DEPARTMENT OF PHYSICS

PROGRAMME OUTCOMES (POs) AND COURSE

LEARNING OUTCOMES (CLOs)

2023-24

B.Sc. 2023-24

PROGRAMME OUTCOMES (POs)		
PO1	Knowledge	Capable of demonstrating comprehensive disciplinary knowledge gained during course of study.
PO2	Communication	Ability to communicate effectively on general and scientific topics with the scientific community and with society at large.
PO3	Problem Solving	Capability of applying knowledge to solve scientific and other problems.
PO4	Individual and Team Work	Capable to learn and work effectively as an individual, and as a Member or leader in diverse teams, in multi disciplinary settings.
PO5	Investigation of Problems	Ability of critical thinking, analytical reasoning and research-based Knowledge including design of experiments, analysis and interpretation of data to provide conclusions.
PO6	Modern Tool Usage	Ability to use and learn techniques, skills and modern tools for scientific practice.
PO7	Science and Society	Ability to apply reasoning to access the different issues related to Society and the consequent responsibilities relevant to the professional scientific practices.
PO8	Life-Long Learning	Aptitude to apply knowledge and skills that are necessary for participating in learning activities throughout the life.
PO9	Environment and Sustainability	Ability to design and develop modern systems which are Environmentally sensitive and to understand the importance of sustainable development.
PO10	Ethics	Apply ethical principles and professional responsibilities in scientific practices.
PO11	Project Management	Ability to demonstrate knowledge and understanding of the Scientific principles and apply these to manage projects.

B.Sc Ist Sem.

Subject	Physics
Semester	1st
Name of the Course	Mechanics
Course Code	B23-PHY-101
Course Type: (CC/MCC/MDC/CC-M/DSEC /VOC/DSE/PC/AEC/VAC)	CC/MCC
Course Learning Outcomes(CLO):	After completing this course, the learner will be able to: 1. Understand the dynamics of system of particles, conservation of energy and momentum application of both translational and rotational dynamics motions simultaneously in analyzing rolling with slipping. 2. Differentiate between elastic and plastic body. Elastic constants, determination and their physical significance. Torque and its significance. 3. Familiar about the special theory of relativity and its applications. Michelson's Morley experiments and its finding. 4. Analyze the two body Central Force problem and its applications

Session:2023-24	
Part A - Introduction	
Subject	Physics
Semester	2nd
Name of the Course	**Electricity, Magnetism and EM Theory**
Course Code	B23-PHY-201
Course Type: (CC/MCC/MDC/CC-M/DSEC /VOC/DSE/PC/AEC/VAC)	CC/MCC
Course Learning Outcomes(CLO):	After completing this course, the learner will be able to: 1. Explain and differentiate the vector and scalar formalisms of electrostatics. Also be able to apply Gauss's Divergence & Stokes theorem to solve various problems in electrostatics 2. Describe the magnetic materials & important properties of magnetic field. Understand the properties and theories of dia-, para- & ferromagnetic materials. 3. Derive Maxwell equations and their physical significance and familiar about the propagation of electromagnetic waves i.e. boundary conditions at the interface between different media. The students will also be able to have basic idea about the propagation of electromagnetic waves in free space and in medium. 4. Understand D.C. and A.C. circuits, able to apply and analyse using networks. Analyze DC/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.

Computer Programming and Thermodynamics: (PH-301)	

Course Objectives: The aim of this course is to introduce Computer Programming, Applications of FORTRAN programming, and thermodynamics.

Course Outcomes: At the end of this course, the students will be able to:

PH-301.1 Learn about the basic computer organization, Problem solution with the help of algorithm and flow charts, Fundamentals of Fortran Programming including control structures and Function subprogram and sub routine.

PH-301.2 Learn to solve various mathematical problems using Fortran Programming language learnt in the previous chapter.

PH-301.3 Understand the basic concepts of thermodynamics, the first and the second law of thermodynamics, Joule Thomson effect, Joule-Thomson (Porous plug) experiment, the concept of entropy and the associated theorems, calculations of entropy of reversible & irreversible process, T-S diagram and Nernst heat law (third law of thermodynamics).

PH-301.4 Students will learn to derive the Clausius-Clapeyron latent heat equations and understand their significance. The students will also be able to learn about Maxwell's thermodynamic relations, their physical interpretations and their application to derive the relation between two specific heats, to derive Clausius-Clapeyron equation, to derive Joule Thomson Effect.

Wave & optics –I (PH-302)	

Course Objectives: The aim of this course is to introduce the optical phenomena: interference and applications related to interference, diffraction and application, experiment based on diffraction.

Course Outcomes: At the end of this course, the students will be able to:

PH-302.1 Understand the concept of interference and applications under division of wavefront: Fresnel's Biprism, Lloyd's mirror and phase change.

PH-302.2 Interference concept due to division of amplitude, thin film reflection and transmission, Newton's rings, wedge shaped film and Michelson Interferometer.

PH-303.3 Understand the basic concept of diffraction: Fresnel's diffraction, zone plate and application under Fresnel's diffraction.

PH -303.4 Solve problems and application based on Fraunhoffer's diffraction, plane transmission diffraction grating, resolving & dispersive power of telescope and grating.

B.Sc. 4th Semester

Statistical Physics:(PH-401)	
Course Objectives: The aim of this course is to introduce the Statistical Physics, Quantum Statistics and Theory of Specific Heat of Solids.	
Course Outcomes: At the end of this course, the students will be able to: PH-401.1 Learn about the basic concepts of Probability, thermodynamic probability, distribution of distinguishable and indistinguishable particles in boxes of equal size and in compartments of different size, condition of equilibrium between two systems in thermal contact. Students will be able to understand the relation between Thermodynamics and Probability (Boltzmann relation). PH-401.2 Learn about the concept of phase space and its division into cells, basic approach to three kinds of statistics, Maxwell Boltzmann statistics applied to derive the energy distribution, speed distribution and velocity distribution laws. Application of these laws to derive RMS and Average speeds and velocities. PH-401.3 Understand the need and application of Quantum Statistics: Bose-Einstein & Fermi-Dirac statistics and their application to derive important laws of Physics like Planck's Radiation Law and energy distribution law for electron gas in metals. Also students will be able to articulate the connection as well as comparison between classical statistical mechanics and quantum statistical mechanics. PH-401.4 Learn and understand the different law's and theory of specific heat of solids and their significance.	

Wave & Optics –II: (PH-402)	
Course Objectives: The aim of this course is to introduce the concept of polarization, Fourier theorem and series, Fourier Transform, aberrations and fiber optics.	
Course Outcomes: At the end of this course, the students will be able to : PH-402.1 Understand the theory of polarization, Nicol prism, plane polarized light, circularly and elliptically polarized light. Also able to understand optical rotation, specific rotation and polarimeters. PH-402.2 Understand Concept of Fourier theorem and series, applications based on Fourier series: square wave, triangular wave etc. PH- 402.3 Concept of Fourier Transform, its properties and applications, basic concept of matrix methods, unit planes, nodal planes. PH-402.4 Understand the concept of aberrations and concept of fiber optics along with its applications.	

Quantum Mechanics and Laser: PH-501

Course Objectives: The aim of this course is to introduce Origin of quantum physics (Experimental basis), Application of Schrodinger wave equation and Laser Physics.

Course Outcomes: At the end of this course, the students will be able to

PH-501.1 Get insights of the inability of classical mechanics to explain various phenomenon which leads to the development of Quantum mechanics which includes developing the idea of probability interpretation. Discussion of the formulation of Schrodinger equation which includes both time dependent and time independent cases.

PH-501.2 Understand the behaviour of quantum particle encountering infinite potential barrier, step potential, quantum tunnelling and linear harmonic oscillator.

PH-501.3 Familiarize with optical phenomena and different concepts related to laser physics, characteristics of Laser Light, and different types of pumping.

PH-501.4 Qualitative understanding of basic lasing mechanism, types of Lasers (Solid state laser and Low power gas laser), application of laser in medicine, industry and military.

CO-PO Mapping Matrix for Course Code: PH-501

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
PH-502.1	3	3	3	2	2	1	2	3	1	2	2
PH-502.2	3	3	3	2	2	1	2	3	1	2	2
PH-502.3	3	3	3	2	2	1	2	2	1	2	2
PH-502.4	3	3	3	2	2	1	2	2	1	2	2
Average	3	3	3	2	2	1	2	2.5	1	2	2

CO-PSO Mapping Matrix for Course Code: PH-501

CO	PSO1	PSO2	PSO3	PSO4	PSO5
PH-502.1	3	3	2	2	2
PH-502.2	3	3	2	2	2
PH-502.3	3	3	2	3	2
PH-502.4	3	3	2	2	3
Average	3	3	2	2.25	2.25

NUCLEAR PHYSICS: PH-502

Course Objectives: The aim of this course is to introduce the structure, properties, stability and energy content of the nucleus along with origin, interaction, detection and acceleration of nuclear particles.

Course Outcomes: At the end of this course, the students will be able to
PH-502.1. Understand the structure, properties, their determination and the stability of the nucleus.
PH-502.2. Understand origin and interaction of nuclear particles like α, β and γ with matter.
PH-502.3. Understand detection and acceleration of nuclear particles.
PH-502.4.Understand the nuclear reactions, Q-value, fission, fusion and nuclear reactors to harness nuclear energy.

CO-PO Mapping Matrix for Course Code: PH-502

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
PH-502.1	3	3	3	2	2	1	2	3	1	2	2
PH-502.2	3	3	3	2	2	1	2	3	1	2	2
PH-502.3	3	3	3	2	2	2	2	2	2	2	2
PH-502.4	3	3	3	2	2	2	2	2	2	2	2
Average	3	3	3	2	2	1.5	2	2.5	1.5	2	2

CO-PSO Mapping Matrix for Course Code: PH-502

CO	PSO1	PSO2	PSO3	PSO4	PSO5
PH-502.1	3	3	2	2	2
PH-502.2	3	3	2	2	2
PH-502.3	3	3	2	3	2
PH-502.4	3	3	2	2	3
Average	3	3	2	2.25	2.25

SOLID STATE AND NANO PHYSICS: PH-601

Course Objectives: The aim of this course is to introduce the crystalline structures and their determination, superconductivity and its uses, nanomaterials and their applications.

Course Outcomes: At the end of this course, the student will be able to
PH-601.1. understand crystals, crystal lattice, unit cell, crystal structure, their characteristics and symmetries, Bravais lattices, crystal planes, Miller indices and the structures of some crystals like diamond, sodium chloride and zinc sulphide.
PH-601.2. understand crystal structure determination using x-ray diffraction and reciprocal lattice and their properties.
PH-601.3. understand basic ideas of superconductivity, classification of superconductors, London and BCS theory of superconductivity and the applications of superconductivity.
PH-601.4. understand the concept of nanomaterials, nanotechnology, Nano-Physics and the applications of nanomaterials and nanotechnology.

CO-PO Mapping Matrix for Course Code: PH-601

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
PH-601.1	3	3	3	2	2	2	2	3	1	2	3
PH-601.2	3	3	3	2	2	2	2	2	1	2	2
PH-601.3	3	3	3	2	2	2	2	2	2	2	1
PH-601.4	3	3	3	2	2	2	3	3	2	2	3
Average	3	3	3	2	2	2	2.25	2.5	1.5	2	2.25

CO-PSO Mapping Matrix for Course Code: PH-601

CO	PSO1	PSO2	PSO3	PSO4	PSO5
PH-601.1	3	3	2	2	3
PH-601.2	3	3	2	2	2
PH-601.3	3	3	2	2	3
PH-601.4	3	3	2	3	3
Average	3	3	2	2.25	2.75

Atomic and Molecular spectroscopy: PH-602

Course Objectives: The aim of this course is to introduce the Historical background of atomic spectroscopy, Vector atom model (single and two valance electrons) and Atom in External Field.

Course Outcomes: At the end of this course, the student will be able to

PH-602.1 Acquire knowledge about the historical background and developments of atomic spectroscopy through the study of spectral series in Hydrogen atom, effect of nuclear motion on line spectra (correction of finite nuclear mass), short comings of Bohr's theory, Wilson Sommerfeld quantization rule, Sommerfeld's extension of Bohr's model, Sommerfeld relativistic correction, Short comings of Bohr-Sommerfeld theory and finally Vector atom model.

PH-602.2 Understand and explain the vector atom model, various coupling schemes and atomic spectra of one and two electron atoms.

PH-602.3. Explain the influence on the spectra of atoms in the presence of external applied electric and magnetic field i.e. Zeeman effect, Paschen-Back effect, Stark effect.

PH-602.4 Have basic idea about the rotational, vibrational and rotational-vibrational spectra of diatomic molecules and basic idea of Raman Effect.

CO-PO Mapping Matrix for Course Code: PH-602

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
PH-602.1	3	3	3	2	2	2	2	3	1	2	3
PH-602.2	3	3	3	2	2	2	2	2	1	2	2
PH-602.3	3	3	3	2	2	1	2	2	1	2	1
PH-602.4	3	3	3	2	2	1	3	3	2	2	3
Average	3	3	3	2	2	1.5	2.25	2.5	1.25	2	2.25

CO-PSO Mapping Matrix for Course Code: PH-602

CO	PSO1	PSO2	PSO3	PSO4	PSO5
PH-602.1	3	3	2	2	3
PH-602.2	3	3	2	2	2
PH-602.3	3	3	2	2	3
PH-602.4	3	3	2	3	3
Average	3	3	2	2.25	2.75

B.SC -1 Lab Practical : PH-203

Course Objectives: The aim of this course is to have hands on experience with different instruments related to mechanics and electronics.

Course Outcomes: At the end of this course:
PH-203.1 Students are able to understand the different concepts related to different experiments in Physics.
PH-203.2 Verify some fundamental principles, effects and concepts of physics through experiements.
PH-203.3 Performed experiments related to mechanics: bar pendulum, flywheel, Young's modulus, Modulus of rigidity, Searle's method.
PH-203.4 Verify basic laws of electronics using PN junction, photo cell, Zener diode, sonometer, impedance of A. C circuits. Learn to present observations, results and analysis in suitable form.

CO-PO Mapping Matrix for Course Code: PH-203

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
PH-203.1	3	3	3	2	2	2	2	3	1	2	3
PH-203.2	3	3	3	2	2	2	2	2	1	2	2
PH-203.3	3	3	3	2	2	1	2	2	1	2	1
PH-203.4	3	3	3	2	2	1	3	3	2	2	3
Average	3	3	3	2	2	1.5	2.25	2.5	1.25	2	2.25

CO-PSO Mapping Matrix for Course Code: PH-203

CO	PSO1	PSO2	PSO3	PSO4	PSO5
PH-203.1	3	3	2	2	3
PH-203.2	3	3	2	2	2
PH-203.3	3	3	2	2	3
PH-203.4	3	3	2	3	3
Average	3	3	2	2.25	2.75

B.SC -2 Lab Practical: PH-403

Course Objectives: The aim of this course is to have hands on experience with different instruments related to optics, electronics and Fortran language.

Course Outcomes: At the end of this course:

PH-403.1 Understand various optical phenomena, principle, and applications.

PH-403.2 Verified: interference and diffraction related experiments like Newton's rings, Diffraction grating, prism and resolving power of telescope.

PH-403.3 Basic concept of Fortran, statements under Fortran and program based on Fortran : Ascending–descending order, even/odd number, area of sphere, circle and triangle.

PH-403.4 Learn to present observations, results and analysis in suitable form.

CO-PO Mapping Matrix for Course Code: PH-403											
CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
PH-403.1	3	3	3	2	2	2	2	3	1	2	3
PH-403.2	3	3	3	2	2	2	2	2	1	2	2
PH-403.3	3	3	3	2	2	1	2	2	1	2	1
PH-403.4	3	3	3	2	2	1	3	3	2	2	3
Average	3	3	3	2	2	1.5	2.25	2.5	1.25	2	2.25

CO-PSO Mapping Matrix for Course Code: PH-403					
CO	PSO1	PSO2	PSO3	PSO4	PSO5
PH-403.1	3	3	2	2	3
PH-403.2	3	3	2	2	2
PH-403.3	3	3	2	2	3
PH-403.4	3	3	2	3	3
Average	3	3	2	2.25	2.75

B.SC -3 Lab Practical: PH-603

Course Objectives: The aim of this course is to have hands on experience with different instruments related to optics, electronics and Fortran language.

Course Outcomes: At the end of this course:

PH-603.1 Perform experiments to determine the resistance& band gap of semiconductor materials and handling of different instruments such as C.R.O.

PH-603.2 Learn the concepts of diffraction and interference by performing experiments like: resolving power of prism and grating, diameter of Lycopodium powder, wavelength of light by Fresnel's biprism etc.

PH-603.3 Understand the applications of FORTRAN in various mathematical problems: Simpson's 1/3 rule, least square fitting, sum of finite series and standard deviation.

PH-603.4 Learn to present observations, results and analysis in suitable form.

CO-PO Mapping Matrix for Course Code: PH-603										
CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
PH-603.1	3	3	3	2	2	2	2	3	1	2	3
PH-603.2	3	3	3	2	2	2	2	2	1	2	2
PH-603.3	3	3	3	2	2	1	2	2	1	2	1
PH-403.4	3	3	3	2	2	1	3	3	2	2	3
Average	3	3	3	2	2	1.5	2.25	2.5	1.25	2	2.25

CO-PSO Mapping Matrix for Course Code: PH-603					
CO	PSO1	PSO2	PSO3	PSO4	PSO5
PH-603.1	3	3	2	2	3
PH-603.2	3	3	2	2	2
PH-603.3	3	3	2	2	3
PH-603.4	3	3	2	3	3
Average	3	3	2	2.25	2.75

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Course Type: SEC

Semester I

Name of the Course:Basic IT-Tools

Course Code: B23-SEC-103

Course Learning Outcomes (CLO): After completing this course, the learner will be able to:

 1. Identify the basic components of computers and terminology

 2. acquaint with Operating System and its applications for both desktop and mobile devices

 3. Understand computer networks, and browse the internet, content search, email and collaborate with peers

4. Use e-Governance applications; and use computer to improve existing skills and learn new skills

Course Type: SEC

Semester I

Name of the Course:Office and spreadsheet Tools Learning (SEC)

Course Code: B23-SEC-101

Course Learning Outcomes (CLO): After completing this course, the learner will be able to:

 1. understand the basic concepts of operating systems

2. do the basic editing and formatting in a document

3. create basic spread-sheets for different purposes

4. create basic presentations for different applications

Course Type: SEC

Semester II

Name of the Course:Numerical Ability Enhancement Skills

Course Code: B23-SEC-225

Course Learning Outcomes (CLO): After completing this course, the learner will be able to:

1. Understand real number system, fundamental arithmetical operations, use of BODMAS rule and solve typical expressions accurately and fast.

2. Acquire skill to identify types of given sequences/series and apply suitable method to find a particular term, sum of specific number of terms and practice this learning in real life mathematical problems.

3. To formulate equations for specific mathematical problem and making use of mathematical skills to solve that.

4. Have a deeper and comprehensive understanding of the basic concepts of Percentage, Profit & Loss, Alligation or mixture, Averages and acquire skill to use this knowledge in real life problems

Course Type: VAC

Semester I/ II

Name of the Course: Environmental Studies

Course Code: B23-VAC-201

Course Learning Outcomes (CLO): After completing this course, the learner will be able to:

1. Understand the concept of environmental studies, sustainable development and ecosystem.
2. Learn about the various natural resources and about biodiversity and its conservation.

3. Know about the types of pollution, solid waste management, global environmental issues and environmental laws.

4. Understand the concept of population growth and its impacts on environment and disaster management.

Course Type: MDC-1

Semester I

Name of the Course: Physics Fundamentals –I

Course Code: B23-PHY-104

Course Learning Outcomes (CLO): After completing this course, the student will be able to:

1. Have knowledge about the nature, scope and impact of physics on technological development of the society.

2. Understand and describe motion of an object in one dimension.

3. Understand and describe the laws of motion and their applications in daily life.

4. Understand and appreciate the importance of work, power and energy in daily life.

Course Type: MDC-2

Semester II

Name of the Course: Physics Fundamentals –II

Course Code: B23-PHY-104

Course Learning Outcomes (CLO): After completing this course, the student will be able to:
1. Have basic knowledge about Wave motion, SHM, the associated phenomena and their applications in daily life.

2. Have basic knowledge about nature of light, the associated phenomena and their importance in daily life.

3. Have basic knowledge about electric current, electric circuit, electric components, and practical utility of heating and magnetic effects of electric current.

4. Grasp an introductory idea about the Electric components and circuits.

Department Of Computer Science

Course Learning Outcomes (CLO)

For BSC Course

Department of Computer Science

NAME OF THE PROGRAMME: BACHELOR OF COMPUTER SCIENCE (BSC)

DURATION: THREE YEARS

SEMESTER-I

Course Code: B23-CSE-101
Name of the Course: Problem Solving through C
1. Learn the basics of C program, data types and input/output statements.
2. Understand different types of operators, their hierarchies and also control statements of C.
3. Implement programs using arrays and strings.
4. Get familiar with advanced concepts like structures, union etc. in C language.

Course Code: B23-CSE-102
Name of the Course: Computer Fundamentals
1. Understand the basics of computer
2. Learn about I/O devices and operating systems
3. Understand internet and its services
4. Learn about the threats and security concepts on computers

Course Code: B23-CSE-103
Name of the Course: Basics of Computer Science

1. To introduce to the students, the basic understanding of the working of a computer system.
2. To familiarize the students with the concept of algorithms and flowchart.
3. To familiarize the students with the various types of software.
4. To make the students familiar with the basic internet technology and concepts.

Course Code: B23-CSE-104
Name of the Course: Fundamentals of Computer Science
1. Understand the basic concepts of operating systems
2. Do the basic editing and formatting in a document
3. Create basic spread-sheets for different purposes
4. Create basic presentations for different applications

SEMESTER-II

COURSE CODE: B23-CSE-201
Name of the Course: Web Development
1. Learn the basics of web development.
2. Understand different types of web pages and websites.
3. Implement HTML and CSS for web page designing.
4. Understand the design of web crawlers and search engines.

COURSE CODE: B23-CSE-202
Name of the Course: Programming with C++
1. Understand the basic concept of C++;
2. Acquire the knowledge of C++ operators, hierarchy and precedence, and various control structures
3. Learn to use arrays and strings in C++ programs;
4. Get familiar with OOPS concepts with C++

COURSE CODE: B23-CSE-203
Name of the Course: Programming Methodologies
1. Understand the problem solving algorithms and flowcharts.
2. Understand the concept of program and debugging.
3. Learn the basic programming constructs.
4. Understand various programming methodologies.
5. Understand the various programming methodologies by implementing these practically.

COURSE CODE: B23-CSE-204

Name of the Course: Web Technologies Fundamentals

1. Learn the basics of web development.
2. Understand different types of web pages and websites.
3. Implement HTML and CSS for web page designing.
4. Understand the design of web crawlers and search engines.

Department Of Computer Science

Course Specific Outcomes

Programme Outcomes

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Programme Specific Outcomes

For BSC Course

Department of Computer Science

NAME OF THE PROGRAMME: BACHELOR OF COMPUTER SCIENCE (BSC)

DURATION: THREE YEARS

Programme Outcomes (POs)		
POI	Knowledge	Capable of demonstrating comprehensive disciplinary knowledge gained during course of study.
PO2	Communication	Ability to communicate effectively on general and scientific topics with the scientific community and with society at large.
PO3	Problem Solving	Capability of applying knowledge to solve scientific and other problems.
PO4	Individual and Team Work	Capable to learn and work effectively as an individual, and as a member or leader in diverse teams in multidisciplinary settings
PO5	Investigation of problems	Ability of creative thinking, analytical reasoning and research based knowledge including design of experiments, analysis and interpretation of data to provide conclusions.
PO6	Modern Tool Usage	Ability to use and learn techniques, skills and modern tools for scientific practice.
PO7	Science and Society	Ability to apply reasoning to access the different issues related to society and the consequent responsibilities relevant to the professional scientific practices.
PO8	Life-Long Learning	Aptitude to apply knowledge and skills that are necessary for participating in learning activities throughout the life.
PO9	Environment and Sustainability	Ability to design and develop modern systems which are environmentally sensitive and to understand the importance of sustainable development.
PO10	Ethics	Apply ethical principles and professional responsibilities in scientific practices.
PO11	Project Management	Ability to demonstrate knowledge and understanding of the scientific principles and apply these to manage projects.

Programme Specific Outcomes (PSOs)	
The objective of the curriculum designed for BSc course is to nurture the technical aptitude of students for professional competency in the IT industry.	
PSO1	Develop proficiency for solving real world problems with the application of programming and supplementary computing skills.
PSO2	Promote exposure to hardware as well as software knowledge with the inclusion of course content targeted to administer technical expertise for employment in the IT industry.
PSO3	Explicit course content is targeted to inculcate programming skills using both conventional and contemporary programming languages as well as to develop potential for realizing web-oriented and other commercial/non-commercial applications.
PSO4	Judicious structuring of the course curriculum has been aimed in order to strengthen competitive ability as per the trending industry requirements.
PSO5	Encourage skillful expertise for employment in commercial/government sectors or pursuance of higher studies aimed towards innovational research leading to the progressive growth of the society and the nation.

SEMESTER-3

Course Code: BSc 301
Name of the Course: Data Structures
1. Learn basics of data structures and algorithm complexities.
2. Acquire knowledge of array and strings.
3. Understand the idea of implementation for linked lists and stacks.
4. Learn implementation of queues.
5. Learn tree structure and implementation of its different types.
6. Learn various operations on graphs in data structures.

Course Code: BSc 302
Name of the Course: Software Engineering
1. Understand concept of software engineering and types of System.
2. Plan the software project for an enterprise.
3. Analyze the requirement of a client to design software.
4. Understand software maintenance and various testing techniques.

SEMESTER-4

Course Code: BSc 401
Name of the Course: C++ Programming
1. Understand basic concepts of C++.
2. Develop programs using arrays, strings and functions.
3. Implement OOPS concepts with C++.
4. Understand constructor and destructors in C++.
5. Acquire the detailed knowledge of polymorphism.

Course Code: BSc 402
Name of the Course: Operating System
1. Understand the basic concepts of operating system and its services.
2. Understand the concept of process management and scheduling.
3. Acquire knowledge of process synchronization along with deadlock handling.
4. Learn about memory management and virtual memory concepts.
5. Learn about device scheduling and directory structure.

