BSc Physics

Program Educational Objectives:

1. Create the facilities and environment to consolidate the knowledge acquired and to motivate and inspire the students to create deep interest in Physics, to develop broad and balanced knowledge and understanding of physical concepts, principles and theories of Physics.
2. Learn, design and perform experiments in the labs to demonstrate the concepts, principles and theories learned in the classrooms.
3. Develop the ability to apply the knowledge acquired in the classroom and laboratories to specific problems in theoretical and experimental Physics.
4. Expose the student to the vast scope of Physics as a theoretical and experimental science with applications in solving most of the problems in nature.
5. Emphasize the discipline of Physics to be the most important branch of science for pursuing the interdisciplinary and multidisciplinary higher education and/or research in interdisciplinary and multidisciplinary areas.
6. To emphasize the importance of Physics as the most important discipline for sustaining the existing industries and establishing new ones to create job opportunities at all levels of employment.

Program Outcomes:

1. Demonstrate a rigorous understanding of the core theories & principles of physics, which includes mechanics, electromagnetism, thermodynamics, & quantum mechanics introduced at degree level in order to understand nature at atomic levels.
2. Understand the set of physical laws, describing the motion of bodies, under the influence of system of forces.
3. Build a foundation in formulating the expressions for the quantities and solve the problems by applying the knowledge of Mathematical science.
4. Apply professional and social skills to cater to the needs of the industry, society and global scientific community.
5. Enhance the research culture and uphold the scientific integrity and objectivity.
6. Experience of workplace problem solving in the form of internship or Research Experience preparing for higher education or Entrepreneurship and employment.

BSc Mathematics

Program Outcomes:

1. **Disciplinary Knowledge:** Bachelor degree in Mathematics is the culmination of in-depth knowledge of Algebra, Calculus, Geometry, differential equations and several other branches of pure and applied mathematics. This also leads to study the related areas such as computer science and other allied subjects.
2. **Communication Skills**: Ability to communicate various mathematical concepts effectively using examples and their geometrical visualization. The skills and knowledge gained in this program will lead to the proficiency in analytical reasoning which can be used for modeling and solving of real life problems.
3. **Critical thinking and analytical reasoning:** The students undergoing this programme acquire ability of critical thinking and logical reasoning and capability of recognizing and distinguishing the various aspects of real life problems.
4. **Problem Solving** : The Mathematical knowledge gained by the students through this programme develop an ability to analyse the problems, identify and define appropriate computing requirements for its solutions. This programme enhances students overall development and also equip them with mathematical modelling ability, problem solving skills.
5. **Research related skills:** The completing this programme develop the capability of inquiring about appropriate questions relating to the Mathematical concepts in different areas of Mathematics.
6. **Information/digital Literacy**: The completion of this programme will enable the learner to use appropriate software to solve system of algebraic equation and differential equations.
7. **Self –directed learning**: The student completing this program will develop an ability of working independently and to make an in depth study of various notions of Mathematics.
8. **Moral and ethical awareness/reasoning:** : The student completing this program will develop an ability to identify unethical behaviour such as fabrication, falsification or misinterpretation of data and adopting objectives, unbiased and truthful actions in all aspects of life in general and mathematical studies in particular.
9. **Lifelong learning**: This programme provides self-directed learning and lifelong learning skills. This programme helps the learner to think independently and develop algorithms and computational skills for solving real word problems.
10. Ability to peruse advanced studies and research in pure and applied Mathematical sciences.

B.Sc Computer Science

Program Educational Objectives:

1. To provide the students about computing principles and business practices in software solutions, outsourcing services, public and private sectors
2. Provide strong foundations in fundamental ions of computer science and applications for employability and/or further graduation.
3. Empower students with competencies in creative thinking and problem solving, interpersonal communication and managerial skills.
4. Facilitate overall understanding of the technological development with legal and ethical issues.
5. Equip the students in providing professional solutions to real-time problems.
6. To develop entrepreneurs
7. To develop ethical managers with inter disciplinary knowledge.
8. To develop IT enabled global middle level managers for solving real life business problems and addressing business development issues with a passion for quality, competency and holistic approach
9. To prepare students to take up higher education to become business scientists, researchers, consultants and teachers, with core competencies

Program Outcomes :

1. The objective behind BSc Computer Science is to equip students with the latest technology, tools and applications in IT and to meet the ever-growing requirement of IT professionals
2. Apply technical and professional skills to excel in business
3. Communicate effectively in both verbal and written form
4. Develop practical skills to provide solutions to industry, society, and business using latest technologies, tools and applications.
5. Ability to go for higher education like MCA and MSc in Computer Science.

