of thermo-electric power at a certain temperature of a given thermocouple.	4
13	Determination of the temperature coefficient of resistance by platinum resistance thermometer.	4
14	To determine temperature coefficient of resistance of the given thermistor and also to draw the V - I characteristic curve.	4

15	Determine physical characteristics of a thermistor (constants A and B) from five temperature and resistance measurement.	4
16	Conversion of given temperature from measuring system to another.	4
Study Resources	• KhoslaB. D., GargV. C., and GulatiA. (2011). Senior Practical Physical Chemistry, R. Chand & Co., New Delhi. • Flint B.L., &Worsnop H.T. (1971). Advanced Practical Physics for students, Asia, Publishing House. New Delhi. • Michael Nelson and Jon M. Ogborn(1985). Advanced level Physics Practicals, 4th Edition, reprinted, Heinemann Educational Publishers. • MichioSorai, Comprehensive Handbook of Calorimetry and Thermal Analysis, Editor-in-Chief , The Japan Society of Calorimetry and Thermal Analysis ,John Wiley & Sons, Ltd.	

F. Y. B. Sc
Semester-I
PHY-OE-111: Mobile Communication I

Total Hours: 30 **Credits: 2**

Course objectives	• To understand basic concepts of communication. • To understand fundamentals of satellite communication and its application in different field. • Study of different mobile generation. • To understand different GSM network architecture.	
Course outcomes	After successful completion of this course, students are expected to: • understand concept of satellite communication, mobile communication, and GSM system. • enhance knowledge about different generation of mobile. • develop theoretical background for mobile communication. • enhance knowledge about GSM, IMEI, EIR etc.	
Unit	**Contents**	**Hours**
Unit I	**Communication** • Introduction, elements of a communication system • Basic terminology used in electronic communication systems • Bandwidth of signals, bandwidth of transmission medium • Propagation of electromagnetic waves: ground wave, sky waves, space wave, modulation and its necessity • Size of the antenna or aerial • Effective power radiated by an antenna • Mixing up of signals from different transmitters • Amplitude modulation, detection of amplitude modulated wave.	**8**
Unit II	**Satellite communication** • Basics of satellite communication • Applications of satellites: weather forecasting, radio and tv, broadcast, military, navigation, global telephone • Connecting remote areas • Global mobile communication • Frequency allocation of satellites • Types of orbits: geo, leo, meo • Sun synchronous orbit • Hohmann transfer orbit • Prograde orbit, retrograde orbit • Polar orbits examples: intelsat, u.s.domsats • Polar orbiting satellites.	**7**
Unit III	**Introduction to mobile generation** • Mobile telephony development • Mobile computing, features of mobile communication • Multiplexing:Frequency division multiplexing (fdm),Time division multiplexing (tdm), Wavelength division multiplexing (wdm) • GSM (global system for mobile communication) • gprs and 2.5g, third generation (3g), fourth generation (4g) • Long-term evolution (lte)	**8**

Unit IV	**Global System for Mobile Communication** • Wireless communications: basic concepts • GSM frequency bands, gsm network structure • Mobile station, functions of mobile station • Subscriber identity module (sim) card • International mobile equipment identity (imei) • International mobile subscriber identity (imsi) • Mobile station international subscriber directory number (msisdn) • GSM network architecture, base station subsystem (bss) • bts-bsc configurations, network switching subsystems (nss) • Home location register, authentication center (auc) • Equipment identify register (eir) • Operation and maintenance center • Mobile intelligent network (mobile in).	**7**
Study Resources	• Jochen H. Schiller (2003). Mobile Communications, Second Edition, Pearson Education Limited, Edinburgh Gate Harlow CM20 2JE. • Louis E. Frenzel Jr., Principles of Electronic Communication Systems, Fourth Edition, McGraw-Hill Education, 2 Penn Plaza, New York, NY 10121. • David Tse, PramodViswanath (2004). Fundamentals of Wireless Communication, Urbana-Champaign. • Louis J. Ippolito, Jr., Satellite Communications Systems Engineering,A John Wiley and Sons, Ltd, Publication. • Elbert Bruce R. (2008). Introduction to Satellite Communication,Artech House, 2008.	