Course Code: BSc 403
Name of the Course: Practical based on Data Structure and C++ Programming
1. Understand the idea of implementation for arrays and sorting algorithm with C.
2. Learn implementation of stacks and queues with C.
3. Understand the idea of implementation for linked lists with C.
4. Develop programs using basic concepts of C++ like arrays, strings and fucntions.
5. Implement OOPS concepts like class and objects, constructor and destructors, and polymorphism with C++.

SEMESTER-5

Course Code: BSc 501
Name of the Course: Data Base Management System-I
1. Learn basic concepts of data base along with its functions and components.
2. Understand data base architecture and different data models.

3. Learn basic concepts of data base designing strategy of ER diagram.
4. Design an ER diagram of an enterprise.

Course Code: BSc 502
Name of the Course: Web Designing
1. Learn about WWW and search engines.
2. Understand domain and assigning name to them.
3. Understand basic web languages and its components.
4. Perform simple web page designing for practical exposure.

SEMESTER-6

Course Code: BSc 601
Name of the Course: Data Base Management System
1. Learn the concept of relational algebra and calculus.
2. Understand functional dependency and normalization.
3. Write SQL statements to retrieve information.
4. Implement SQL and PL/SQL in any software industry for database handling.

Course Code: BSc 602
Name of the Course: Computer Networks
1. Provide a comprehensive understanding of networking concepts and basic terminology along with its hardware components.
2. Understand and characterize various types of computer networks
3. Conceptualize the various design issues related to network architecture and have an overview of the standard OSI reference model that illustrates the network architecture.
4. Gain knowledge of Local Area Network technologies and components that will provide the competency for setting up of network environments in local areas.

Course Code: BSc 603
Name of the Course: Practical based on Web Designing and Data Base Management System
1. Understand basic web languages and its components Frame, Form and Button.
2. Perform simple web sites designing for practical exposure.
3. Write SQL statements to retreive information.
4. Implement SQL and PL/SQL in any software industry for database handling.

Department Of Computer Science

Course Learning Outcomes (CLO)

For BCA Course

NAME OF THE PROGRAMME: BACHELOR OF COMPUTER APPLICATION

DURATION: THREE YEARS

Course Learning Outcomes (CLO)

SEMESTER-1

Course Code: B23-CAP-101
Name of the Course: Problem Solving through C
1. Learn the basics of C program, data types and input/output statements.
2. Understand different types of operators, their hierarchies and also control statements of C.
3. Implement programs using arrays and strings.
4. Get familiar with advanced concepts like structures, union etc. in C language.

Course Code: B23-CAP-102
Name of the Course: Foundations of Computer Science
1. Understand the basics of computer
2. Learn about I/O devices and operating systems
3. Understand internet and its services
4. Learn about the threats and security concepts on computers

Course Code: B23-CAP-103
Name of the Course: Logical Organization of Computer
1. Understand number systems, error detecting correcting code and representations of numbers in a computer system.
2. Understand computer arithmetic and Boolean algebra and simplification of Boolean expressions.
3. Understand working of logic gates and design various combinational circuits using these logic gates.
4. Understand working of different types of flip-flops and design different types of registers.

Course Code: B23-CAP-104
Name of the Course: Mathematical Foundations for Computer Science-I
1. Gain the knowledge of set theory, types of sets and operations on sets. Understand various concepts of matrices and determinants, and acquire the cognitive skills to apply different operations on matrices and determinants.
2. Have the knowledge of the basic concepts of complex numbers and acquire skills to solve linear quadratic equations.
3. Gain the knowledge of the concepts of Arithmetic progression, Geometric progression and Harmonic progression, and find A.M., G.M. and H.M. of given numbers.
4. Understand the concept of differentiation

SEMESTER-2

Course Code: B23-CAL-201
Name of the Course: Object Oriented Programming using C++
1. Learn the input/output statements and functions in C++.
2. Get familiar with OOPS concepts, constructors, and destructors in C++.
3. Learn the various concepts of operator overloading and inheritance.
4. Get familiar with concepts of virtual functions and exception handling in C++ language.

Course Code: B23-CAL-202
Name of the Course: Introduction to Web Technologies
1. Learn the basics of web development.
2. Understand different types of web pages and websites.
3. Implement HTML and CSS for web page designing.
4. Understand the design of web crawlers and search engines.

Course Code: B23-CAL-203
Name of the Course: Concepts of Operating Systems
1. Understand the basic concepts of operating systems and their services along with process management.
2. Understand the concept of process scheduling and acquire knowledge of process synchronization.
3. Learn about memory management and virtual memory concepts.
4. Learn to work with directory structure and security aspects.

Course Code: B23-CAL-204
Name of the Course: Mathematical Foundations for Computer Science-II
1. Understand the concept of integration.
2. Acquire cognitive and technical knowledge about a variety of methods of representation of statistical data
3. Understand methods of measure of central tendency. Analyze the problem and apply the best measure of central tendency to draw inferences from the available data.
4. Understand the concept of correlation, and correlation methods and conclude about the type of correlation for the available data. Comprehend the skills of curve fitting.

Department Of Computer Science

Course Specific Outcomes

&

Programme Specific Outcomes

For BCA Course

DYAL SINGH COLLEGE, KARNAL

NAME OF THE PROGRAMME : BACHELOR OF COMPUTER APPLICATIONS (BCA)

DURATION : THREE YEARS

PROGRAMME OUTCOMES(POs)		
PO1	Knowledge	Capable of demonstrating comprehensive disciplinary knowledge gained during course of study
PO2	Communication	Ability to communicate effectively on general and scientific topics with the scientific community and with society at large.
PO3	Problem Solving	Capability of applying knowledge to solve scientific and other problems.
PO4	Individual and Team Work	Capable to learn and work effectively as an individual, and as a member or leader in diverse teams, in multidisciplinary settings.
PO5	Investigation of Problems	Ability of critical thinking, analytical reasoning and research based knowledge including design of experiments, analysis and interpretation of data to provide conclusions.
PO6	Modern Tool Usage	Ability to use and learn techniques, skills and modern tools for scientific practise.
PO7	Science and Society	Ability to apply reasoning to access the different issues related to society and the consequent responsibility relevant to the professional scientific practices.
PO8	Life-Long Learning	Aptitude to apply knowledge and skills that are necessary for participating in learning activities throughout the life.
PO9	Environment and Sustainability	Ability to design and develop modern systems which are environmentally sensitive and to understand the importance of sustainable development.
PO10	Ethics	Apply ethical principles and professional responsibilities in scientific practices.
PO11	Project Management	Ability to demonstrate knowledge and understanding of the scientific principles and apply these to manage projects.

PROGRAMME SPECIFIC OUTCOMES(PSOs)

The objective of the program designed for BSc course is to foster the scientific talent of students for proficient skill in the field of education and research.

PSO1	Develop proficiency for solving real world problems with the application of programming and supplementary computing skills.
PSO2	Promote exposure to hardware as well as software knowledge with the inclusion of course content targeted to administer expertise for employment in IT industry.
PSO3	Explicit course content is targeted to inculcate programming skills using both conventional and contemporary programming languages as well as to develop potential for realizing web oriented and other commercial and non- commercial applications.
PSO4	Judicious structuring of the course curriculum has been aimed in order to strengthen competitive ability as per the trending industry requirements.
PSO5	Encourage skilful expertise for employment in Commercial/ Government sectors or pursuance of higher studies aimed towards innovational research leading to the progressive growth of the society and the nation.

SEMESTER- III

BCA-231: Object Oriented PROGRAMMING Using C++

Course Outcomes: At the end of this course, the student will be able to:

BCA-231.1. understand basic concepts of C++.

BCA-231.2. learn operators, hierarchy and their precedence and different control structures of C++.

BCA-231.3. develop programs using arrays, strings and functions.

BCA-231.4. implement OOPS concepts with C++.

BCA-232: DATA STRUCTURES

Course Outcomes: At the end of this course, the student will be able to:

BCA-232.1. learn basics of data structure and algorithm complexities.

BCA-232.2. acquire knowledge of arrays and strings.

BCA-232.3. understand the idea of implementation for linked lists and stacks.

BCA-232.4. learn various searching and sorting techniques along with implementation of queues.

BCA-233: COMPUTER ARCHITECTURE

Course Outcomes: At the end of this course, the student will be able to:

BCA-233.1. learn various trends in computer architectures.

BCA-233.2. learn RTL and working of micro programmed control unit.

BCA-233.3. learn hardware algorithms for basic arithmetic operations.

BCA-233.4. understand role of memory hierarchy and working of various types of memory.

BCA-234: SOFTWARE ENGINEERING

Course Outcomes: At the end of this course, the student will be able to:

BCA-234.1. understand concept of Software Engineering and types of System.

BCA-234.2. plan the software project for an Enterprise.

BCA-234.3. analyse the requirement of a client to design a software.

BCA-234.4. design a software using structured and object- oriented approach.

BCA-235: Fundamentals of Data Base System

Course Outcome: At the end of this course, the student will be able to:

BCA-235.1. learn basic concepts of data base along with its functions and components.

BCA-235.2. understand data base architecture and different data models.

BCA-235.3. design an ER diagram of an enterprise.

BCA-235.4. write SQL statements to retrieve information and learn the concept of relational algebra and calculus.

BCA-236: COMPUTER ORIENTED NUMERICAL METHODS

Course Outcomes: At the end of this course, the student will be able to:

BCA-236.1 learn the concepts of algebraic methods and find solutions of polynomial equation.

BCA-236.2 apply methods to obtain approximate solutions to mathematical problems.

BCA-236.3 fit curves and find correlations.

BCA-236.4 solve statistical problems using probability distributions.

SEMESTER-IV

BCA-241: Advanced Data Structures

Course Outcomes: At the end of this course, the student will be able to:

BCA-241.1. learn tree structure and implementations of its different types.

BCA-241.2. implement various operations on graphs in data structure.

BCA-241.3. understand the idea file organization and hashing functions.

BCA-241.4. learn the idea of priority queues in data structures along with some advanced sorting techniques.

BCA-242: Advanced Programming using C++

Course Outcomes: At the end of this course, the student will be able to:

BCA-242.1. understand pointers, constructer and destructors in C++.

BCA-242.2. acquire the detailed knowledge of polymorphism.

BCA-242.3. learn to implement exception handling and template.

BCA-242.4. learn File handling in C++.

BCA-243: E-COMMERCE

Course Outcomes: At the end of this course, the student will be able to:

BCA-243.1. learn the main components of e-commerce and its prerequisites.

BCA-243.2. understand the architecture of EDI and learn the different mode of electronic payment.

BCA-243.3. learn the implementation of b2c type of e-commerce in real life applications.

BCA-243.4. understand the idea of commerce over mobile phones, security prospectus and legal aspects of e-commerce.

BCA-244: Relational Data Base Management System

Course Outcomes: At the end of this course, the student will be able to:

BCA-244.1. learn basic concepts of data base designing strategy of ER diagram.

BCA-244.2. understand functional dependency and normalization.

BCA-244.3. learn advance concept of DBMS.

BCA-244.4. implement SQL and PL/SQL in any software industry for database handling.

BCA-245: COMPUTER ORIENTED STATISTICAL METHODS

Course Outcomes: At the end of this course, the student will be able to:

BCA-245.1. learn the concepts of algebraic methods and find solutions of polynomial equation.

BCA-245.2. apply numerical methods to obtain approximate solutions to mathematical problems.

BCA-245.3. fit curves and find correlations.

BCA-245.4. solve statistical problems using probability distributions.

BCA-246: MANAGEMENT INFORMATION SYSTEM

Course Outcomes: At the end of this course, the student will be able to:

BCA-246.1. relate the basic concepts and technologies used in the field of Management Information Systems.

BCA-246.2. apply the understanding that how MIS is helpful in decision making.

BCA-246.3. learn the process of system detailed designing.

BCA-246.4. understand the processes of developing and implementing information systems.

SEMESTER-V

BCA- 351: WEB DESIGNING FUNDAMENTALS

Course Outcomes: At the end of this course, the student will be able to:

BCA-351.1. learn about WWW and search engines.

BCA-351.2. understand domain and assigning name to them.

BCA-351.3. understand basic web languages and its components.

BCA-351.4. perform simple web page designing for practical exposure.

BCA-352: OPERATING SYSTEM-I

Course Outcomes: At the end of this course, the student will be able to:

BCA-352.1. understand the basic concepts of operating systems and its services.

BCA-352.2. understand concept of process management and scheduling.

BCA-352.3. acquire knowledge of process synchronization along with deadlock handling.

BCA-352.4. learn about memory management and virtual memory concepts.

BCA-353: ARTIFICAL INTELLIGENCE

Course Outcomes: At the end of this course, the student will be able to:

BCA-353.1. learn the basic concepts of Artificial Intelligence

(AI) and its application areas.

BCA-353.2. acquire the knowledge of heuristic search and approaches for knowledge representations.

BCA-353.3. understand the idea of natural language processing and predicate logic.

BCA-353.4. gain the knowledge of learning technologies & build expert systems.

BCA-354: COMPUTER NETWORKS

Course Outcomes: At the end of this course, the student will be able to:

BCA-354.1. have a comprehensive understanding of networking concepts and basic terminology along with its hardware components.

BCA-354.2. understand and characterize various types of computer networks.

BCA-354.3. conceptualize the various design issues related to Network Architecture and have an overview of the standard OSI reference model that illustrates the network architecture.

BCA-354.4. gain knowledge of Local Area Network technologies and components that will provide the competency for setting up of network environments in local areas.

BCA-355: PROGRAMMING USING VISUAL BASICS

Course Outcomes: At the end of this course, the student will be able to:

BCA-355.1. get the knowledge of the structure and model of the programming language C#.

BCA-355.2. develop various applications in C# classes and objects.

BCA-355.3. understand and implement object oriented features in C# programming language to solve the given problem.

BCA-355.4. learn LINQ that binds the gap between relational and object-oriented approaches.

BCA-356: MULTIMEDIA TOOLS

Course Outcomes: At the end of this course, the student will be able to:

BCA-356.1. learn multimedia applications tools and products.

BCA356.2. understand multimedia building blocks and compression techniques.

BCA-356.3. acquire knowledge of internet role in multimedia

BCA-356.4. identify the future prospectus of multimedia.

SEMESTER-VI

BCA-361: WEB DESIGNING USING ADVANCED TOOLS

Course Outcomes: At the end of this course, the student will be able to:

BCA-361.1. learn JavaScript and VBScript.

BCA-361.2. make use of control statement and objects of ASP.

BCA-361.3. learn advanced web languages like DHTML and CSS along with its components.

BCA-361.4. implement dynamic web page designing to acquire job as web developer.

BCA-362: OPERATING SYSTEM-II

Course Outcomes: At the end of this course, the student will be able to:

BCA-362.1. understand the basic concepts of operating systems and its services.

BCA-362.2. understand concept of process management and scheduling.

BCA-362.3. acquire knowledge of process synchronization along with deadlock handling.

BCA-362.4. learn about memory management and virtual memory concepts.

BCA-363: COMPUTER GRAPHICS

Course Outcomes: At the end of this course, the student will be able to:

BCA-363.1. understand the core concepts of computer graphics.

BCA-363.2. learn and implement point, line and circle drawing algorithms.

BCA-363.3. acquire knowledge two dimensional transformations and line clipping algorithms.

BCA-363.4. understand 3-D graphics concept and acquire skills for designing 3-D graphics.

BCA-364: INTERNET TECHNOLOGIES

Course Outcomes: At the end of this course, the student will be able to:

BCA-364.1. learn IOT techniques and deployment templates.

BCA-364.2. Acquire knowledge of domain specific IOT.

BCA-364.3. learn IOT platform design methodology.

BCA-364.4. understand design and development challenges in IOT.

BCA-365: ADVANCED PROGRAMMING WITH VISUAL BASICS

Course Outcomes: At the end of this course, the student will be able to:

BCA-365.1. get the knowledge of the structure and model of the programming language C #.

BCA-365.2. develop various applications in C # classes and objects.

BCA-365.3. understand and implement object oriented features in C # programming language to solve the given problem.

BCA-365.4. learn LINQ that binds the gap between relational and object-oriented approaches.

BCA-366: PROGRAMMING IN CORE JAVA

Course Outcomes: At the end of this course, the student will be able to:

BCA-366.1. demonstrate the basic programming constructs of Java and OOPs to develop Java programs.

BCA-366.2. learn and develop various controls and branching of logics under various cases using language control structures.

BCA-366.3. exemplify the usage to implement polymorphism and Inheritance in java programs.

BCA-366.4 acquire knowledge of Packages, Interfaces, Exceptions and Multithreading in building efficient applications.

DEPARTMENT OF MATHEMATICS

PROGRAMME OUTCOMES (POs) AND

COURSE LEARNING OUTCOMES (CLOs)

2023-24

B.A./ B.Phy. Sc. with Mathematics (2023-24)

Program Outcomes (POs) for Under Graduate Programme

Dyal Singh College, Karnal

PO1	Knowledge	Capable of acquiring comprehensive subject knowledge to compete globally
PO2	Communication	To have effective communication skills with their peers , society around them and the scientific community
PO3	Problem Solving	Familiarity with Maxima prepares students for role requiring computational expertise in academia and professional sectots
PO4	Individual and Team Work	Capable of working effectively and efficiently as an individual, as a member or a leader in diverse teams in multidisciplinary areas
PO5	Investigation of Problems	To be able to develop critical thinking, logical and analytical reasoning and research based knowledge, design of experiments, analysis and data interpretation to reach logical conclusions
PO6	Modern Tool usage	Ability to learn techniques, skills and modern tools and apply them in various areas of Science and Mathematics
PO7	Science and Society	Ability to apply reasoning and critical thinking to assess the different issues related to world and discharging their responsibilities towards the society
PO8	Life-Long Learning	To gain natural liking to apply knowledge and skills required to keep learning process on throughut the life
PO9	Environment and Sustainability	Ability to have awareness of and able to develop solution oriented approach towards various social and environmental issues, understand the importance of sustainable development and contribute in sustainable environment
PO10	Ethics	Apply and adhere to ethical principles, professional responsibilities in scientific practices and discharging duties in serving the world
PO11	Project Management	Ability to apply knowledge and understanding of the scientific principles and apply these to manage various projects in Science and Mathematics

Course Learning Outcomes(CLOs)

B23-MAT-101: Calculus

Course objectives: The aim of this course is to study the concepts of calculus.

Course Outcomes: This course will enable the students to:

1. Gain knowledge of the concepts and theory of limit, continuity and differentiability of functions. Attain skills of calculating the limit of functions and examining the continuity and differentiability of different types of functions, and perform successive differentiation of functions. To apply the procedural knowledge to obtain the series expansions of functions which find multidisciplinary applications.
2. Understand concepts of asymptotes and curvature, the geometrical meaning of these terms and to have procedural knowledge to solve related problems.
 3. Determine singular points of a curve and classify them. Understand the concept of rectification of curves and derive the reduction formulae.
4. Have theoretical knowledge and practical skills to evaluate the area bounded by the curves, and volume and surface area of solids formed by revolution of curves.
5. Attain cognitive and technical skills required for solving different problems of calculus associated with tracing of curves, determination of curvature, and rectification of curves, volume and surface area of solids of revolution. Have technical and practical skills of solving calculus problems related to differentiation and integration of functions by using MAXIMA software.

B23-MAT-201 : Algebra and Number theory

Course objectives: The aim of this course is to study the concepts of algebra and number theory.

Course Outcomes: This course will enable the students to:

1. Gain knowledge of the concepts of symmetric, skew-symmetric, Hermitian, skew-Hermitian, Orthogonal and Unitary matrices, Linear dependence and independence of rows and columns of a matrix. Have knowledge of procedure and cognitive skills used in calculating rank of a matrix, eigen values, characteristic equation, minimal polynomial of a matrix and technical skills used in solving problems based on Cayley- Hamilton theorem.
2. Have knowledge of the concepts used in solving problems based on relations between the roots and coefficients of general polynomial equation in one variable, solutions of polynomial equations having conditions on roots, common roots and multiple roots. Understand Descarte's rule of signs and learn cognitive and technical skills required in assessing nature of the roots of an equation and

solving problems based on these.

3. Have deeper and procedural knowledge required for solving cubic and biquadratic equations used in Mathematics as well as many other learning fields of study. To understand the basic concepts of number theory and their applications in problem solving and life- long learning.

4. Have knowledge of concepts, facts, principles and theories of Linear Congruences, Fermat's theorem, Euler's theorem, Wilson's theorem and its converse, Chinese Remainder theorem. Attain cognitive skills used in solving linear Diophantine equations in two variables

5. Attain cognitive and technical skills required to formulate and solve practical problems involving rank of a matrix, inverse of a matrix, Cardon's method, Ferrari's method, Descarte's method, Cayley-Hamilton theorem, Euler's theorem and Chinese Remainder theorem. Have technical and practical skills required for solving algebraic equations, finding inverse and eigen values of matrices by using built in functions of MAXIMA software.

B.Com. Ist (2023-24)
Program Outcomes (PO) for Under Graduate Programme (B.Com.)
Dyal Singh College, Karnal

PO1	Knowledge	Capable of demonstrating comprehensive disciplinary knowledge gained during course of study.
PO2	Communication	Develop an ability to effectively communicate both orally and verbally.
PO3	Problem Solving	Acknowledge roles of entrepreneur, businessmen, managers and consultant etc., which will help learners to possess knowledge and other soft skills and to react aptly when confronted with critical decision making.
PO4	Pragmatic Approach	The practical knowledge of various aspects of finance for business, like accountancy, financing, costing and economics etc are helpful in honing and application-centric approach towards business amongst students.
PO5	Implementation of Modern Tool	Ability to use and learn latest techniques, skills and modern tools for practices in businesses.
PO6	Life-Long Learning	Knowledge and skills that are learnt during the course are applied in realistic situations throughout the life.
PO7	Project Management	Exemplify knowledge and skills for Banking, Financial Services and Insurance functions. Capable to respond to the global outlook on challenges and opportunities in Accounting and Financial sector.
PO8	Entrepreneurship	Students can independently start up their own business with requisite knowledge of legal, financial, technical and marketing aspects of entrepreneurship.
PO9	Individual and Team Work	Develop self-confidence and should also appreciate importance of working independently and in a team.

PO10	Environment and Sustainability	Development of a responsible entrepreneur who are environmentally sensitive and understands the importance of sustainable development.
PO11	Ethics	Awareness on legal, social and ethical issues in business.

Course Learning Outcomes(CLOs)

B23-COM-104: BUSINESS MATHEMATICS-I

COURSE OBJECTIVE: The aim of this course is to study the concepts of sets, logarithms, AP & GP, Matrix and Determinants, Compound Interest & Annuities.

Course Outcomes: At the end of this course, the student will be able to:
1. Understand set theory, logical statements and truth tables.
2. Learn the logarithms and arithmetic and geometric progressions and their applications.
3. Familiarize with the concepts of matrices and determinants. Learn to solve system of simultaneous linear equations. \
4. Have the conceptual knowledge of Compound interest, annuity, loan, debenture and sinking funds and attain skills to use these concepts in daily life.

B23-COM-204: BUSINESS MATHEMATICS-II

COURSE OBJECTIVE: The aim of this course is to study the concepts of DERIVATIVES, Integration, Binomial Theorem, Linear Programming.

Course Outcomes: At the end of this course, the student will be able to:

1. gain the knowledge to find derivatives simple functions related to commerce problems, attain skills to use application of derivatives in evaluating maxima and minima.
2. learn to find integration of simple functions related to commerce and economic problems, attain skills to use application of integration in business and commerce problems
3. apply binomial theorem, learn the concept and applications of permutations and combinations
4. learn the concept of Linear programming and formulation of linear programming problems related to business and commerce.

B.C.A. I (2023-24)

Program Outcomes (PO) for Under Graduate Programme (B.C.A.)

Dyal Singh College, Karnal

PO1	Knowledge	Capable of acquiring comprehensive subject knowledge to compete globally
PO2	Communication	To have effective communication skills with their peers , society around them and the scientific community
PO3	Problem Solving	To be able to solve scientific and other Mathematical problems
PO4	Individual and Team Work	Capable of working effectively and efficiently as an individual, as a member or a leader in diverse teams in multidisciplinary areas
PO5	Investigation of Problems	To be able to develop critical thinking, logical and analytical reasoning and research based knowledge, design of experiments, analysis and data interpretation to reach logical conclusions
PO6	Modern Tool usage	Ability to learn techniques, skills and modern tools and apply them in various areas of Science and Mathematics
PO7	Science and Society	Ability to apply reasoning and critical thinking to assess the different issues related to world and discharging their responsibilities towards the society
PO8	Life-Long Learning	To gain natural liking to apply knowledge and skills required to keep learning process on throughout the life
PO9	Environment and Sustainability	Aptitude towards green energy ,design and develop systems which are environmentally sensitive, understand the importance of sustainable development and contribute in sustainable environment
PO10	Ethics	Apply and adhere to ethical principles, professional responsibilities in scientific practices and discharging duties in

		serving the world
PO11	Project Management	Ability to apply knowledge and understanding of the scientific principles and apply these to manage various projects in Science and Mathematics

Course Learning Outcomes(CLOs)

B23-CAP-104: MATHEMATICAL FOUNDATIONS – I

COURSE OBJECTIVE: The aim of this course is to study the concepts of sets, Matrix and determinants, quadratic equations, AP, GP & HP and Differentiation.

Course Outcomes: This course will enable the students to:

1) Gain the knowledge of set theory, types of sets and operations on sets. Understand various concepts of matrices and determinants, and acquire the cognitive skills to apply different operations on matrices and determinants.
2) Have the knowledge of the basic concepts of complex numbers and acquire skills to solve linear quadratic equations.
3) Gain the knowledge of the concepts of Arithmetic progression, Geometric progression and Harmonic progression, and find A.M., G.M. and H.M. of given numbers.
4) Understand the concept of differentiation
5) Attain the skills to make use of the learnt concepts of Introductory Mathematics in multidisciplinary learning contexts and to know their applications

B23-CAP-204: MATHEMATICAL FOUNDATIONS – II

Course Objectives : The aim of this course is to study concepts of integration, statistical data,

Measure of central tendency, Curve fitting and Correlation.