Course Structure

(Major Discipline: Physics)

Semester 1 - 10

SEMESTER	Discipline Core Theory (DSCT)	Core Papers
SEMESTER -1	Phy.DSCT1	Mechanics & Properties of Matter
SEMESTER -2	Phy.DSCT2	Electricity and Magnetism
SEMESTER -3	Phy.DSCT3	Wave motion and optics
SEMESTER -4	Phy.DSCT4	Thermal Physics & Electronics
SEMESTER -5	Phy.DSCT5 Phy.DSCT6	1. Classical Mechanics and Quantum Mechanics- I 2. Elements of Atomic, Molecular Physics
SEMESTER -6	Phy.DSCT7 Phy.DSCT8	1. Elements of Nuclear Physics and Nuclear Instruments 2. Elements of Condensed Matter Physics
SEMESTER -7	Phy.DSCT9 Phy.DSCT10 Phy.DSCT11	1. Mathematical Methods of Physics – I 2. Classical Electrodynamics. 3. Experimental methods of Physics 4. Research Methodology
SEMESTER -8	Phy.DSCT12 Phy.DSCT13 Phy.DSCT14	1. Classical Mechanics and Quantum Mechanics-II 2. Statistical Mechanics 3. Astrophysics & Astronomy 4. Research Project* (Select Two DSE subjects from the Pool B-II shown below) *In lieu of the research Project, two additional elective papers/ Internship may beoffered.
SEMESTER -9	Phy.DSCT15	1. Mathematical Methods of Physics – II (Select One DSE subjects from the Pool B-III shown below) 2. Research Project
SEMESTER -10	Phy.DSCT17	1. Quantum Mechanics – III (Select One DSE subjects from the Pool B-IV shown below) 2. Research Project

Open Electives

1st Semester	
1.	Phy-OE1: Energy Sources
2.	*Phy-OE2: Physics for All.
2nd Semester	
3.	Phy-OE3: Atmospheric Science
4.	Phy-OE4: Sports Science
3rd Semester	
5.	**Phy-OE5: Optical Instruments**
6.	**Phy-OE6: Elements of Astronomy and Astrophysics**
4th Semester	
7.	**Phy-OE7: Medical Physics**
8.	**Phy-OE9: Electrical Instruments**

***Students who have chosen Phy-DST1 are not eligible to take Open Electivepaper Phy-OE2.**

I Semester

Course title : Mechanics & Properties of Matter and Lab

Paper : Phy.DSCT1

Course Objectives:

1. The course is aims to provide a thorough knowledge of the basics of kinematics, gravitation, properties of matter and special theory of relativity.
2. Each topic includes problem-solving which develops the thinking process and application skills of the students.
3. Mechanics helps the students to understand the basic laws of physics in day-to-day life.
4. Practical will help students to determine and verify physical quantities related to mechanics.

Course Outcomes:

1. Fixing units, tabulation of observations, analysis of data (graphical/analytical).
2. Accuracy of measurement and sources of errors, importance of significant figures.
3. Knowledge of how g can be determined experimentally and derive satisfaction.
4. Understanding the difference between simple and torsional pendulum and their use in the determination of various physical parameters.
5. Knowledge of how various elastic moduli can be determined.
6. Measuring surface tension and viscosity and appreciate the methods adopted.
7. Hands on experience of different equipment's.
8. By the end of the course the student should be able to get: A better understanding of theory and development of practical application skills.

II Semester

Course title : Electricity & Magnetism and Lab

Paper : Phy.DSCT2

Course Objectives:

1. The course on electricity and magnetism enables to understand the fundamentals of electrostatics, magneto statics, electromagnetic induction and electromagnetic theory.
2. The experiments related to electricity and magnetism included in this course enables the students to understand the theory better and develops the application skills.
3. The course on Electromagnetism will help the students to understand the effect of charge at rest and in motion and dielectric properties of the matter.
4. The basics of electronics are required to understand the different functions of electronic devices.
5. The practical will help the students to determine physical properties of electrical and electronic components.