F. Y. B. Sc
Semester-I
PHY-SEC-111: Mathematical Tools in Physics

Total Hours: 30 **Credits: 2**

Course objectives	• To impart knowledge of various physical, mathematical, and statistical quantities and its basic operations. • To provide the knowledge and methodology necessary for solving problems in Physics. • The course also involves the related experiments based on the theory.	
Course outcomes	After successful completion of this course, students are expected to: • apply the concept of use of knowledge of physical, mathematical, and statistical quantities in real life problems. • help to understand types of error and method of finding error. • understanding of the course will create scientific temperament.	
Unit	**Contents**	**Hours**
Unit I	**Physical quantities and its dimensional analysis** • Units, Conditions for standard unit • System of units, Fundamental quantities and its dimensions • Derived quantities and its dimensions, Supplementary quantities • Dimensions and dimensional analysis • Uses of dimensional analysis • Limitations of dimensional analysis • Conventions followed in SI-Multiples & sub-multiples and prefixes of units.	**8**
Unit II	**Errors in Measurements** • Systematic errors • Random errors, Estimation of errors • Combination of errors- errors in sum • difference, product, division and powers • Determination of errors in instruments such as VernierCalliper, Micro meter screw gauge and Spherometer, • Significant figures and Rules for determining significant figures.	**7**
Unit III	**Scalar and Vectors** • Definition and examples of scalar and vector quantities, • Types of vectors, Vector Operations, • Triangle law of Vector addition, • Law of Parallelogram of Vectors, • Resolution of vectors, Multiplication of vectors- scalar product and vector product and their geometrical interpretation, • Vector product expressed as determinant, • volume of parallelogram, • Scalar triple product and its geometrical interpretation, • Volume of tetrahedron, • CollinearityCoplanarity of vectors.	**8**

Unit IV	**Statistical Techniques** • Statistics, Frequency distribution • Graphical Representation- Histogram, Frequency Polygon • Frequency curve, Cumulative Frequency curve or Ogive • Bar chart and Pie diagrams • Exclusive and Inclusive Class intervals • Arithmetic averages or Mean, Median, Mode • Geometric mean, Harmonic mean, standard deviation • Variance, Symmetry, Skewness and Kurtosis • Moments, Covariance • Correlation, Types of correlation • Karl Pearson's Coefficients of Correlation.	**7**
Study Resources	• DasH. K. (2014), Mathematical Physics, Seventh Revised Edition, Chand Publishers. • VarmaH. C., Concept of Physics, Vol I, BharatiBhawan Publisher • GaikwadD. T., PadmakarS., RaneS. R. and MorankarV. (2011), Basic Physics, Chand Publisher. • RajputB. S. (1997), Mathematical Physics, PragatiPrakashan. • Roshan Kr. Sinha, Basic Physics, Foundation Publishing House.	

F. Y. B. Sc
Semester-I
PHY-SEC-112: Practical course on Mathematical Tools in Physics

Total Hours:30 **Credits:1**

LearningObjectives	• To give hands on training on errors and dimensional analysis. • To give hands on training on statistsical techniques. • To study practically different phenomenon of scalars and vectors.	
CourseOutcomes	After successful completion of this course, students are expected to: • understand and verify errors in the instruments and how to resolve the various types of errors. • understand the dimensional analysis of various physical quantities. • understand the basic concepts of scalars and vectors and its applications practically. • understand the various statistical tehniques for ungrouped and grouped data practically.	
Sr. No.	**Contents**	**Hours**
1	Estimation of absolute error, relative error and percentage error from given data.	4
2	Measurements of length (or diameter or thickness) using vernier caliper of given objects.	4
3	Measurements of length (or diameter or thickness) using micrometer screw guage of given objects.	4
4	Measurements of length (or diameter or thickness) using travelling microcope of given objects.	4
5	Determine the dimensions of given physical quantities.	4
6	To check the correctness of given physical equations.	4
7	To determine the zero errors in vernier caliper and micrometer screw guage.	4
8	To find the conversion factors between units of same physical quantities in different systems of units by using given data.	4
9	To establish the relation between related physical quantities by dimensional analysis.	4
10	From the given figure, determine the resultant of vectors using triangle law vector addition	4
11	To determine the mean, mode and median of the given data.	4
12	To determine the Karl Pearson's Coefficient of Skewness from the given data.	4
13	To determine the standard deviation and variation of the given data.	4
14	To determine the gradient, divergence and curl of given equations.	4
15	To establish the relation between related physical quantities by graph	4
16	To determine radius of curvature of given spherical surface by spectrometer.	4
17	To find weight of given body using parallelogram of vectors.	4