Course Outcomes: This course will enable the students to:

1) Understand the concept of integration.
2) Acquire cognitive and technical knowledge about a variety of methods of representation of statistical data
3) Understand methods of measure of central tendency. Analyze the problem and apply the best measure of central tendency to draw inferences from the available data.
4) Understand the concept of correlation, and correlation methods and conclude about the type of correlation for the available data. Comprehend the skills of curve fitting.
5) Attain a range of cognitive and technical skills to integrate various functions. Have the technical and practical skills required for selecting and using suitable methods for data representation and measurement of central tendency

B.A./ B.Sc. with Mathematics

Program Outcomes (PO) for Under Graduate Programme in the Faculty of Sciences, Dyal Singh College, Karnal

PO1	Knowledge	Capable of acquiring comprehensive subject knowledge to compete globally
PO2	Communication	To have effective communication skills with their peers, society around them and the scientific community
PO3	Problem Solving	To be able to solve scientific and other Mathematical problems
PO4	Individual and Team Work	Capable of working effectively and efficiently as an individual, as a member or a leader in diverse teams in multidisciplinary areas
PO5	Investigation of Problems	To be able to develop critical thinking, logical and analytical reasoning and research based knowledge, design of experiments, analysis and data interpretation to reach logical conclusions
PO6	Modern Tool usage	Ability to learn techniques, skills and modern tools and apply them in various areas of Science and Mathematics
PO7	Science and Society	Ability to apply reasoning and critical thinking to assess the different issues related to world and discharging their responsibilities towards the society
PO8	Life-Long Learning	To gain natural liking to apply knowledge and skills required to keep learning process on throughout the life
PO9	Environment and Sustainability	Ability to have awareness of and able to develop solution oriented approach towards various social and environmental issues, understand the importance of sustainable development and contribute in sustainable environment
PO10	Ethics	Apply and adhere to ethical principles, professional responsibilities in scientific practices and discharging duties in serving the world
PO11	Project Management	Ability to apply knowledge and understanding of the scientific principles and apply these to manage various projects in Science and Mathematics

Program Specific Outcomes (PSO)

After successful completion of the programme, a student will be able to:

PSO1	Have basic understanding and knowledge in different core areas of Mathematics such as Algebra, Real analysis, Calculus, Differential Equations, Statics, Dynamics and Numerical Analysis. Develop thinking in a critical way. Demonstrate and to be able to effectively use that information to find the solution of problems at hand
PSO2	Gain a good knowledge of Mathematical concepts and develop the mathematical reasoning, knowledge, critical thinking, skills and aptitude for pursuing high quality research in Mathematics. Understand, formulate and use quantitative models
PSO3	Inculcate problem solving skills, creative talent and power of communication necessary for various kinds of employment and have good and effective communication by presentation, written, computational and graphical means
PSO4	Inculcate a new perspective to look at problems from scientific point of view and enabling them to pursue higher studies at post-graduate and research level. Enhance their employability in government/private sectors, jobs in banking/insurance and investment sectors

CO-PSO matrix for the course BM-243 : Programming in C and Numerical methods (Practicals)

Cos	PSO1	PSO2	PSO3	PSO4
BM-243.1	3	3	3	3
BM-243.2	3	3	3	3
BM-243.3	3	3	3	3
BM-243.4	3	3	3	3
Average	**3**	**3**	**3**	**3**

BM-351: Real Analysis

Course objective: The objective of this course is to provide knowledge of Riemann integration, improper integrals and metric space concepts.

Course Outcomes: This course will enable the students to:

BM-351.1 Understand the concept of Riemann integration theory, conditions of integrability. Learn Fundamental theorem and Mean Value theorems of integral calculus.

BM-351.2   Study convergence and divergence behavior of Improper integrals using basic definitions and various tests.

BM-351.3   Learn the concepts of metric spaces, subspaces, limit points, interior points, open and closed sets, sequences and theorems related to these concepts.

BM-351.4 Study the concepts of continuity, uniform continuity, compactness and connectedness in metric spaces.

CO-PO matrix for the course BM-351: Real Analysis

Cos	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
BM-351.1	3	3	3	3	3	2	2	3	2	2	2
BM-351.2	3	3	3	3	3	3	3	2	2	2	3
BM-351.3	3	3	3	3	3	2	2	2	2	2	2
BM-351.4	3	3	3	2	3	2	2	3	2	2	2
Average	**3**	**3**	**3**	**2.75**	**3**	**2.25**	**2.25**	**2.5**	**2**	**2**	**2.25**

CO-PSO matrix for the course BM-351: Real Analysis

Cos	PSO1	PSO2	PSO3	PSO4
BM-351.1	3	3	2	2
BM-351.2	3	3	2	2
BM-351.3	3	3	2	2
BM-351.4	3	3	2	2
Average	**3**	**3**	**2**	**2**

BM-352: GROUPS AND RINGS

Course Objective : The aim of this course is to study concepts of Groups and Rings.

Course Outcomes: The course will enable the students to:

BM-352.1 Recognize the mathematical objects called groups, their elementary properties, order
of a group, subgroup, cyclic groups and their properties, normal subgroup,Quotient
groups.

BM-352.2 Understand the concepts of homomorphisms, isomorphisms to prove related
Theorems.

BM-352.3 Familiarize about ring, subring, integral domain, field , ideal , Quotient ring and
related results.

BM-352.4 Study Euclidean rings, Polynomial rings, Polynomials over the rational field
and Unique Factorization Domain.

CO-PO matrix for the course BM-352:Groups and Rings

Cos	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
BM-352.1	3	3	3	2	3	3	2	3	2	2	2
BM-352.2	3	3	3	3	2	2	3	3	2	2	3
BM-352.3	3	3	3	3	2	2	2	3	2	2	2
BM-352.4	3	3	3	2	3	3	3	3	2	2	3
Average	**3**	**3**	**3**	**2.5**	**2.5**	**2.5**	**2.5**	**3**	**2**	**2**	**2.5**

CO-PSO matrix for the course BM-352: Groups and Rings

Cos	PSO1	PSO2	PSO3	PSO4
BM-352.1	3	3	2	2
BM-352.2	3	3	3	3
BM-352.3	3	3	2	3
BM-352.4	3	3	3	3
Average	**3**	**3**	**2.5**	**2.75**

BM-353: Numerical Analysis (Theory)

Course objective: The objective of this course is to provide the skills to students to solve the real life practical problems using numerical methods.

Course Outcomes: This course will enable the students to:

BM-353.1 Learn the effects of errors in a tabular values, finite difference operators, numerical methods to study practical problems related to concepts of interpolation and extrapolation.

BM-353.2 Attain numerical skills to find solutions of system of linear equations by different methods.

BM-353.3 Study different Central difference interpolation methods to find values of functions and their derivatives and their use in solving practical problems.

BM-353.4 Learn numerical methods for evaluating integrals and solving differential equations and to develop skills of applying these methods for further use in scientific problems.

CO-PO matrix for the course BM-353 : Numerical Analysis(Theory)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
BM-353.1	3	3	3	3	3	3	3	3	2	2	3
BM-353.2	3	3	3	3	3	3	3	3	2	2	3
BM-353.3	3	3	3	3	3	3	3	3	2	2	3
BM-353.4	3	3	3	3	3	3	3	3	2	2	3
Average	**3**	**3**	**3**	**3**	**3**	**3**	**3**	**3**	**2**	**2**	**3**

CO-PSO matrix for the course BM-353 : Numerical Analysis (Theory)

	PSO1	PSO2	PSO3	PSO4
BM-353.1	3	3	3	3
BM-353.2	3	3	3	3
BM-353.3	3	3	3	3
BM-353.4	3	3	3	3
Average	**3**	**3**	**3**	**3**

<p align="center">**Course BM-353: Numerical Analysis (Practicals)**</p>

Course objective: The objective of this course is to demonstrate numerical methods using C language.

Course Outcomes: This course will enable the students to:

BM-353.1 Learn to write codes in C language efficiently and skillfully to demonstrate numerical methods.

BM-353.2 Apply numerical methods to obtain solution to mathematical problems.

BM-353.3 Solve scientific problems by applying numerical techniques in C programming language.

BM-353.4 Write and execute programs of numerical methods in C.

<p align="center">**CO-PO matrix for the course BM-353 : Numerical Analysis(PRACTICAL)**</p>

Cos	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
BM-353.1	3	3	3	3	3	3	3	3	2	2	3
BM-353.2	3	3	3	3	3	3	3	3	2	2	3
BM-353.3	3	3	3	3	3	3	3	3	2	2	3
BM-353.4	3	3	3	3	3	3	3	3	2	2	3
Average	3	3	3	3	3	3	3	3	2	2	3

<p align="center">**CO-PSO matrix for the course BM-353 : Numerical Analysis (PRACTICAL)**</p>

Cos	PSO1	PSO2	PSO3	PSO4
BM-353.1	3	3	3	3
BM-353.2	3	3	3	3
BM-353.3	3	3	3	3
BM-353.4	3	3	3	3
Average	3	3	3	3

<p align="center">**BM- 361: REAL AND COMPLEX ANALYSIS**</p>

COURSE OBJECTIVE: The aim of this course is to study the concepts of real and complex analysis.

Course Outcomes: At the end of this course, the students will be able to:

BM-361.1 : Familiarize with the concepts of Jacobians, Beta and Gamma functions, double and triple integrals, Dirichlet's integral, change the order of integration and solve related problems.

BM-361.2 : Learn the concepts of fourier series, properties of fourier coefficients, parseval's identity.

BM-361.3: Know about stereographic projection of complex numbers, continuity and differentiability of complex functions, analytic functions, Cauchy-Riemann equations and harmonic functions.

BM-361.4 Understand the concepts of elementary functions, mobius transformations and critical mappings.

CO-PO Mapping Matrix for Course Code: BM-361: REAL AND COMPLEX ANALYSIS

Cos	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
BM-361.1	3	3	3	3	3	2	2	3	2	2	2
BM-361.2	3	3	3	3	3	2	2	3	2	2	2
BM-361.3	3	3	3	3	3	2	2	3	2	2	2
BM-361.4	3	3	3	3	3	2	2	3	2	2	2
Average	3	3	3	3	3	2	2	3	2	2	2

CO-PSO Mapping Matrix for Course Code: BM-361: REAL AND COMPLEX ANALYSIS

Cos	PSO1	PSO2	PSO3	PSO4
BM-361.1	3	3	3	3
BM-361.2	3	3	3	3
BM-361.3	3	3	3	3
BM-361.4	3	3	3	3
Average	3	3	3	3

BM-362: LINEAR ALGEBRA

COURSE OBJECTIVE: The aim of this course is to study the concepts of Linear Algebra .

Course Outcomes: At the end of this course, the student will be able to:

BM-362.1 Understand the concepts of vector spaces, subspaces, linear span and dimension of a vector space, bases and their properties, quotient space, use of these concepts in problem solving.

BM-362.2 Learn the concepts of linear transformations on vector spaces to find out rank and Nullity, dual-spaces and to use these concepts for problems solving.

BM-362.3 Know about the matrix representation of a linear transformation and change of basis; Determine eigen values, eigen vectors, characteristic polynomial and minimal polynomial of a linear transformation and their further use in solutions of problems.

BM-362.4 Understand the concepts of inner product spaces, related theorems and orthogonalization process.

CO-PO Mapping Matrix for Course Code: BM-362: LINEAR ALGEBRA

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
BM-362.1	3	3	3	3	2	2	2	2	2	2	2
BM-362.2	3	3	3	3	3	2	2	3	2	2	2
BM-362.3	3	3	3	2	3	2	2	2	2	2	2
BM-362.4	3	3	3	2	2	2	2	3	2	2	2
Average	3	3	3	2.5	2.5	2	2	2.5	2	2	2

CO-PSO Mapping Matrix for Course Code: BM- 362: LINEAR ALGEBRA

COs	PSO1	PSO2	PSO3	PSO4
BM-362.1	3	3	3	2
BM-362.2	3	3	3	3
BM-362.3	3	3	3	2
BM-362.4	3	3	3	3
Average	3	3	3	2.5

Course: BM-363 : Dynamics

Course Objective: Develop the kinematics of displacement, velocity and acceleration for systems of particles and rigid bodies.

Course Outcomes: At the end of this course, students will be able to learn:

BM-363.1 Velocity and acceleration along radial, transverse, tangential and normal directions. Relative velocity and acceleration.
BM-363.2 Mass, Momentum and Force. Newton's laws of motion. Work, Power and Energy.
BM-363.3 Motion on smooth and rough plane curves. Projectile motion of a particle in a plane. Vector angular velocity.
BM-363.4 General motion of a rigid body. Central Orbits, Kepler's laws of motion.

CO-PO matrix: BM-363 : Dynamics

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
BM -363.1	3	3	3	3	3	3	3	3	2	2	3
BM -363.2	3	3	3	3	3	3	3	3	2	2	3
BM -363.3	3	3	3	3	3	3	3	3	2	2	3
BM -363.4	3	3	3	3	3	3	3	3	2	2	3
Average	3	3	3	3	3	3	3	3	2	2	3

CO-PSO matrix : BM -363: Dynamics

Cos	PSO1	PSO2	PSO3	PSO4
BM -363.**1**	3	3	3	3
BM -363.**2**	3	3	3	3
BM -363.**3**	3	3	3	3
BM -363.**4**	3	3	3	3
Average	**3**	**3**	**3**	**3**

Principal
Dyal Singh College
KARNAL

DEPARTMENT OF CHEMISTRY

PROGRAMME OUTCOMES (POs) AND

COURSE LEARNING OUTCOMES (CLOs)

2023-24

Programme Outcomes (POs) for B.Sc. Chemistry Programme

PO 1: Demonstrate, solve and have an understanding of major fundamental concepts in all disciplines of basic sciences.

PO 2: Solve the problem by thinking methodically, strategically, independently and draw a logical conclusion.

PO 3: Use of modern experimental techniques and scientific equipments.

PO 4: Ability of critical thinking, analytical reasoning and research-based knowledge including design of experiments, analysis and interpretation of data to provide conclusions

PO 4: After this programme, students will be able to perform jobs in different fields like education, research, industries, civil service, survey, banking, business, public service etc.

Programme Specific Outcomes (PSOs) of B.Sc. with Chemistry

PSO 1: Students acquire knowledge of States of matter, Chemical Thermodynamics, Kinetics, Equilibrium, Electrochemistry, Distribution Law, Quantum Mechanics, Statistical Mechanics, Photochemistry, Solutions, Organic and Inorganic Synthesis, Atomic Structure, Periodic Table, Chemical Bonds, Qualitative and Quantitative Analysis of compounds, Metal Complexes, Organometallic Compounds, Bio-inorganic Chemistry, Stereochemistry, Hydrocarbons and their Derivatives, Spectroscopy, Biomolecules, Heterocyclic Compounds, Polymers etc.

PSO 2: Students become professionally skilled for further studies in higher institutions and working in chemical industries like pharmaceutical companies, ONGC, NTPC, GAIL etc. and other scientific research institutes like DRDO, BARC, ISRO etc.

PSO 3: To inculcate the scientific temperament in the students and create an awareness of the impact of chemistry on the environment and society.

PSO 4: Employ critical thinking, systematic approach and scientific knowledge to design, carry out, observe and analyze the results of chemical reactions.

PSO 5: Students understand the details of organic reaction mechanisms, inorganic and organic compound analysis, chemical structures, instrumental methods of chemical analysis, training of scientific experiments, observation and logical analysis of experimental results.

PSO 6: Students understand the theoretical concepts of physical and chemical properties of compounds and their experimental synthesis.

B.Sc. Chemistry

Semester – 1

Course Learning Outcomes (CLO)

1. Enable to understand the basis of quantum mechanics and structural idea and relevance in describing shapes of s, p and d orbitals.

2. To learn about role of temperature and pressure to establish the state of gases and describe the concept of critical constants of real gases.

3. Get knowledge about the electrophile/nucleophile and its role in mechanism of preparation of organic compounds.

4. To know the physical properties, morphology and crystalline study of liquid and different type of solids.

5. Hand on practice in preparation of solutions, compounds, estimation and determination of physical properties of some compounds.

B.sc 2nd semester (Chemistry)

Course Learning Outcomes (CLO):

1. **Able to understand the theories which governs the shape, structure and ionic behavior, polarizability, ionic structures and concept of Lattice energy of crystals of molecules.**

2. **To know the basics of rates of chemical reactions, the laws and solubility behavior of solutes in different compositions of solvents**

3. **To know about alkanes, alkene, cycloalkanes and their chemical reactions.**

4. **To understand about weak interactions and bonding in metals.**

5. **Hand on practice for estimation and determination of viscosity, specific refractivity properties of some compounds.**

B. Sc. 2nd Year (3rd Semester) CHEMISTRY

Course Outcomes of Paper- VIII (CHEM-201) Inorganic Chemistry

Course Objectives: After studying this paper, the student will:

CHEM- 201.1	Gets insights into d-block elements particularly of transition elements.
CHEM - 201.2	Have an idea of Stability of various oxidation states and e.m.f (Latimer and Frost diagrams), Structure and properties of some compounds of transition elements.
CHEM - 201.3	Be able to know about the basic concepts of coordination chemistry like EAN, Werner theory of coordination and isomerism in coordination complexes.
CHEM - 201.4	Learn the Physical properties of solvents, reactions in non aqueous solvents.

Mapping of CO with PO's

Cos#	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CHEM-201.1	3	3	3	2	3	2	3	2	2	2	3
CHEM-201.2	3	3	3	3	3	3	3	3	3	3	2
CHEM-201.3	3	3	3	2	3	2	3	2	3	2	3
CHEM-201.4	3	2	3	3	3	3	3	3	3	3	2
Average	3	2.75	3	2.5	3	2.5	3	2.5	2.75	2.5	2.5

Mapping of CO with PSO's

Cos#	PSO1	PSO2	PSO3	PSO4	PSO5
CHEM-201.1	2	3	2	2	3
CHEM-201.2	2	2	3	2	2
CHEM-201.3	3	3	3	3	3
CHEM-201.4	3	3	3	3	3
Average	2.5	2.75	2.75	2.5	2.75

B. Sc. 2nd Year (3rd Semester) CHEMISTRY
Course Outcomes of Paper- IX (CHEM-202) Physical Chemistry

Course Objectives: After studying this paper, the student will:

CHEM- 202.1	Get knowledge of basic terms of thermodynamics, various processes, and concept of heat and work.
CHEM - 202.2	Be able to Calculate w,q, dU & dH for isothermal and adiabatic conditions.
CHEM - 202.3	Understand the basic terms related to chemical equilibrium and derive the law thermodynamically and will be able to deduce relation between various equilibrium constants.
CHEM - 202.4	Have an idea of partition coefficient for a solvent dissolved in two immiscible solvents and apply it for calculating degree of hydrolysis and hydrolysis constant, equilibrium constant, Process of extraction.

Mapping of CO with PO's

Cos#	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CHEM-202.1	3	2	3	2	3	2	3	3	2	2	2
CHEM-202.2	3	3	3	3	3	3	3	2	3	3	3
CHEM-202.3	3	3	3	2	3	2	3	2	3	2	2
CHEM-202.4	3	2	3	3	3	3	3	3	3	3	3
Average	3	2.5	3	2.5	3	2.5	3	2.5	3	2.5	2.5

Mapping of CO with PSO's

Cos#	PSO1	PSO2	PSO3	PSO4	PSO5
CHEM-202.1	2	3	2	2	3
CHEM-202.2	2	2	3	2	2
CHEM-202.3	3	3	3	3	3
CHEM-202.4	3	3	3	3	3
Average	2.5	2.75	2.75	2.5	2.75

B. Sc. 2nd Year (3rd Semester) CHEMISTRY

Course Outcomes of Paper- X (CHEM-203) Organic Chemistry

Course Objectives: After studying this paper, the student will:

CHEM- 203.1	Learn the nomenclature, methods of formation, chemical reactions of monohydric and dihydric alcohols.
CHEM - 203.2	Come to know about Preparation of phenols and Epoxides, their physical properties, chemical properties and reactions.
CHEM - 203.3	Understand Ultraviolet (UV) absorption spectroscopy basics, various shifts and finally its applications in structure elucidation.
CHEM - 203.4	Have Knowledge about various methods for the preparation of carboxylic acid, carboxylic derivatives (ester, amide, acid chlorides, anhydrides) and their chemical reactions.

Mapping of CO with PO's

Cos#	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CHEM-203.1	3	2	3	3	3	3	3	2	3	2	2
CHEM-203.2	3	3	3	2	3	3	3	3	2	2	3
CHEM-203.3	3	3	3	3	3	2	3	2	2	3	3
CHEM-203.4	3	2	3	2	3	3	3	3	3	3	2
Average	3	2.5	3	2.5	3	2.75	3	2.5	2.5	2.5	2.5

Mapping of CO with PSO's

Cos#	PSO1	PSO2	PSO3	PSO4	PSO5
CHEM-203.1	3	3	2	2	3
CHEM-203.2	3	3	2	3	3
CHEM-203.3	3	3	3	3	3
CHEM-203.4	3	3	3	3	3
Average	3	3	2.5	2.75	3

B. Sc. 2nd Year (4th Semester) CHEMISTRY

Course Outcomes of Paper- XI (CHEM-204) Inorganic Chemistry

Course Objectives: After studying this paper, the student will:

CHEM- 204.1	Gets insight into the position of f block elements in periodic table and their general characteristics.
CHEM - 204.2	Be able to compare the properties of Lanthanides and actinides with transition elements.
CHEM - 204.3	Gain knowledge of analysis of various groups of basic and acidic radicals, chemistry of interference.
CHEM - 204.4	Learn the common ion effect, solubility product, theory of precipitation, co-precipitation, post precipitation, purification of precipitates.

Mapping of CO with PO's

Cos#	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CHEM- 204.1	3	2	3	2	3	2	3	3	2	2	2
CHEM - 204.2	3	2	3	3	3	3	3	2	3	3	3
CHEM - 204.3	3	3	3	2	3	2	3	3	3	2	2
CHEM - 204.4	3	3	3	3	3	3	3	3	3	3	3
Average	3	2.5	3	2.5	3	2.5	3	2.75	2.75	2.5	2.5

Mapping of CO with PSO's

Cos#	PSO1	PSO2	PSO3	PSO4	PSO5
CHEM - 204.1	2	3	2	2	3
CHEM - 204.2	2	2	3	2	2
CHEM - 204.3	3	3	3	3	3
CHEM - 204.4	3	3	3	3	3
Average	2.5	2.75	2.75	2.5	2.75

B. Sc. 2nd Year (4th Semester) CHEMISTRY

Course Outcomes of Paper- XII (CHEM-205) Physical Chemistry

Course Objectives: After studying this paper, the student will:

CHEM- 205.1	Get knowledge about the laws and concepts of chemical thermodynamics and their applications in thermochemical calculations.
CHEM - 205.2	Be able to describe Gibbs function (G) and Helmholtz function (A), spontaneity, Variation of G and S with P, V and T.
CHEM - 205.3	Understand basics of cells, their EMF determination by use of Nernst equation and thermodynamic properties.
CHEM - 205.4	Learn derivation of cell EMF and its application.

Mapping of CO with PO's

Cos#	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CHEM-205.1	3	2	3	2	3	2	3	2	2	2	3
CHEM - 205.2	3	3	3	3	3	3	3	3	3	3	3
CHEM - 205.3	3	3	3	2	3	2	3	2	3	2	2
CHEM - 205.4	3	2	3	3	3	3	3	3	3	3	2
Average	3	2.5	3	2.5	3	2.5	3	2.5	2.75	2.5	2.5

Mapping of CO with PSO's

Cos#	PSO1	PSO2	PSO3	PSO4	PSO5
CHEM - 205.1	2	3	2	2	3
CHEM - 205.2	2	2	3	2	2
CHEM - 205.3	3	3	3	3	3
CHEM - 205.4	3	3	3	3	3
Average	2.5	2.75	2.75	2.5	2.75

B. Sc. 2nd Year (4th Semester) CHEMISTRY
Course Outcomes of Paper- XIII (CHEM-206) Organic Chemistry

Course Objectives: After studying this paper, the student will:

CHEM- 206.1	Understand Infrared (IR) absorption spectroscopy basics, characterstic peak for functional groups, its applications in structure elucidation.
CHEM - 206.2	Learn Structure, nomenclature, physical properties of amines, factors affecting basicity of amines.
CHEM - 206.3	Be able to discuss synthetic application of diazonium salt
CHEM - 206.4	Know about the preparation, the acidity of α-hydrogens of aliphatic, aromatic aldehydes and ketones and various important name reactions of aldehydes and ketones.

Mapping of CO with PO's

Cos#	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CHEM - 206.1	3	2	3	2	3	3	3	2	3	2	2
CHEM - 206.2	3	3	3	2	3	3	3	3	2	3	3
CHEM - 206.3	3	3	3	3	3	2	3	2	2	3	3
CHEM - 206.4	3	2	3	3	3	3	3	3	3	2	2
Average	3	2.5	3	2.5	3	2.75	3	2.5	2.5	2.5	2.5

Mapping of CO with PSO's

Cos#	PSO1	PSO2	PSO3	PSO4	PSO5
CHEM- 206.1	3	3	2	2	3
CHEM - 206.2	3	3	2	3	3
CHEM - 206.3	3	3	3	3	3
CHEM - 206.4	3	3	3	3	3
Average	3	3	2.5	2.75	3

B. Sc. 2ⁿᵈ Year (4ᵗʰ Semester) CHEMISTRY	

Course Outcomes of Paper- XIV (CHEM-207) Practical Chemistry

Course Objectives: After performing the experiments, the student will:

CHEM- 207.1	Acquire skill for quantitative estimations of Cu^{2+}, Al^{3+} and Ni^{2+}, verifying Beer – Lamberts' law.
CHEM - 207.2	Learn the Preparation of various inorganic complexes.
CHEM - 207.3	Be able to determine various enthalpies, rate constant and distribution coefficient.
CHEM - 207.4	Detect extra elements, functional groups, melting point along with preparation of one pure solid derivative.

Mapping of CO with PO's

Cos#	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CHEM- 207.1	3	3	3	3	3	3	3	3	3	3	3
CHEM - 207.2	3	3	3	2	3	3	2	3	2	3	3
CHEM - 207.3	3	3	3	2	2	3	2	3	2	3	3
CHEM - 207.4	3	2	3	3	3	3	3	3	3	3	3
Average	3	2.75	3	2.5	2.75	3	2.5	3	2.5	3	3

Mapping of CO with PSO's

Cos#	PSO1	PSO2	PSO3	PSO4	PSO5
CHEM- 207.1	3	3	3	2	3
CHEM - 207.2	3	3	2	3	3
CHEM - 207.3	3	3	2	2	3
CHEM - 207.4	3	3	3	3	3
Average	3	3	2.5	2.5	3

B. Sc. 3rd Year (5th Semester) CHEMISTRY

Course Outcomes of Paper-XV (CHEM-301) Inorganic Chemistry

Course Objectives:

CHEM-301.1	Understanding about metal ligand bonding in transition metal complexes and elementary idea of crystal field theory, factor affecting crystal field parameters.
CHEM-301.2	Familiarize with thermodynamic and kinetic aspects of metal complexes
CHEM-301.3	Understanding about magnetic properties of Transition metal complexes, types of magnetic materials. Magnetic susceptibility, methods of determining magnetic susceptibility.
CHEM-301.4	Understanding about Electronic spectra of transition metal complexes.