Course Outcomes:

1. Demonstrate Gauss law, Coulomb's law for the electric field, and apply it to systems of point charges as well as line, surface, and volume distributions of charges.

2. Explain and differentiate the vector (electric fields, Coulomb's law) and scalar (electric potential, electric potential energy) formalisms of electrostatics.
3. Apply Gauss's law of electrostatics to solve a variety of problems.
4. Describe the magnetic field produced by magnetic dipoles and electric currents.
5. Explain Faraday-Lenz and Maxwell laws to articulate the relationship between electric and magnetic fields.
6. Describe how magnetism is produced and list examples where its effects are observed.
7. Apply Kirchhoff's rules to analyse AC circuits consisting of parallel and/or series combinations of voltage sources and resistors and to describe the graphical relationship of resistance, capacitor and inductor.
8. Measure resistances, voltages, current, charge density, magnetic field strength, and mutual inductance of a pair of coils using appropriate instruments and experimental setup and develop experimental skills.
9. Perform experiments to study frequency response & calculate resonant frequency.
10. Perform experiments to determine self inductance of the coil, unknown capacitance, charging & discharging of a capacitor.
11. The practical will help the students in handling the multimeter, potentiometer and function generators.

B.Sc. with Mathematics as Major
Subject & B.Sc. (Hons.) Mathematics

I Semister

MATDSCT 1.1: Algebra - I and Calculus – I
Teaching Hours : 4 Hours/Week **Credits: 4**
Total Teaching Hours: 56 Hours **Max. Marks: 100 (S.A.-60 + I.A. – 40)**

Course Learning Outcomes: This course will enable the students to

1. Learn to solve system of linear equations.
2. Solve the system of homogeneous and non homogeneous linear of m equations in n variables by using concept of rank of matrix, finding eigen values and eigenvectors.
3. Sketch curves in Cartesian, polar and pedal equations.
4. Students will be familiar with the techniques of integration and differentiation of function with real variables.
5. Identify and apply the intermediate value theorems and L'Hospital rule.

MATDSCP 1.1: Practical's on Algebra - I and Calculus – I

Practical Hours : 4 Hours/Week **Credits: 2**
Total Practical Hours: 56 Hours **Max. Marks: 50 (S.A.-25 + I.A.-25)**

Course Learning Outcomes: This course will enable the students to

1. Learn Free and Open Source Software (FOSS) tools for computer programming
2. Solve problem on algebra and calculus theory studied in MATDSCT 1.1 by using FOSS software's.
3. Acquire knowledge of applications of algebra and calculus through FOSS.

Open Elective

(For students of Science stream who have not chosen Mathematics as one of Core subjects)

MATOET 1.1: Mathematics – I
Teaching Hours : 3 Hours/Week **Credits: 3**
Total Teaching Hours: 42 Hours **Max. Marks: 100 (S.A.-60 + I.A.-40)**

Course Learning Outcomes: This course will enable the students to

1. Learn to solve system of linear equations.
2. Solve the system of homogeneous and non homogeneous m linear equations by using the concept of rank of matrix, finding eigen values and eigenvectors.
3. Students will be familiar with the techniques of differentiation of function with real variables.
4. Identify and apply the intermediate value theorems and L'Hospital rule.
5. Learn to trace some standard curves.

Open Elective

(For Students of other than Science Stream)

MATOE 1.1(B): Business Mathematics-I

Teaching Hours : 3 Hours/Week **Credits: 3**
Total Teaching Hours: 42 Hours **Max. Marks: 100 (S.A.- 60 + I.A.-40)**

Course Learning Outcomes: This course will enable the students to:

1. Translate the real word problems through appropriate mathematical modelling.
2. Explain the concepts and use equations, formulae and mathematical expression and relationship in a variety of context.
3. Finding the extreme values of functions.
4. Analyse and demonstrate the mathematical skill require in mathematically intensive areas in economics and business.

