Undergraduate Programmes
2023 May (Physics)
Tentative Template

Terminologies

Abbreviation	Full-form	Remarks	Related to Major and Minor Courses	
Major (Core)	Main Discipline			
Major (Elective)	Elective Options		related to the Major Discipline	
Minor Stream	Other Disciplines (Inter/ Multidisciplinary) not related to the Major	either from the same Faculty or any other faculty		
OEC	Open Elective Courses/ Generic		**Not** Related to the Major and Minor	
VSEC	Vocational and Skill Enhancement Courses			
VSC	Vocational Skill Courses		~~Not~~ Related to the Major and Minor	Advanced laboratory practical of Major
SEC	Skill Enhancement Courses		**Not** Related to the Major and Minor	
AEC	Ability Enhancement Courses	Communication skills, critical reading, academic writing, etc.	**Not** Related to the Major and Minor	
VEC	Value Education Courses	Understanding India, Environmental science/education, Digital and technological solutions, Health & Wellness, Yoga education, sports, and fitness	**Not** Related to the Major and Minor	

IKS	Indian Knowledge System	I. Generic IKS Course: basic knowledge of the IKS II. Subject Specific IKS Courses: advanced information pertaining to the subject: part of the major credit.	Subject Specific IKS related to Major	
OJT	On-Job Training (Internship/Apprenticeship)	corresponding to the Major Subject	Related to the Major	
FP	Field projects	corresponding to the Major Subject	Related to the Major	
CC	Co-curricular Courses	Health and Wellness, Yoga education sports, and fitness, Cultural Activities, NSS/NCC and Fine/ Applied/Visual/ Performing Arts	Not Related to the Major and Minor	
CE	Community Engagement and service		Not Related to the Major and Minor	
RP	Research Project	corresponding to the Major Subject	Related to the Major	

Programme Template:

Programme Degree e.g. B.A./B.Com./B.Sc./ B.M.S., etc.		B.Sc.
Parenthesis if any (Specialization) e.g. History, Human Development, English, etc.		Physics
Preamble (Brief Introduction to the programme)		The NEP scheme of Physics syllabus is to be implemented from the A.Y. 2024-2025. The syllabus will cover the basics to the higher advances of the subject over the four years of the program. While following UGC guidelines and approval from appropriate Ethical Committee, the use of animals could be included and / or substituted the same with audiovisual, ICT and simulation aids such that the syllabus is made more interesting with new, innovative topics. Providing the pedagogy as indicated by module-wise outcomes of all courses would be helpful for the teachers in order to gauge the depth of the knowledge to be imparted keeping to the higher orders of learning as per Bloom's revised taxonomy. Use of innovative pedagogies such as inquiry-based, flipped classroom, blended learning, project-based, skill-based, participative learning and such others. Experiential learning through field studies would enhance understanding through 'out of class' learning. Assessment methods would be outcome-based which would help in mapping the curricula for the attainment of the course outcomes.
Programme Specific Outcomes (PSOs) *Action Verbs demonstrating (Major) discipline-related knowledge acquisition, mastery over cognitive and professional, vocational skills are to be used e.g. demonstrate sound understanding of.., analyse, compare, create, design, etc… (minimum 5)*		After completing this programme, Learner will
	1.	Apply the field-based and the in-class knowledge of animal biology to identify and classify the animals in their natural habitat up to class 8. Develop that attributes that promote lifelong learning & extension, communication, and Leadership skills
	2.	Identify the various types of animal behaviour, and animal interactions with the ecosystem
	3.	Relate the applications of specialized fields such as developmental biology, toxicology, hematology, economic and applied zoology
	4.	Design the research activity that involves application of critical thinking and experimental skills
	5.	Practice the scientific writing and documentation of research while conducting the research projects
	6.	Get career opportunities in a variety of fields such as conservation, research, education, and animal management – skills acquired
	7.	Acquire in-depth knowledge of biodiversity and adopt an eco-friendly approach towards life ensuring sustainable use of resources SNDTWU 2023 May Programme Structure Template
Eligibility Criteria for Programme		10+2 certificate preferably with Physics as one of the major subjects
Intake (For SNDT WU Departments and Conducted Colleges)		

- *External Examination does not always mean Theory paper. It may practical examination, Product submission, projects, etc. checked by external examiners.*
- *Internal evaluation should not be Written Theory papers like Unit tests.*
  Internal marks will be acquired through practical, small group or individual Projects, activities, presentations, seminars, workshops, products, assignments, application-based work, reports, etc.
- Practical may be part of the main courses alongwith theory modules instead of having separate courses of practical work.