Mapping of CO with PO's

Cos#	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CHEM-301.1	3	3	3	3	3	3	3	2	3	3	3
CHEM-301.2	3	3	3	3	3	3	3	3	2	3	3
CHEM-301.3	3	3	3	3	3	3	3	2	3	3	3
CHEM-301.4	3	3	3	3	3	3	3	3	2	3	3
Average	3	3	3	3	3	3	3	2.5	2.5	3	3

Mapping of CO with PSO's

Cos#	PSO1	PSO2	PSO3	PSO4	PSO5
CHEM-301.1	3	3	3	3	3
CHEM-301.2	3	3	3	3	3
CHEM-301.3	3	3	3	3	3
CHEM-301.4	3	3	3	3	3
Average	3	3	3	3	3

B. Sc. 3rd Year (5th Semester) CHEMISTRY

Course Outcomes of Paper-XVI (CHEM-302) Physical Chemistry

Course Objectives:

CHEM-302.1	Understanding about quantum mechanics – Black body radiation, planck's radiation law, photoelectric effect, postulates of quantum mechanics, quantum operator, role of operator in quantum mechanics.
CHEM-302.2	Brief idea about physical property and molecular structure – clausius mossotti equation, dipole moment.
CHEM-302.3	Application of magnetic susceptibility.
CHEM-302.4	Discussion about spectroscopy-rotational, vibrational and raman spectrum.

Mapping of CO with PO's

Cos#	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CHEM-302.1	3	3	3	3	3	3	3	3	3	2	3
CHEM-302.2	3	3	3	3	3	3	3	3	3	3	3
CHEM-302.3	3	3	3	3	3	3	3	3	3	2	3
CHEM-302.4	3	3	3	3	3	3	3	3	3	3	3
Average	3	3	3	3	3	3	3	3	3	2.5	3

Mapping of CO with PSO's

Cos#	PSO1	PSO2	PSO3	PSO4	PSO5
CHEM-302.1	3	3	3	3	3
CHEM-302.2	3	3	3	3	3
CHEM-302.3	3	3	3	3	3
CHEM-302.4	3	3	3	3	3
Average	3	3	3	3	3

B. Sc. 3rd Year (5th Semester) CHEMISTRY

Course Outcomes of Paper-XVII (CHEM-303) Organic Chemistry

Course Objectives:

CHEM-303.1	Discussion about Principal of NMR spectroscopy – simple problem on PMR spectroscopy for structure determination of organic compound.
CHEM-303.2	Understanding about classification of carbohydrates.
CHEM-303.3	An introduction of disaccharides and polysaccharides.
CHEM-303.4	Understanding about organometallic compounds such as Mg, Zn, Li.

Mapping of CO with PO's

Cos#	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CHEM-303.1	3	3	3	3	3	3	3	3	3	3	3
CHEM-303.2	3	3	3	3	3	3	3	3	3	2	3
CHEM-303.3	3	3	3	3	3	3	2	3	3	3	3
CHEM-303.4	3	3	3	3	3	3	3	3	3	2	3
Average	3	3	3	3	3	3	2.75	3	3	2.5	3

Mapping of CO with PSO's

Cos#	PSO1	PSO2	PSO3	PSO4	PSO5
CHEM-303.1	3	3	3	3	3
CHEM-303.2	3	3	3	3	3
CHEM-303.3	3	3	3	3	3
CHEM-303.4	3	3	2	3	3
Average	3	3	2.75	3	3

B. Sc. 3rd Year (6th Semester) CHEMISTRY

Course Outcomes of Paper-XVIII (CHEM-304) Inorganic Chemistry

Course Objectives:

CHEM-304.1	A brief discussion of organometallic chemistry-its preparation, properties and bonding of alkyls of Li, Al, Hg and Sn.
CHEM-304.2	Understanding about acids and bases, HSAB concept.
CHEM-304.3	Discussion about Bioinorganic chemistry, Nitrogen fixation.
CHEM-304.4	Understanding about Silicones and phosphazenes; their prepration, properties, structure and uses.

Mapping of CO with PO's

Cos#	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CHEM-304.1	3	3	3	3	3	3	3	3	3	3	3
CHEM-304.2	3	3	3	3	3	3	3	3	2	3	3
CHEM-304.3	3	3	3	3	3	3	3	3	3	2	3
CHEM-304.4	3	3	3	3	3	3	3	3	2	3	3
Average	3	3	3	3	3	3	3	3	2.5	2.75	3

Mapping of CO with PSO's

Cos#	PSO1	PSO2	PSO3	PSO4	PSO5
CHEM-304.1	3	3	3	3	3
CHEM-304.2	3	3	3	3	3
CHEM-304.3	3	3	3	2	3
CHEM-304.4	3	3	3	3	3
Average	3	3	3	2.75	3

B. Sc. 3rd Year (6ᵗʰ Semester) CHEMISTRY

Course Outcomes of Paper-XIX (CHEM-305) Physical Chemistry

Course Objectives:

CHEM-305.1	Discussion about the concept of electronic spectrum, qualitative description of selection rules and Franck-Condon principle.
CHEM-305.2	Understanding about photochemical processes, loss of photochemistry, Jablonski diagram.
CHEM-305.3	Discussion about dilute solutions and colligative properties.
CHEM-305.4	Understanding about Phase equilibrium – Derivation of Gibbs phase rule, Phase equilibria of one and two component system.

Mapping of CO with PO's

Cos#	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CHEM-305.1	3	3	3	3	3	3	3	3	3	3	3
CHEM-305.2	3	3	3	3	3	3	3	3	2	3	3
CHEM-305.3	3	3	3	3	3	3	3	3	3	2	3
CHEM-305.4	3	3	3	3	3	3	3	3	3	3	3
Average	3	3	3	3	3	3	3	3	2.75	2.75	3

Mapping of CO with PSO's

Cos#	PSO1	PSO2	PSO3	PSO4	PSO5
CHEM-305.1	3	3	3	3	3
CHEM-305.2	3	3	2	3	3
CHEM-305.3	3	3	3	3	3
CHEM-305.4	3	3	3	3	3
Average	3	3	2.75	3	3

B. Sc. 3rd Year (6th Semester) CHEMISTRY

Course Outcomes of Paper-XX (CHEM-306) Organic Chemistry

Course Objectives:

CHEM-306.1	Understanding about Heterocylic Coumponds – I, aromatic characters of pyrole, furan , Thiophene and pyridine.
CHEM-306.2	Introduction to Heterocylic Coumpounds – II, Introduction to condensed five and six membered heterocyles, Prepration and reactions of indole, quinolone and isoquinoline, organosulphur compounds.
CHEM-306.3	A brief discussion of organic synthesis via enolates.
CHEM-306.4	Understanding about synthetic polymers.

Mapping of CO with PO's

Cos#	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CHEM-306.1	3	3	3	3	3	3	3	3	3	3	3
CHEM-306.2	3	2	3	3	3	3	3	3	2	3	3
CHEM-306.3	3	3	3	3	3	3	3	3	3	2	3
CHEM-306.4	3	3	3	3	3	3	3	3	2	3	3
Average	3	2.75	3	3	3	3	3	3	2.5	2.75	3

Mapping of CO with PSO's

Cos#	PSO1	PSO2	PSO3	PSO4	PSO5
CHEM-306.1	3	3	3	3	3
CHEM-306.2	3	2	3	3	3
CHEM-306.3	3	3	3	3	3
CHEM-306.4	3	3	3	3	3
Average	3	2.75	3	3	3

B. Sc. 3rd Year (6th Semester) CHEMISTRY										
Course Outcomes of Paper-XXI (CHEM-307) Practicals										

Course Objectives:

CHEM-307.1	Inorganic-qualitative inorganic analysis, macro-analysis, analysis of acid radicals, interference among acid radicals, analysis of basic radicals.
CHEM-307.2	Physical-to determine the strength of given acid solution (conductometrically, potentiometrically), to standardize the given acid solution pH metrically.
CHEM-307.3	Organic-Steam distillation, column chromatography, thin layer chromatography.
CHEM-307.4	Synthesis of Organic compounds.

Mapping of CO with PO's

Cos#	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CHEM-307.1	3	3	3	3	3	3	3	3	2	2	3
CHEM-307.2	3	3	3	2	3	3	3	3	3	3	3
CHEM-307.3	3	3	3	3	3	3	3	3	3	3	3
CHEM-307.4	3	3	3	3	3	3	3	3	2	2	3
Average	3	3	3	2.75	3	3	3	3	2.5	2.5	3

Mapping of CO with PSO's

Cos#	PSO1	PSO2	PSO3	PSO4	PSO5
CHEM-307.1	3	3	3	3	3
CHEM-307.2	3	2	3	2	2
CHEM-307.3	3	3	2	3	3
CHEM-307.4	3	3	3	3	3
Average	3	2.75	2.75	2.75	2.75

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KARNAL

DEPARTMENT OF ZOOLOGY

PROGRAMME OUTCOMES (POs) AND

COURSE LEARNING OUTCOMES (CLOs)

2023-24

DYAL SINGH COLLEGE, KARNAL

B.Sc. Medical

Subject: Zoology

Programme Outcomes (POs) for Three Year B.Sc. Programme of Faculty of Life Sciences

PO1	Knowledge	To inculcate theoretical and practical knowledge in fundamentals of biology.
PO2	Problem Solving	To instil the ability to critically evaluate problems and apply lateral thinking and analytical skills in solving them.
PO3	Ethics	To create awareness ethical principles, professional responsibilities good scientific practices and biosafety.
PO4	Communication	To develop communication skills and be able to communicate effectively on general and scientific topics.
PO5	Employability	To prepare the students for career in teaching, research, industry, government organizations and entrepreneurship.
PO6	Environment and Sustainability	To sensitize the students about the current environmental scenario and promote a mindset of sustainable development.
PO7	Science and Society	To develop an aptitude to apply the knowledge of the scientific principles for the benefit of society.
PO8	Modern Tool usage	To inculcate the ability to use and learn modern techniques, skills and tools for scientific practices
PO9	Life-Long Learning	To develop the capacity to apply knowledge and skills that are essential for participating in learning activities throughout the life

Programme Specific Outcomes (PSOs) for Zoology subject of Three Year B.Sc. Medical/ M.Sc. Forensic Science

PSO1	Understand the various aspects of the life cycles/biology of the animal species around them and their interaction with the environment.
PSO2	Gain knowledge of the physiological processes at the cellular and organismic levels.
PSO3	Use understanding of subject and analytical methods in identifying and solving various complex situations of living forms and environment.
PSO4	Awareness of natural resources and their sustainable utilization.
PSO5	Encourage skillfull expertise for a career as teacher, in industry or as entrepreneur in the realms of the subject.

DEPARTMENT OF ZOOLOGY
Course Learning Outcomes (CLO)
Semester-I

Course Code: B23-ZOO-101
Name of the Course: Animal Diversity of Non-Chordates

1. Student will be able to describe unique characters and recognize life forms of phylum Protozoa and Porifera
2. Student will be able to describe unique characters and recognize life forms of phylum Coelenterata and Helminthes
3. Student will be able to describe unique characters and recognize life forms of phylum Annelida and Arthropoda
4. Student will be able to describe unique characters and recognize life forms of phylum Mollusca, Echinodermata and Hemichordates
5. Students will be capable of identifying the characters and classification of Non-Chordates

Course Code: B23-ZOO-102
Name of the Course: Type study of Non-chordates

1. Student will be able to describe about Type study of *Paramecium*
2. Student will be able to describe Type study of *Ascaris*
3. Student will be able to describe about Annelids and Arthropods
4. Student will be able to describe Type study of *Balanoglossus*
5. Students will be capable of identifying the characters and classification of Non-Chordates

Course Code: B23-ZOO-103
Name of the Course: Introduction of Non-Chordates

1. Student will be able to understand about phylum Protozoa and Porifera
2. Student will be able to understand about phylum Coelenterata and Helminthes
3. Student will be able to understand about phylum Annelida and Arthropoda
4. Student will be able to understand about phylum Mollusca, Echinodermata and Hemichordates
5. Students will be capable of identifying the characters and classification of Non-Chordates

Course Code: B23-ZOO-104
Name of the Course: Basics of Zoology-I

1. Student will be able to learn about Kingdom Animalia
2. Student will be able to learn about Chordates
3. Student will be able to describe unique characters and recognize life functions of phylum Annelida and Arthropoda
4. Student will be able to describe unique characters and recognize life functions of phylum Mollusca, Echinodermata and Hemichordates
5. Students will be capable understand the role of non-chordates in their surroundings

DEPARTMENT OF ZOOLOGY
Course Learning Outcomes (CLO)
Semester-II

Course Code: B23-ZOO-201

Name of the Course: Animal Diversity of Chordates (B23-ZOO-201)

1. Student will be able to describe unique characters and recognize life functions of Urochordates
2. Student will be able to describe unique characters and recognize life functions of Pisces
3. Student will be able to describe unique characters and recognize life functions of Amphibians & Reptiles
4. Student will be able to describe unique characters and recognize life functions of Birds & Mammals
5. Students will be capable of identifying the characters and classification of Chordates

Course Code: B23-ZOO-202

Name of the Course: Applied Zoology

1. Students will be able to identify different species and casts of honeybees and species of silkworm.
2. Students will be able to use the tools and techniques used in apiculture, sericulture, aquaculture, piggery poultry and leather Industry and capabilities to
3. initiate startups will develop
4. Students will able to explain the basic concept of Poultry and Pisciculture
5. Student will understand the basic concepts of industry based applied methods.
6. Students will develop skills in basic laboratory techniques and understand the principles in biology.

Course Code: B23-ZOO-203

Name of the Course: Introduction of Chordates

1. Student will be able to describe unique characters of Protochordates
2. Student will be able to describe unique characters of Pisces
3. Student will be able to describe unique characters of Amphibians & Reptiles
4. Student will be able to describe unique characters of Birds & Mammals
5. Students will be capable of identifying the characters and classification of Chordates

Course Code: B23-ZOO-204

Name of the Course: Basics of Zoology-I

1. Student will learn the role of different groups of chordates in mantling an equilibrium in our ecosystem
2. Students will be able to identify local fishes species and their role in the ecosystem.
3. Course will help to understand how the natural systems on which we depend function.
4. Course will give the idea about how birds are economically important.
5. Student will learn about identification of chordates

SEMESTER-III

B-ZOO-301:   **Life and Diversity of Chordates-I**

Objective: To make students appreciate the basic characters of Chordates, origin and ancestry of chordates from proto-chordates and about the general characters in class Pisces.

Course outcomes:

CO301.1   Students will be capable of identifying the characters and classify different proto-chordate species and explain their ecological and ecological adaptations and associations.

CO301.2   Students will be able to explain the basic concepts of evolutionary relationship among proto-chordates and fishes.

B-ZOO-302:   **Mammalian Physiology-I**

Objective: To make students understand the structure and classification of bio-molecules, dynamics of enzymes and concept of physiology of bones and muscles.

Course outcomes:

CO302.1   Students will be able to appreciate and explain the mechanisms of the human body functions.

CO302.2   Students will be able to understand and explain the various physiological and biochemical processes of the human body.

CO-PO and CO-PSO Mapping Matrix for Semester III - Zoology

B-ZOO-301		Life and Diversity of Chordates-I											
B-ZOO-302		Mammalian Physiology-I											
Programme Outcomes (POs)									Programme Specific Outcomes (PSOs)				
COs#	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PSO1	PSO2	PSO3	PSO4	PSO5
CO301.1.	3	2	2	2	2	1	1	1	2	3	3	2	3	3
CO301.2.	2	1	2	1	2	3	2	1	2	3	2	2	3	2
CO302.1.	3	1	1	2	2.5	2	3	1.5	2	3	3	3	1	3
CO302.2.	2	1	1	2	2.5	2	3	1.5	2	3	3	3	1	3
Average	2.5	1.25	1.5	1.75	2.25	2	2.25	1.25	2	3	2.75	2.5	2	2.75

SEMESTER-IV

B-ZOO-401: **Life and Diversity of Chordates-II**

Objective: To make students capable of identifying and differentiating between species from different vertebrate classes (amphibians to mammals).

Course outcomes:

CO401.1 Students will be able to explain the evolutionary trends of vertebrate classes from amphibians to mammals.

CO401.2 Students will be able to differentiate between species from different vertebrate classes (amphibians to mammals) and understand their adaptations.

B-ZOO-402: **Mammalian Physiology-II**

Objective: To impart the basic knowledge of physiology and endocrine system of animals.

Course outcomes:

CO402.1 Students will understand the functioning of each body system and its mechanism of working.

CO402.2 Students will be able to explain the mechanism of action of hormones and related molecules involved in various physiological processes.

B-ZOO-403: **Practical based on Theory Papers of Semester III & IV**

Objective: To help students comprehend the classification of vertebrates phyla and ways of identifying respective species and to develop the practical understanding of various physiological experiments.

Course outcomes:

CO403.1 Students will be able to classify and identify vertebrate species and their skeleton and understand their economic importance.

CO403.2 Students will be able to understand and perform biological and analytical techniques like DLC, Blood group testing etc

CO-PO and CO-PSO Mapping Matrix for Semester IV - Zoology

B-ZOO-401	Life and Diversity of Chordates-II												
B-ZOO-402	Mammalian Physiology-II												
B-ZOO-403	Practical based on Theory Papers of Semester III & IV												
Programme Outcomes (POs)										**Programme Specific Outcomes (PSOs)**				
COs#	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PSO1	PSO2	PSO3	PSO4	PSO5
CO401.1.	3	2	1	2	2	3	3	1	2	3	2	3	3	3
CO401.2.	2	2	2	1	2	2	2	1	2	3	3	3	3	3
CO402.1.	3	1	1	2	2.5	2	3	1.5	2	3	3	3	1	3
CO402.2.	3	1	1	2	2.5	2	3	1.5	2	3	3	3	1	3
CO403.1.	3	2	3	2	2	2	1	2	2	3	3	3	3	2
CO403.2.	2	2	3	2	3	2	3	2	2	2	2	3	2	3
Average	2.67	1.67	1.83	1.83	2.33	2.16	2.5	1.5	2	2.83	2.67	3	2.16	2.83

B-ZOO-501: **Environmental Biology**

Objective: To acquaint the students about interactions between organisms and environment.

Course outcomes:

CO501.1   Students will understand the different biological interactions and relation between abiotic and biotic factors.

CO501.2   Students will able to explain the causes of different types of pollution and how to manage them.

B-ZOO-502: **Evolution and Developmental Biology**

Objective: To make students aware of evolution of species, population dynamics and the processed of early development of different organisms.

Course outcomes:

CO502.1   Students will understand the concept of evolution of life on earth with emphasis on mam and horse.

CO502.2   Students will be able to explain the processes of gametogenesis, fertilization, its stages and cellular mechanisms for gastrulation, and embryonic development.

CO-PO and CO-PSO Mapping Matrix for Semester V - Zoology

B-ZOO-501	Environmental Biology												
B-ZOO-502	Evolution and Developmental Biology												
Programme Outcomes (POs)										Programme Specific Outcomes (PSOs)			
COs#	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PSO1	PSO2	PSO3	PSO4	PSO5
CO501.1.	3	3	2.5	2	2.5	3	3	1	2	3	2	2	3	3
CO501.2.	3	3	3	2	3	3	3	2	2	3	2	3	3	2.5
CO502.1.	3	2.5	2.5	2	2.5	2.5	2	1	2	3	2	2	2	2.5
CO502.2.	3	2.5	3	2	3	2.5	3	2	2	2	3	2	2	3
Average	3	2.75	2.75	2	2.75	2.75	2.75	1.5	2	2.75	2.25	2.25	2.5	2.75

B-ZOO-601: **Aquaculture and Pest Management-I**

Objective: To impart the students with the basic information about fishery and aquaculture and identification of the different species of insect pests of crops.

Course outcomes:

CO601.1 Students will learn concepts of fisheries, fishing crafts and gears for aquaculture industry

CO601.2 Students will be able to identify important insect pests of common crops and the nature of damage done by them.

B-ZOO-602: **Aquaculture and Pest Management-II**

Objective: To acquaint the students with the necessary technical knowledge for aquaculture and pest management.

Course outcomes:

CO602.1 Students will able to explain induced breeding and pre- and post-harvesting techniques.

CO602.2 Students will be able to identify important insect pests of stored grains, the nature of damage done by them along with various pest management techniques.

B-ZOO-603: **Practical based on Theory Papers of Semester V & VI**

Objective: To develop observational, analytical and Evaluation skills related to aquaculture and pest management.

Course outcomes:

CO603.1 Students will study the common animals, tools and techniques used in aquaculture industry.

CO603.2 Students will able to identify common insect pests of crops and stored grains and the nature of damage caused by them.

CO-PO and CO-PSO Mapping Matrix for Semester II - Zoology

B-ZOO-601	Aquaculture and Pest Management-I												
B-ZOO-602	Aquaculture and Pest Management-II												
B-ZOO-603	Practical based on Theory Papers of Semester V & VI												
Programme Outcomes (POs)										**Programme Specific Outcomes (PSOs)**				
COs#	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PSO1	PSO2	PSO3	PSO4	PSO5
CO601.1.	3	2.5	3	2.5	2	2.75	2.75	2	2	3	2	2.75	2.5	2.75
CO601.2.	2.25	2.5	2.75	2.75	2.5	2.75	2.5	1.5	2	2.75	2	2.75	2.5	3
CO602.1.	3	2.25	3	2.5	2	2.5	2.25	2.5	2	3	2.5	3	2	2.5
CO602.2.	3	2	2.75	2.5	2.5	3	2.75	1.5	2	2.75	2	3	2.75	3
CO603.1.	3	2.75	3	2.5	2	2.75	2.5	2.5	2	2.75	2.5	2.75	2.5	2.75
CO603.2.	3	2.5	3	2.75	2.5	3	2.5	1.5	2	3	2.5	3	2.5	3
Average	2.87	2.41	2.91	2.58	2.25	2.79	2.54	1.92	2	2.87	2.25	2.87	2.45	2.83

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DEPARTMENT OF BOTANY

PROGRAMME OUTCOMES (POs) AND

COURSE LEARNING OUTCOMES (CLOs)

2023-24

DEPARTMENT OF BOTANY
B.Sc Life Science (2023-24)

Programme Outcomes (POs

1. To develop skills in graduate students to be able to acquire theoretical and practical knowledge in fundamentals of biology in respective disciplines of plants, animals, microbes and environment.

2. To inculcate ability to critically evaluate problems and apply lateral thinking and analytical skills for professional development.

3. To create awareness on ethical issues, good laboratory practices and biosafety.

4. To develop ability in youth for understanding basic scientific learning and effective communication skills.

5. To prepare youth for career in teaching, industry, government organizations and self reliant entrepreneurship.

6. To make students aware of natural resources and environment and its sustainable utilization.

7. To provide learning experience in students that instills deep interest in biological science for the benefit of society.

Programme Specific Outcomes (PSOs)

1. The students will be able to identify the various plants and compare the diagnostic characteristics of lower and higher groups of plants. This comparative approach will help the students to explain the evolution and degree of genetic diversity in plants.

2. The students will be able to explain the various biological processes in plants and how they are sustained and regulated at the cellular and molecular levels. Students will also be able to understand the ecology, development, and behavior of different forms of life.

3. The students will be able to describe and demonstrate the different experimental techniques and methods in various fields of plant sciences.

4. The students will also strengthen their ethical and moral values and shall be able to deal with psychological weaknesses. Students will also learn team workmanship in order to serve the institutions, industry, and society efficiently.

5. The students will possess minimum standards of communication skills expected from a Botany graduate in the country. They will also become acritical thinker and acquire problem-solving capabilities.

6. This programme will help the students in finding career opportunities in higher education in the field of plant sciences and other entrepreneurship programmes.

Course Learning Outcomes (CLO)
Semester-I

Course Code: B23-BOT-101

Name of the Course: Diversity of Microbes, Algae, Fungi and Archegoniates

1. Students will be able to understand the general characteristics of bacteria, actinobacteria, viruses and fungi.
2. Students will develop a conceptual understanding of Phycology.
3. Students will gain knowledge on the concepts of Bryology.
4. Basic understanding of the biology of pteridophytes will be developed by the students.
5. Students will gain the knowledge of practical aspects of microorganisms, algae, fungi, lichens, bryophytes, and pteridophytes.

Course Code: B23-BOT-102
Name of the Course : Conservation Biology
1. Students will comprehend the fundamental principles of biodiversity.
2. Students will acquire a conceptual understanding of the classifications used by the IUCN.
3. Students will acquire knowledge about the principles of conservation laws and international legislation.
4. Students will develop a foundational understanding of international legislation.
5. Student will learn about the practical approaches to protect and restore the biological communities.

Course Code: B23-BOT-103
Name of the Course : Plant Diversity

1. The general characteristics of microorganisms, algae, fungi, and lichens will be understandable to students.
2. Students will acquire a conceptual grasp of bryophytes and pteridophytes.
3. Students will acquire knowledge about the fundamental features of gymnosperms.
4. Students will acquire a foundational understanding of angiosperm morphology.
5. Student will gain the knowledge about the practical aspects related to identification, structure, economic values of microorganisms, algae, fungi, bryophytes, pteridophytes gymnosperms, and angiosperms.

Course Code: B23-BOT-104
Name of the Course : Fundamentals of Botany

1: Students will gain a foundational understanding of the biology of microorganisms, algae, fungi and lichens.
2: Students will develop a conceptual understanding of bryophytes and pteridophytes.
3: Students will acquire knowledge about the fundamental characteristics of gymnosperms and the challenges related to their propagation.
4: Students will acquire a basic understanding of angiosperm morphology.
5. Students will be able to learn the practical aspects of microorganisms, algae, fungi and students

will be able to identify the major groups of plants and compare the characteristics of higher plants(angiosperms and gymnosperms)and lower plants (bryophytes and pteridophytes).