II Semester

MATDSCT 2.1: Algebra - II and Calculus – II

Teaching Hours : 4 Hours/Week **Credits: 4**
Total Teaching Hours: 56 Hours **Max. Marks: 100 (S.A.-60 + I.A. – 40)**

Course Learning Outcomes: This course will enable the students to

1. Recognize the mathematical objects called Groups.
2. Link the fundamental concepts of groups and symmetries of geometrical objects.
3. Explain the significance of the notions of Co-sets, normal subgroups and factor groups.
4. Understand the concept of differentiation and fundamental theorems in differentiation and various rules.
5. Find the extreme values of functions of two variables.

MATDSCP 2.1: Practical's On Algebra -II and Calculus – II

Practical Hours : 4 Hours/Week **Credits: 2**
Total Practical Hours: 56 Hours **Max. Marks: 50 (S.A.-25 + I.A. – 25)**

Course Learning Outcomes: This course will enable the students to

1. Learn Free and Open Source Software (FOSS) tools for computer programming.
2. Solve problem on algebra and calculus by using FOSS software's.
3. Acquire knowledge of applications of algebra and calculus through FOSS.

Open Elective

(For students of Science stream who have not chosen Mathematics as one of the Core subjects)

MATOET 2.1(A): Mathematics – II

Teaching Hours : 3 Hours/Week **Credits: 3**
Total Teaching Hours: 42 Hours **Max. Marks: 100 (S.A.- 60 + I.A. – 40)**

Course Learning Outcomes: This course will enable the students to

1. Recognize the mathematical objects called Groups.
2. Link the fundamental concepts of groups and symmetries of geometrical objects.
3. Explain the significance of the notions of Co-sets, normal subgroups and factor groups.
4. Understand the concept of differentiation and fundamental theorems in differentiation and various rules.

Open Elective

(For Students of other than science stream)

MATOET 2.1(B): Business Mathematics-II

Teaching Hours : 3 Hours/Week **Credits: 3**

Total Teaching Hours: 42 Hours **Max. Marks: 100 (S.A.- 60 + I.A. –40)**

Course Learning Outcomes: This course will enable the students to

1. Integrate concept in international business concept with functioning of global trade.
2. Evaluate the legal, social and economic environment of business.
3. Apply decision-support tools to business decision making.
4. Will be able to apply knowledge of business concepts and functions in an integrated manner.

BANGALORE UNIVERSITY
PROPOSED B.Sc Syllabus - Computer Science as a MINOR Subject
(NEP, 2020)

Semester	Course Code	Title of the Paper	Credits	Languages, Skill Enhancement (SEC), and Ability Enhancement Courses (AECC)	Credits	Total Credits
I	CS-C1T	Problem Solving Techniques	4	OE1: Open Elective	3	25
	CS-C2P	Problem Solving Lab using C HLL	2	Language L1	3	
	XX	Other Option Theory	4	Language L2	3	
	XX	Other Option LAB	2	SEC I :	2	
				Physical Education	1	
				Health & Wellness	1	
II	CS-C3T	Data Structure	4	OE2: Open Elective	3	25
	CS-C4P	Data Structures Lab	2	Language L1	3	
	XX	Other Option Theory	4	Language L2	3	
	XX	Other Option LAB	2	Environmental studies	2	
				Physical Education	1	
				NCC/NSS/CL/R&R	1	
III	CS-C5T	Object Oriented Programming using Java	4	OE3: Open Elective	3	25
	CS-C6P	Java Lab	2	Language L1	3	
	XX	Other Option Theory	4	Language L2	3	
	XX	Other Option LAB	2	SEC II :	2	
				Physical Education	1	
				NCC/NSS/CL/R&R	1	
IV	CS-C7T	Operating Systems	4	OE4: Open Elective	3	25
	CS-C8P	UNIX Lab	2	Language L1	3	
	XX	Other Option Theory	4	Language L2	3	
	XX	Other Option LAB	2	The Constitution of India	2	
				Physical Education	1	
				NCC/NSS/CL/R&R	1	
V	CS-C9T	Database Management System	3	Vocation Course I : Computer Animation	3	22
	xx	Other Option (Major) Theory	3	SEC III :	2	
	xx	Other Option (Major) Theory	3	Physical Education	1	
	CS-C10P	Database Management System Lab	2	NCC/NSS/CL/R&R	1	
	XX	Other Option (Major) Practicals	2			
	XX	Other Option (Major) Practicals	2			