Structure with Course Titles

(Options related to our area of study to be provided with "OR" for baskets of different types)

SN	Courses	Type of Course	Credits	Marks	Int	Ext
	Semester I					
10132211/ 10132212 (Any one?)	T1. Modern Physics T2. Basic Electronics	Major (Core)	4	100	50	50
10132221 (title?)	P1. Practical 1	Major (Core)	2	50	0	50
10432211	Electrical and Electronic gadgets for all	OEC	4	100	50	50
		VSC	2	50	50	0
10732201	Basic Measurements and Calculations	SEC	2	50	50	0
		AEC	2	50	0	50
		IKS	2	50	0	50
		VEC	2	50	50	0
		CC	2	50	50	0
			22	**550**	**300**	**250**
	Semester II					
20132211/ 20132212 (Prerequsite?)	**T3.** Mechanics And Waves **T4.** Thermodynamics	Major (Core)	4	100	50	50
20132221 (title?)	**P2.** Practical 2	Major (Core)	2	50	0	50
20332221	Mathematical Techniques	Minor Stream	2	50	0	50
20432211	Basics of Web Designing	OEC	4	100	50	50

		VSC	2	50	0	50
20732201	Photography	SEC	2	50	50	0
		AEC	2	50	50	0
		VEC	2	50	0	50
		CC	2	50	50	0
			22	**550**	**250**	**300**

Exit with UG Certificate with 10 extra credits (44 + 10 credits)

SN	Courses	Type of Course	Credits	Marks	Int	Ext
	Semester III					
30132211	**Thermodynamics**	Major (Core)	4	100	50	50
30132212	**Modern Physics**	Major (Core)	4	100	50	50
		Minor Stream	4	100	50	50
		OEC	2	50	0	50
30632221 (title?)	**Physics Practicals-III**	VSC	2	50	50	0
		AEC	2	50	0	50
		FP	2	50	50	0
		CC	2	50	50	0
			22	**550**	**300**	**250**
	Semester IV					
40132211	**Digital Electronics**	Major (Core)	4	100	50	50
40132212	**Material Science**	Major (Core)	4	100	50	50
		Minor Stream	4	100	50	50
		OEC	2	50	0	50
30732221 (title?)	**Practical- IV**	SEC	2	50	0	50
		AEC	2	50	0	50
		CEP	2	50	50	0
		CC	2	50	50	0
			22	**550**	**250**	**300**

Exit with UG Diploma with 10 extra credits (44 + 10 credits)

SN	Courses	Type of Course	Credits	Marks	Int	Ext
	Semester V					
50132211	**Solid state Physics**	Major (Core)	4	100	50	50
50132212	**Thermal and Statistical Physics**	Major (Core)	4	100	50	50
50132213	**Atomic and Molecular Physics**	Major (Core)	2	50	0	50
50232211/ 50232212/ 50232213	**i) Microprocessor** **ii) Python** **iii) Space Biology**	Major (Elective)	4	100	50	50
		Minor Stream	4	100	50	50
		VSC	2	50	50	0
		FP/CEP	2	50	50	0
			22	**550**	**300**	**250**
	Semester VI					
60132211	**Electrodynamics**	Major (Core)	4	100	50	50
60132212	**Nuclear physics**	Major (Core)	4	100	50	50
60132213	**Relativity**	Major (Core)	2	50	0	50
60232211/ 60232212/ 60232213	**i) Microcontroller** **ii) C++** **iii) Computational Physics**	Major (Elective)	4	100	50	50
		Minor Stream	4	100	50	50
		OJT	4	100	50	50
			22	**550**	**250**	**300**

Exit with Degree (3-year)