DEPARTMENT OF BOTANY

Course Learning Outcomes (CLO)
Semester-II

Course Code: B23-BOT-201

Name of the Course: Plant Taxonomy and Ecology

1. Students will gain knowledge about taxonomy, including the rules of nomenclature and other essential aspects.
2: Students will acquire a conceptual understanding of angiosperm classification systems and the diversity of families within them.
3. Students will gain knowledge about Ecology and Environmental interactions.
4: Students will acquire a conceptual understanding of ecosystem structure, environmental pollution and biodiversity conservation.

5. Students will gain the knowledge about the diagnostic features, morphology, internal structure, economic value of angiosperms and ecological concepts and biodiversity indices.

Course Code: B23-BOT-202

Name of the Course: Plant Propagation

1. Students will acquire knowledge regarding the fundamental aspects of plant propagation.
2: Students will develop a conceptual understanding of seed propagation. 3: Students will gain knowledge about vegetative propagation methods.
4: Students will acquire a conceptual understanding of cell and tissue propagation techniques.
5. Students will be able to demonstrate the basic principles and practical consideration of in vitro plant cell/tissue culture, plant propagation methods, sterilization methods, tools and techniques.

Course Code: B23-BOT-203

Name of the Course: Plants for Human Welfare

1. Students will acquire a foundational understanding of plant diversity.
2: Students will develop a conceptual grasp of plants utilized for human welfare.
3: Students will gain knowledge about the origins of certain cultivated plants.
4: Students will acquire a conceptual understanding of the utilization of fruits, nuts, and other plant components for human welfare.
5. Students will acquire the knowledge about the economic valuable plants and their products.

Course Code: B23-BOT-204

Name of the Course: Economic Botany

1. Students will gain a foundational understanding of the origins of significant cultivated plants.
2: Students will develop a conceptual understanding of important plants that yield vegetables, fiber, and oil.
3: Students will acquire knowledge about the cultivation techniques of essential plants.
4: Students will gain a conceptual understanding of the processing methods applied to economically significant plants.
5. Students will be able to gain the knowledge of economic values of cereals, legumes, spices, oil & fibre yielding plants.

Dyal Singh College, Karnal
Name of the Programme: Bachelor of Science (Medical), Subject: Botany
Duration: Three years

PROGRAMME OUTCOMES (POs)		
PO1	Knowledge	Enables the students in gaining knowledge and to study in a holistic manner.
PO2	Communication	Ability to effectively communicate their views and present their work with confidence to the scientific community and society
PO3	Problem Solving	Enables the student to apply the knowledge gained to study plants in a holistic manner and to solve scientific problems in a directional way
PO4	Individual and Team Work	Capable to learn and work as an individual or team in an effective manner.
PO5	Investigation of Problems	Develop skill to critically think and analyse the knowledge of subject in interpretation of data and addressing practical problems.
PO6	Modern Tool Usage	Capable of learning advanced scientific techniques and tools used in learning plant biology.
PO7	Science and Society	Ability to apply theoretical and practical knowledge to resolve issues related to the society.
PO8	Life-Long Learning	Capable in applying fundamental concepts, principle and processes of botany that are required in learning activities throughout life.
PO9	Environment and Sustainability	Ability to adopt knowledge in plant structure, function and solve the issues related to environment and ecology in a sustainable manner.
PO10	Ethics	Apply moral and ethical principles in both academics and research to become professionally more responsible citizen
PO11	Project Management	Ability to apply knowledge in understanding, designing and managing novel projects related to plant biology

PROGRAMME SPECIFIC OUTCOMES (PSOs)	
The objective of the curriculum designed for B.Sc Med. course is to nurture the fundamental knowledge and modern concepts of biology in students for developing professional competency to work in institutions and pharmaceutical, biotechnological, healthcare industries.	
PSO1	To develop proficiency for identifying the various plants and compare the characters of lower and higher groups of plants. This comparative approach will help them to explain the evolution and degree of genetic diversity in plants.
PSO2	This course content is targeted to explain the various biological processes in plants and how they occur at the cellular and molecular levels. Students will also be able to understand the ecology, morphology, anatomy and development of different forms of life.
PSO3	Exposure to various experimental techniques and methods in various fields of plant sciences.
PSO4	The structure of course curriculum is aimed to inculcate minimum standards of communication skills expected from a Botany graduate in the country. They will also acquire critical thinking abilities that will enhance their problem-solving capabilities.
PSO5	Encourage students in finding career opportunities in higher education in the field of plant sciences and other entrepreneurship programmes. They will also learn team work in order to serve the Government sector institutions or industry and society.

B-BOT-301: BIOLOGY AND DIVERSITY OF SEED PLANTS-I

Course Objective: The aim of this course is to introduce students to the world of basic botany that include primary diversity of seed plants.

Course Outcomes: At the end of the course students will be able to
B-BOT-301.1 learn and understand the general characters, economic importance and life-cycle of gymnosperms
B-BOT-301.2 students will be able to explain their impact on environment, human welfare and role in different industries.
B-BOT-301.3 students will understand the evolutionary significance and lineage of these seed plants

COs	PO1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO1 0	PO1 1
B-BOT-301.1	3	2	2	1	3	2	2	3	3	1	2
B-BOT-301.2	3	2	3	2	1	2	1	2	3	1	3
B-BOT-301.3	3	1	1	1	2	1	1	2	1	1	1
Average	3	1.67	2	1.33	2	1.67	1.33	2.33	2.33	1	2

CO-PO Mapping Matrix for Course Code: B-BOT-301

COs	PSO1	PSO2	PSO3	PSO4	PSO5
B-BOT-301.1	3	3	1	1	2
B-BOT-301.2	3	3	2	2	3
B-BOT-301.3	3	2	1	2	1
Average	3	2.67	1.33	1.67	2

CO-PSO Mapping Matrix for Course Code: B-BOT-301

B-BOT-302: PLANT ANATOMY

Course Objective: The aim of this course is to introduce students to internal organization of plants which is very important in plant biology
Course Outcomes: At the end of the course students will be able to **B-BOT-302.1** identify, describe and differentiate plant cells, cell organelles and their functions which is helpful in botany **B-BOT-302.2** students will be able to apply plant anatomical features for correct identification and it will be useful in taxonomy **B-BOT-302.3** students will understand the wood structure in a better manner

CO-PO Mapping Matrix for Course Code: B-BOT-302										
Cos	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
B-BOT-302.1	3	1	3	1	2	2	2	3	3	1	2
B-BOT-302.2	3	2	3	2	1	2	1	2	3	1	3
B-BOT-302.3	3	1	1	1	2	1	1	2	1	1	1
Average	3	1.33	2.33	1.33	1.67	1.67	1.33	2.33	2.33	1	2

CO-PSO Mapping Matrix for Course Code: B-BOT-302					
Cos	PSO1	PSO2	PSO3	PSO4	PSO5
B-BOT-302.1	3	3	1	1	2
B-BOT-302.2	3	3	2	2	3
B-BOT-302.3	3	2	1	2	1
Average	3	2.67	1.33	1.67	2

B-BOT-401: BIOLOGY AND DIVERSITY OF SEED PLANTS-II

Course Objective: The aim of this course is to introduce students to the different concepts of plant taxonomy that icludes naming, classification and basic knowledge about flowering plants

Course Outcomes: At the end of the course students will be able to

B-BOT-401.1 learn and understand the botanical description of plants, nomenclature and terms related to their identification

B-BOT-401.2 discuss the importance of plant taxonomy and taxonomic hierarchy and will understand the Bentham and Hooker classification system

B-BOT-401.3 students will understand the concepts of numerical taxonomy

CO-PO Mapping Matrix for Course Code: B-BOT-401											
COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
B-BOT-401.1	3	2	1	2	3	1	2	3	2	1	2
B-BOT-401.2	3	2	3	1	2	1	1	3	1	1	1
B-BOT-401.3	3	2	3	3	3	3	3	2	2	3	2
Average	3	2	2.33	2	2.67	1.67	2	2.67	1.67	1.67	1.67

CO-PSO Mapping Matrix for Course Code: B-BOT-401					
COs	PSO1	PSO2	PSO3	PSO4	PSO5
B-BOT-401.1	3	1	3	2	2
B-BOT-401.2	3	2	1	1	2
B-BOT-401.3	3	2	3	2	2
Average	3	1.67	2.33	1.67	2

B-BOT-402: PLANT EMBRYOLOGY

Course Objective: The aim of this course is to introduce students to the embryological studies that play important role in plant breeding and crop improvements.

Course Outcomes: At the end of the course students will be able to
B-BOT-402.1 explain the developmental patterns of both vegetative and reproductive organs of plants
B-BOT-402.2 apply knowledge about embryological characters in explaining plant reproductive biology

CO-PO Mapping Matrix for Course Code: B-BOT-402											
COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
B-BOT-402.1	3	1	2	1	1	1	2	2	2	1	1
B-BOT-402.2	3	2	2	1	1	1	2	2	2	1	1
Average	3	1.5	2	1	1	1	2	2	2	1	1

CO-PSO Mapping Matrix for Course Code: B-BOT-402					
Cos	PSO1	PSO2	PSO3	PSO4	PSO5
B-BOT-402.1	3	2	2	2	1
B-BOT-402.2	3	2	2	2	2
Average	3	2	2	2	1.5

B-BOT-403: Biology and diversity of seed plants-I, II, plant taxonomy & plant embryology Practical

Course Objective: The aim of this course is to introduce students to the world of seed plants, taxonomy and embryology
Course Outcomes: At the end of the course students will be able to **B-BOT-403.1** learn and understand the morphology, anatomy, reproductive biology of seed plants **B-BOT-403.2** students will be able to explain important characters and describe flowers in technical terms **B-BOT-403.3** students will understand the embryology of plants

CO-PO Mapping Matrix for Course Code: B-BOT-403										
COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
B-BOT-403.1	3	3	2	1	3	3	2	1	2	1	1
B-BOT-403.2	3	2	3	1	3	3	2	2	2	1	1
B-BOT-403.3	3	3	2	3	3	2	3	3	2	3	3
Average	3	2.67	2.33	1.67	3	2.67	2.33	2	2	1.67	1.67

CO-PSO Mapping Matrix for Course Code: B-BOT-403					
Cos	PSO1	PSO2	PSO3	PSO4	PSO5
B-BOT-403.1	3	1	3	1	2
B-BOT-403.2	1	3	3	1	2
B-BOT-403.3	2	2	1	3	1
Average	2	2	2.33	1.67	1.67

B-BOT-501: Plant Physiology

Course Objective: This course will makes students aware of various plant growth parameters	

Course Outcomes: At the end of the course students will be able to
B-BOT-501.1 Understand plant – water relation and mineral requirements of plants
B-BOT-501.2 Detail of plant movement and photoperiodic responses
B-BOT-501.3 Acknowledge physiology of Photosynthesis and Respiration

CO-PO Mapping Matrix for Course Code: B-BOT-501											
COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
B-BOT-501.1	3	2	2	1	2	3	1	2	2	1	1
B-BOT-501.2	2	3	2	2	3	2	2	1	2	1	2
B-BOT-501.3	3	2	2	3	2	1	2	2	1	2	1
Average	2.6	2.3	2.0	2.0	2.3	2.0	1.6	1.6	1.6	1.3	1.3

CO-PSO Mapping Matrix for Course Code: B-BOT-501					
Cos	PSO1	PSO2	PSO3	PSO4	PSO5
B-BOT-501.1	3	2	2	1	2
B-BOT-501.2	2	3	2	2	1
B-BOT-501.3	2	3	2	2	1
Average	2.3	2.6	2.0	1.6	1.3

B-BOT-502: Ecology

Course Objective: This course provide importance of ecology for human development
Course Outcomes: At the end of the course students will be able to
B-BOT-502.1 Explain the introduction of ecology and importance of various environmental factors
B-BOT-502.2 Know about population growth and ecological adaptations
B-BOT-502.3 Study various types of pollution and phytogeographic zones of India

CO-PO Mapping Matrix for Course Code: B-BOT-502											
COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
B-BOT-502.1	2	3	2	2	1	2	3	2	1	1	2
B-BOT-502.2	3	2	1	2	1	3	1	2	2	1	1
B-BOT-502.3	2	3	2	2	2	3	2	2	1	2	1
Average	2.3	2.6	1.6	2.0	1.3	2.6	2.0	2.0	1.3	1.3	1.3

CO-PSO Mapping Matrix for Course Code: B-BOT-502					
Cos	PSO1	PSO2	PSO3	PSO4	PSO5
B-BOT-502.1	3	2	1	2	1
B-BOT-502.2	2	3	2	1	2
B-BOT-502.3	1	2	2	1	2
Average	2.0	2.3	1.6	1.3	1.6

B-BOT-601: Biochemistry and Plant Biotechnology

Course Objective: The aim of this course is to make Student aware of growth metabolism and plant tissue culture	

Course Outcomes: At the end of the course students will be able to
B-BOT-601.1 Understand basics of enzymology
B-BOT-601.2 Explain the nitrogen and lipid metabolism
B-BOT-601.3 Understand gene cloning and different types of plant tissue culture

CO-PO Mapping Matrix for Course Code: B-BOT-601

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
B-BOT-601.1	3	1	2	2	3	2	3	2	2	2	2
B-BOT-601.2	2	3	2	3	3	1	2	3	2	1	2
B-BOT-601.3	3	2	2	3	2	2	3	2	1	2	2
Average	2.6	2.0	2.0	2.6	2.6	1.6	2.6	2.3	1.6	1.6	2.0

CO-PSO Mapping Matrix for Course Code: B-BOT-601

Cos	PSO1	PSO2	PSO3	PSO4	PSO5
B-BOT-601.1	3	2	2	1	3
B-BOT-601.2	2	3	2	2	1
B-BOT-601.3	3	2	3	2	2
Average	2.6	2.3	2.3	1.6	2.0

B-BOT-602: Economic Botany

Course Objective: The aim of this course is to provide importance of economic plants
Course Outcomes: At the end of the course students will be able to **B-BOT-602.1** Explain description and importance of various types of plants **B-BOT-602.2** Know about various types of timber **B-BOT-602.3** Study cultivation of various important plants

CO-PO Mapping Matrix for Course Code: B-BOT-602

Cos	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
B-BOT-602.1	3	3	2	2	3	3	2	3	2	2	2
B-BOT-602.2	2	3	2	2	3	2	2	3	3	2	1
B-BOT-602.3	3	2	2	3	2	2	3	2	2	2	2
Average	2.6	2.6	2.0	2.3	2.6	2.3	2.3	2.6	2.3	2.0	1.6

CO-PSO Mapping Matrix for Course Code: B-BOT-602

Cos	PSO1	PSO2	PSO3	PSO4	PSO5
B-BOT-602.1	3	2	3	2	2
B-BOT-602.2	2	3	2	2	3
B-BOT-602.3	3	3	2	3	2
Average	2.6	2.6	2.3	2.3	2.3

B-BOT-603: Plant Physiology I, Plant Biochemistry&Biotechnology, Ecology and Economic Botany Practical

Course Objective: The aim of this course is to introduce students to the world of physiology, ecology and environment	
Course Outcomes: At the end of the course students will be able to **B-BOT-603.1** learn and understand the physiology, biochemistry and biotechnological roles of plants **B-BOT-603.2** students will be able to study ecology and its impact on environment **B-BOT-603.3** students will understand the role of plants in human welfare	

CO-PO Mapping Matrix for Course Code: B-BOT-603

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
B-BOT-603.1	3	2	3	3	3	3	2	1	2	1	1
B-BOT-603.2	3	2	3	1	3	3	2	2	2	1	1
B-BOT-603.3	3	3	2	3	3	2	3	3	2	3	3
Average	3	2.33	2.67	2.33	3	2.67	2.33	2	2	1.67	1.67

CO-PSO Mapping Matrix for Course Code: B-BOT-603

Cos	PSO1	PSO2	PSO3	PSO4	PSO5
B-BOT-603.1	3	1	3	1	2
B-BOT-603.2	1	3	3	1	2
B-BOT-603.3	2	2	1	3	1
Average	2	2	2.33	1.67	1.67

Principal
Dyal Singh College
KARNAL

DEPARTMENT OF FORENSIC SCIENCE

PROGRAMME OUTCOMES (POs) AND

COURSE LEARNING OUTCOMES (CLOs)

2023-24

MSC FORENSIC SCIENCE (2023-24)

PROGRAMME OUTCOMES (POs)

PO1 Soft Skills and Working Skills: To comprehend, communicate and execute effectively and efficiently in all of their dealings

PO2 Leadership: To develop abilities to both lead and respect the views, positions and beliefs of others and to plan and manage effectively.

PO3 Innovativeness and Entrepreneurship: To explore issues and problems that needs solutions with entrepreneurial orientation.

PO4 Ethics and Values: To recognize, appreciate and follow ethical standards in all walks of life.

PO5 Adaptability and Sociability: Ready to understand and adapt the changing environment.

PO6 Research and Analytical abilities: To explore, analyses and provide solutions on emerging issues concerning various fields including public policy.

PO7 Practical exposure and Employability: Exposure to actual working environment leading to employability.

PO8 Environmental Consciousness: In every action, dealing, service and manifestation.

Course Learning Outcomes (CLO)

Msc forensic Science 5th Semester

Name of the Course: Fingerprints and impressions & Analytical methods used in forensic science
After completing this course, the learner will be able to:

1. develop the understanding of theoretical framework of development of various methods of fingerprints.
2. students will develop an understanding of scientific principles of crime scene .
3. investigation and reconstruction , including evidence collection and preservation of fingerprints.
4. Apply/create : students will receive intensive hands on training in forensic laboratory methodologies with respect to the analysis of evidence.

Msc forensic Science 7th Semester

Name of the Course: General forensic science

Course Code – fsc 101

After completing this course, the learner will be able to:

1. show commitment to and preservance in crime analysis experience.
2. students will develop an understanding of scientific principles of crime scene .
3. demonstrate the skills and recognize the benefit of working collaboratively.
4. recognize and consider the ethics of choices and actions.

Name of the Course: Instrumental analysis

Course Code – fsc 102

After completing this course, the learner will be able to:
1. students will receive intensive hands on training in forensic laboratory methodologies with respect to the analysis of evidence.
2. students will develop an understanding of scientific principles of different techniques used in forensic.
3. students can explore more applications of instruments and its advantages and disadvantages.
4. a field of analytical that investigates analytes using scientific instruments.

Name of the Course: Forensic biology and serology

Course Code – fsc 103

After completing this course, the learner will be able to:
1. students learn to analyze and interpret biological evidence using biology and serology techniques..
2. students learn about the legal and ethical aspects of working with biological samples..
3. learn to identify and analyze different body fluids found at a crime scene.
4. learn about dna extraction and the significance of dna profiling in forensic science.

Name of the Course: Forensic Psychology and statistics

Course Code – fsc 104

After completing this course, the learner will be able to:
1. understanding how psychology can be applied to criminal and civil legal issues.
2. learning about legal cases that have helped define the role of psychology in the legal system .
3. exploring human cognition and the mistakes the brain can make.
4. understanding the psychology of eyewitness testimony.

Msc forensic Science 9th Semester

Name of the Course: forensic ballistics and explosives

Course Code – fsc 301

After completing this course, the learner will be able to:
1. learn difference between internal, external and terminal ballistics.
2.different test of GSR analysis.
3. advantages of rifle over improvised.
4. recognize the difference between antemortem and postmortem firing.

Name of the Course: Computer forensic and recent advances

Course Code – fsc 302

After completing this course, the learner will be able to:
1. different type of cyber crimes.
2. scope of biometrics.
3. explaining how operating system manage computer hardware, software and subsystems.
4. identify and analyzing threats, risks and vulnerability assosicated with digital tools.

Name of the Course: DNA profiling

Course Code – fsc 303

After completing this course, the learner will be able to:
1. students learn to analyze and interpret biological evidence using biology and serology techniques.
2. students learn about the legal and ethical aspects of working with biological samples..
3. learn to identify and analyze different body fluids found at a crime scene.
4. learn about DNA extraction and the significance of DNA profiling in forensic science.

Name of the Course: Advances in forensic chemistry -1

Course Code – fsc 304

After completing this course, the learner will be able to:
1. examination of poison cases.
2. identification of adulteration.
3. students learn the fundamental of forensic chemistry including its importance in crime.
4. learn how to analyze evidence using statistical and instrumental methods and draw conclusions.

Name of the Course: Advances in forensic biology -1

Course Code – fsc 305

After completing this course, the learner will be able to:
1. students learn to analyze and interpret biological evidence using biology and serology techniques..
2. students learn about the legal and ethical aspects of working with biological samples..
3. learn to identify and analyze different body fluids found at a crime scene.
4. learn about DNA extraction and the significance of DNA profiling in forensic science.

DYAL SINGH COLLEGE, KARNAL

Name of the Programme: **M.Sc. Forensic Science 5yr Integrated (UG) With Forensic Science (as One Of The Subject)**

Duration (in Years): 3(UG) + 2(PG)

Subject: Forensic Science

PROGRAMME OUTCOMES(POs)		
PO1	Knowledge	Proficiency in demonstrating multidisciplinary knowledge gained during course of study
PO2	Communication	Proficiency to communicate effectively on general and scientific topics with the scientific community and with society at large
PO3	Dealing with problems	Will be able to think critically , analyze, to have rational and research-based knowledge including performing of experiments, analysis and interpretation of data from evidences to deduce opinion
PO4	Modern tool/Instrument usage	Ability to learn and use conventional and latest techniques, skills and modern tools/instruments for scientific practices
PO5	Science and Society	Ability to apply reasoning to assess the different issues related to society and the consequent responsibilities relevant to the professional scientific practices
PO6	Life-Long Learning	Aptitude to apply knowledge and skills that are necessary for participating in learning activities throughout the life
PO7	Ethics	Apply ethical principles and professional responsibilities in scientific and legal practices

PROGRAMME SPECIFIC OUTCOMES (PSOs)	
The objective of the curriculum designed for M.Sc. 5yr Integrated (UG) with Forensic Science course is to develop professional, ethical graduates whose competence in problem-solving, legal analysis and application, quantitative reasoning, investigation and scientific laboratory procedures can be applied to immediate employment or advanced study.	
PSO1	Students will gain knowledge to comprehend the basic knowledge of Forensic Science in resolving the criminal and civil cases by applying fundamental principles of Forensic Science
PSO2	Students will be empowered with skills to identify, examine and evaluate the problems related to Forensic to solve the crime cases.
PSO3	Students will develop subject specific expertise by analytical and experimental work.
PSO4	Students will be capable of using research-based knowledge and research methods with problem solving expertise and robust communication and Scientific inquiry skill with reference to Forensic Science.
PSO5	Forensic specialist youth will come out with a thorough knowledge of Ethics and law with all recent developments and emerging trends in Forensic Science.
PSO6	Students will be trained with excellence in Forensic Science for career in teaching, research, industry and independent Forensic practices.

CO-PSO Mapping Matrix for Course Code UG-FSC-202					
PSO CO	PSO1	PSO2	PSO3	PSO4	PSO5
UG-FSC-202.1	3	3	3	2.5	2
UG-FSC-202.2	2	2	2.5	2.5	3
UG-FSC-202.3	2	3	3	3	2
UG-FSC-202.4	3	2	2.5	3	3
Average	2.5	2.5	2.75	2.75	2.5

UG-FSC-203: PRACTICAL
Course Objectives: To Provide practical information about the different physical evidences followed by handling and preservation.
Course Outcomes: At the end of this course, the student will be able to: UG-FSC-203.1 Learn the examination of diatoms by using optical methods. UG-FSC-203.2 Understand the examination of biological fluids like semen, saliva, etc. UG-FSC-203.3 Students can analyse the patterns of fingerprints and study of features of handwriting. UG-FSC-203.4 Understand the Report writing of a crime scene.

CO-PO Mapping Matrix for Course Code UG-FSC-203							
PO CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7
UG-FSC-203.1	2.5	3	3	3	2	3	3
UG-FSC-203.2	2.5	2	2	2.5	3	3	2
UG-FSC-203.3	3	3	3	3	2	3	3
UG-FSC-203.4	3	2	2	2.5	3	3	2
Average	2.75	2.5	2.5	2.75	2.5	3	2.5

CO-PSO Mapping Matrix for Course Code UG-FSC-203					
PSO CO	PSO1	PSO2	PSO3	PSO4	PSO5
UG-FSC-203.1	3	3	3	2.5	2
UG-FSC-203.2	2.5	2.5	3	3	3
UG-FSC-203.3	2.5	3	2	2.5	2
UG-FSC-203.4	3	2.5	2	3	3
Average	2.75	2.75	2.5	2.75	2.5

UG-FSC-301: Analytical Techniques And Methods Used In Forensic Science
Course Objectives: To Provide knowledge about various instrumental techniques used in Forensic science for analysis of various type of evidences.
Course Outcomes: At the end of this course, the student will be able to: UG-FSC-301.1 Learn the technique and handling of various types of microscopes. UG-FSC-301.2 Understand the basic principle, instrumentation and use of various type of chromatographic techniques. UG-FSC-301.3 Understand the basic principle, instrumentation and use of various type of spectroscopic techniques. UG-FSC-301.4 Learn about the use of various analytical techniques and methods in forensic science examination.

CO-PO Mapping Matrix for Course Code UG-FSC-301

PO / CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7
UG-FSC-301.1	2.5	3	3	2.5	2	3	3
UG-FSC-301.2	3	2	2	2.5	3	3	2
UG-FSC-301.3	2.5	3	3	3	2	3	3
UG-FSC-301.4	3	2	2	3	3	3	2
Average	2.75	2.5	2.5	2.75	2.5	3	2.5

CO-PSO Mapping Matrix for Course Code UG-FSC-301

PSO / CO	PSO1	PSO2	PSO3	PSO4	PSO5
UG-FSC-301.1	3	3	3	2.5	2
UG-FSC-301.2	3	2.5	2	3	3
UG-FSC-301.3	2	3	3	2.5	2
UG-FSC-301.4	2	2.5	2	3	3
Average	2. 5	2.75	2.5	2.75	2.5

UG-FSC-302: QUESTIONED DOCUMENTS AND REPORT WRITING

Course Objectives: The importance of collection, preservation and examining of questioned documents in crime cases.

Course Outcomes: At the end of this course, the student will be able to:

UG-FSC-302.1 Learn about the preliminary examination of questioned documents.