References	• FlintB.L., and WorsnopH.T. (1971), Advanced Practical Physics for students, Asia Publishing House. • Das H. K. (2014), Mathematical Physics, Seventh Revised Edition, S. Chand Publishers. • Michael Nelson and OgbornJon M. (1985), Advanced level Physics Practicals, 4thEdition, reprinted, Heinemann Educational Publishers. • InduPrakash and Ramakrishna (2011), A Text Book of Practical Physics, 11th Edition, KitabMahal, New Delhi. • Gupta and Kumar, Practical Physics, PragatiPrakashan Meerut. • PanigrahiS.&MallickB. (2015), Engineering Practical Physics, Cengage Learning India Pvt. Ltd. • D. C. Tayal, University Practical Physics, Himalaya Publishing House.	

F. Y. B. Sc
Semester-II
PHY-DSC-121: Electrostatics

Total Hours: 30 **Credits: 2**

Course objectives	• To understand the basic phenomenon in static charge and moving charge. • To understand basic concepts of different network theorems. • To study relation between current and magnetic field. • To impower students with basic knowledge of electrostatics.	
Course outcomes	After successful completion of this course, students are expected to: • to understand different phenomenon in electrostatics. • help in enhancing knowledge of students for moving charge. • build ability to apply different network law in practical's. • understanding of the course will create scientific temperament.	
Unit	**Contents**	**Hours**
Unit I	**Electric Charges and Fields** • Electric charge • Conductors and insulators • Basic properties of electric charge, Coulomb's law,Limitation of coulombs law • Forces between multiple charges • Electric field, electric field lines, electric flux • Electric dipole, electric dipole moment • Dipole in a uniform external field • Different types of charge density • Equation of electric field due to continuous charge distribution, • Gauss law and its application	**8**
Unit II	**Electrostatics Potential and Gauss law in Dielectric** • Electrostatic potential • Potential due to a point charge • Potential due to an electric dipole • Potential due to a system of charges • Equipotential surfaces • Potential energy of a system of charges • Potential energy in an external field • Electrostatics of conductors, dielectrics • Polar and non- polar molecule, polarisation • Electric displacement • Differential and integral form of Gauss law in dielectric.	**7**
Unit III	**Current Electricity** • Electric current • DC and AC current • Electric currents in conductors • Ohm's law, limitations of ohm's law • Drift of electrons, mobility, origin of resistivity • Resistivity of various materials • Temperature dependence of resistivity • Electrical energy, power, units, cells, emf • Internal resistance • Cells in series and in parallel	**8**

	• Kirchhoff's current and voltage law • Sign convention for kirchhoff's law • Norton's and Thevenin's law • Maximum power transfer theorem, wheatstone bridge	
Unit IV	**Moving Charge and Magnetism** • Magnetic force: sources and field • Magnetic field and lorentz force • Magnetic force on a current carrying conductor • Motion in a magnetic field • Magnetic field due to a current element • Biot-savart law, magnetic field on the axis of a circular current loop • Ampere's circuital law, the solenoid, toroid • Force between two parallel currentscarrying conductors • Torque on current loop • Circular current carrying loop as magnetic dipole • The moving coil galvanometer.	**7**
Study Resources	• GriffithsD.J. (1998), Introduction to Electrodynamics, 3rd Edn, BenjaminCummings • FewkesJ.H. &YarwoodJ., Electricity and Magnetism, Vol. I, Oxford Univ.Press. • TayalD. C. (1988), Electricity and Magnetism, Himalaya Publishing House. • VermaH. C.,Concepts Of Physics [Volume 2],BharatiBhawan, India • Barut A. O. (1980). Electrodynamics and classical theory of fields & particles. Courier Corporation.	