4-Year Degree with Honors

SN	Courses	Type of Course	Credits	Marks	Int	Ext
	Semester VII					
70132211	**Electronics**	Major (Core)	4	100	50	50
70132212	**Classical Mechanics**	Major (Core)	4	100	50	50
70132213	**Solid state Electronics**	Major (Core)	4	100	50	50
70132214	**Nuclear Physics**	Major (Core)	2	50	50	0
70232211/ 70232212	**Digital electronics/ Communication Channels**	Major (Elective)	4	100	50	50
		Minor Stream (RM)	4	100	50	50
			22	**550**	**300**	**250**
	Semester VIII					
80132211	**Advance Atomic Physics**	Major (Core)	4	100	50	50
80132212	**Advance Electronics**	Major (Core)	4	100	50	50
80132213	**Particle Physics**	Major (Core)	4	100	50	50
80132214	**Mathematical Physics**	Major (Core)	2	50	0	50
80232211/ 80232212	**Digital electronics/ Communication Channels**	Major (Elective)	4	100	50	50
		OJT	4	100	50	50
			22	**550**	**250**	**300**

Course Syllabus F. Y B Sc (Physics) Semester I

1.1 Major (Core). Marks 50 (15 Hrs)

Course Title	**T2. Modern Physics**
Course Credits	2
Course Outcomes	After going through the course, learners will be able to
	1. Use appropriate and accurate scientific/technical terminology to **communicate** theirobservations and conclusions.
	2. **comprehend** the scientific articles and research papers.
	3. **comprehend** the scientific articles and research papers.
	4. **perform** experiments and explain the results with appropriate scientific models
	5. **seek clear understanding** of concepts and ideas that shape reasoning through **problemsolving**.

1.1	Black body radiation (no derivation), ultraviolet catastrophe Photoelectric effect, Compton Effect, Pair production and annihilation, gravitational red shift. AB :2.2, 2.3,2.7,2.8 Problem solving session	**[5 Hr]** **[2 Hr]**	
1.2	Discovery of X-ray, X-ray production, characteristic x-ray spectra, applications of X-ray, X-ray diffraction AB :2.5,2.6 Problem solving session	**[6 Hr]** **[2 Hr]**	
	References: 1 Arthur Beiser , Concepts of Modern Physics Sixth Edition , McGraw-Hill Publications. 2. Stephen T. Thornton and Andrew Rex, Modern Physics for scientists and Engineers 4th Edition		

1.2 Major (Core). Marks 50 (15 Hrs)

Course Title	**T2. Basic Electronics**
Course Credits	2

1.1	Types of diode biasing (review), Bridge rectifier-ripple factor-Types of filter circuits-Zener diode-Zener diode as a voltage stabilizer-solving Zener diode circuits. Problem solving sessions	**[5** Hr] **[3** Hr**]**	

	Reference: Principles Of Electronics V.K.Mehta, Rohit Mehta S. CHAND & COMPANY LTD (6.1,6.6,6.8,6.9,6.10, 6.13 ,6.14, 6.15, 6.18, 6.21,6.25,6.27)		
1.2	Binary number system- Decimal to binary conversion- Binary to decimal conversion-octal number system-hexadecimal number system- binary coded decimal code (BCD)-binary addition and binary subtraction using 2's complement. Problem solving sessions Refeence: PRINCIPLES OF ELECTRONICS V.K.Mehta, Rohit MehtaS. CHAND & COMPANY LTD (26.3,26.5,26.6,26.7, 26.8, 26.9) RP Jain Modern digital electronics (2.4,2.5,2.6)	**[5** Hr] **[2 Hr]**	
	References: RP Jain Modern digital electronics (5.3,5.4,5.5)		

PROGRAM(s): F.YB.Sc.			**SEMESTER: I**		
Course: Practical 1			**Course Code: P1.**		
Teaching Scheme			**Evaluation Scheme**		
Lectures (Hours per week)	**Practical (Hours per week)**	**Tutorial (Hours per week)**	**Credit**	**Continuous Internal Assessment (CIA) (Marks- 40)**	**Semester End Examination (Marks- 60)**
-	**4**	**-**	**2**	**40**	**60**

Learning Objectives:
To enable students to
1. acquire understanding of usage of basic measuring instruments.
2. plot graphs easily
3. get an understanding of the working of analogue components.
4. get an understanding of the working of digital components.