UG-FSC-302.2 Understand about the basic principles of handwriting, general and individual characteristics of handwriting.

UG-FSC-302.3 Learn about various types of forgeries and their detection.

UG-FSC-302.4 Learn about the different stages of investigations, types of offences and components of scientific report writing.

CO-PO Mapping Matrix for Course Code UG-FSC-302

PO / CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7
UG-FSC-302.1	2	3	3	2.5	2	3	3
UG-FSC-302.2	3	3	2	2.5	2	3	2
UG-FSC-302.3	2	3	3	3	2	3	3
UG-FSC-302.4	3	3	2	3	2	3	2
Average	2.5	3	2.5	2.75	2	3	2.5

CO-PSO Mapping Matrix for Course Code UG-FSC-302

PSO / CO	PSO1	PSO2	PSO3	PSO4	PSO5
UG-FSC-302.1	3	3	2	2.5	2
UG-FSC-302.2	3	2.5	2	3	3
UG-FSC-302.3	2	3	2	2.5	2
UG-FSC-302.4	2	2.5	2	3	3
Average	2. 5	2.75	2	2.75	2.5

UG-FSC-401: FORENSIC MEDICINE

Course Objectives: To study the application of medical knowledge in criminal investigation, particularly in establishing the causes of injury or death.

Course Outcomes: At the end of this course, the student will be able to:

UG-FSC-401.1 Learn about the fundamental aspects and scope of medical Jurisprudence, Legal procedure in criminal court.

UG-FSC-401.2 Understand about the medico-legal aspects of death.

UG-FSC-401.3 Learn about various types of injuries and their medico-legal importance.

UG-FSC-401.4 Learn about the different methods of identification of living and dead.

CO-PO Mapping Matrix for Course Code UG-FSC-401

PO / CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7
UG-FSC-401.1	2	3	3	2.5	2	2	3
UG-FSC-401.2	3	3	2	2.5	2	3	2
UG-FSC-401.3	2	3	3	3	2	2	3
UG-FSC-401.4	3	3	2	3	2	3	2
Average	2.5	3	2.5	2.75	2	2.5	2.5

CO-PSO Mapping Matrix for Course Code UG-FSC-401

PSO / CO	PSO1	PSO2	PSO3	PSO4	PSO5
UG-FSC-401.1	3	3	3	2.5	2
UG-FSC-401.2	3	2.5	3	3	3
UG-FSC-401.3	2	3	3	2.5	2
UG-FSC-401.4	2	2.5	3	3	3
Average	2. 5	2.75	3	2.75	2.5

UG-FSC-402: FORENSIC CHEMISTRY AND TOXICOLOGY

Course Objectives: To introduce students about the nature and analysis of evidence related to chemistry and toxicological importance in Forensics.

Course Outcomes: At the end of this course, the student will be able to:

UG-FSC-402.1 Learn about the chemical tests that are being used in Forensic Chemistry.

UG-FSC-402.2 Understand about the general chemistry and analysis of legal and illegal alcoholic substances, evidence related to petroleum products and drugs of abuse, NDPS act.

UG-FSC-402.3 Learn about various types of methods for extraction of poisons.

UG-FSC-402.4 Learn about the medico legal aspects and analysis of different types of toxic substances related to crime like metallic poison, snake venom etc.

CO-PO Mapping Matrix for Course Code UG-FSC-301

PO / CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7
UG-FSC-402.1	2	3	3	2.5	3	2	3
UG-FSC-402.2	3	3	2	2.5	2	3	2
UG-FSC-402.3	2	3	3	3	3	2	3
UG-FSC-402.4	3	3	2	3	2	3	2
Average	2.5	3	2.5	2.75	2.5	2.5	2.5

CO-PSO Mapping Matrix for Course Code UG-FSC-301					
PSO CO	PSO1	PSO2	PSO3	PSO4	PSO5
UG-FSC-402.1	3	3	3	2.5	2
UG-FSC-402.2	3	2.5	2	3	3
UG-FSC-402.3	2	3	3	2.5	2
UG-FSC-402.4	2	2.5	2	3	3
Average	2. 5	2.75	2.5	2.75	2.5

UG-FSC-403: PRACTICALS
Course Objectives: To identify handwriting characters and study natural variations in handwriting. To study alterations, obliterations and erasures in handwriting samples. This course will provide knowledge of various evidence found on crime scenes.
Course Outcomes: At the end of this course, the student will be able to: UG-FSC-403.1 Students can identify class and individual characteristics of handwriting. UG-FSC-403.2 Students can decipher secret writing and can examine the altered documents. UG-FSC-403.3 Students will be able to write a scientific report and interpret it. UG-FSC-403.4 Students can analyse blood spatter patterns and learn how to sketch scenes of crime.

CO-PO Mapping Matrix for Course Code UG-FSC-403							
PO CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7
UG-FSC-403.1	2	3	3	2.5	3	2	3
UG-FSC-403.2	3	3	2	2.5	2	3	2
UG-FSC-403.3	2	3	3	3	3	2	3
UG-FSC-403.4	3	3	2	3	2	3	2
Average	2.5	3	2.5	2.75	2.5	2.5	2.5

CO-PSO Mapping Matrix for Course Code UG-FSC-403					
PSO CO	PSO1	PSO2	PSO3	PSO4	PSO5
UG-FSC-403.1	3	3	3	2.5	2
UG-FSC-403.2	3	2.5	2	3	3
UG-FSC-403.3	2	3	3	2.5	2
UG-FSC-403.4	2	2.5	2	3	3
Average	2. 5	2.75	2.5	2.75	2.5

UG-FSC-501: FINGER PRINTS & IMPRESSIONS
Course Objectives: To Provide knowledge about fingerprints and their types with various chemical and instrumental techniques used in development and analysis of fingerprints and brief introduction   of type of biometric and their application in forensic investigations.
Course Outcomes: At the end of this course, the student will be able to: UG-FSC-501.1 Learn the basics and classification of fingerprints. UG-FSC-501.2 Understand the basic principle, various types of instrumentation used in development of fingerprints. UG-FSC-501.3 Understand the basic principle and procedure of examination of fingerprints. UG-FSC-501.4 Learn about the biometric and their application in Forensic Science.
CO-PO Mapping Matrix for Course Code UG-FSC-501

PO CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7
UG-FSC-501.1	3	3	3	2.5	2	3	3
UG-FSC-501.2	2	2.5	2	2.5	3	3	2
UG-FSC-501.3	3	3	3	3	2	3	3
UG-FSC-501.4	2	2.5	2	3	3	3	2
Average	2.5	2.75	2.5	2.75	2.5	3	2.5

CO-PSO Mapping Matrix for Course Code UG-FSC-501					
PSO CO	PSO1	PSO2	PSO3	PSO4	PSO5
UG-FSC-501.1	3	3	3	2.5	2
UG-FSC-501.2	3	2.5	2	3	3
UG-FSC-501.3	2	3	3	2.5	2
UG-FSC-501.4	2	2.5	2	3	3
Average	2. 5	2.75	2.5	2.75	2.5

UG-FSC-502: Analytical Techniques And Methods Used In Forensic Science - Ii

Course Objectives: This paper aims to provide knowledge about various instrumental techniques used in Forensic science for analysis of various types of evidence.

Course Outcomes: At the end of this course, the student will be able to:
UG-FSC-502.1 Learn the technique and handling of various types of biophysical techniques.
UG-FSC-502.2 Understand the basic principle, instrumentation and use of various types of chromatographic techniques.
UG-FSC-503.3 Understand the basic principle, instrumentation and use of various types of digestion techniques.
UG-FSC-504.4 Learn about the use of various analytical techniques and methods in forensic science examination.

CO-PO Mapping Matrix for Course Code UG-FSC-502							
PO CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7
UG-FSC-502.1	2	3	3	2.5	3	3	3
UG-FSC-502.2	3	2	2	2.5	3	3	2
UG-FSC-502.3	2	3	3	3	3	3	3
UG-FSC-502.4	3	2	2	3	2	3	2
Average	2.5	2.5	2.5	2.75	2.75	3	2.5

CO-PSO Mapping Matrix for Course Code UG-FSC-502					
PSO CO	PSO1	PSO2	PSO3	PSO4	PSO5
UG-FSC-502.1	3	3	2.5	2.5	2
UG-FSC-502.2	3	2.5	2.5	3	3
UG-FSC-502.3	2	3	2.5	2.5	2
UG-FSC-502.4	2	2.5	2.5	3	3
Average	2. 5	2.75	2.5	2.75	2.5

UG-FSC-601: COMPUTER FORENSICS AND BIOMETRICS

Course Objectives: To study the application of computers and the role of digital forensics and the

relationship of digital forensics to traditional forensic science, traditional science and the appropriate use of scientific methods.

Course Outcomes: At the end of this course, the student will be able to:
UG-FSC-601.1 Learn about the fundamental aspects and scope of medical Jurisprudence, Legal procedure in criminal court.
UG-FSC-601.2 Understand about the medico-legal aspects of death.
UG-FSC-601.3 Learn about various types of injuries and their medico-legal importance.
UG-FSC-601.4 Learn about the different methods of identification of living and dead.

CO-PO Mapping Matrix for Course Code UG-FSC-601							
PO CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7
UG-FSC-601.1	2	3	3	2.5	3	2	3
UG-FSC-601.2	3	3	2	2.5	2	3	2
UG-FSC-601.3	2	3	3	3	3	2	3
UG-FSC-601.4	3	3	2	3	2	3	2
Average	2.5	3	2.5	2.75	2.5	2.5	2.5

CO-PSO Mapping Matrix for Course Code UG-FSC-601					
PSO CO	PSO1	PSO2	PSO3	PSO4	PSO5
UG-FSC-601.1	3	3	3	2.5	2
UG-FSC-601.2	3	2.5	2	3	3
UG-FSC-601.3	2	3	3	2.5	2
UG-FSC-601.4	2	2.5	2	3	3
Average	2. 5	2.75	2.5	2.75	2.5

UG-FSC-602: Advanced Forensic Serology and DNA Forensics
Course Objectives: A brief introduction of basic principles underlying modern applications of biology in forensic science. The course will explore the science of forensic biology, serology with laboratory tests that are used to investigate crimes involving DNA, blood, and other body fluids. Focuses on the issues related to DNA fingerprinting as well.
Course Outcomes: At the end of this course, the student will be able to: UG-FSC-602.1 Learn about Forensic Biology and its application in Forensic Science. UG-FSC-602.2 Understanding the biological and serological evidences UG-FSC-602.3 Obtain the knowledge about the preliminary and confirmatory examination of biological fluids.. UG-FSC-602.4 Learn about the medico legal aspects of various crimes i.e. rape, murder, assault etc

CO-PO Mapping Matrix for Course Code UG-FSC-602							
PO CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7
UG-FSC-602.1	2	3	3	2.5	2.75	2	3
UG-FSC-602.2	3	3	2	2.5	2.75	3	2
UG-FSC-602.3	2	3	3	3	2.75	2	3
UG-FSC-602.4	3	3	2	3	2.75	3	2
Average	2.5	3	2.5	2.75	2.75	2.5	2.5

CO-PSO Mapping Matrix for Course Code UG-FSC-602

CO \ PSO	PSO1	PSO2	PSO3	PSO4	PSO5
UG-FSC-602.1	3	3	2.5	2.5	2
UG-FSC-602.2	3	2.5	3	3	3
UG-FSC-602.3	2	3	2.5	2.5	2
UG-FSC-602.4	2	2.5	3	3	3
Average	2. 5	2.75	2.75	2.75	2.5

UG-FSC-603: PRACTICALS

Course Objectives: This paper aims to let students' deals with various types of cyber crimes and the handling and examination of cyber evidence. Students will also explore the analysis methods and instrumentation of various biological, serological and fingerprint evidence .

Course Outcomes: At the end of this course, the student will be able to:

UG-FSC-603.1 identifies type of cyber crime, analysis of cyber evidence.

UG-FSC-603.2 made to understand about the risks and measures in the cyber world.

UG-FSC-603.3 to examine and give opinion on fingerprints.

UG-FSC-603.4 to study and analyze biological evidences

CO-PO Mapping Matrix for Course Code UG-FSC-603							
CO \ PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7
UG-FSC-603.1	2	3	3	2.5	2.5	2	3
UG-FSC-603.2	3	3	2	2.5	3	3	2
UG-FSC-603.3	2	3	3	3	2.5	2	3
UG-FSC-603.4	3	3	2	3	3	3	2
Average	2.5	3	2.5	2.75	2.75	2.5	2.5

CO-PSO Mapping Matrix for Course Code UG-FSC-603					
CO \ PSO	PSO1	PSO2	PSO3	PSO4	PSO5
UG-FSC-603.1	3	3	3	2.5	2
UG-FSC-603.2	3	2.5	3	3	3
UG-FSC-603.3	2	3	3	2.5	2
UG-FSC-603.4	2	2.5	3	3	3
Average	2. 5	2.75	3	2.75	2.5

DYAL SINGH COLLEGE, KARNAL

Name of the Programme: **M.Sc. Forensic Science 5yr Integrated (PG)**

Duration (in years) : 3(UG) + 2(PG)

Subject: Forensic Science

PROGRAMME OUTCOMES(POs)		
PO1	Knowledge	Proficiency in demonstrating multidisciplinary knowledge gained during course of study
PO2	Communication	Proficiency to communicate effectively on general and scientific topics with the scientific community and with society at large
PO3	Dealing with problems	Will be able to think critically , analyze, to have rational and research-based knowledge including performing of experiments, analysis and interpretation of data from evidences to deduce opinion
PO4	Modern tool/Instrument usage	Ability to learn and use conventional and latest techniques, skills and modern tools/instruments for scientific practices
PO5	Science and Society	Ability to apply reasoning to assess the different issues related to society and the consequent responsibilities relevant to the professional scientific practices
PO6	Life-Long Learning	Aptitude to apply knowledge and skills that are necessary for participating in learning activities throughout the life
PO7	Ethics	Apply ethical principles and professional responsibilities in scientific and legal practices
PO8	Research	Ability to do research in various thrust areas of Forensic Science by applying knowledge gained through practical and minor research project.

PROGRAMME SPECIFIC OUTCOMES (PSOs)	
The objective of the curriculum designed for M.Sc. 5yr Integrated (UG) with Forensic Science course is to develop professional, ethical graduates whose competence in problem-solving, legal analysis and application, quantitative reasoning, investigation and scientific laboratory procedures can be applied to immediate employment or advanced study.	
PSO1	Students will gain knowledge of the basic knowledge of Forensic Science to be used in resolving criminal and civil cases.
PSO2	Students will be empowered with skills to identify, examine and evaluate the problems related to Forensic to solve the crime cases.
PSO3	Students will develop subject specific expertise in analytical and experimental work.
PSO4	Students will be capable of using research and experimental based knowledge and research methods in problem solving expertise and robust communication and Scientific inquiry skills with reference to Forensic Science.
PSO5	These students will come out as Forensic specialist youth with a thorough knowledge of Ethics and law with all recent developments and emerging trends in Forensic Science.
PSO6	Students will be skilled with excellence in Forensic Science so that they can make a career in teaching, research, industry and independent Forensic practices.

PG-FSC-101: General Forensic Science

Course Objectives: To Provide knowledge about the basics of the field of Forensic Science and familiarize students to crime scene management, including the basics of investigation, Documentation of Crime Scene and Basic Forensic Principles and Laws.

Course Outcomes: At the end of this course, the student will be able to:

PG-FSC-101.1 Learn the different domains of forensic science.

PG-FSC-101.2 Understand about the history and background of Forensic Science.

PG-FSC-101.3 Describe reconstruction of scene of crime, basic principles of Crime Scene Documentation and its Importance.

PG-FSC-101.4 Learn about the ethical issues in forensic science.

CO-PO Mapping Matrix for Course Code PG-FSC-101								
PO CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8
PG-FSC-101.1	3	3	3	3	2	3	3	2
PG-FSC-101.2	3	3	3	2	3	3	3	3
PG-FSC-101.3	3	3	3	3	2	3	3	2
PG-FSC-101.4	3	3	3	2	3	3	3	3
Average	3	3	3	2.5	2.5	3	3	2.5

CO-PSO Mapping Matrix for Course Code PG-FSC-101					
PSO CO	PSO1	PSO2	PSO3	PSO4	PSO5
PG-FSC-101.1	3	3	3	3	2
PG-FSC-101.2	3	3	3	2	3
PG-FSC-101.3	3	3	3	3	2
PG-FSC-101.4	3	3	3	2	3
Average	3	3	3	2.5	2.5

PG-FSC-102: Instrumental Analysis- I

Course Objectives: To Provide knowledge about the basic analytical techniques which are used in examination and evaluation of evidences encountered in Forensic investigations.

Course Outcomes: At the end of this course, the student will be able to:

PG-FSC-102.1 Understand about the principle and working of optical and electronic microscope.

PG-FSC-102.2 Obtain knowledge about the concept of different chromatographic techniques.

PG-FSC-102.3 Learn the basics of Spectroscopy, sources of radiation, their utility and limitations.

PG-FSC-102.4 Learn handling of different instruments and tools used in Forensic Science.

CO-PO Mapping Matrix for Course Code PG-FSC-102								
PO CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8
PG-FSC-102.1	3	3	3	3	2	3	3	3
PG-FSC-102.2	2.5	3	3	2	3	3	2	2
PG-FSC-102.3	2.5	3	3	3	2	3	3	3
PG-FSC-102.4	3	3	3	2	3	3	2	2
Average	2.75	3	3	2.5	2.5	3	2.5	2.5

CO-PSO Mapping Matrix for Course Code PG-FSC-102					
PSO	PSO1	PSO2	PSO3	PSO4	PSO5

CO					
PG-FSC-102.1	3	3	2.5	3	2
PG-FSC-102.2	2	3	2.5	2	3
PG-FSC-102.3	2	3	3	3	2
PG-FSC-102.4	3	3	3	2	3
Average	2.5	3	2.75	2.5	2.5

PG-FSC-103: Forensic Biology and Serology

Course Objectives: The Paper aims to make students understand the Importance of biological material and its properties to aid in forensic investigations. The subject will also explore the learners regarding the analysis procedures of various evidences of related to animal or plant origin

Course Outcomes: At the end of this course, the student will be able to:

PG-FSC-103.1 Learn about the Biological Evidences, types and their Biological properties..

PG-FSC-103.2 Examine of biological evidence like biological fluids, hair, fibres, diatoms recovered from crime scenes.

PG-FSC-103.3 Understand the wildlife forensics and investigations in wildlife crimes.

PG-FSC-103.4 Learn about the entomology and its importance in PMI determination.

CO-PO Mapping Matrix for Course Code PG-FSC-103								
PO CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8
PG-FSC-103.1	2.5	3	3	3	2	3	3	3
PG-FSC-103.2	2.5	3	2	3	3	3	3	2
PG-FSC-103.3	3	3	3	3	2	3	3	3
PG-FSC-103.4	3	3	2	3	3	3	3	2
Average	2.75	3	2.5	3	2.5	3	3	2.5

CO-PSO Mapping Matrix for Course Code PG-FSC-103					
PSO CO	PSO1	PSO2	PSO3	PSO4	PSO5
PG-FSC-103.1	3	3	3	2.5	2
PG-FSC-103.2	2	2	3	2.5	3
PG-FSC-103.3	2	3	3	3	2
PG-FSC-103.4	3	2	3	3	3
Average	2.5	2.5	3	2.75	2.5

PG-FSC-104: Forensic Psychology and Statistics

Course Objectives: The Paper aims to give introduction to the human behaviour and importance of psychological aspects in criminal trials and uses of statistics for veritable reporting of findings..

Course Outcomes: At the end of this course, the student will be able to:

PG-FSC-104.1 Learn the general principles of Forensic Psychology.

PG-FSC-104.2 made skilled in conducting tests of interrogations like polygraph test and brain mapping

etc.

PG-FSC-104.3 Exposed to Statistics Principles and their implementation in Forensics.

PG-FSC-104.4 Learn about the research methodology, sampling methods, statistical analysis of data

CO-PO Mapping Matrix for Course Code PG-FSC-104							
PO / CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7
PG-FSC-104.1	2.5	2	3	2	2	3	3
PG-FSC-104.2	2.5	2	2	2	3	3	2
PG-FSC-104.3	3	2	3	2	2	3	3
PG-FSC-104.4	3	2	2	2	3	3	2
Average	2.75	2	2.5	2	2.5	3	2.5

CO-PSO Mapping Matrix for Course Code PG-FSC-104					
PSO / CO	PSO1	PSO2	PSO3	PSO4	PSO5
PG-FSC-104.1	3	3	3	2.5	2
PG-FSC-104.2	2	2	3	2.5	3
PG-FSC-104.3	2	3	3	3	2
PG-FSC-104.4	3	2	3	3	3
Average	2.5	2.5	3	2.75	2.5

PG-FSC-105: PRACTICAL(Based on Papers PG-FSC 101 & PG-FSC 102)
Course Objectives: To Provide practical knowledge to students about the crime scene investigation and reconstruction, polygraph test and chromatographic techniques.
Course Outcomes: At the end of this course, the student will be able to: PG-FSC-105.1 Learn the examination of different Crime Scenes and their Management.   PG-FSC-105.2 Understand the importance of Collection & Packaging Procedure and Chain of Custody   PG-FSC-105.3 Students will be exposed to different types of Microscopes and their handling.   PG-FSC-105.4 Understand the Report writing of a crime scene.

CO-PO Mapping Matrix for Course Code PG-FSC-105							
PO / CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7
PG-FSC-105.1	2.5	2	3	3	2	3	3
PG-FSC-105.2	2.5	2	2	3	3	3	2
PG-FSC-105.3	3	2	3	3	2	3	3
PG-FSC-105.4	3	2	2	3	3	3	2
Average	2.75	2	2.5	3	2.5	3	2.5

CO-PSO Mapping Matrix for Course Code PG-FSC-105					
PSO / CO	PSO1	PSO2	PSO3	PSO4	PSO5
PG-FSC-105.1	3	3	3	2.5	2
PG-FSC-105.2	2.5	2.5	3	3	3
PG-FSC-105.3	2.5	3	3	2.5	2
PG-FSC-105.4	3	2.5	3	3	3

Average	2.75	2.75	3	2.75	2.5	

PG-FSC-106: PG-FSC-105: PRACTICAL(Based on Papers PG-FSC 103 & PG-FSC 104)
Course Objectives: The Paper aims to make students aware of Biological evidence , their Importance and examination procedure.
Course Outcomes: At the end of this course, the student will be able to: PG-FSC-106.1 Learn about practical knowledge on Forensic analysis of biological samples like hair, fibres etc. for personal identification. PG-FSC-106.2 Identify and examine botanical evidence of Forensic interest. PG-FSC-106.3 Examine Biological Fluids. PG-FSC-106.4 Learn about the use of various analytical techniques and methods used in forensic Biology.

CO-PO Mapping Matrix for Course Code PG-FSC-106								
PO CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8
PG-FSC-106.1	3	3	3	2.5	2	3	3	3
PG-FSC-106.2	3	3	2	2.5	3	3	2	2
PG-FSC-106.3	3	3	3	3	2	3	3	3
PG-FSC-106.4	3	3	2	3	3	3	2	2
Average	3	3	2.5	2.75	2.5	3	2.5	2.5

CO-PSO Mapping Matrix for Course Code PG-FSC-106					
PSO CO	PSO1	PSO2	PSO3	PSO4	PSO5
PG-FSC-106.1	3	3	3	2.5	2
PG-FSC-106.2	3	2.5	3	3	3
PG-FSC-106.3	2	3	3	2.5	2
PG-FSC-106.4	2	2.5	3	3	3
Average	2. 5	2.75	3	2.75	2.5

PG-FSC-201: FORENSIC CHEMISTRY AND TOXICOLOGY
Course Objectives: The Paper aims to make students aware about the importance and analysis of toxicological and chemical evidences.
Course Outcomes: At the end of this course, the student will be able to: PG-FSC-102.1 Learn about the analysis of alcohol and non-alcoholic beverages. PG-FSC-102.2 Learn about the analysis of trace evidences and petroleum products. PG-FSC-102.3 Introduction to drugs of abuse and the legal perspective of NDPS Act. PG-FSC-102.4 Learn about the different kinds of poisons followed by the pharmacokinetics.

CO-PO Mapping Matrix for Course Code PG-FSC-201								
PO CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8

PG-FSC-102.1	3	3	3	2.5	2	3	3	3
PG-FSC-102.2	3	3	2	2.5	3	3	2	2
PG-FSC-102.3	3	3	3	3	2	3	3	3
PG-FSC-102.4	3	3	2	3	3	3	2	2
Average	3	3	2.5	2.75	2.5	3	2.5	2.5

CO-PSO Mapping Matrix for Course Code PG-FSC-201					
PSO CO	PSO1	PSO2	PSO3	PSO4	PSO5
PG-FSC-102.1	3	3	3	2.5	2
PG-FSC-102.2	3	2.5	3	3	3
PG-FSC-102.3	2	3	3	2.5	2
PG-FSC-102.4	2	2.5	3	3	3
Average	2. 5	2.75	3	2.75	2.5

PG-FSC-202: INSTRUMENTAL ANLYSIS-II
Course Objectives: The Paper aims to make students aware about the different biochemical and immunochemical techniques used in Forensic DNA analysis
Course Outcomes: At the end of this course, the student will be able to: PG-FSC-202.1 Learn about isolation of DNA and RNA with the process of amplification. PG-FSC-202.2 Learn about the concept of antigen-antibody interaction with techniques like ELISA and RIA. PG-FSC-202.3Learn about the various biophysical techniques like electrophoresis and centrifugation. . PG-FSC-202.4 Learn about the enzyme kinetics.

CO-PO Mapping Matrix for Course Code PG-FSC-202								
PO CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8
PG-FSC-202.1	3	3	3	2.5	2	3	3	3
PG-FSC-202.2	3	3	2	2.5	3	3	2	2
PG-FSC-202.3	3	3	3	3	2	3	3	3
PG-FSC-202.4	3	3	2	3	3	3	2	2
Average	3	3	2.5	2.75	2.5	3	2.5	2.5

CO-PSO Mapping Matrix for Course Code PG-FSC-202					
PSO CO	PSO1	PSO2	PSO3	PSO4	PSO5
PG-FSC-202.1	3	3	3	2.5	2
PG-FSC-202.2	3	2.5	3	3	3
PG-FSC-202.3	2	3	3	2.5	2
PG-FSC-202.4	2	2.5	3	3	3
Average	2. 5	2.75	3	2.75	2.5

PG-FSC-203: QUESTIONED DOCUMENT EXAMINATION

Course Objectives: The Paper aims to make students aware about the nature of examination performed in the field of Questioned Documents.