F. Y. B. Sc
Semester-II
PHY-DSC-122: Magnetostatics

Total Hours: 30 **Credits: 2**

Course objectives	• To impart knowledge of basic concepts in magnetic phenomena. • To provide the knowledge and methodology necessary for solving problems inmagnetostatics. • To classify the magnetic materials based on their magnetic propertiess	
Course outcomes	After successful completion of this course, students are expected to: • Understand the basics of EMI, electromagnetic waves and A.C. • Able to apply theoretical concepts of magnetism in real life • Understanding of the course will create scientific temperament.	
Unit	**Contents**	**Hours**
Unit I	**Magnetism and Matter** • Introduction • Bar magnet • Torque on a bar magnet place in a Magnetic Field • Magnetic field due to a bar magnet • Magnetic scalar potential, Magnetism and Gauss Law • Magnetization and Magnetic Intensity • Permeability, Paramagnetism • Ferromagnetism and Diamagnetism • Magnetic Properties of Paramagnetic • Ferromagnetic, and Diamagnetic Materials	**8**
Unit II	**Electromagnetic Induction** • Introduction • The Experiment of Faraday and Henry • Magnetic Flux • Faraday law of electromagnetic induction • Len'z Law and Conservation of Energy • Eddy Current • Motional EMF, Inductance • Energy Stored in a Inductor • AC Generator	**7**
Unit III	**Electromagnetic Waves** • Introduction • Maxwell displacement current • continuity of electric current • Maxwell equations • EM waves • EM spectrum	**8**
Unit IV	**Alternating current** • Introduction, Alternating current • Instantaneous current and RMS current • AC Voltage applied to a resistor • Representation of AC Current and Voltage by Rotating Vector- Phasor • AC Voltage applied to an inductor • AC Voltage applied to a capacitor	**7**

	• AC Voltage applied to a series LCR circuit • Power in AC Circuit-the power factor • Transformers	
Study Resources	• Purcell Edward M. (1986), Electricity and Magnetism, McGraw-Hill Education. • FewkesJ.H. &YarwoodJ. (1991), Electricity and Magnetism, Vol. I, Oxford Univ. Press • TayalD. C. (1988), Electricity and Magnetism, Himalaya Publishing House • Reese R. L.(2003), University Physics, Thomson Brooks/Cole.11 • Griffiths D. J. (1998), Introduction to Electrodynamics, Benjamin Cummings	

F. Y. B. Sc
Semester-II
PHY-DSC-123: Practical course on Electrostatics and Magnetostatics
Total Hours: 60 **Credits: 2**

Course Objectives	• To study electrical effect in real life practically. • To study magnetic effect in real life practically. • To distinguish between various magnetic materials and to study their applications. • Knowledge of electricity to be applied in household purposes.	
Course Outcomes	After successful completion of this course, students are expected to: • understand different electrical effect and magnetic effect • will get knowledge of various electrical component. • understand and practice the skills while doing physics practical. • to correlate their physics theory concepts through practical.	
Sr. No.	**Contents**	**Hours**
1	To use a Multimeter for measuring (a) Resistances, (b) A.C. and D.C. Voltages, (c) D.C. Current, and (d) checking electrical fuses.	4
2	Ballistic Galvanometer: (a) Measurement of charge and current sensitivity (b) Measurement of CDR (c) Determine a high resistance by Leakage Method (d) To determine Self Inductance of a Coil by Rayleigh's Method.	4
3	To compare capacitances using De'Sauty's bridge.	4
4	Measurement of field strength B and its variation in a Solenoid (Determine dB/dx).	4
5	To study the Characteristics of a Series RC Circuit.	4
6	To study a series LCR circuit and determine its (a) Resonant Frequency, (b) Quality Factor.	4
7	To study a parallel LCR circuit and determine its (a) Anti-resonant frequency and (b) Quality factor Q	4
8	To determine a Low Resistance by Carey Foster's Bridge.	4
9	Verification of Kirchhoff's laws.	4
10	To verify Thevenin's theorem	4
11	To verify Norton's theorem	4
12	To verify Maximum Power Transfer Theorem	4
13	To verify Joule's law.	4
14	To determine time constant of R-C circuit using charging and discharging of condenser through resistor.	4
15	Determination of time constant of L-R circuit.	4
16	Electric billing with energy meter.	4
17	Frequency of a. c. using vibrating wire and magnet.	4
18	To determine efficiency and turns ratio of transformer.	4

Study Resources	• Flint B. L. &WorsnopH. T. (1971), Advanced Practical Physics for students, Asia Publishing House. • Prakash I. and Ramakrishna (2011), A Text Book of Practical Physics, 11th Edition, KitabMahal, New Delhi • PanigrahiandS., MallickB. (2015), Engineering Practical Physics, Cengage Learning India Pvt. Ltd. • Nelson M.and Ogborn J. M. (1985), Advanced level Physics Practical's,4thEdition, reprinted Heinemann Educational Publishers. • PatilJ. R. et.al, Practical Course in Electronics, JaydeepPrakashan.	