Course Outcomes:

A student will be able to,

CO1: demonstrate his/her practical skills.
CO2: practice the skills required to perform experiments in physics.
CO3: work with apparatus without fear.
CO4: correlate the ideas discussed in lectures to the experiments being carried out..
CO5: understand the concepts of errors and their estimation.
CO6: connect circuits, perform measurements and analyse observations.

Course code	**P1. Practical**	**Credits**
		2
	Skills 1) Identifying components 2) Use of DMM 3) Graph plotting Main experiments 1. Bridge Rectifier, rectification, load regulation, ripple factor. 2. Maximum power transfer theorem 3. Zener Diode Characteristics. 4. L- R circuit 5. C-R circuit	

Course code	Practical	Credits
	6. De-Morgan's Theorem using logic gates 7. NAND and NOR as Universal Building Blocks 8. Transistor Characteristics (CE mode) 9. Thermistor Characteristics 10. Constructing Half adder, Full adder 11. Photo-diode characteristics 12. LDR characteristics 13. Reading Scientific Articles (2 experiments equivalent) Minimum 12 total experiments (skills and main) to be performed.	

1.3 Open Elective Courses (OEC)

Course Title	Electrical and Electronic Gadgets for all
Course Credits	**4**
Course Outcomes	After going through the course, learners will be able to
	1. Calculate the energy consumption for his/her house, office, public places.
	2. Compare heating technologies for their advantages and disadvantages.
	3. Distinguish between ionising and non-ionising radiations.
	4. Use digital camera/ mobile camera effectively.
	5. Describe various network parameters.

Unit	Sub-Unit	Course/ Unit Title	Lectures
I		**ELECTRICAL GADGETS AT HOME**	
	1.1	Concept of electricity, voltage, current, power, energy. Types of conducting materials. Electrical ratings of various appliances, electrical billing calculations. Understanding light sources and units – LED, CFL, tube lights, halogen lamps	4
	1.2	Concept of heat energy and temperature scales. Types of thermal materials. Understanding heating appliances – electric heaters, induction hotplate, microwave oven, heating pads.	5

Unit	Sub-Unit	Course/ Unit Title	Lectures
		Understanding cooling devices – dry ice storage, coolers, air-conditioning, refrigerator.	
	1.3	Understanding medical instruments: ionising and non-ionising radiations, X rays, MRI, MRA, CT scan, PET scan, ultrasonography Imaging using ECG and EEG	6
II		**ELECTRONIC AND COMMUNICATING GADGETS**	
	2.1	Digital and analog data. Electronic signals and communication media - wired and wireless communications. wifi, bluetooth, satellite communication. LAN, WAN and larger networks. Internet and world wide web. Concept of bandwidth and data compression, various file formats, 4G/5G networks.	5
	2.2	Mobile phone, PC, laptop, tablets, smart TV, Digital camera: – DSLR/Mirrorless/Mobile camera	5
	2.3	Various Social media platforms and online communication etiquette Artificial intelligence, AI tools Online transactions and safety issues	5

Reference:-

https://www.youtube.com/c/Theengineeringmindset

Modality of Assessment Theory Examination Pattern: (for Discipline Specific Core papers)

A. Internal Assessment- 40%- 40 Marks per paper

Sr. No.	Evaluation Type	Marks
1	Assignment/ Case study/ field visit report/ presentation/ project Multiple assignments may be given.	**40**
	Total	**40**

A. Semester End Theory Examination

1. Duration - These examinations shall be of **two hours** duration.
2. Theory question paper pattern:
   a) There shall be 3 questions each of 20 marks with different levels of difficulty.
   b) All questions shall be compulsory with at least 50% internal choice within the questions. (For example, 4 out of 6 sub-questions or 3 out of 6 **sub-questions to be solved).**

All units will be given equal weightage

Skill Enhancement Course

PROGRAM(s): F.YB.Sc.			**SEMESTER:** I		
Course: Basic Measurements and Calculations			**Course Code:** SEC		
Teaching Scheme			**Evaluation Scheme**		
Lectures (Hours per week)	**Practical (Hours per week)**	**Tutorial (Hours per week)**	**Credit**	**Continuous Internal Assessment (CIA) (Marks- 40)**	**Semester End Examination (Marks- 60)**
-	4	-	2	-	60