Course Outcomes: At the end of this course, the student will be able to:

PG-FSC-203.1 Learn about principles of handwriting and the different features associated with it.

PG-FSC-203.2 Examination and methods of alterations, obliterations performed in case of suspected documents.

PG-FSC-203.3 Study about the Presentation of Expert evidence in court of law.

PG-FSC-203.4 Learn about the examination of seal, stamp and counterfeit currency.

CO-PO Mapping Matrix for Course Code PG-FSC-203								
PO CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8
PG-FSC-203.1	3	3	3	2.5	2	3	3	3
PG-FSC-203.2	3	3	2	2.5	3	3	2	2
PG-FSC-203.3	3	3	3	3	2	3	3	3
PG-FSC-203.4	3	3	2	3	3	3	2	2
Average	3	3	2.5	2.75	2.5	3	2.5	2.5

CO-PSO Mapping Matrix for Course Code PG-FSC-203					
PSO CO	PSO1	PSO2	PSO3	PSO4	PSO5
PG-FSC-203.1	3	3	3	2.5	2
PG-FSC-203.2	3	2.5	3	3	3
PG-FSC-203.3	2	3	3	2.5	2
PG-FSC-03.4	2	2.5	3	3	3
Average	2. 5	2.75	3	2.75	2.5

PG-FSC-204: FORENSIC MEDICINE AND ANTHROPOLOGY

Course Objectives: The Paper aims to make students aware about the medical knowledge required to establish the cause of death and identification of human remains on the basis of skeletal remains.

Course Outcomes: At the end of this course, the student will be able to:

PG-FSC-204.1 Learn about the characteristics and causes of death with estimation of time since death.

PG-FSC-204.2 Study about the medico legal importance of various injuries.

PG-FSC-204.3 Study of determination of age, sex and stature from skeletal remains.

PG-FSC-204.4 Learn about the techniques of personal identification.

CO-PO Mapping Matrix for Course Code PG-FSC-204								
PO CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8
PG-FSC-204.1	3	3	3	2.5	2	3	3	3
PG-FSC-204.2	3	3	2	2.5	3	3	2	2
PG-FSC-204.3	3	3	3	3	2	3	3	3
PG-FSC-204.4	3	3	2	3	3	3	2	2
Average	3	3	2.5	2.75	2.5	3	2.5	2.5

CO-PSO Mapping Matrix for Course Code PG-FSC-204					
PSO CO	PSO1	PSO2	PSO3	PSO4	PSO5
PG-FSC-204.1	3	3	3	2.5	2
PG-FSC-204.2	3	2.5	3	3	3
PG-FSC-204.3	2	3	3	2.5	2
PG-FSC-204.4	2	2.5	3	3	3
Average	2. 5	2.75	3	2.75	2.5

PG-FSC- PG-FSC-205: BASICS OF FORENSIC SCIENCE (OPEN ELECTIVE)
Course Objectives: The Paper aims to make students aware
Course Outcomes: At the end of this course, the student will be able to: PG-FSC-205.1 Learn about the history, development and need of forensic science. PG-FSC-205.2 Study about the basics of the science of fingerprinting. PG-FSC-205.3 Learn about the importance of forensic physics and the examination of evidences related to it. Study about the handling and examination of various types of chemical and toxicological evidences. PG-FSC-205.4 Learn about the concepts of serological analysis and DNA fingerprinting.

CO-PO Mapping Matrix for Course Code PG-FSC-205								
PO CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8
PG-FSC-205.1	3	3	3	2.5	2	3	3	3
PG-FSC-205.2	3	3	2	2.5	3	3	2	2
PG-FSC-205.3	3	3	3	3	2	3	3	3
PG-FSC-205.4	3	3	2	3	3	3	2	2
Average	3	3	2.5	2.75	2.5	3	2.5	2.5

CO-PSO Mapping Matrix for Course Code PG-FSC-205					
PSO CO	PSO1	PSO2	PSO3	PSO4	PSO5
PG-FSC-205.1	3	3	3	2.5	2
PG-FSC-205.2	3	2.5	3	3	3
PG-FSC-205.3	2	3	3	2.5	2
PG-FSC-205.4	2	2.5	3	3	3
Average	2. 5	2.75	3	2.75	2.5

PG-FSC-207: PRACTICAL(Based on Papers PG-FSC-201 & PG-FSC-202)

Course Objectives: The Paper aims to make students aware about the laboratory analysis of chemicals and toxicological evidences.

Course Outcomes: At the end of this course, the student will be able to:

PG-FSC-207.1 Learn about practical knowledge on chemical analysis of phenolphthalein in trap cases.

PG-FSC-207.2 Learn about the preliminary and confirmatory analysis of metallic poisons

PG-FSC-207.3 Separation of drugs based on TLC method

PG-FSC-207.4 Examination and evaluation of estimation of ethanol.

CO-PO Mapping Matrix for Course Code PG-FSC-207								
PO CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8
PG-FSC-207.1	3	3	3	2.5	2	3	3	3
PG-FSC-207.2	3	3	2	2.5	3	3	2	2
PG-FSC-207.3	3	3	3	3	2	3	3	3
PG-FSC-207.4	3	3	2	3	3	3	2	2
Average	3	3	2.5	2.75	2.5	3	2.5	2.5

CO-PSO Mapping Matrix for Course Code PG-FSC-207					
PSO CO	PSO1	PSO2	PSO3	PSO4	PSO5
PG-FSC-207.1	3	3	3	2.5	2
PG-FSC-207.2	3	2.5	3	3	3
PG-FSC-207.3	2	3	3	2.5	2
PG-FSC-207.4	2	2.5	3	3	3
Average	2. 5	2.75	3	2.75	2.5

PG-FSC-208: PRACTICAL(Based on Papers PG-FSC-203 & PG-FSC-204)

Course Objectives: The Paper aims to make students aware of practical knowledge regarding examination of questioned documents and skeletal analysis.

Course Outcomes: At the end of this course, the student will be able to:

PG-FSC-208.1 Learn about practical knowledge on normal and disguised handwriting.

PG-FSC-208.2 Detection of different types of forgeries.

PG-FSC-208.3 Examine printed and indented handwriting.

PG-FSC-208.4 Learn about the determination of sex from skull and pelvis and stature determination from long bones.

CO-PO Mapping Matrix for Course Code PG-FSC-208								
PO CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8
PG-FSC-208.1	3	3	3	2.5	2	3	3	3
PG-FSC-208.2	3	3	2	2.5	3	3	2	2
PG-FSC-208.3	3	3	3	3	2	3	3	3
PG-FSC-208.4	3	3	2	3	3	3	2	2
Average	3	3	2.5	2.75	2.5	3	2.5	2.5

CO-PSO Mapping Matrix for Course Code PG-FSC-208					
PSO CO	PSO1	PSO2	PSO3	PSO4	PSO5
PG-FSC-208.1	3	3	3	2.5	2
PG-FSC-208.2	3	2.5	3	3	3
PG-FSC-208.3	2	3	3	2.5	2
PG-FSC-208.4	2	2.5	3	3	3
Average	2. 5	2.75	3	2.75	2.5

PG-FSC- PG-FSC-301: FORENSIC BALLISTICS AND EXPLOSIVES

Course Objectives: The Paper aims to make students aware of nature and scientific examination of evidences of firearms and ammunition.

Course Outcomes: At the end of this course, the student will be able to:

PG-FSC-301.1 Learn about the history, classification and characteristics of firearms and ammunitions.

PG-FSC-301.2 Study about the basics of the forensic ballistics and measurements of trajectory parameters.

PG-FSC-301.3 Learn about firearm injuries. Firearms and ammunition linkage with the crime scene. Reconstruction of shooting incidence.

PG-FSC-301.4 Learn about explosives and their classification, types and composition.

CO-PO Mapping Matrix for Course Code PG-FSC-301								
PO CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8
PG-FSC-301.1	3	3	3	2.5	2	3	3	3
PG-FSC-301.2	3	3	2	2.5	3	3	2	2
PG-FSC-301.3	3	3	3	3	2	3	3	3
PG-FSC-301.4	3	3	2	3	3	3	2	2
Average	3	3	2.5	2.75	2.5	3	2.5	2.5

CO-PSO Mapping Matrix for Course Code PG-FSC-301					
PSO CO	PSO1	PSO2	PSO3	PSO4	PSO5
PG-FSC-301.1	3	3	3	2.5	2
PG-FSC-301.2	3	2.5	3	3	3
PG-FSC-301.3	2	3	3	2.5	2
PG-FSC-301.4	2	2.5	3	3	3
Average	2. 5	2.75	3	2.75	2.5

PG-FSC- PG-FSC-302: COMPUTER FORENSIC AND RECENT ADVANCES

Course Objectives: The Paper aims to make students aware of various computer and internet related crimes.

Course Outcomes: At the end of this course, the student will be able to:

PG-FSC-302.1 Learn about the basis of computer and types of computer crimes.

PG-FSC-302.2 Study about various cyber crimes and investigation of cyber crimes.

PG-FSC-302.3 Fundamental of Computer Security and recent advances in computer forensics. Reconstruction of shooting incidence.

PG-FSC-302.4 Learn about Quality Management (ISO/ IEC-17025, NABL) explosives and their classification, types and composition.
PG-FSC-302.5 Learn about different types of biometric tools.
PG-FSC-302.6 Learn about Intellectual property right and IT act 2000.

CO-PO Mapping Matrix for Course Code PG-FSC-302								
PO CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8
PG-FSC-302.1	3	3	3	2.5	2	3	3	3
PG-FSC-302.2	3	3	2	2.5	3	3	2	2
PG-FSC-302.3	3	3	3	3	2	3	3	3
PG-FSC-302.4	3	3	2	3	3	3	2	2
PG-FSC-302.5	3	3	3	3	3	3	3	3
PG-FSC-302.6	3	3	2	3	3	3	2	2
Average	3	3	2.5	2.75	2.5	3	2.5	2.5

CO-PSO Mapping Matrix for Course Code PG-FSC-302					
PSO CO	PSO1	PSO2	PSO3	PSO4	PSO5
PG-FSC-302.1	3	3	3	2.5	2
PG-FSC-302.2	3	2.5	3	3	3
PG-FSC-302.3	2	3	3	2.5	2
PG-FSC-302.4	2	2.5	3	3	3
PG-FSC-302.5					
PG-FSC-302.6					
Average	2. 5	2.75	3	2.75	2.5

PG-FSC- PG-FSC-303: DNA PROFILING
Course Objectives: To introduce students about the basic concepts of DNA fingerprinting and issues related to examination of evidences submitted in criminal cases.
Course Outcomes: At the end of this course, the student will be able to: PG-FSC-303.1 Learn about the Human chromosomes and karyotype and Forensic DNA Profiling. PG-FSC-303.2 Study about basic Genotyping VNTR, STR, SNPs polymorphism PG-FSC-303.3 Learn about the Methods of DNA profiling and gender identification. PG-FSC-303.4 Learn about DNA Amplification (PCR) and blotting techniques. PG-FSC-303.5 Learn about DNA sample preparation and Nucleic acid hybridization techniques. PG-FSC-303.6 Learn about forensic issues regarded DNA issues.

CO-PO Mapping Matrix for Course Code PG-FSC-303								
PO CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8
PG-FSC-303.1	3	3	3	2.5	2	3	3	3
PG-FSC-303.2	3	3	2	2.5	3	3	2	2
PG-FSC-303.3	3	3	3	3	2	3	3	3
PG-FSC-303.4	3	3	2	3	3	3	2	2
PG-FSC-303.5	3	3	3	3	3	3	3	3
PG-FSC-303.6	3	3	2	3	3	3	2	2
Average	3	3	2.5	2.75	2.5	3	2.5	2.5

CO-PSO Mapping Matrix for Course Code PG-FSC-303					
PSO / CO	PSO1	PSO2	PSO3	PSO4	PSO5
PG-FSC-303.1	3	3	3	2.5	2
PG-FSC-303.2	3	2.5	3	3	3
PG-FSC-303.3	2	3	3	2.5	2
PG-FSC-303.4	2	2.5	3	3	3
PG-FSC-303.5					
PG-FSC-303.6					
Average	2. 5	2.75	3	2.75	2.5

PG-FSC- PG-FSC-304: ADVANCES IN FORENSIC CHEMISTRY –I

Course Objectives: The Paper aims to make students aware of alcoholic products, adulteration in petroleum etc and detailed analysis of evidences related to Forensic chemistry

Course Outcomes: At the end of this course, the student will be able to:
PG-FSC-304.1 Learn about the descriptive analysis of different adulterants in liquors used in Forensic Chemistry.
PG-FSC-304.2 Study about detailed process of extraction and isolation of drugs/ poisons from samples related to forensic toxicology.
PG-FSC-304.3 Learn about the recent methods of sample extraction from body fluids.
PG-FSC-304.4 Learn about Analysis of gold & other metals in cheating cases.

CO-PO Mapping Matrix for Course Code PG-FSC-304								
PO / CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8
PG-FSC-304.1	3	3	3	2.5	2	3	3	3
PG-FSC-304.2	3	3	2	2.5	3	3	2	2
PG-FSC-304.3	3	3	3	3	2	3	3	3
PG-FSC-304.4	3	3	2	3	3	3	2	2
Average	3	3	2.5	2.75	2.5	3	2.5	2.5

CO-PSO Mapping Matrix for Course Code PG-FSC-304					
PSO / CO	PSO1	PSO2	PSO3	PSO4	PSO5
PG-FSC-304.1	3	3	3	2.5	2
PG-FSC-304.2	3	2.5	3	3	3
PG-FSC-304.3	2	3	3	2.5	2
PG-FSC-304.4	2	2.5	3	3	3
Average	2. 5	2.75	3	2.75	2.5

PG-FSC- PG-FSC-305: ADVANCES IN FORENSIC BIOLOGY- I

Course Objectives: The Paper aims to make students aware of basics of biological material and its properties to aid in forensic investigations.

Course Outcomes: At the end of this course, the student will be able to:
PG-FSC-305.1 Learn about the insect development and geographical distribution for assistance in estimating the time since death and locating the probable crime scene.
 PG-FSC-305.2 Study about analysis of various evidences of animal or plant origin.
PG-FSC-305.3 Learn about information of poaching and hunting of protected animal species and trade in international market.

PG-FSC-305.4 Learn about wildlife forensics.

CO-PO Mapping Matrix for Course Code PG-FSC-305

PO CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8
PG-FSC-305.1	3	3	3	2.5	2	3	3	3
PG-FSC-305.2	3	3	2	2.5	3	3	2	2
PG-FSC-305.3	3	3	3	3	2	3	3	3
PG-FSC-305.4	3	3	2	3	3	3	2	2
Average	3	3	2.5	2.75	2.5	3	2.5	2.5

CO-PSO Mapping Matrix for Course Code PG-FSC-305

PSO CO	PSO1	PSO2	PSO3	PSO4	PSO5
PG-FSC-305.1	3	3	3	2.5	2
PG-FSC-305.2	3	2.5	3	3	3
PG-FSC-305.3	2	3	3	2.5	2
PG-FSC-305.4	2	2.5	3	3	3
Average	2. 5	2.75	3	2.75	2.5

PG-FSC- PG-FSC-306: METHODS OF SOLVING FORENSIC CASES (OPEN ELECTIVE)

Course Objectives: The Paper aims to introduce the students with the various methods which are being used in Forensic Investigations

Course Outcomes: At the end of this course, the student will be able to:
PG-FSC-306.1 Learn about various Forensic examinations conducted in the laboratories.
PG-FSC-306.2 Study about better implementation of scientific principles in criminal cases.
PG-FSC-306.3 Learn about methods of personal identification and their importance.
PG-FSC-306.4 Learn about forensic odontology, forensic medicine and writing examination.

CO-PO Mapping Matrix for Course Code PG-FSC-306

PO CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8
PG-FSC-306.1	3	3	3	2.5	2	3	3	3
PG-FSC-306.2	3	3	2	2.5	3	3	2	2
PG-FSC-306.3	3	3	3	3	2	3	3	3
PG-FSC-306.4	3	3	2	3	3	3	2	2
Average	3	3	2.5	2.75	2.5	3	2.5	2.5

CO-PSO Mapping Matrix for Course Code PG-FSC-306

PSO CO	PSO1	PSO2	PSO3	PSO4	PSO5
PG-FSC-306.1	3	3	3	2.5	2
PG-FSC-306.2	3	2.5	3	3	3
PG-FSC-306.3	2	3	3	2.5	2
PG-FSC-306.4	2	2.5	3	3	3
Average	2. 5	2.75	3	2.75	2.5

PG-FSC-307: PRACTICAL(Based on Papers PG-FSC-301 & PG-FSC-302 & PG-FSC-303)

Course Objectives: The Paper aims to make students aware about the laboratory analysis of firearms and ammunitions.

Course Outcomes: At the end of this course, the student will be able to:

PG-FSC-307.1 Learn about practical knowledge on fired bullets and cartridge cases.

PG-FSC-307.2 Learn to determine range of firing and examination of Firearms injuries.

PG-FSC-307.3 Identification of explosives by TLC methods

PG-FSC-307.4 Learn about Image processing using various tools and phishing case report.

PG-FSC-307.5 Learn about the preparation of human karyotype and extraction of DNA from body fluids.

CO-PO Mapping Matrix for Course Code PG-FSC-307								
PO CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8
PG-FSC-307.1	3	3	3	2.5	2	3	3	3
PG-FSC-307.2	3	3	2	2.5	3	3	2	2
PG-FSC-307.3	3	3	3	3	2	3	3	3
PG-FSC-307.4	3	3	2	3	3	3	2	2
PG-FSC-307.5	3	3	2	3	2	3	3	3
Average	3	3	2.5	2.75	2.5	3	2.5	2.5

CO-PSO Mapping Matrix for Course Code PG-FSC-307					
PSO CO	PSO1	PSO2	PSO3	PSO4	PSO5
PG-FSC-307.1	3	3	3	2.5	2
PG-FSC-307.2	3	2.5	3	3	3
PG-FSC-307.3	2	3	3	2.5	2
PG-FSC-307.4	2	2.5	3	3	3
PG-FSC-307.5	3	2.5	3	2.5	2
Average	2. 5	2.75	3	2.75	2.5

PG-FSC-308: PRACTICAL(Based on Paper PG-FSC-304)

Course Objectives: The Paper aims to make students aware about the laboratory analysis of alcohol and poisons.

Course Outcomes: At the end of this course, the student will be able to:

PG-FSC-308.1 Learn about practical knowledge on fired Analysis of alcoholic liquor and gasoline as per BIS specifications.

PG-FSC-308.2 Learn to determine range methanol and ethanol in alcoholic liquors and metallic poisons in viscera.

PG-FSC-308.3 Learn about Qualitative Analysis of explosion residues.

PG-FSC-308.4 Learn about extraction of acidic and basic drugs and pesticides from viscera.

CO-PO Mapping Matrix for Course Code PG-FSC-308								
PO CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8
PG-FSC-308.1	3	3	3	2.5	2	3	3	3
PG-FSC-308.2	3	3	2	2.5	3	3	2	2
PG-FSC-308.3	3	3	3	3	2	3	3	3
PG-FSC-308.4	3	3	2	3	3	3	2	2
Average	3	3	2.5	2.75	2.5	3	2.5	2.5

CO-PSO Mapping Matrix for Course Code PG-FSC-308					
PSO CO	PSO1	PSO2	PSO3	PSO4	PSO5
PG-FSC-308.1	3	3	3	2.5	2
PG-FSC-308.2	3	2.5	3	3	3
PG-FSC-308.3	2	3	3	2.5	2
PG-FSC-308.4	2	2.5	3	3	3
Average	2. 5	2.75	3	2.75	2.5

PG-FSC-309: PRACTICAL(Based on Paper PG-FSC-305)
Course Objectives: The Paper aims to make students aware about the measurement of human body and skeleton.
Course Outcomes: At the end of this course, the student will be able to: PG-FSC-309.1 Learn to determine age from skull sutures and teeth. PG-FSC-309.2 Learn to determine sex from pelvis and skull. PG-FSC-309.3 Learn To Perform osteometric measurements on Long bones and craniometric measurement of skull and somatometric measurement on living. PG-FSC-309.4 Learn to identify various body fluids and fibres and hair.

CO-PO Mapping Matrix for Course Code PG-FSC-309								
PO CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8
PG-FSC-309.1	3	3	3	2.5	2	3	3	3
PG-FSC-309.2	3	3	2	2.5	3	3	2	2
PG-FSC-309.3	3	3	3	3	2	3	3	3
PG-FSC-309.4	3	3	2	3	3	3	2	2
Average	3	3	2.5	2.75	2.5	3	2.5	2.5

CO-PSO Mapping Matrix for Course Code PG-FSC-309					
PSO CO	PSO1	PSO2	PSO3	PSO4	PSO5
PG-FSC-309.1	3	3	3	2.5	2
PG-FSC-309.2	3	2.5	3	3	3
PG-FSC-309.3	2	3	3	2.5	2
PG-FSC-309.4	2	2.5	3	3	3
Average	2. 5	2.75	3	2.75	2.5

PG-FSC- 401: FORENSIC PHYSICS

Course Objectives: The Paper aims to study the types, nature and examination of physical evidences of Forensic importance.

Course Outcomes: At the end of this course, the student will be able to:

PG-FSC-401.1 Learn about the tools marks and their examination and restoration of obliterated marks.

PG-FSC-401.2 Study about the types of glass and their composition and forensic examinations of glass fractures

PG-FSC-401.3 Types of paint and their composition and also types of fibres and forensic aspects of fibre examination.

PG-FSC-401.4 Learn theory of voice production and its identification and methods of voice comparison.

CO-PO Mapping Matrix for Course Code PG-FSC-401

PO \ CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8
PG-FSC-401.1	3	3	3	2.5	2	3	3	3
PG-FSC-401.2	3	3	2	2.5	3	3	2	2
PG-FSC-401.3	3	3	3	3	2	3	3	3
PG-FSC-401.4	3	3	2	3	3	3	2	2
Average	3	3	2.5	2.75	2.5	3	2.5	2.5

CO-PSO Mapping Matrix for Course Code PG-FSC-401

PSO \ CO	PSO1	PSO2	PSO3	PSO4	PSO5
PG-FSC-401.1	3	3	3	2.5	2
PG-FSC-401.2	3	2.5	3	3	3
PG-FSC-401.3	2	3	3	2.5	2
PG-FSC-401.4	2	2.5	3	3	3
Average	2. 5	2.75	3	2.75	2.5

PG-FSC- PG-FSC-402: FORENSIC DACTYLOGRAPHY AND OTHER IMPRESSIONS

Course Objectives: The Paper aims to make students learn about fingerprints and various methods for the development of latent prints.

Course Outcomes: At the end of this course, the student will be able to:

PG-FSC-402.1 Learn about the basis of development and morphology of ridged skin, types, and finger prints

PG-FSC-402.2 Study about searching and collection of prints samples of living and deads, and various material for recording prints.

PG-FSC-402.3 Learn different classification system, Henry system of classification and its extension and single digit finger print classification.

PG-FSC-402.4 Learn various methods of development of fingerprints: Physical methods, chemical methods and Biological methods of development of latent prints on skin.

PG-FSC-402.5 Leran about Automatic Finger Print Identification system (AFIS) and its variants, digital Image processing of finger prints and their enhancement.

PG-FSC-402.6 Learn about various other impressions such as tyre impressions and other prints such as lip print and ear print.

CO-PO Mapping Matrix for Course Code PG-FSC-402

PO \ CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8

PG-FSC-402.1	3	3	3	2.5	2	3	3	3
PG-FSC-402.2	3	3	2	2.5	3	3	2	2
PG-FSC-402.3	3	3	3	3	2	3	3	3
PG-FSC-402.4	3	3	2	3	3	3	2	2
PG-FSC-402.5	3	3	3	3	3	3	3	3
PG-FSC-402.6	3	3	2	3	3	3	2	2
Average	3	3	2.5	2.75	2.5	3	2.5	2.5

CO-PSO Mapping Matrix for Course Code PG-FSC-402					
PSO CO	PSO1	PSO2	PSO3	PSO4	PSO5
PG-FSC-402.1	3	3	3	2.5	2
PG-FSC-402.2	3	2.5	3	3	3
PG-FSC-402.3	2	3	3	2.5	2
PG-FSC-402.4	2	2.5	3	3	3
PG-FSC-402.5					
PG-FSC-402.6					
Average	2. 5	2.75	3	2.75	2.5

PG-FSC- PG-FSC-403: ADVANCES IN FORENSIC CHEMISTRY II

Course Objectives: To introduce students about the basic and detailed analysis of narcotic and Psychotropic substances and plants alkaloids.

Course Outcomes: At the end of this course, the student will be able to:
PG-FSC-403.1 Learn about the Narcotic Drugs and Psychotropic Substances
PG-FSC-403.2 Study about basics and analysis of Opiate, cannabis, Barbiturates, Benzodiazepines etc.
PG-FSC-403.3 Learn about the different types of plant alkaloids.
PG-FSC-403.4 Learn about identification and analysis of different plant poisons.
PG-FSC-403.5 Learn about how to use sophisticated techniques for analysis of different poisons.

CO-PO Mapping Matrix for Course Code PG-FSC-403								
PO CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8
PG-FSC-403.1	3	3	3	2.5	2	3	3	3
PG-FSC-403.2	3	3	2	2.5	3	3	2	2
PG-FSC-403.3	3	3	3	3	2	3	3	3
PG-FSC-403.4	3	3	2	3	3	3	2	2
PG-FSC-403.5	3	3	3	3	3	3	3	3
Average	3	3	2.5	2.75	2.5	3	2.5	2.5

CO-PSO Mapping Matrix for Course Code PG-FSC-403					
PSO CO	PSO1	PSO2	PSO3	PSO4	PSO5
PG-FSC-403.1	3	3	3	2.5	2
PG-FSC-403.2	3	2.5	3	3	3
PG-FSC-403.3	2	3	3	2.5	2
PG-FSC-403.4	2	2.5	3	3	3
PG-FSC-403.5	3	2.5	3	2.5	2

	Average	2. 5	2.75	3	2.75	2.5	

PG-FSC- PG-FSC-404: ADVANCES IN FORENSIC BIOLOGY- II

Course Objectives: The Paper aims to make students aware of basics of biological fluids and the immunological responses of the body and their application in forensic examination.