F. Y. B. Sc
Semester-II
PHY-MIN-121: Applied Physics

Total Hours: 30 **Credits: 2**

Course objectives	• To impart knowledge of sound, acoustics and light to the students. • To provide the knowledge and methodology necessary for solving problems in Physics. • The course also involves the related experiments based on the theory.	
Course outcomes	After successful completion of this course, students are expected to: • apply the concept of use of knowledge of sound, Acoustics and light and its properties in real life problems. • understanding of the course will create scientific temperament • apply the concept of use of knowledge of sound and acoustics to real life problems.	
Unit	**Contents**	**Hours**
Unit I	**Sound** • Introduction of sound • Types of waves, Properties of waves • Relation between frequency, velocity and wavelength • Phase and phase difference, Transverse wave • Longitudinal wave, Mathematical expression for sound wave • Speed of Travelling waves • Newton's formula for velocity of sound • Laplace Correction, Factors affecting the speed of sound • Doppler effect of sound • Comparison of Doppler effect of sound and light.	**8**
Unit II	**Introduction to Acoustics** • Acoustics, Acoustics observed in surroundings • Applications of Acoustics • Classification of sound • Characteristics of musical sound, pitch, timbre, loudness • Weber Fechner law, sound intensity level- Decibel • Sound pressure level • Human Audiogram, PHON, SONE • Reflection of sound, Reverberration • Reverberration time, Absorption of sound • Sabine's Formula for Reverberration.	**7**
Unit III	**Ultrasonics** • Introduction of ultrasonics • Production of Ultrasonic waves • Magnetostriction effect • MagnetostrictionUlrasonic Generator • Piezoelectric effect, Piezoelectric Ulrasonic Generator • Detection of ultrasonic waves • Properties of ultrasonic waves • Types of ultrasonic waves • Determination of velocity of ultrasonic waves • Applications of Ultrasonic sound waves.	**8**

Unit IV	**Light** • Introduction of light • Nature of light, Velocity of light, optical medium • Homogeneous and Inhomogeneous isotropic medium • Reflection and Refraction • Total Internal Reflection, Reflectivity • Transmissitivity and Absorptivity of light • Wave Front and ray • Mathematical representation of plane wave • Light is an Electromagnetic wave • Visible range, Interference, Diffraction • Dispersion and scattering.	**7**
Study Resources	• VarmaH. C., Concept of Physics, Vol I, BharatiBhawan Publisher. • AvadhanuluM. N. and KshirsagarP.G. (1992), Engineering Physics, S. Chand publishers • GarrateS. L., Understanding Acoustics, 2nd Edition, ASA press. • Esminger D. (1998), Ultasonics, Printed in United State of America	

F. Y. B. Sc
Semester-II
PHY-MIN-122: Practical course on Applied Physics

Total Hours: 60 **Credits: 2**

Course Objectives	• To give hands on training on sound experiments. • To give hands on training on acoustics and ultrasonics experiments. • To study practically different phenomenon in lights.	
Course Outcomes	After successful completion of this course, students are expected to: • understand and verify the various concepts of sound experimentally. • understand the various phenomenon of light practically. • understand the basic concepts of acoustics practically and solve the problem based on acoustics. • understand the various concepts of ultrasonic sound experimentally.	
Sr. No.	**Contents**	**Hours**
1	To determine the velocity of sound by resonance tube.	4
2	To determine the relation between frequency and length under tension using sonometer.	4
3	To determine the relation between velocity and length under tension using sonometer.	4
4	To determine velocity of sound using Kundt's tube.	4
5	To determine angle of prism.	4
6	To determine angle of minimum deviation by dispersion through prism.	4
7	To determine the refractive index of glass slab using refraction.	4
8	To determine the refractive index of glass slab using travelling microscope.	4
9	To determine reverberation time of auditorium using given measurements.	4
10	To study interference phenomenon.	4
11	To study diffraction pattern using laser and grating.	4
12	To determine the width central bright fringe using diffraction of light.	4
13	To determine the velocity of liquid by ultrasonic interferometer.	4
14	To determine angle of rotation using polarimeter.	4
15	To determine the absorption coefficient of different materials.	4
Study References	• Flint, B.L. &Worsnop H.T. (1971). Advanced Practical Physics for students, Asia Publishing House. 2 nd edition • Nelson M.and Ogborn J. M. (1985). Advanced level Physics Practicals, 4th Edition, reprinted, Heinemann Educational Publishers • Prakash I. and Ramakrishna (2011). A Text Book of Practical Physics, 11th Edition, KitabMahal, New Delhi. • Arora C. L., B.Sc. Practical Physics, S. Chand Publishing Co. Ltd., New Delhi	