Learning Objectives:

1) expose students to basic instrumentation
2) develop measurement skills
3) develop analytical skills in laboratory measurements

Course Outcomes:

After completing this course, learner will be able to

1) enlist parameters of measuring instruments
2) use basic measuring instruments to measure physical quantities
3) record observations with correct significant digits
4) identify types of uncertainties in the measurement
5) plot graphs of given quantities
6) calculate uncertainties in derived quantities

Practical

1. **Measuring size: travelling microscope, micrometer screw, vernier callipers**
2. **Time measurement: using stop-watch**
3. **Mass measurement: single pan balance**
4. **Use of Digital multimeter for measurement of various electrical parameters**
5. **Measurement of internal resistance of voltmeter, current-meter and loadingeffect**
6. **Measurement of output impedance of signal generator**
7. **Constant voltage source: current capacity and internal resistance**
8. **Constant current source: internal resistance**
9. **Uncertainty analysis: sources of uncertainties, types of uncertainties**
10. **Propagation of uncertainties**
11. **Graph plotting I: linear (slope, interpolation, extrapolation)**
12. **Graph plotting II: Non-linear graphs (slope at given point, interpolation), converting non-linear to linear from known equation**
13. **Statistical analysis of data I**
14. **Statistical analysis of data II**

Minimum 10 experiments to be completed.

FYBSc Sem II syllabus Physics

paper – II

COURSE TITLE: Mechanics and Waves
COURSE CODE: T3 [CREDITS - 02]

Total contact hours : 30

After the successful completion of the Course, the learner will be able to:

1. Apply the principle of superposition to two perpendicular SHMs
2. Understand the Physics of the compound pendulum
3. Apply the wave equation to derive velocity of waves in medium
4. Understand how ultrasound is produced and it's applications
5. Understand and apply the principles of acoustics

Learning Objectives:

The module is intended to

1. Lay the groundwork for Classical Mechanics
2. Apply Newtonian dynamics to complicated systems such as compound pendulums
3. Be able to apply conservation laws to a system of particles

Learning Outcome:

After the successful completion of the module, the learner will be able to:

1. Elucidate the basic principles of mechanics
2. Apply mechanics to a system of particles

Solve a wide variety of problems in mechanics

1.1	Composition of two SHM: (Only for review: Definition of SHM and composition of two parallel SHM's of same period.) Composition of two perpendicular S H M's having the same period and period in the ratio 1:2, Types of Lissajous figures. Problem solving Ref: SPP:2.4.1, 2.4.3, 2.4.	[3 Hr] [1 Hr]
1.2	Mechanics of a system of particles: Centre of mass of a system of particles, Linear momentum of a system of particles and its conservation. Angular momentum of a system of particles and its conservation (only statement). Rocket motion (neglecting gravity) (derivation up to maximum velocity and only final expression for distance travelled) Problem solving Ref: TM: 9.2, 9.3, 9.4, 9.11	[4 Hr] [2 Hr]
1.3	Compound pendulum: Expression for period, maximum and minimum time period, centers of suspension and oscillations, reversible compound pendulum, compound pendulum and simple pendulum- a relative study, torsion pendulum-measurements of rigidity modulus Problem solving KJ: 1.2 to 1.8	[3 Hr] [2 Hr]

Learning Objectives:

The module is intended to

1. Give a general overview of wave motion
2. Introduce the learner to Ultrasonic and its applications
3. Give a brief introduction to acoustics

Learning Outcome:

After the successful completion of the module, the learner will be able to:

1. Solve a wide variety of numerical related to wave motions
2. Understand how ultrasonic are produced and applied.
3. Understand the principles behind acoustic design