Semester	Course Code	Title of the Paper	Credits	Languages, Skill Enhancement (SEC), and Ability Enhancement Courses (AECC)	Credits	Total Credits
VI	CS-C11T	Computer Networks	3	Vocation Course I : Other Option (Major)	3	24
	CS-C12P	Computer Networks Lab	2	Internship	2	
	XX	Other Option (Major) Theory	3	SEC III :	2	
	XX	Other Option (Major) Theory	3	Physical Education	1	
	XX	Other Option (Major) LAB	2	NCC/NSS/CL/R&R	1	
	XX	Other Option (Major) LAB	2			
VII	XX	Other Option (Major) Theory	3	Elective I: Other Option (Major)	3	22
	XX	Other Option (Major) Theory	3	Elective II : Other Option (Major)	3	
	XX	Other Option (Major) Theory	3	Research Methodology	3	
	XX	Other Option (Major) LAB	2			
	XX	Other Option (Major) LAB	2			
VIII	XX	Other Option (Major) Theory	3	Elective III : Other Option (Major)	3	20
	XX	Other Option (Major) Theory	3	Research Project	6	
	XX	Other Option (Major) Theory	3			
	XX	Other Option (Major) LAB	2			

I SEMESTER

PROBLEM SOLVING TECHNIQUES USING C & LAB

Course Objectives:

1. To gain experience about structured programming. To help students to understand the implementation of C language. To understand various features in C.
2. To make the students to understand practically about the control structures and function.
3. To give the knowledge about collection of elements, character such as arrays, strings.
4. To make the students to gain the knowledge about Structure and pointers.
5. To give the information about files and its operation. About the c pre-processor directives.

Course outcomes:

1. Achieve Knowledge of design and development of C problem solving skills.
2. Understand the basic principles of Programming in C language.
3. Design and develop modular programming skills.
4. Effective utilization of memory using pointer technology.
5. Understands the basic concepts of pointers and data structures.

II SEMESTER

DATA STRUCTURES & LAB

Course Objective:

1. To teach efficient storage mechanisms of data for an easy access.
2. To design and implement of various basic and advanced data structures.
3. To introduce various techniques for the representation of the data in the real world.
4. To develop application using data structures.
5. To teach the concept of protection and management of data.
6. To improve the logical ability.

Course outcomes:

1. Acquire knowledge of

   i. Various types of data structures, operations, and algorithms.
   ii. Sorting and searching operations.
   iii. File structures.

2. Analyse the performance of

   i. Stack, Queue, Lists, Trees, Graphs, and Searching and Sorting techniques.

3. Implement all the applications of Data structures in a high-level language.
4. Design and apply appropriate data structures for solving computing problems.

III SEMESTER

OBJECT ORIENTED PROGRAMMING USING JAVA & LAB

Course objectives:

1. To gain knowledge about java language syntax and semantics to write java program
2. To understand the fundamentals of oops in java, including classes, methods and objects
3. To understand the principles of inheritance, packages and interface
4. To understand the concept of vectors , string and exception handling
5. To gain knowledge about java applets
6. Creating GUI applications using Applets
7. Read and write data using java streams

Course Outcomes:

1. Understand JAVA , Object Oriented concepts for implementing classes and its specification.
2. Understand and implementation of multi threads and event handling in JAVA.
3. Understand GUI components of JAVA
4. Understand and analyse JAVA collection API using Applet

IV SEMESTER

OPERATING SYSTEM & UNIX LAB

Course Objectives:

1. Demonstrate the need for OS and different types of OS
2. Apply suitable techniques for management of different resources
3. Use processor, memory, storage and file system commands
4. Realize the different concepts of OS in platform of usage through case studies.

Course outcomes:

1. Identify the structure of an operating system and its scheduling mechanism.
2. Demonstrate the allocation of resources for a process using scheduling algorithm.
3. Identify root causes of deadlock and provide the solution for deadlock elimination.