F. Y. B. Sc
Semester-II
PHY-OE-121: Mobile Communication II

Total Hours: 30 **Credits: 2**

Course objectives	• Define mobile technologies in terms of hardware, software, and communications. • To impart knowledge of basic concepts in mobile. • To provide the knowledge and methodology necessary for solving problems in mobile communication technology.	
Course outcomes	After successful completion of this course, students are expected to: • provide a systematic explanation of mobile communication as a discrete discipline • provide an in-depth coverage of mobile systems.Apply the concept of use of knowledge of motions to real life problems. • understand in depth different application and use of mobile communication	
Unit	**Contents**	**Hours**
Unit I	**Mobile Component** • A circuit board • antenna, display, keyboard • microphone, speaker, battery, antenna switch • SIM, USB, MIC, application (CPU), ON/OFF switch • base band processing and audio/speech processing (DSP) • RF part (frequency conversion, power amplification) • Tx/Rx switch, BT/ GPS.	**7**
Unit II	**Hardware and Software** Hardware: • Introduction and study of Printed Circuit Board (Motherboard) • Details of various components on the PCB • Testing of various parts and components • Study of different ICs (chips) used on the motherboard, how to recognize various ICs • Soldering &desoldering of components by using a soldering iron • Soldering &desoldering of components by using a rework station • Reheating and mounting of various BGA and SMD chips • Ultrasonic cleaning procedure. Software: • Detailed study of various faults arising due to corrupt software • Introduction of various flasher boxes and software • Flashing of various brands of handsets • Removing virus from infected phones • Unlocking of handsets through codes and/or software • Use of various secret codes.	**8**
Unit III	**LAN, Wi-Fi GPS** • Cellular Network • WLAN Wi-Fi IEEE 802.11x Networks • Adhoc Networks • Mobile Computing operating System • Client Server Computing Using Mobile • Design Considerations For Mobile Computing • Mobile Computing Using Apis	**7**

	• Design Considerations For Mobile Computing • Considerations For Frameworks And Programming Languages • Operating System Considerations • Middleware Functions • Data Synchronization And Dissemination • Mobile Computing And The Apps, Novel	
Unit IV	**Application of Mobile Communication** • Business (point-of-sale transactions [seller, buyer] • Internet purchases, online banking) • Communication (voice, text, social media, email, Internet access, travel directions), • Computing, Entertainment (gaming, music, streaming video, ebooks), IoT, Mobile apps, Remote sensing, • Travel directions (GPS, cellular-based) • Video communication, Audio/Voice Communication • Transportation industries, location dependant service • Infotainment (education), sensor, embedded controller • Mobile commerce, mobile-based supply chain management.	**8**
Study Resources	• SangoleR., PatkiR., Patil M., Mobile Technologies. • Collins L., Ellis, S. R. (2015). Mobile devices: tools and technology. (1st ed.) Chapman and Hall/CRC; • Pujolle, G. (2005). Mobile and wireless communication networks: IFIP 19th World Computer Congress, TC-6, 8th IFIP IEEE, Springer; • Osseiran, A., Monserra, tJ. F.,and Marsch, P. (2016).5G Mobile and wireless communications technology. (1st ed), Cambridge University Press • Introduction to Mobile Network Engineering: GSM, 3G-WCDMA, LTE and the Road to 5G Hardcover – Illustrated, 24 August 2018. Wiley; 1st edition (24 August 2018).	