2.1	Wave motion in one dimension: General solution of wave equation, Classification of waves, Examples of one-dimensional waves, derivation of velocity of Transverse wave on string, expression of velocity of longitudinal waves in rod. Problem solving	[3 Hr] [2 Hr]
	Ref: SPP: 6.1, 6.2, 6.5, 6.5.1, 6.5.2, 6.5.3.	
2.2	Ultrasonic: Piezoelectric effect, Production of Ultrasonic waves: Magnetostriction method and Piezoelectric Crystal Method, Detection, Properties and applications of Ultrasonic Waves, (Formula of frequency of ultrasonic waves) Problem solving Ref: MS: 5.1 to 5.6	[3 Hr] [2 Hr]
2.3	Acoustics of Buildings: Reverberation, Sabine's formula, Determination of Absorption coefficient, Acoustics of Buildings, factors affecting Acoustics of Buildings, Sound distribution in an auditorium. Distinction between sound and noise Sound isolation – transmission loss- noise reduction – Speech privacy-construction criteria. Noise control in specific types of buildings like – auditoriums, residential buildings, hotels, school, hospitals, offices, libraries Problem solving Ref: MS: 5.8, 5.9, 5.10, 5.12, 5.13, 5.14, and 5.15	[3 Hr] [2 Hr]

References:

1. SPP: Fundamentals of vibration and waves – S P Puri (Tata McGraw Hill)
2. TM: Classical Dynamics – Thornton and Marion (5th Ed.) Thomson Books.
3. MS: : Properties of matter and Acoustics – R Murugeshan and K. Shivaprasath, S Chand & Co. Ltd. (2005-Ed)
4. HP: H. S. Hans and S. P. Puri, Tata McGraw Hill (2nd ED.)
5. RHW:Fundamentals of Physics. Resnick, Halliday and Walker (9th Ed. 2012). Wiley.
6. KJ:College Physics I,Kailas R Jagdeo

Additional references :

Moore, J.E., Design for Good Acoustics and Noise Control

Discipline Specific Core Course 1

PROGRAM(s): F.Y.B.Sc.			SEMESTER: II		
Course: Thermodynamics			Course Code: T4		
Teaching Scheme			Evaluation Scheme		
Lectures (hours per week)	**Practical (hours per week)**	**Tutorials (hours per week)**	**Credits**	**Continuous Internal assessment**	**Semester End Examination (Marks - 60)**
2	**-**	**-**	**2**	**40**	**60**

Learning Objectives:
1: Analyse natural phenomena
2: Model real systems
3: Understand behaviour of bulk matter
4: Predict evolution of a system

Course Outcomes:
A student will be able to,
CO1: describe macroscopic phenomena based on molecular theory of matter
CO2: correlate experimental observations to theoretical models
CO3: identify thermodynamic quantities and processes associated with different systems.
CO4: apply the first law of thermodynamics to various systems
CO5: grasp the concept of reversibility and irreversibility in systems
CO6: analyse the nature of processes using the second law of thermodynamics

Unit	Sub-Unit	Course/ Unit Title	Lectures
I		**Molecular Structure of Matter**	**15**
	1.1	Dilute gas System – Equilibrium phenomena, Ideal gas Equation of state, Kinetic theory, Maxwellian velocity distribution	
	1.2	Dilute gas System – Non-equilibrium phenomena, fluctuations, mechanism of transport	
	1.3	Real gas System – Experimental observations, Theoretical Model, Van-der-Waal equation of state.	
	1.4	Phase rule and phase curves	
II		**Basic Thermodynamics**	**15**
	2.1	Basics – System, Environment, Boundaries, Interactions, Physical quantities, processes, Concept of Equilibrium	
	2.2	Zeroth Law of Thermodynamics, Concept of temperature, thermometry at different scales	

	2.3	First Law of Thermodynamics – Concept of Heat and Work, Adiabatic Processes, First Law of Thermodynamics, Relations between Thermodynamic quantities.	
	2.4	Applications of the First Law – Processes in Matter, Carnot Cycle, Joule-Thompson effect, Heat engines, Refrigerators.	