Course Outcomes: At the end of this course, the student will be able to:
PG-FSC-404.1 Learn about immune response, acquired immunity, antigens and antisera.
PG-FSC-404.2 Study about Lectins and their Forensic significance and various method of sterilization.
PG-FSC-404.3 Learn about HLA system, Its applications in paternity testing.
PG-FSC-404.4 Learn about Individualization through various body fluids (Blood Grouping, seminal fluid saliva, urine, faecal matter, vaginal secretions)

CO-PO Mapping Matrix for Course Code PG-FSC-404								
PO CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8
PG-FSC-404.1	3	3	3	2.5	2	3	3	3
PG-FSC-404.2	3	3	2	2.5	3	3	2	2
PG-FSC-404.3	3	3	3	3	2	3	3	3
PG-FSC-404.4	3	3	2	3	3	3	2	2
Averag	3	3	2.5	2.75	2.5	3	2.5	2.5

CO-PSO Mapping Matrix for Course Code PG-FSC-404					
PSO CO	PSO1	PSO2	PSO3	PSO4	PSO5
PG-FSC-404.1	3	3	3	2.5	2
PG-FSC-404.2	3	2.5	3	3	3
PG-FSC-404.3	2	3	3	2.5	2
PG-FSC-404.4	2	2.5	3	3	3
Average	2. 5	2.75	3	2.75	2.5

PG-FSC-405: PRACTICAL(Based on Papers PG-FSC-401 & PG-FSC-402)

Course Objectives: The Paper aims to make students aware about the laboratory analysis of various Physical Evidences.

Course Outcomes: At the end of this course, the student will be able to:
PG-FSC-405.1 Learn about Physical and chemical examination of paints.
PG-FSC-405.2 Learn density gradients method for soil, paint and glass.
PG-FSC-405.3 Collection of plain and rolled inked fingerprints and identification of patterns
PG-FSC-405.4 Learn about various developing methods of fingerprint and their analysis.
PG-FSC-405.5 Learn casting of foot wear/ tyre impression mark and their comparison.

CO-PO Mapping Matrix for Course Code PG-FSC-405								
PO CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8
PG-FSC-405.1	3	3	3	2.5	2	3	3	3
PG-FSC-405.2	3	3	2	2.5	3	3	2	2
PG-FSC-405.3	3	3	3	3	2	3	3	3
PG-FSC-405.4	3	3	2	3	3	3	2	2

| PG-FSC-405.5 | 3 | 3 | 2 | 3 | 2 | 3 | 3 | 3 |
| Average | 3 | 3 | 2.5 | 2.75 | 2.5 | 3 | 2.5 | 2.5 |

CO-PSO Mapping Matrix for Course Code PG-FSC-405					
PSO CO	PSO1	PSO2	PSO3	PSO4	PSO5
PG-FSC-405.1	3	3	3	2.5	2
PG-FSC-405.2	3	2.5	3	3	3
PG-FSC-405.3	2	3	3	2.5	2
PG-FSC-405.4	2	2.5	3	3	3
PG-FSC-405.5	3	2.5	3	2.5	2
Average	2. 5	2.75	3	2.75	2.5

PG-FSC-406: PRACTICAL(Based on Paper PG-FSC-403)
Course Objectives: The Paper aims to make students aware about the laboratory analysis of drugs..
Course Outcomes: At the end of this course, the student will be able to: PG-FSC-406.1 Learn identification of Narcotic Drugs and Psychotropic substances PG-FSC-406.2 Learn analysis of barbiturates, benzodiazepine and amphetamines using UV/Vis spectrophotometer PG-FSC-406.3 Learn Identification of vegetable poisons through microscopy. PG-FSC-406.4 Learn systematic analysis of plant poisons.

CO-PO Mapping Matrix for Course Code PG-FSC-406								
PO CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8
PG-FSC-406.1	3	3	3	2.5	2	3	3	3
PG-FSC-406.2	3	3	2	2.5	3	3	2	2
PG-FSC-406.3	3	3	3	3	2	3	3	3
PG-FSC-406.4	3	3	2	3	3	3	2	2
Average	3	3	2.5	2.75	2.5	3	2.5	2.5

CO-PSO Mapping Matrix for Course Code PG-FSC-406					
PSO CO	PSO1	PSO2	PSO3	PSO4	PSO5
PG-FSC-406.1	3	3	3	2.5	2
PG-FSC-406.2	3	2.5	3	3	3
PG-FSC-406.3	2	3	3	2.5	2
PG-FSC-406.4	2	2.5	3	3	3
Average	2. 5	2.75	3	2.75	2.5

PG-FSC-407: PRACTICAL(Based on Paper PG-FSC-404)
Course Objectives: The Paper aims to make students aware about different types of body fluids and their analysis and also about DNA analysis.

Course Outcomes: At the end of this course, the student will be able to:

PG-FSC-407.1 Learn test for species of origin determination.

PG-FSC-407.2 Learn to determine blood group from stains of blood and various body fluids.

PG-FSC-407.3 Learn to Extraction and isolation of DNA from blood and other body fluids.

PG-FSC-407.4 Learn examination of hair of different animals as cat, dog, cow, horse and goat.

<table>
<tr><td colspan="9">CO-PO Mapping Matrix for Course Code PG-FSC-407</td></tr>
<tr><td>PO
CO</td><td>PO1</td><td>PO2</td><td>PO3</td><td>PO4</td><td>PO5</td><td>PO6</td><td>PO7</td><td>PO8</td></tr>
<tr><td>PG-FSC-407.1</td><td>3</td><td>3</td><td>3</td><td>2.5</td><td>2</td><td>3</td><td>3</td><td>3</td></tr>
<tr><td>PG-FSC-407.2</td><td>3</td><td>3</td><td>2</td><td>2.5</td><td>3</td><td>3</td><td>2</td><td>2</td></tr>
<tr><td>PG-FSC-407.3</td><td>3</td><td>3</td><td>3</td><td>3</td><td>2</td><td>3</td><td>3</td><td>3</td></tr>
<tr><td>PG-FSC-407.4</td><td>3</td><td>3</td><td>2</td><td>3</td><td>3</td><td>3</td><td>2</td><td>2</td></tr>
<tr><td>Average</td><td>3</td><td>3</td><td>2.5</td><td>2.75</td><td>2.5</td><td>3</td><td>2.5</td><td>2.5</td></tr>
</table>

<table>
<tr><td colspan="6">CO-PSO Mapping Matrix for Course Code PG-FSC-407</td></tr>
<tr><td>PSO
CO</td><td>PSO1</td><td>PSO2</td><td>PSO3</td><td>PSO4</td><td>PSO5</td></tr>
<tr><td>PG-FSC-407.1</td><td>3</td><td>3</td><td>3</td><td>2.5</td><td>2</td></tr>
<tr><td>PG-FSC-407.2</td><td>3</td><td>2.5</td><td>3</td><td>3</td><td>3</td></tr>
<tr><td>PG-FSC-407.3</td><td>2</td><td>3</td><td>3</td><td>2.5</td><td>2</td></tr>
<tr><td>PG-FSC-407.4</td><td>2</td><td>2.5</td><td>3</td><td>3</td><td>3</td></tr>
<tr><td>Average</td><td>2. 5</td><td>2.75</td><td>3</td><td>2.75</td><td>2.5</td></tr>
</table>

Principal
Dyal Singh College
KARNAL

DEPARTMENT OF BIO-TECHNOLOGY

PROGRAMME OUTCOMES (POs) AND

COURSE LEARNING OUTCOMES (CLOs)

2023-24

Department of Biotechnology
Programme Outcomes (POs)

1. To develop skills in graduate students to be able to acquire theoretical and practical knowledge in fundamentals of biology in respective disciplines of plants, animals, microbes and environment.

2. To inculcate ability to critically evaluate problems and apply lateral thinking and analytical skills for professional development.

3. To create awareness on ethical issues, good laboratory practices and biosafety.

4. To develop ability in youth for understanding basic scientific learning and effective communication skills.

5. To prepare youth for career in teaching, industry, government organizations and self reliant entrepreneurship.

6. To make students aware of natural resources and environment and its sustainable utilization.

7. To provide learning experience in students that instills deep interest in biological science for the benefit of society.

Programme specific Outcomes (PSOs)

PSO1 : demonstrate the knowledge and understanding of biological sciences i.e. structure and function of biological molecules, biological mechanisms, such as the processes and control of bioenergetics and metabolism, as chemical reactions with engineering technologies to manipulate living organisms and biological systems to produce products that advance healthcare, medicine, agriculture, food, pharmaceuticals and environment control

PSO2 : critically think and correlate the biological knowledge of distribution, morphology and physiology of organisms (animals, plants and microorganisms) to techniques in aseptic procedures, isolation, identification, characterization and modifications to improve quality of life in person as well as community.

PSO3: demonstrate an understanding of the principles of bio- techniques, and exhibit basic professional skills pertaining to biotechnology, carry out laboratory-orientated numerical calculations and analyse biological data (e.g. in enzyme kinetics, molecular structure analysis, microbiological techniques, immunological inferences)

PSO4 : scientific writing and authentic reporting, effective presentation skills and ability to work in a group with cooperation

Department of Biotechnology
Course Learning Outcomes(CLO)
Semester I

Name of the Course: Introduction of Biotechnology

Course Code :B23-BTY-101

Course Type: CC-1 / MCC -1

Level of the course : 100-199

Course Learning Outcomes(CLO):

After completing this course, the learner will be able to:

1. Understand the concepts in biotechnology

2. Gain the knowledge of scope and applications of plant biotechnology

3. Gain the knowledge of scope and applications of animal biotechnology

4. Get an insight of scope and applications of biotechnology in environment, food and chemical industries

5.*Gain knowledge of structure,working, maintenance/calibration and safety measures during handling of biotech lab instruments and biochemicals. Also get insight of maintenance of hygiene/ aseptic conditions and proper disposal of biochemicals.

Name of the Course :Basics of Biomolecules

Course Code :B23-BTY-102

Course Type: MCC -2

Level of the course:100-199

Course Learning Outcomes(CLO):

After completing this course, the learner will be able to:

1. Understand physical and chemical basis of biomolecules involved in life processes.

2. Demonstrate the knowledge of chemical basis of biomolecules, Classify, define, draw structures and correlate to various properties, functions of carbohydrates.

3. Classify, draw structures and correlate the chemical structures of lipids, amino acids, and nucleic acids to their organization, properties and functions.

4. Gain fundamental knowledge of proteins biochemistry.

5*. Practically analyze the samples qualitatively and quantitatively for the presence of various biomolecules.

Name of the Course : Laboratory Techniques & Practices

Course Code : B23-BTY-103

Course Type: CC-M1

Level of the course :100-199

Course Learning Outcomes(CLO):

After completing this course, the learner will be able to:

1. Acquire knowledge of analytical tools and techniques of biotechnology & understanding of good laboratory practices.

2. Handle general & specific problems while processing of experimental material and learn to devise solution by choosing appropriate methodology/biotechnique for processing of biomaterials/products.

3. Exhibit the knowledge of testing the potency of antibiotics / disinfectants /antiseptics and learn aseptic conditions for working in Biotechnology Lab.

4. Understand the biochemical and microbiological techniques essential for working in a biotechnological laboratory.

5*. Acquire knowledge of working and hands-on training of tools and techniques of biotechnology labs.

Name of the Course :Biology-I

Course Code : B23-BTY-104

Course Type: MDC-1

Level of the course :100-199

Course Learning Outcomes(CLO):

After completing this course, the learner will be able to:

1. Understand the structures and purposes of basic components of prokaryotic and eukaryotic cells, especially macromolecules, membranes, and organelles.

2 Know about features of biodiversity in the living world and their biological classification describing the principal theories of taxonomy

2. Describe the unique characteristics of Kingdom Plantae and classify Kingdom Plantae into different groups.

3. Demonstrate knowledge of the principles of animal nomenclature and terminology by explaining the process, procedures, and purpose of the scientific classification of animals.

5*. Learn practical skills on basic Biology practical like parts of microscope, slide preparation, identify plants and

animals using models and specimens.

Department of Biotechnology
Course Learning Outcomes(CLO)
Semester II

Name of the Course : General Microbiology

Course Code :B23-BTY-201

Course Type: CC-2 /MCC -3

Level of the course :200-299

Course Learning Outcomes (CLO):

After completing this course, the learner will be able to:

1 Illustrate the knowledge of history, scope, classification and various approaches of study of microbes. Compare and characterize prokaryotic and eukaryotic cells based on morphology, different groups of microorganisms based on their structures.

2 Illustrate the knowledge of microbial growth, reproduction and exhibit skill of isolation, purification, and preservation of microbial cultures.

3 Gain the knowledge of characteristics of viruses, their types and mode of multiplication. Also understand the various control measures of microbes.

4 Understand the role of micro-organisms in the environment, for making industrially important fermented foods and also gain the knowledge of spoilage of food and food borne diseases.

5. Exhibit practical skills in preparation of media and staining of microbes, Isolate bacteria from different sources and determine their count and cell size. Testing of antibiotic sensitivity and MIC value.

Name of the Course :Diagnostic Laboratory techniques

Course Code :B23-BTY-202

Course Type: DESC-1

Level of the course :200-299

Course Learning Outcomes(CLO):

After completing this course, the learner will be able to:

1. Comprehensive introduction to various laboratory techniques used in diagnostics.

2. To learn essential skills, specimen collection and handling.

3. Microscopy, hematology, clinical biochemical tests, microbiology and infectious disease testing, as well as point-of-care testing and emerging technologies.

4. The course emphasizes hands-on laboratory experience, safety protocols, and quality control measures to ensure accurate and reliable diagnostic results.

5. Hands-on laboratory experience, safety protocols, and quality control measures to ensure accurate and reliable diagnostic results.

Name of the Course : Introduction of Biological Chemistry

Course Code : B23-BTY-203

Course Type: CC-M2

Level of the course :200-299

Course Learning Outcomes(CLO):

After completing this course, the learner will be able to:

1 Gain a firm foundation in fundamentals of chemistry.

2. Understand chemical reactions and energy changes during reactions.

3. Exhibit knowledge of light and matter interactions, chemical bonding, states of matter, acids, bases and buffers.

4. Understand types of organic reactions, concept of isomerism and redox reactions.

5 Hands-on chemistry laboratory experience and safety protocols along with preparation of chemicals stocks and working solutions

Name of the Course : Biology - II

Course Code : B23-BTY-204

Course Type :MDC-2

Level of the course :200-299

Course Learning Outcomes(CLO):

After completing this course, the learner will be able to:

1. Students will understand the physiological processes taking place at the level of the cell, organ and the whole plant, will get knowledge of Interaction of light with green plant parts, preparation of food etc.

2. Students will describe how plants obtain the reactants needed for respiration, including the role of the roots and the stomata, functions of various plant hormones in plant development.

3. Students will learn the structure of major human organs surrounding respiratory, circulatory and excretory systems and explain their role in the maintenance of healthy individuals

4.Students will learn the structure of major human organs surrounding musculoskeletal and nervous system and explain their role in the maintenance of healthy individuals.

5*. Students will be able to learn practical skills on basic Biology practical like root slide preparation, chromatography, biochemical tests, mitosis and various models.

B-BTY-203: PRACTICAL (SEMESTER I & II)

Course Objectives: The aim of this course is to learn the concepts of biotechnology, biochemistry, microbiology and enzymology by practical experimentation.

Course Outcomes: At the end of this course, the student will be able to:

B-BTY-203.1Demonstrate the working of various instruments and techniques used in biotechnology as well as will be able to analyze carbohydrates, proteins, lipids and vitamins from a sample both qualitatively and quantitatively

B-BTY-203.2prepare nutrient media and will be able to estimate the total count of microorganisms from a sample

CO-PO Mapping Matrix for Course Code: B-BTY-203

Cos#	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
B-BTY-203.1	3	3	3	3	3	3	3	3	3	2	3
B-BTY-203.2	3	3	3	3	3	2	3	3	3	3	3
Average	3	3	3	3	3	2.5	3	3	3	2.5	3

CO-PO Mapping Matrix for Course Code: B-BTY-203

Cos#	PSO1	PSO2	PSO3	PSO4	PSO5
B-BTY-203.1	3	3	3	2	3
B-BTY-203.2	3	3	2	3	3
Average	3	3	2.5	2.5	3

B-BTY- 301: IMMUNOLOGY

Course objectives: To introduce the basic concept of Immunology.

Course outcomes:

B-BTY-301.1 Conceptualize how the innate and adaptive immune responses coordinate to fight invading pathogens.

B-BT-301.2 Understand and describe antigen, antibodies interactions, and generation of immune cells responses, and hybridoma technology for the production of monoclonal antibodies, recombinant antibodies, and different types of vaccines.

CO-PO Mapping Matrix for course code: B-BTY-301

Cos#	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
B-BTY-301.1	3	3	2	3	3	2	2	2	2	3	2
B-BTY-301.2	3	2	3	3	2	3	2	2	2	2	2
Average	3	2.5	2.5	3	2.5	2.5	2	2	2	2.5	2

CO-PSO Mapping Matrix for course code: B-BTY-301

Cos#	PSO1	PSO2	PSO3	PSO4	PSO5
B-BTY-301.1	3	3	2	3	3
B-BTY-301.2	3	2	3	3	3
Average	3	2.5	2.5	3	3

B-BTY- 302: MOLECULAR BIOLOGY
Course objectives: To introduce the basic concept of Molecular Biology
Course outcomes: B-BTY-302.1 Elaborate the central dogma of life, the general principles of gene organization and describe the structure and functions of proteins involved in replication and repair mechanisms B-BT-302.2Give an insight of the process of gene expression, mechanism of transcription, post-transcriptional processing of RNA in prokaryotes; Describe and correlate the concept of genetic code and mechanism of translation in prokaryotes

CO-PO Mapping Matrix for course code: B-BTY-302

Cos#	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
B-BTY-302.1	3	3	2	3	3	2	2	2	2	3	2
B-BTY-302.2	3	2	3	3	2	3	2	2	2	2	2
Average	3	2.5	2.5	3	2.5	2.5	2	2	2	2.5	2

CO-PSO Mapping Matrix for course code: B-BTY-302

Cos#	PSO1	PSO2	PSO3	PSO4	PSO5
B-BTY-302.1	3	3	2	3	3
B-BTY-302.2	3	2	3	3	3
Average	3	2.5	2.5	3	3

B-BTY- 401: Recombinant DNA Technology
Course objectives: To introduce the basic concept of Recombinant DNA Technology
Course outcomes: B-BTY-401.1 Give insight of the principles and applications of the molecular tools used in recombinant DNA technology B-BT-401.2Elaborate the process and applications of genetic engineering in animals

CO-PO Mapping Matrix for course code: B-BTY-401

Cos#	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
B-BTY-401.1	3	3	2	3	3	2	2	2	2	3	2
B-BTY-401.2	3	2	3	3	2	3	2	2	2	2	2
Average	3	2.5	2.5	3	2.5	2.5	2	2	2	2.5	2

CO-PSO Mapping Matrix for course code: B-BTY-401

Cos#	PSO1	PSO2	PSO3	PSO4	PSO5
B-BTY-401.1	3	3	2	3	3
B-BTY-401.2	3	2	3	3	3
Average	3	2.5	2.5	3	3

B-BTY- 402: Bioinformatics
Course objectives: The aim of this course is to introduce the students to the basics of bioinformatics. This includes teaching the basis of the biological system via information and technology.
Course outcomes: B-BTY-402.1 Know about basic tools and concepts of Bioinformatics and their significance in applied and basic Biology. They will also learn application of various bioinformaticstools B-BTY-402.2Develop concept of sequence alignment, matrix, algorithms and tools to generate more accurate predictions of various Biological data.Have overview about molecular level phylogenetics, Proteomics, Genomics and Human Genome Project.

CO-PO Mapping Matrix for course code: B-BTY-402

Cos#	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
B-BTY-402.1	3	3	2	3	3	2	2	2	2	3	2
B-BTY-402.2	3	2	3	3	2	3	2	2	2	2	2
Average	3	2.5	2.5	3	2.5	2.5	2	2	2	2.5	2

CO-PSO Mapping Matrix for course code: B-BTY-401

Cos#	PSO1	PSO2	PSO3	PSO4	PSO5
B-BTY-402.1	3	3	2	3	3
B-BTY-402.2	3	2	3	3	3
Average	3	2.5	2.5	3	3

B-BTY- 403: Practical (Sem III +IV)
Course objectives: The aim of this course is to introduce the students how to apply the theoretical knowledge in the practical world.
Course outcomes: B-BTY-403.1 Isolate DNA from plants and bacteria, plasmid DNA. B-BTY-403.2Perform various tests to identify infectious diseases and blood typing immunoassays such as Western Blotting, ELISA for diagnosis of various diseases.

CO-PO Mapping Matrix for course code: B-BTY-403

Cos#	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
B-BTY-403.1	3	3	2	3	3	2	2	2	2	3	2
B-BTY-403.2	3	2	3	3	2	3	2	2	2	2	2
Average	3	2.5	2.5	3	2.5	2.5	2	2	2	2.5	2

CO-PSO Mapping Matrix for course code: B-BTY-404

Cos#	PSO1	PSO2	PSO3	PSO4	PSO5
B-BTY-403.1	3	3	2	3	3
B-BTY-403.2	3	2	3	3	3
Average	3	2.5	2.5	3	3

B-BTY- 501: Animal Biotechnology

Course objectives: The aim of this course is to introduce the students to animal Biotechnology

Course outcomes:
B-BTY-501.1 exhibit the knowledge of the basic concepts of animal biotechnology; animal cell and tissue culture technology, principles and applications
B-BTY-501.2 Elaborate the techniques and applications of invitro fertilization and transgenic animals. Describe thetechniques of transfection and applications in production of vaccines and gene therapy.

CO-PO Mapping Matrix for course code: B-BTY-501

Cos#	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
B-BTY-501.1	3	3	2	3	3	2	2	2	2	3	2
B-BTY-501.2	3	2	3	3	2	3	2	2	2	2	2
Average	3	2.5	2.5	3	2.5	2.5	2	2	2	2.5	2

CO-PSO Mapping Matrix for course code: B-BTY-501

Cos#	PSO1	PSO2	PSO3	PSO4	PSO5
B-BTY-501.1	3	3	2	3	3
B-BTY-501.2	3	2	3	3	3
Average	3	2.5	2.5	3	3

B-BTY- 502: Plant Biotechnology

Course objectives: The aim of this course is to introduce the students to Plant Biotechnology
Course outcomes:
B-BTY-502.1Elaborate the basic concept of plant tissue culture, different aseptic conditions, culture media and their supplements
B-BTY-502.2 Describe different types of plant culture (tissue, organ and protoplast) and various techniques such as micropropagation, totipotency, somaclonal variation, their applications and limitations.

CO-PO Mapping Matrix for course code: B-BTY-502

Cos#	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
B-BTY-502.1	3	3	2	3	3	2	2	2	2	3	2
B-BTY-502.2	3	2	3	3	2	3	2	2	2	2	2
Average	3	2.5	2.5	3	2.5	2.5	2	2	2	2.5	2

CO-PSO Mapping Matrix for course code: B-BTY-502

Cos#	PSO1	PSO2	PSO3	PSO4	PSO5
B-BTY-502.1	3	3	2	3	3
B-BTY-502.2	3	2	3	3	3
Average	3	2.5	2.5	3	3

B-BTY-601: MICROBIAL BIOTECHNOLOGY

Course Objectives: The aim of this course is to create a general understanding of microbial technology including the role of microbes in biotechnology and their application in various industries.

Course Outcomes: At the end of this course, the student will be able to:

B-BTY-601.1 Understand the basic techniques of isolation and cultivation of microbes, their growth kinetics and microbial bioreactors

B-BTY-601.2 Know the applications of microbes in production of various industrial products, agriculture medicine and bioremediation.

CO-PO Mapping Matrix for Course Code: B-BTY-301

Cos#	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
B-BTY-601.1	2	3	3	2	3	3	3	3	3	3	2
B-BTY-601.2	2	3	3	3	3	3	3	3	3	3	2
Average	2	3	3	2.5	3	3	3	3	3	3	2

CO-PO Mapping Matrix for Course Code: B-BTY-301

Cos#	PSO1	PSO2	PSO3	PSO4	PSO5
B-BTY-601.1	2	3	3	2	3
B-BTY-601.2	2	3	3	2	3
Average	2	3	3	2	3

B-BTY-602: PRACTICAL (SEMESTER V & VI)

Course Objectives: The aim of this course is to develop practical skill and acquaint with recent knowledge and techniques in the field of microbial biotechnology and enzymology

Course Outcomes: At the end of this course, the student will be able to:

B-BTY-602.1 learn and perform the basics of microbial culturing, its applications and enzyme action through various experiments

B-BTY-602.2 Imbibe the value of team spirit and as well as work independently to write and manage their research experimentation.

CO-PO Mapping Matrix for Course Code: B-BTY-302

Cos#	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
B-BTY-601.1	3	3	3	3	3	3	3	3	3	2	3
B-BTY-601.2	3	3	3	3	3	2	3	3	3	3	3
Average	3	3	3	3	3	2.5	3	3	3	2.5	3

CO-PO Mapping Matrix for Course Code: B-BTY-302

Cos#	PSO1	PSO2	PSO3	PSO4	PSO5
B-BTY-601.1	3	3	3	2	3
B-BTY-601.2	3	2	3	3	3
Average	3	2.5	3	2.5	3

B-BTY-603: PROJECT (IN-HOUSE)
Course Objectives: The aim of this course is to provide practical understanding and hands-on training of various techniques of biotechnology by undertaking a research based problem
Course Outcomes: At the end of this course, the student will be able to: B-BTY-603.1 imbibe the knowledge of practical applications of biotechnology B-BTY-603.2 learn to work in a team and will be able to write a project report scientifically.

CO-PO Mapping Matrix for Course Code: B-BTY-603

Cos#	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
B-BTY-603.1	3	2	3	3	3	3	3	3	3	3	3
B-BTY-603.2	3	3	3	3	3	2	3	3	3	3	3
Average	3	2.5	3	3	3	2.5	3	3	3	3	3

CO-PO Mapping Matrix for Course Code: B-BTY-603

Cos#	PSO1	PSO2	PSO3	PSO4	PSO5
B-BTY-603.1	3	3	3	3	3
B-BTY-603.2	2	3	2	3	3
Average	2.5	3	2.5	3	3

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