F. Y. B. Sc
Semester-II
PHY-SEC-121: Fundamentals of Electronic Components

Total Hours: 30 **Credits: 2**

Course objectives	• To develop analytical abilities towards electronics and technological world. • To familiarize with current and recent scientific and technological developments in fuldamenta electronics • To enrich knowledge through problem-solving abilities of students in electronics.	
Course outcomes	After successful completion of this course, students are expected to: • understand the basics of resistor, capacitor, inductor etc. and their applications. • understand the basic concepts of transformers and be able to perform calculations using them. • understand the working of digital circuits. • demonstrate quantitative problem-solving skills in all the topics covered.	
Unit	**Contents**	**Hours**
Unit I	**Resistance and resistivity** • Resistance, Colour code • Calculation of resistance • Combination of resistance – series and parallel • Veriable resistor, rheostat, thermistors, veristors • Resistivity of material • Dependence of resistivity on various factors – area, lemgth, material and temperature.	**8**
Unit II	**Capacitor and Inductor** • Capacitors, types of capacitors • Series combination of capacitor • Parallel combination of capacitor • Variable capacitors, capacitance, dielectric constant • Charging discharging of Capacitor, inductor • Fixed inductor, variable inductor.	**7**
Unit III	**Transformer** • Solenoid, toroid • Self-induction, mutual induction • Transformer, construction • Working, types, application of transformer • Losses in transformer.	**8**
Unit IV	**DC Circuit** • Ammeter – construction, working, types and, application • Voltmeter - construction, working, types and application • Galvanometer - construction, working, and application • Potentiometer - construction, working, and application • Meter Bridge - construction, working, application.	**7**
Study Resources	• Platt, C., Encyclopedia of electronic components, maker media. • Geier, M. J., Everything electronics , McGraw Hill • Maheshwari, L. K., Analog electronics , PHI learning pvt ltd. • Milman & Halkins, Integrated electronics , McGraw Hill	

F. Y. B. Sc
Semester-II
PHY-SEC-122: Practical course on Fundamentals of Electronic Components

Total Hours: 30 **Credits: 1**

Course Objectives	• To develop analytical abilities towards technological developments • To familiarize with understanding of basic electronics components • To enrich knowledge through hands-on activities, study visits, projects etc.	
Course Outcomes	After successful completion of this course, students are expected to: • to demonstrate their practical skills. • to understand and practice the skills while doing physics practical. • to correlate their theorotical concepts through practical. • understand the application of electrical component in various system.	
Sr. No.	**Contents**	**Hours**
1	To verify the law of combination (series and parallel) of resistances using ammeter – voltmeter method and coils of known resistances.	4
2	To compare the e.m.f.'s of two given primary cells by using a potentiometer.	4
3	To determine the specific resistance of the material of two given wires using a metre bridge.	4
4	To determine the internal resistance of a primary cell using a potentiometer.	4
5	To determine the inductance and resistance of a given coil (inductor) using a suitable series resistance and an AC voltmeter.	4
6	To study decay of current in a R.C. circuit while charging the capacitor, using a galvanometer and find the time constant of the circuit.	4
7	To draw the characteristic curve of a forward biased pn junction diode and to determine the static and dynamic resistance of the diode.	4
8	To draw the characteristics of annpn transistor in common emitter mode. From the characteristics find out (i) the current gain (β) of the transistor and (ii) the voltage gain AV with a load resistances of 1k Ω.	4
9	To draw the lines of force due to a bar magnet keep (i) N-pole pointing to north (ii) N-pole pointing to South. Locate the neutral points.	4
10	To determine the internal resistance of a moving coil galvanometer by half deflection method, and to convert it into a volt meter of a given range, say (0- 3V), and verify it.	4
11	To obtain V-I characteristics of PN Junction Diode	4
12	To study the Diode Applications of Half wave and Full	4
13	wave Rectifier	4
14	To obtain V-I characteristics of Zener Diode with Graph	4
15	Design a low Pass Filter	4

Study Resources	• Chattopadhya, D., Rakshit, P. C. &Saha, B., Advanced course in Practical Physics, (8th Edition)Book& Allied Pvt. Ltd. • Singh, H. (2001). BSc Practical Physics, S. Chand & Co. Ltd. • Ghosh, S. K. ,A Text book of Practical Physics ,New Central Book Agency (4rd ed) • Arora, C. L. (2001). B Sc. Practical Physics, 1st Edition S. Chand & Co. Ltd. • Squires, C. L., Practical Physics, (3^{rd} ed.) , Cambridge University Press. • Tayal, D. C., University Practical Physics, Himalaya Publication. • Advanced Practical Physics :Worsnop& Flint.	