References:- **Thermal Physics, Garg, Bansal Ghosh, Tata-McGraw Hill**

Additional References:

1) Heat and Thermodynamics, M W Zemansky, McGraw Hill (5th and 7th edition)
2) Thermodynamics, Kinetic Theory, and Statistical Thermodynamics, F. W. Sears, G. L. Salinger,Addison- Wesley (3rd Edition)

PROGRAM: F.Y.B.Sc.			**SEMESTER:II**		
Course: Practical 2			**Course Code: P2**		
Teaching Scheme			**Evaluation Scheme**		
Lectures (Hours per week)	**Practical (Hours per week)**	**Tutorial (Hours per week)**	**Credit**	**Continuous Internal Assessment (CIA) (Marks- 40)**	**Semester End Examination (Marks- 60)**
-	**4**	**-**	**2**	**40**	**60**

Learning Objectives:
To enable students to
1. understand some fundamental ideas of Thermodynamics.
2. efficiently use mobile or other cameras.
3. make use of optical coupling of devices for real life usage.
4. understand aberration in optical systems.

Course Outcomes:
A student will be able to
CO1) demonstrate their practical skills.
CO2) understand and practice the skills while doing physics practical.
CO3) understand the use of apparatus and their use without fear.
CO4) correlate their physics theory concepts through practical.
CO5) Understand the concepts of errors and their estimation.

Detailed syllabus

Practical (WSPHYMJ123)

Demonstration Experiments

1) Thermocouple
2) Lens aberrations
3) Mobile Camera Settings
4) Lux meter

Main Experiments

1	Spectrometer(μ)
2	Lens Combination
3	LASER Divergence
4	LDR Characteristics
5	Surface Tension of Biological fluid
6	Frequency of A.C. mains
7	Viscosity by Stoke's Method
8	Flywheel
9	Torsional Oscillations
10	Bifilar Pendulum
11	Y by vibrations
12	Thermocouple

Minimum of total 12 experiments (demonstration and main) to be completed.

PROGRAM: F.Y.B.Sc.			**SEMESTER: 2**		
Course: Mathematical Techniques			**Course Code:**		
Teaching Scheme			Evaluation Scheme		
Lectures (Hours per week)	Practical (Hours per week)	Tutorials (Hours per week)	Credits	Continuous Internal Assessment CIA Marks	Semester End Examination Marks
-	4	-	2	-	60

Learning Objectives:

1) Develop mathematical skills required for theories in physics
2) Develop numerical skills
3) Appreciate Mathematical modeling of the physical world

Course Outcomes:

After completing the course, learner will be able to

1) convert physical situations into mathematical equations
2) solve mathematical equations using analytical methods when possible
3) solve mathematical equations using numerical methods
4) extract physically meaningful conclusions from numerical / algebraic expressions
5) build mathematical models for physical situations

Unit	Subunit	Unit Title	Lectures
I		**Partial Differentiation**	**15**
	1.1	Introduction and Notation	
	1.2	Power series in two variables	
	1.3	Total Differentials	
	1.4	Approximations using differentials	
	1.5	Chain Rule or differentiating a function of a function	
	1.6	Implicit differentiation	
	1.7	More chain rule	
	1.8	Application of partial differentiation to maximum and minimum problems	
	1.9	Maximum and minimum problems with constraints: Lagrange Multipliers	
Unit	**Subunit**	Unit Title	Lectures
	1.10	Endpoint or boundary value problems	
	1.11	Change of variables	
	1.12	Differentiation of integrals: Leibneitz rule	
	1.13	Miscellaneous problems	
2		Vector Analysis	15
	2.1	Introduction	

	2.2	Applications of Vector multiplication	
	2.3	Triple products	
	2.4	Differentiation of vectors	
	2.5	Fields	
	2.6	Directional derivative: Gradient	
	2.7	Some other expressions involving ∇	
	2.8	Line Integrals	
	2.9	Green's theorems in the plane	
	2.10	The divergence and divergence theorem (applications only, mathematical proof not needed)	
	2.11	The curl and Stokes theorem (applications only, mathematical proof not needed)	
	2.12	Miscellaneous problems	

References:-

1. Boas, Mary L., Mathematical Methods in the Physical Sciences, 3rd Edition, Wiley, 2023

Additional Reference:

1. MATHEMATICAL METHODS FOR PHYSICISTS A Comprehensive Guide SEVENTH EDITION — George B. Arfken Miami University Oxford, OH Hans J. Weber University ofVirginia Charlottesville, VA Frank E. Harris University of Utah, Salt Lake City, UT
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